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Artificial Intelligence for Sustainable Finance and Sustainable Technology

Proceedings of ICGER 2021

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Foreword

A new era is upon us. The era of the digital economy has only accelerated due to the underlying effects of the global COVID-19 pandemic. The core of this new normal is technology. Transition to smart cities and sustainable economies is associated with the process of holistic transformation of the economic and socio-technological systems intended to increase its environmental sustainability and social equality. Artificial intelligence (AI) is changing the shape of technology and businesses in terms of global productivity, diversity, and equal opportunities, environmental and social outcomes in both the short and long run. Moreover, digital transformation is revamping business models by creating new revenue streams in new ways. This Industry 4.0 paradigm has brought a new way of thinking about innovation within firms.

Digitalization connects to digital innovation, where information technologies play a vital role and involve different stakeholders, characterized by transformation, Internet of things, big data, and knowledge management. There is a dire need for businesses, organizations, and societies to adapt to these changes that can cause resistance and culture shifts. Consequently, in this context, the emergence of AI and its impact on many sectors, mainly the financial sector, requires further investigation in terms of its progressively wider effect on the achievement of the United Nation's Sustainable Development Goals (SDGs).

Academics and professionals world wide are still looking for the ultimate answer to sustainability and sustainable development. This book provides a discussion forum and takes on a modern approach to artificial intelligence in the era of digitalization. It provides diverse insights into various concepts and explores five main themes related to sustainability in the age of the digital economy. These include digitalization, AI and sustainable technologies, AI and sustainable finance, sustainability and governance, and finally big data and security. It discusses relevant and important topics related to the implications of digitalization on societies,

organizations, banking, education, and entrepreneurship. This book offers holistic knowledge to practitioners, entrepreneurs, boards of directors, policymakers, academics, educational institutions, and students.

Abdalmuttaleb M. A. Musleh Al-Sartawi
Conference chair

Preface

The International Conference on Global Economic Revolutions (ICGER 2021) conference's call for papers asked for submissions in full research papers centering around the theme: 'the era of the digital economy.' Accordingly, a diverse variety of submissions were received. The submissions were refereed in a double-blind process by at least two specialized scholars in the relevant fields. The ICGER conference received a total of 113 submissions. However, only 60 papers were accepted with an acceptance rate of 53 %.

This book, which is the final set of proceedings, has been structured according to five main tracks: 1. Artificial Intelligence and Sustainable Finance, 2. Artificial Intelligence and Sustainable Technology, 3. Sustainability and Governance, 4. Big Data, Blockchain and Security, and finally, 5. Digitalization.

The papers in Track 1 discusse diverse topics in sustainable finance and technology. The works here deal with financial technology in the Arab region and the GCC. Chapter 1 delves into the effectiveness of applying Fintech application in Bahrain, while Chapter 2 explores the usage of artificial intelligence in Arab Financial Institutions. Other works included in the track provide insights into computing financial performance of freight transportation in India. Moreover, Chapter 18, for example, offers perspectives on COVID-19 and Islamic social finance instruments in Nigeria.

The papers in Track 2 address sustainable technologies in the digital economy and discuss topics related to crowdsourced technologies as tools for environmental enforcement. Other works explore the efficacy of machine learning in intrusion detection as well as smart universities in the Arab region.

The papers in Track 3 provide novel insights into works related to critical governance issues in the digital economy such as corporate governance and real earnings management, Takaful regulatory frameworks, gender diversity, and ethical concerns in artificial intelligence.

The works in Track 4 explore topics related to the foundation of the digital economy: big data, blockchain, and security. While Chapter 39 delves into blockchain in environmental compliance and enforcement, Chapter 45 carefully discusses the issue of the innovation resistance theory and the case of cryptocurrencies.

Finally, Track 5 addresses the core theme of the conference, which is digitalization. The papers discuss vital topics such as the role of social responsibility in the digital PR age and the e-role of artificial intelligence in entrepreneurship. Other interesting topics include an interview with a serial digital entrepreneur and the implication of cyber-security in the digital economy.

It is noteworthy to mention that the success of the ICGER 2021 conference on 'Artificial Intelligence for Sustainable Finance and Sustainable Technology,' which was held on September 15–16, 2021, depended on the hard work and support of the various individuals, committees, and organizations. I would like to take this opportunity to applaud the guidance and support provided by the Abdulla Y. Al-Hawaj, Godfather and Founding President of Ahlia University, and Mansoor Alaali, President of Ahlia University.

Abdalmuttaleb M. A. Musleh Al-Sartawi

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The Effectiveness of Applying Fintech Application in Bahrain: Theoretical Perspective

Sameh Reyad[1(✉)] and Mohamed Alsayed[2]

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Abstract. The aim of this research is to discover the products and applications that Fintech offers and to point out the importance of following Fintech products. The research framework contains of the independent variable which is the Fintech applications and the dependent variable which is the Bahrain business. The study recommends to run a study regarding the Fintech in different areas to see the different effects the applications are making, make special study about Fintech and its future in Bahrain since it is one of few countries adopting the concept of Fintech, generate more hypothesis for testing in order to cover more discoverable points such as Fintech and financial stability and Fintech with economic situation and interview banks that has adopted the Fintech concept and run a case study about them.

Keywords: Fintech · Organizational effectiveness · Bahrain

1 Introduction

Technology is playing a huge role in many sectors such as the education sectors, the business and the financial sectors [5]. And for that, technology has been involved in many of the advancement of the sectors it is involved in. this also helped the technology not to be considered as a sole entity, but it merged with those sectors due to the large effect it made and the many enhancements experienced by its users [2, 3]. At the same time, the financial sector is working hard to provide easy to use processes and services for its users. This include many payment services and financial products that could be processed with a touch of a button. This was due to the introduction of Fintech, the financial technology [12].

Nevertheless, Bahrain had been adopting the Fintech technology by merging it into the banking and finance section. It also used the official guidelines provided by the Central Bank of Bahrain (CBB) to regulate the services in order to guarantee the quality of service and ensure a secure usage of the technology. For that, the suggested topic for this research will be discussing the impact of Fintech applications in Bahrain. The study will be introduced in this chapter. The introduction includes the importance of the

research, the research questions and the objectives of the study. The study has its own significance including the financial and banking sectors and their customers as the end users will benefit a lot of it.

The topic of Fintech is a raising one in recent years. With technology being enabled in the hand of most of the people. And with the changes most of Banking and Finance institutions are trying to make, Fintech is becoming more important than any time before.

2   Important of Fintech

According to [10] proposed in their study to clarify the role of "Fintech digital banking start-ups in the financial industry. The results indicate a positive relationship exists between the growth in Fintech funding or deals and the contemporaneous stock returns of incumbent retail banks. Although these results suggest complementarity between Fintech and traditional banking, we note that our results at the banking industry level are not statistically significant, and that the coefficient signs for about one-third of the banks are negative, but not statistically significant. Since the Fintech industry is young and our sample period short, we cannot rule out that our findings are spurious".

Also, [11] said that "worldwide economy, developing significance of advancements just as wide utilization of innovations have changed the financial business around the world. Monetary innovations (Fintech) have become an indispensable piece of banking, and these days banks have begun to contend past monetary administrations confronting expanding rivalry from nonfinancial organizations giving, for instance, installment administrations. Start-up specialist co-ops, web crawlers, and interpersonal organizations have extended their administrations "meddling" in the fields generally covered by banks. The fast ascent of Fintech has changed the business scene in financial requesting more creative arrangements [6, 7]. These new inclinations require the banks to expand interest in Fintech, reexamine administration conveyance channels, particularly the business-to-purchasers models, increment further normalization of administrative center capacities, and so forth A few individuals from the monetary administrations industry consider the to be in Fintech as a danger to customary financial industry. Others accept that Fintech has become a test that can be transformed into a chance as it gives greater adaptability, better usefulness in certain spaces, and total of administrations. The point of the paper is to dissect the new patterns in banking, recognizing openings and dangers of Fintech for banks. An opportune incorporation of Fintech into business permits banks to get a benefit in developing rivalry. This paper gives a broad investigation of ongoing patterns in Fintech and banking, analyzing experience of driving European and US banks, just as studies led among individuals from the monetary administrations industry in various nations. The creators have examined the advancement of the monetary development and innovation market, surveyed the current practices applied in the field of Fintech, distinguished the fundamental dangers identified with improvement of Fintech and monetary advancements the banks are presented to on the miniature and macrolevel. The paper gives suggestions to controllers and banks to guarantee decrease of dangers related with advancement of Fintech. Examination of Fintech market has shown developing rivalry, including from nonfinancial organizations. The paper gives useful proposals to

business banks for reinforcing the situation in monetary advancements and controlling the dangers related with presentation of monetary developments".

Furthermore, [4] aimed in their study to "explore the determinants of perceived benefit and perceived risk of Islamic Fintech. Second, this study examines the influence of perceived benefit, perceived risk and user trust on the intention to adopt Islamic Fintech. The sample of 350 was distributed among the respondents, while a usable sample of 321 was retained for the analysis. The study performed a self-administration survey to collect the sample data while the hypothesized model was tested using SmartPLS. The results revealed that perceived benefit and perceived risk were significant and positively influenced by their factors. Moreover, perceived benefits showed a positive and significant impact on trust. However, perceived risk had a negative and significant impact on trust. The results also found a strong positive and significant relationship between trust and intention to adopt Islamic Fintech".

3 Fintech in Bahrain

[5] stated that "financial technology (Fintech) has developed rapidly over the last decade. In the Kingdom of Bahrain, both public and private sectors have adopted Fintech in different ways. The objective of this research is to explore and assess Bahraini users' adoption of and satisfaction with Fintech services. A model was built to quantify Fintech users' satisfaction. and a questionnaire was used to collect data; 319 responses were returned. The outcome was that all the factors investigated, accessibility, ease of use, completeness, accuracy, security, reliability, responsiveness, service quality, system quality, and information quality, have a significant positive effect on user satisfaction. The contribution of this research is the model of satisfaction for Fintech that can be applied in different countries. The proposals recommended by the authors will also inform government and concerned organizations about Fintech in Bahrain for greater user satisfaction".

In addition, [13] stated that "sustainability has been a critical concept in various sectors of the economy. Given the importance of banking sector in Bahrain and its significant contribution to the GDP, we explore the sustainability in Bahrain's Banking sector. The findings show that there is an evidence, both at a macro level such as the initiatives by Bahrain Association of Banks and Bahrain Fintech Bay and at a micro level by some retail banks, of sustainability in Bahrain's Banking sector. However, there is a need for additional enrichment and enhancement of the concept in all banks in Bahrain. We also highlight some challenges facing the further development of sustainability in banking sector such as short-termism, lack of legal framework and need of clear definition to sustainability".

4 The Effectiveness of Applying Fintech

[1] says that Expectation Confirmation Model, Technology Acceptance Model, and Cognitive Model are viewed as the most popular frameworks that discuss the continuous intention to use information system. The combination of these three models has

led to the creation of Technology Continuance Theory (TCT). [9] said that Fintech is a specific type of Financial Technology, defined as technology used to provide financial markets a financial product or financial service, characterized by sophisticated technology relative to existing technology in that market. [8] suggested that there is substantial value creation in further exploring the dynamics, mechanisms and social consequences of Fintech.

Also, [10] found a positive relationship exists between the growth in Fintech funding or deals and the contemporaneous stock returns of incumbent retail banks. [11] study provides practical recommendations to commercial banks for strengthening the position in financial innovations and controlling the risks associated with introduction of financial innovations. [4] provided a result that a strong positive and significant relationship between trust and intention to adopt Islamic Fintech. In addition, [10] said that all the factors investigated, accessibility, ease of use, completeness, accuracy, security, reliability, responsiveness, service quality, system quality, and information quality, have a significant positive effect on user satisfaction. [13] study findings show that there is an evidence, both at a macro level such as the initiatives by Bahrain Association of Banks and Bahrain Fintech Bay and at a micro level by some retail banks, of sustainability in Bahrain's Banking sector.

5   Conclusion

The literature review which handled the topics of applications of Fintech and the importance of Fintech along with a review of the literature and available work done in this field. The aim of this research is to discover the products and applications that Fintech offers and to point out the effectiveness of applying Fintech products. The research framework contains of the independent variable which is the Fintech applications and the dependent variable which is the Bahrain business. The previous studies revealed that there is significant relationship between Fintech applications and Bahrain businesses.

References

1. Abdul Rahim, N.F., Jaaffar, A.R., Sarkawi, M.N., Shamsuddin, J.B.: Fintech and commercial banks development in Malaysia: continuous intention to use fintech services in IR 4.0 environment. In: Sergi, B.S., Jaaffar, A.R. (eds.) Modeling Economic Growth in Contemporary Malaysia (Entrepreneurship and Global Economic Growth), pp. 235–253. Emerald Publishing Limited, Bingley (2021)
2. Kerényi, A., Molnár, J.: The impact of the fintech phenomenon – radical change occurs in the financial sector? Finan. Econ. Rev. **16**(3), 32–50 (2017)
3. Alansari, Y., Al-Sartawi, A.: IT governance and E-banking in GCC listed banks. Procedia Comput. Sci. **183**, 844–848 (2021)
4. Ali, M., Raza, S.A., Khamis, B., Puah, C.H., Amin, H.: How perceived risk, benefit and trust determine user Fintech adoption: a new dimension for Islamic finance. Foresight **23**, 403–420 (2021)

5. Ali, H., Al Kaabi, R., Ali, H.M., Ahmed, H.S., Naser, M.: Fintech in the kingdom of Bahrain: an investigation of users' adoption and satisfaction. In Albastaki, Y.A., Razzaque, A., Sarea, A.M. (ed.) Innovative Strategies for Implementing Fintech in Banking, pp. 174–190. IGI Global, Hershey (2021). https://doi.org/10.4018/978-1-7998-3257-7.ch011

6. Haddad, C., Hornuf, L.: The emergence of the global Fintech market: economic and technological determinants. Small Bus. Econ. **53**, 81–105 (2019)

7. Hannoon, A., Al-Sartawi, A., Khalid, A.: Relationship between financial technology and financial performance. In: Musleh Al-Sartawi, A.M.A. (ed.) The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. SCI, vol. 974, pp. 337–344. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-73057-4_26

8. Hua, X., Huang, Y., Zheng, Y.: Current practices, new insights, and emerging trends of financial technologies. Ind. Manag. Data Syst. **119**(7), 1401–1410 (2019)

9. Knewtson, H.S., Rosenbaum, Z.A.: Toward understanding Fintech and its industry. Manag. Finan. **46**(8), 1043–1060 (2020)

10. Li, Y., Spigt, R., Swinkels, L.: The impact of Fintech start-ups on incumbent retail banks' share prices. Finan. Innov. **3**, 26 (2017)

11. Romānova, I., Kudinska, M.: Banking and fintech: a challenge or opportunity? In: Contemporary Issues in Finance: Current Challenges from Across Europe, Contemporary Studies in Economic and Financial Analysis, vol. 98, pp. 21–35. Emerald Group Publishing Limited (2016)

12. Musleh Al-Sartawi, A.M., Razzaque, A., Kamal, M.M. (eds.): Artificial Intelligence Systems and the Internet of Things in the Digital Era: Proceedings of EAMMIS 2021. Springer International Publishing, Cham (2021)

13. Abdulla, Y., Ebrahim, R., Naser, H.: Sustainability in the banking sector: the case of Bahrain. In: 2020 Second International Sustainability and Resilience Conference: Technology and Innovation in Building Designs, Sakheer, Bahrain, vol. 51154, pp. 1–4 (2020). https://doi.org/10.1109/IEEECONF51154.2020.9319949

The Usage of Artificial Intelligence in Arab Financial Institutions

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Abstract. The global banking sector has undergone a radical transformation as a result of the implications of the rapid digital development imposed by the twenty-first century. Artificial intelligence is emerging as one of the most effective technologies that have a strong and tangible impact that will make a comprehensive change in the global business environment. The Study revealed that the Arab world is witnessing a major shift towards digital banks in the coming years in the Arab markets, especially the Gulf, with the world's tendency towards artificial intelligence, which may open the door for the disappearance of traditional banks, especially since digital transformation will reduce spending by reducing traditional bank branches.

Keywords: Artificial intelligence · Financial institutions · Banks

1 Introduction

Artificial intelligence has brought about pivotal changes in the patterns of customer interaction in the banking sector. Many financial institutions have created customer service models for them to use by integrating chatbots [13].

There has been a lot of talk in recent times about advanced technology and its impact on various sectors [12]. However, it has become recognized that business enterprises must keep abreast of all developments in the field of technical innovation, which is developing at an accelerated pace that would require a permanent update of the strategies and plans drawn by these institutions, in order to be able to keep pace with future developments in a timely manner [26].

Artificial intelligence is currently changing and reshaping the way we interact with the world and business in general. Current estimates indicate that at least 30% of all companies around the world will start integrating some form of artificial intelligence into their business model by 2022. Some recent studies also indicate interesting facts in this regard [15], for example that about 85% of interactions customers with companies that they do business through artificial intelligence tools instead of the human element [17]. The situation is no different in the financial services industry, as we clearly notice the increasing number of financial institutions seeking to benefit from artificial intelligence applications in order to simplify the performance of operations and services for their customer base. In parallel with the development of artificial intelligence concepts, we can expect that the services provided by financial institutions to their customers will also witness a technological breakthrough in the coming years [12]. In this article, we

will try to shed light on the way in which financial institutions benefit from AI applications with the aim of providing a better customer experience and developing the services provided [35]. Financial institutions continue to harness artificial intelligence techniques to enhance customer experience, and to provide specialized, quality and efficient services to achieve the highest levels of customer satisfaction [33], while gaining customer loyalty remains the most important factor in this process. It can be said that financial institutions are now more able to predict customer trends and behaviors, because of innovative artificial intelligence technologies that enhance the ability to develop and provide customized products and services that meet changing needs [20]. Digital development is one of the most important pillars of the future of the financial and banking sector, as customers are increasingly moving towards implementing their banking transactions through electronic applications and smart solutions. Within this framework, both artificial intelligence and financial technology have the real potential to transform the structure of traditional financial services [17]. Fintech can make financial services faster, cheaper, more secure, transparent and accessible, especially for the large segment of the population that does not deal with the banking sector. On the other hand, the speed of development in financial technology services and emerging companies that provide innovative financial solutions that simulate what the banking sectors offer and simplify banking operations, constitutes a threat that must be guarded against and take all precautionary measures that achieve the safety [7], integrity and stability of the banking and financial sector, as technology represents finance and its various applications, opportunities and challenges at the same time for financial institutions and Banks [15]. As for the use of artificial intelligence in financial and banking services, it would reduce operational costs and improve the performance and profitability of Banks. Therefore, most institutions seek to invest in the applications and tools of modern financial technology and "financial artificial intelligence" [5]. According to PwC, artificial intelligence is expected to contribute about $ 15.7 trillion to the global economy in 2030, divided into $ 6.6 trillion that comes from high productivity rates and $ 9.1 trillion as a result of increased consumption in light of the high level of quality of goods produced [3]. At the Arab level, the region's share is expected to reach 2%, as artificial intelligence applications will contribute about $ 320 billion to the economy of the Middle East by 2030, equivalent to 11% of GDP [17].

Over the past few years, the financial technology sector has revolutionized the global financial systems, as emerging companies in the field of financial technology have succeeded in providing a variety of financial services, including payments services, digital currencies and money transfer, as well as lending, crowdfunding and wealth management in addition to insurance services [31]. Therefore, financial institutions and Financial institutions seek to introduce some changes in their business models by expanding the adoption of technology and investing in their own infrastructure, and perhaps entering into partnerships with emerging companies to improve their competitiveness and increase reliance on modern technology in providing financial services [11]. Here, the importance of the availability of the legislative, regulatory and supervisory framework that allows the development and operation of financial technology and financial artificial intelligence business models, and which enables the supervisory and regulatory authorities to reduce risks and provide growth opportunities in a competitive environment [10].

Definition of Financial Technology and Artificial Intelligence

As for artificial intelligence, since its inception in 1956, it has been known as the intelligence shown by machines and programs to simulate human mental capabilities and patterns of work, such as the ability to learn, deduce and react. It is the ability of a machine to simulate the human mind and its way of working, such as its ability to think, discover and benefit from previous experiences [12]. Artificial intelligence is defined as "computer devices and systems designed to work in a way that can be considered intelligent [8]. It includes technological patterns that simulate human performance through learning and reaching their own conclusions, by understanding complex contents, engaging in dialogues with humans, enhancing human cognitive performance [6]. The Financial Stability Board defined financial technology as: "Financial innovations using technology that can create new business models, applications, processes or products that have a tangible material impact on financial markets and institutions, and on the provision of financial services [7]." Several factors have driven innovation in the field of financial technology, most notably developments in technology, in addition to the spread of mobile, smart phones and the use of the Internet [14].

Advantages of Using Artificial Intelligence in Banks

The benefit from the use of artificial intelligence techniques in the banking sectors is to increase customer demand, help customers achieve all their demands, try to help answer all customer questions and inquiries [8], the presence of great trust between the customer and the bank that provides the service, in addition to these technologies that do not allow the presence of which mistake [24]. Also, as a result of using these technologies, great transformations will occur in the field of dealing with customers, as this technology provides the ability to understand more customers with the change in what they need from services, as it is through artificial intelligence technology that those changes are easily known [27]. Artificial intelligence techniques will also interfere in many banking matters, whether in the technological structure, services provided through the bank, or the rates of revenues achieved by the bank, or otherwise [36]. But before relying on these technologies completely, he must do full studies about what will happen to all the departments of financial institutions and branches of those banks, and how to protect this technology for the digital age from hacking operations [31].

Increased Use of Automated Assistant Apps

One of the most important things that customers will notice when moving to deal with a bank that uses artificial intelligence tools is the use of what is called a 'virtual automated assistant' that relies on the use of this advanced technology [37]. Chatbots are one of the prominent examples of 'virtual assistant' applications, which many financial institutions use in order to improve the level of services provided to their customers through the use of advanced software based on machine learning technology [30]. The virtual assistant can perform many banking operations starting from basic tasks, such as providing the customer with information on his account balances, to executing more sophisticated orders such as transferring money and paying bills [39].

Conducting Banking Transactions via Voice Commands
The development in the performance of banking services is no longer limited to the use of the mouse or clicking on the screen, as artificial intelligence has evolved to the level that allows the customer to speak on the phone to a specific application and give him orders to carry out specific tasks. This technology allows the customer to use phone calls to check his balance or transfer funds between different accounts, and many other important orders [22].

Faster Credit Processing
Credit applications such as home loans, auto financing, and personal loans usually take a few days before they are processed by the bank and the customer is given approval for the requested loan [19]. The situation has changed at the present time because of the applications of artificial intelligence, as the customer is able to submit his requests while a computer program reviews his credit evaluation, record of previous payments and other factors that help in assessing whether the customer is eligible or not worthy of the loan [25]. As Financial institutions begin to rely on AI applications, we expect customers to make better use of virtual assistant services [17]. Machine learning technology also gives them the ability to conduct banking operations via voice commands, see detailed information about their balances, and provide professional advice to help reduce costs and save money [7].

Global and Arab Investments in the Financial Technology and Artificial Intelligence Sector
Global investments in the fintech sector have achieved rapid growth in the past few years, as their value increased more than tenfold between 2012 and 2015, and total global financing for Fintech companies reached $ 24.7 billion in 2016 ($ 13.6 billion came from Venture Capital investments) compared to with $ 46.6 billion in 2015. The total investment in Fintech companies amounted to about $ 29 billion by the end of 2017, through 1,134 deals [5]. The cumulative investment in financial technology around the world until 2016 exceeded $ 100 billion in more than 8,800 companies and is expected to exceed $ 150 billion by the end of 2017 [21]. In the Arab region, fintech startups have reaped more than $ 100 million in investments in the last ten years, between announced and unannounced deals and acquisitions, according to Wamda's estimates [3]. The main source of funding has been global risk investment funds, business accelerators and, more recently, banks. According to the Wamda and Pefort report, these companies aimed to raise $ 50 million in financing in 2020, registering an increase of 270% from 18 million in 2016. The number of announced investment deals in financial technology companies emerging in the Arab countries doubled from 5 deals in 2017 to 10. 2019 deals [23]. As for artificial intelligence, according to the International Data Corporation (IDC), global spending on artificial intelligence is expected to reach $ 19.1 billion by the end of 2022, an increase of 54.2% over the year 2019 [15]. It is expected to reach $ 52.2 billion by 2025, Recording a compound annual growth rate (CAGR) of 46.2%. Currently, the retail sector is the largest spender on artificial intelligence, followed by the banking sector [15].

In the Middle East and Africa (MENA) region, spending on cognitive and artificial intelligence systems is expected to increase from $ 37.5 million in 2025 to more than $ 114 million by 2022, a growth rate of 32% annually. The biggest opportunity for artificial intelligence in the region lies in the financial sector, where it is expected that

28.3 million dollars, which represents 25% of the total investments in the field of artificial intelligencep [34], will be spent on developing artificial intelligence solutions in the financial sector, followed by the public services sector such as education and health, Then the manufacturing sector [8]. The Arab world occupies a leading position in adopting artificial intelligence technologies. The UAE is leading the pioneering efforts exerted in the Arab world, at a time when artificial intelligence technology is expected to account for about 14% of the country's GDP by 2030, according to the PwC Middle East report [23]. The UAE has taken advanced steps with the creation of the Ministry of Artificial Intelligence in a qualitative initiative that is the first in the world, confirming its absolute commitment to adopting new generation technologies [17]. Several Arab countries are making vigorous efforts in the field of artificial intelligence, as this technical sector constitutes about 12.4% of the GDP in the Kingdom of Saudi Arabia, 8.2% in the other Gulf countries, and 7.7% in Egypt, according to the results of the "PW" study. C Middle East" [16]. In Egypt, the base of companies seeking to use artificial intelligence technologies is expanding, which is the new trend in the world of technology after smart services. Artificial intelligence is expected to enhance the national efforts aimed at transforming towards a knowledge-based economy, in line with the goals of "Egypt Vision 2030" [25]. The Egyptian Ministry of Communications announced its plan to establish an "Artificial Intelligence Academy" in cooperation with the Ministry of Higher Education and Scientific Research. This important step is expected to contribute to advancing innovation and building capabilities in the field of artificial intelligence at the national level [15].

Sectors/Uses of Fintech and Artificial Intelligence

According to the Basel Committee on Banking Supervision, financial technology is linked to three major sectors directly related to basic banking services: 1) credit, deposit and capital raising. 2) payments, clearing and settlement. 3) investment/wealth management [13].

According to the Wamda and PayFort report, the stages of financial technology development are divided into two waves. The first wave includes payment solutions and lending solutions. As for the second wave, it includes the introduction of technology into international money transfers, insurance (wealth management, and investments) [26]. Another new phenomenon in the field of financial technology is blockchain technology, which is a decentralized digital ledger, in which transactions that take place in cryptocurrencies are recorded (Cryptocurrencies), as the year 2020 was characterized by the entry of cryptocurrencies into the global financial markets, the most controversial of which is "Bitcoin", which is a cryptocurrency virtual currency that has become the most famous financial trading and speculative tool, has no physical existence, and is not subject to any control [12]. As for the uses of artificial intelligence in the banking sector, they are numerous and include the following: financial technology, market operations, pricing and hedging decisions, foresight capacity, risk management and anticipation, intelligent interaction with the customer and exploring his requirements by studying the local interest market and adapting to depositor requirements [17].

Artificial intelligence systems can also provide analyzes of historical data, real-time statistics, and accurate reports from all electronic systems and investment tools, which

in turn show patterns and trends of indicators, stocks and trades [35], which supports the decision-making process. It provides financial intermediaries with financial information and data to help them achieve a better understanding of the market and make solid and sound decisions [8].

Among the most prominent global examples of the use of artificial intelligence in banking operations is the Santander Bank's use of robots to deal with customers in a customer center in Spain since 2010, in addition to UBS Bank's use of Amazon digital assistant «Alexa» to serve customers [17].

The Challenges that Hinder the Expansion of Startups in the Field of Financial Technology and the Application of Artificial Intelligence in the Arab World

The most prominent challenges and obstacles hindering the spread and expansion of startups in the field of financial technology in the Arab world is the difficulty of gaining customer confidence due to fear of fraud and piracy, in light of the lack of adequate consumer protection frameworks in the field of financial services and data privacy laws in many countries [18]. In addition, there is no legislation on cybercrime and information security except in seven countries in the region (Algeria, Egypt, Oman, Morocco, Qatar, Tunisia and the United Arab Emirates). Challenges include the difficulty of establishing and launching startups as a result of laws governing licensing of financial services companies, the scarcity of risk capital that underpins the financing of startups in financial technology [11], as well as the weak competitiveness of startups in the field of financial technology if they do not adopt a business model based on cooperation with Arab banks, as a result of the firm trust and loyalty of customers in the Arab banking sectors, especially in light of the major Arab financial institutions heading towards development in the field of digital financial transactions by adopting innovative digital strategies [28]. The most prominent challenge facing the sectors' adoption of artificial intelligence in the region, in addition to fears of piracy and electronic fraud, and the need for huge investments, is the inability to access information, as most companies and financial institutions need the systems and infrastructure that allow them to collect the data that produces, whether it needs it in its growing business, or in creating a competitive advantage in the market by incorporating AI at the core of its business. The second challenge is the need to build capabilities in the field of artificial intelligence [9], as the region suffers from a skill gap, as there are no qualified professionals to work in the field of artificial intelligence and manage its affairs in the process of digital transformation in the face of the increasing demand for these capabilities, which hinders the progress of companies in their endeavors to achieve their agendas [32].

Opportunities and Risks Arising from the Application of Financial Technology and Artificial Intelligence in Banking Operations

Due to their small size and limited spread in the Arab region in general, startups do not act as a direct competitor to Arab banks. Rather, most startups in the financial technology field in the Arab region seek partnership and cooperation with banks. The selection of appropriate financial technology and its successful implementation continues to be a challenge for banks, especially those that have a weak innovation culture [15]. Therefore, partnerships with emerging companies specialized in the field of financial technology, as is the case in Lebanon, can help financial institutions maintain their market share. And that by providing innovative banking products to its customers

[30]. The opportunities offered by financial technology to the financial and banking sector can be reviewed as follows: enhancing financial inclusion, providing better and more convenient banking services to customers, the potential positive impact on financial stability due to increased competition [17]. On the other hand, the main risks that may arise from applying technology in banking operations include strategic risks, operational risks, compliance risks, outsourcing risks, cyber-risks, and liquidity and financing risks [29].

Within this framework, the use of artificial intelligence is expected to redraw the map of banking activity. The banking activity will become invisible in the future, as transactions are carried out with virtual assistance that completely dispenses with bankers in all stages of dealing with customers [12]. However, this expectation is not realistic, as it is expected that artificial intelligence will be used to provide more intelligent solutions to customers by improving the efficiency of decision-making and enhancing the capabilities of employees, and not to dispense with them completely [5].

Challenges Facing Artificial Intelligence in the Banking Sector

Artificial intelligence puts its impact on the world through many different applications. According to the "Gartner" research company, nearly 40% of the largest companies will implement solutions based on this technology this year [15]. Although these forecasts were predicted before the spread of the "Covid 19" pandemic, which resulted in slowing the growth of the global economy, these figures reflect the case of the steady growth of artificial intelligence over time [22]. However, what about the role of this technology in financial services? In this article, we review the role of artificial intelligence in this sector, with examples in this regard [4].

Risk Management

In the financial world, time is money. For risk cases, artificial intelligence algorithms can be used to analyze the case history and identify any potential problems with it. This includes using machine learning to create accurate models that enable financial experts to follow specific trends and note potential risks [7]. They can also ensure more reliable information for use in future training models [19]. The use of machine learning to manage risk means that large amounts of data can be subject to rapid processing in a short period of time. Both structured and unstructured data can also be managed using cognitive computing, which is cognitive computing, and includes creating systems capable of self-learning, pattern recognition, language understanding, and ultimately working without human intervention [12]. The US company "Kensho" uses artificial intelligence to provide data analytics for Banks. It also uses cloud computing, along with natural language processing, to provide complex analytical solutions in an understandable language about potential risks to companies [1].

Fraud Prevention

As well as dealing with depositors' money, Financial institutions handle huge amounts of sensitive data associated with their customers. Fraud is at the top of the list of threats that can occur in the financial sector, as only one mistake can cause large losses [29]. Artificial intelligence is used to avoid this, by reviewing the spending history and its behaviors so that it can shed light on violations, such as using a card in different global sites within a short period of time [6]. Shape Security provides fraud detection services

for US banks, credit card fraud, tracking gift cards and more, through machine learning models that have been trained on many requests, so that they are able to distinguish between real customers and robots. Likewise, the "Data Visor" platform works on big data to combat fraud in financial transactions and says that the fraud detection rate is over 90% [18].

Customize Services
In the field of banking services, chat programs supported by artificial intelligence can provide comprehensive solutions to the customer according to his situation and reduce the workload of customer service centers [3]. Virtual assistants work on interactive voice response to increase the efficiency of the services provided, as they are characterized by their ability to check balances, account activity, and schedule payments and many financial institutions have applications that provide customized financial advice and help achieve financial goals [6].

Quantitative Trading
Quantitative trading or data-driven investing is witnessing remarkable growth in various stock and stock markets around the world. Investment firms rely on computing and data science to accurately forecast future patterns in the market [5]. Artificial intelligence provides this advantage by being able to monitor patterns from past data and predict the likelihood of them being repeated later [11].

Decision Making
In many areas, technology is used effectively in decision-making processes. One of these areas is credit, as this technology can provide accurate assessments to potential borrowers quickly and at a lower cost [22]. Compared to traditional credit scoring systems, the AI credit rating system can be more complex, as it can help identify applicants who are more likely to default and those who lack any reliable credit history [19].

2   Recommendations

Artificial intelligence has brought about pivotal changes in the patterns of customer interaction in the banking sector. Many financial institutions have created models for customer service that they adopt by integrating "chatbots" applications that are used to communicate and deal with customers just like a customer service employee [25]. This new smart solution, which mostly uses text-based live chat applications via popular applications such as Facebook Messenger, WhatsApp and other platforms, has helped financial institutions reduce the time it takes to connect the customer with the relevant relationship employee, as well as Providing multidisciplinary services without any delay [12]. There are some financial institutions that are already experimenting with "chatbots" applications to provide their customers with a customized experience that anticipates their needs [30].

How does Artificial Intelligence Affect the Future of the Banking Sector in the Arab World?

The global banking sector is undergoing a radical transformation as a result of the implications of the rapid digital development imposed by the twenty-first century [8]. Artificial Intelligence is emerging as one of the most effective technologies that have a strong and tangible impact that will make a comprehensive change in the global business environment [32].

The banking sector is expected to benefit more from artificial intelligence systems, as specialized reports indicate the expected role of artificial intelligence technologies in enabling the banking community to achieve savings of more than $ 1 trillion by 2030 [15].

As for the shape of bank branches in the future, it will not be the current traditional form in terms of spaces and number of employees, and financial institutions will tend to provide different types of branches that meet the different needs of customers, which are universal branches, business services branches, golden services branches, express services branches and smart branches [14]. The banking sector in the Arab region and abroad is witnessing a strong entry into digital technologies that change its features. Changes in customer behavior and developments in the field of technology have pushed financial institutions to transform their branch network into patterns of a futuristic nature, making them more accessible to customers [7]. The new branch model integrates digital innovation with the services provided by traditional branches, providing customers with fast and seamless interaction [12].

This new concept, which has a higher focus on digital services, offers a full range of banking functions such as, a self-service area integrated with self-service kiosks, ATMs, cash and check deposit machines, large cash deposit machines, interactive teller machines and communication services [33]. Via video, it allows customers to communicate with the specialized employees in the bank for longer hours [33]. Digital financial institutions will become the actual locomotive for growth in the retail banking services sector, and therefore financial institutions seek to add more features and services to them, stressing that through the digital bank, residents of the country can open the bank account in just four clicks, via smartphones, tablets or Computer, without the need to visit any of the bank branches [34]. Digital financial institutions will become the actual locomotive for growth in the retail banking services sector, and therefore financial institutions seek to add more features and services to them, stressing that through the digital bank, residents of the country can open the bank account in just four clicks, via smartphones, tablets or computer, without the need to visit any of the bank branchesp [38].

Digital financial institutions provide customers with an innovative and easy experience, evidenced by the integrated digital bank "Neo", which provides multi-currency accounts, a check book, a debit card, and a credit card [19].

Financial Institutions Function in the Future

1. Robots receive customers in branches and fulfill their requests [9].
2. The virtual assistant answers clients' inquiries, displays their data, and performs services [12].
3. Increase reliance on artificial intelligence solutions to perform simple and routine work [17].

4. The ATM interacts with customers with sound and video and replaces the "teller" [12].
5. Performing and executing banking operations at any time around the clock.
6. Reducing the number of branches and directing to different types of them with a future digital nature [18].
7. Use technology to protect customers from check fraud [17].
8. Increase investments in technology to improve customer experience [13].
9. Open a bank account within a minute from anywhere in the world [16].
10. Replacing the traditional banking models through digital transformation [3].
11. Expanding the concept of digital financial institutions to meet the requirements of new generations [15].
12. Full-time human resources in financial institutions to contribute to accelerating business growth [4].

3 Conclusion

Financial institutions are moving towards the 'coordination' stage with AI programs providing recommendations based on past experience, in the same way that Spotify provides song recommendations or Netflix when recommending a program. It may not be long before an online wealth advisor says that the shares that the client refused to buy two weeks ago have fallen in price, making it a stronger opportunity than before. Today, this interaction may be available via email, text message, or chatbot, but over time, it may become part of a better customized direct dialogue, and of course, powered by artificial intelligence. At Saxo, the use of artificial intelligence and machine learning helps us at every stage of the customer journey, from acquiring a customer, through commercial services, to preserving it, which speeds up the process of making trade and investments more democratic for all. Artificial intelligence has the same ability to quantify customer experiences in financial services as wealth management as in other business areas that engage with the customer directly. This app, like a live teller, will not remain the front of the bank or the spokesperson for it. As the knowledge economy matures, financial service providers may have to know where they are, and where they want to go. For many of them, they may need to take a relatively small step to the coordination stage, by starting by focusing on desired interactions with clients, rather than technology. Indeed, small steps usually provide the best opportunities for new initiatives to gain momentum over time.

References

1. Abdel-Karim, B.M.: Beautiful fractals as a crystal ball for financial markets? - investment decision support system based on image recognition using artificial intelligence 2020. J. Predict. Mark. **14**(2), 27–43 (2020)
2. Alshehhi, A., Nobanee, H., Khare, N.: The impact of sustainability practices on corporate financial performance: literature trends and future research potential. Sustainability **10**(2), 494–519 (2018)

3. Musleh Al-Sartawi, A.M.A. (ed.): The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. SCI, vol. 974. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-73057-4

4. Alansari, Y., Al-Sartawi, A.: IT governance and E-banking in GCC listed banks. Procedia Comput. Sci. **183**, 844–848 (2021)

5. Al-Sartawi, A.: social media disclosure of intellectual capital and firm value. Int. J. Learn. Intellect. Cap. **17**(4), 312–323 (2020)

6. Al-Sartawi, A.: Information technology governance and cybersecurity at the board level. Int. J. Crit. Infrastruct. **16**(2), 150–161 (2020)

7. Bathaee, Y.: The artificial intelligence black box and the failure of intent and causation. Harvard J. Law Technol. **31**(2), 889–938 (2018)

8. Buchanan, B.G.: Artificial intelligence in finance, Seattle University. Albers School of Business and Economics (2019)

9. Chayjan, M.R., Bagheri, T., Kianian, A., Someh, N.G.: Using data mining for prediction of retail banking customer's churn behaviour. Int. J. Electron. Bank. **2**(4), 303–320 (2020)

10. Chen, N., Christensen, L., Gallagher, K., Rosamond, M., Rafert, G.: Global Economic Impacts Associated with AI, United States (2016)

11. Chu, A.B.: Mobile technology and financial inclusion. In: Handbook of Blockchain, Digital Finance, and Inclusion, Volume 1: Cryptocurrency, FinTech, InsurTech, and Regulation, pp. 131–144. Academic Press, Cambridge (2018)

12. Mhlanga, D.: Industry 4.0 in finance: the impact of artificial intelligence (AI) on digital financial inclusion. Int. J. Finan. Stud. **8**(45), 1–14 (2020)

13. Elegunde, A.F.: Effects of artificial intelligence on business performance in the banking industry (a study of access bank plc and united bank for africa-uba), IOSR Journal of Business and Management (IOSR-JBM) Ser. IV **22**(5), 41–49 (2020)

14. Mercier, F.: Beyond the hype: How can the financial industry benefit from artificial intelligence? J. Secur. Oper. Cust. **13**(2), 163–169 (2021)

15. Gupta, M., Sikarwar, T.S.: Modelling credit risk management and bank's profitability. Int. J. Electron. Bank. **2**(2), 170–183 (2020)

16. Gomber, P., Koch, J.-A., Siering, M.: Digital finance and fintech: current research and future research directions. J. Bus. Econ. **87**, 537–580 (2017)

17. Hannoon, A., Al-Sartawi, A., Khalid, A.: Relationship between financial technology and financial performance. In: Musleh Al-Sartawi, A.M.A. (ed.) The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. SCI, vol. 974, pp. 337–344. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-73057-4_26

18. Cao, J., Zhou, Y.L.: Research progress on the influence of artificial intelligence on economy. Econ. Inf. **1**, 103–115 (2018)

19. White, A., Safi, S.: The efficiency of artificial neural networks for forecasting in the presence of autocorrelated disturbances. Int. J. Stat. Prob. **5**(2), 51 (2016)

20. Karolak, M., Razzaque, A., Al-Sartawi, A.: E-services and M-services using IoT: an assessment of the kingdom of Bahrain. In: Abdalmuttaleb, M.A., Al-Sartawi, M., Razzaque, A., Kamal, M.M. (eds.) Artificial Intelligence Systems and the Internet of Things in the Digital Era: Proceedings of EAMMIS 2021, pp. 523–533. Springer International Publishing, Cham (2021). https://doi.org/10.1007/978-3-030-77246-8_48

21. Suresh Kumar, K., Aishwaryalakshmi, S., Akalya, A.: Impact and challenges of artificial intelligence in banking. J. Inf. Comput. Sci. **10**(2), 1101–1109 (2020)

22. Kim, M.K., Eom, J.G.: A study on determinants of banks' profitability: focusing on the comparison between before and after global financial crisis. Int. J. Contents. **18**, 196–209 (2018)

23. Liao, G., Yao, D., Zhihao, H.: The spatial effect of the efficiency of regional financial resource allocation from the perspective of internet finance: evidence from Chinese Provinces. Emerg. Mark. Finan. Trade **56**, 1211–1223 (2020)
24. Lin, T.C.W., Deshpande, A.: Financial artificial intelligence: risks and implications. Bank. Finan. Serv. Policy Rep. **39**(1), 9–16 (2020)
25. Lui, A., Lamb, G.W.: Artificial intelligence and augmented intelligence collaboration: regaining trust and confidence in the financial sector. Inf. Commun. Technol. Law **27**(3), 267–283 (2018)
26. Memdani, L.: Demonetisation: a move towards cashless economy in India. Int. J. Electron. Bank. **2**(3), 205–211 (2020)
27. Xie, M.: Development of artificial intelligence and effects on financial system. J. Phys. Conf. Ser. **1187**, 1–7 (2019)
28. Abdalmuttaleb, M.A., Al-Sartawi, M., Razzaque, A., Kamal, M.M. (eds.): Artificial Intelligence Systems and the Internet of Things in the Digital Era: Proceedings of EAMMIS 2021. Springer, Cham (2021)
29. Inclusion in India Smita Miglani Indian Council for Research on International Economic Relations. Accessed 28 Mar 2021
30. Reim, W., Åström, J., Eriksson, O.: Implementation of artificial intelligence (AI): a roadmap for business model innovation. AI **1**(2), 180–191 (2020)
31. Venkatesan, S., Sumathi, N.: Technology acceptance of artificial intelligence in banking and its impact on banking efficiency. Int. J. Innov. Technol. Explor. Eng. (IJITEE) **8**(7C2), 371–374 (2019)
32. Sanad, Z., Al-Sartawi, A.: Financial statements fraud and data mining: a review. In: Abdalmuttaleb, M.A., Al-Sartawi, M., Razzaque, A., Kamal, M.M. (eds.) Artificial Intelligence Systems and the Internet of Things in the Digital Era: Proceedings of EAMMIS 2021, pp. 407–414. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-77246-8_38
33. Scherer, M.U.: Regulating artificial intelligence systems: risks, challenges, competencies, and strategies. Harvard J. Law Technol. **29**(2), 354–400 (2016)
34. Soni, N., Sharma, E.K., Singh, N., Kapoor, A.: Impact of artificial intelligence on business. In: Paper Presented at the University of Delhi, Delhi, India (2018). http://www.researchgate.net/publication/325644986-impact-of-ArtificialIntelligence-on-Business,pdf
35. Strusani, D., Houngbonon, GV.: The role of artificial intelligence in supporting development in emerging markets. In: EM Compass Note 69, IFC, July 2019, pp. 1–2 (2019)
36. The impact of artificial intelligence in the banking sector & how AI is being used in 2020. BI, New York (2019). https://www.businessinsider.com/the-ai-in-bankingreport-2019-6, Accessed 24 June 24
37. Wang, X., He, G.: Digital financial inclusion and farmers' vulnerability to poverty: evidence from rural China. Sustainability **12**, 1668 (2020)
38. Yang, L., Zhang, Y.: Digital financial inclusion and sustainable growth of small and micro enterprises—evidence based on China's new third board market listed companies. Sustainability **12**, 3733 (2020)
39. Yubo, C.: Innovation of enterprise financial management based on machine learning and artificial intelligence technology. J. Intell. Fuzzy Syst. **40**, 1–12 (2020)

Libra Currency and its Global Financial and Economic Impact

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Abstract. Facebook, the social media, has announced its very own cryptocurrency called 'Libra,' formerly known as 'Facebook coin,' to the basket of blockchain digital currencies. It is yet another option in the digital age's monetary system. Long before its launch, it was compared to the world's largest cryptocurrency; Bitcoin has so far been successful due to its nonvolatile nature, making it a good stock investment. If everything goes as planned, the Libra Association expected to launch in 2020. According to current reports, the Libra currency will be backed by American multinational corporations Uber, MasterCard, eBay, and Visa. The paper shows this new development in the digital tern and how it will influxes the financial markets. Its unforeseen consequences, libra will have a significant impact on the global economy.

Keywords: Libra · Financial markets · Digital payment

1 Introduction

In Mid-2020, the global banking markets hosted a new cryptocurrency called Libra, a cryptocurrency that uses Facebook's platform as a means of making money transfers around the world. It is a currency that is not designed to replace existing currencies but instead designed to facilitate digital payments, especially for citizens of developing countries who do not have access to banks or financial services, like social networking. Giant Facebook has confirmed that it wants to create a separate Libra system to allow users to make cross-border payments more efficiently and at higher speed. Moreover, because it is a digital currency, the transfer fees will be deficient compared with the fees and operations analysis of traditional banks and exchange shops worldwide [1, 14]. If the currency succeeds in entering the financial transactions markets, it will undoubtedly affect remittance policies worldwide, especially given the growing number of Facebook users estimated at 2.5 billion people per month during the first quarter of 2020 [3]. For its profit, the currency primarily aims at those who do not have bank accounts and an estimated 1.7 billion people worldwide by the beginning of 2020, and all Facebook users can use it for the same purpose [13].

2 Literature Review

Libra formed 28 companies worldwide, establishing an independent organization called the Libra Association, based in Switzerland. This consortium is supposed to control the Libra issuance process using the Libra Blockchain technology developed by Facebook. Under this mandate, the Libra consortium has established a Libra Board of directors and governance, with each founder having only one vote, and Facebook will not control Libra entirely but will be controlled mainly by the Libra consortium. Many companies support the Libra issuance process, such as MasterCard, Vodafone, Visa, Uber, eBay, and others, who have invested at least $10 million each in the project's operations [4]. Facebook has established a subsidiary representing it in the Libra consortium called Calibra, which handles crypto transactions and protects users' privacy by not mixing Libra payments with their Facebook data. Thus, the real identity of the user will not be associated with financial transactions based on Libra. However, Facebook/Calibra and other founding members of the Libra consortium will benefit from the funds held in Reserve to keep Libra's value stable. Accordingly, the new currency trading planned to start by mid-2020, according to company officials. In light of this, Libra will be available to the entire world for payments and transfers between people inside and outside their countries worldwide. For example, someone may purchase from eBay or send money to Uber easily by texting messages on WhatsApp. According to economic analysts, Libra will lead the world's digital currencies, surpassing bitcoin, Litecoin and others, and its portfolio will be the largest in the world. The currency will not be as volatile as bitcoin because the organizations and companies supporting it strives to remain stable and are linked to a global currency basket, i.e., the Libra consortium will not.

The following figure shows the group of companies that formed the Libra consortium, which consists of 28 companies from different countries around the world:

In preparation for the launch of the cryptocurrency, Facebook seeks to create an ATM to convert regular cash into Libra and create platforms that are different from regular Facebook platforms so that the new currency becomes Facebook's new source of revenue away from advertising revenue. As a result, the Central Bank of Bahrain (CBB) issued the final rules for digital assets and currencies, including licensing, governance, capital, Environmental Control, and risk management. A recent statement from the Central Bank of Bahrain explained that digital assets operating under Blockchain distributed ledger systems had attracted much attention globally. The Central Bank of Bahrain rules aims to ensure that relevant activities are within the regulatory environment and are subject to comprehensive regulatory and supervisory measures.

As previously stated, Calibra will retain Libra's financial data information separately from the regular Facebook page data, i.e. Libra's financial transactions will have a platform separate from Facebook's common data platform. This process maintains the financial safety of people who will use the upcoming digital currency Libra. Facebook says Calibra will use the same verification and anti-fraud processes that banks and credit cards use and will have automated systems proactively.

The U.S. dollar is a highly trusted and accepted currency worldwide, and some countries prefer to trade in dollars so much that they use it instead of their currency. However, the dollar has many weaknesses. For example, the use of the U.S. dollar, especially across borders, can be costly because banks decide to hand over the dollar in the local currencies of the countries. If the dollar is used on a prepaid credit card, the credit card company will likely charge the merchant using it a fee consistent with the value of the purchase bill. Moreover, if the U.S. government prints many dollars to meet specific needs, it could expose the U.S. economy to a state of inflation and, consequently, depreciation of the dollar against other currencies. Despite the considerable sparring over cryptocurrencies, their use is still timid, as it is clear that the value of cryptocurrencies is volatile, often rising or falling more than 5% per day, making it difficult to understand their actual value in the long run. However, what distinguishes cryptocurrencies is that they are used for intra-state and intra-state remittances with great ease and speed. Although cryptocurrencies are not private currencies, each cryptocurrency has an alias that distinguishes it from other cryptocurrencies [29, 36].

Although the launch of Libra will take place in mid-2020, this does not mean that users are not already worried about the whole issue. Facebook promised that it would not use Libra's financial statements for advertising purposes, but it would take much work on Facebook's part to gain people's trust. Reacting to the move by regulators, France stressed that only governments could make money and warned Libra's potential uses. The Bank of England also said Libra would have to meet very high financial standards to be allowed in the U.K. Of course, lawmakers in both the United States and the European Union are concerned about Facebook's expansion into the financial sphere. The Bank for International Settlements (BIS) was the first to warn about Facebook's new cryptocurrency, only a few days after it was announced. The bank, an umbrella of global central banks, said Libra posed a threat to global banking and the international banking system. Although there are potential benefits to this currency in introducing more customers into banking systems, it will operate outside the current financial system and create data privacy issues, he said. Chris Hughes, the co-founder

of Facebook who commented on Libra, warned that big technology transition to the finance sector would shift much of the control over the monetary policy from central banks to private companies.

Members must commit to paying at least $10 million, to operate the Calibra platform, although more money can be invested in operating the platform. They also have to agree to help strengthen the ecosystem and push for adopting the Calibra platform. These funds will be allocated to cover the operating costs of the consortium and create a package of incentives that traders, developers and wallet providers will receive. Facebook said it would also conduct a private securities offering, "only available to a select group of accredited investors", to start the project but did not give further details. In the long run, the benefits from the Reserve, invested in low-risk assets, will cover operating costs and pay dividends to members.

Facebook hopes that some of the companies that co-funded the project, such as Spotify and Uber, will integrate cryptocurrency into their systems. While this is not yet clear, David Marcus, the former PayPal president who will now head Calibra, said blockchain technology would allow for small transactions, i.e. small purchases online. In the case of Spotify, this may mean that users can pay a few cents to listen to a song, for example. One of the challenges that Spotify and its users worldwide face is the lack of easily accessible payment systems, especially for those in markets that lack financial services, said Alex Norström, Spotify's chief Distinguished Business Officer.

3   Research Methodology

This paper follows the qualitative approach that uses secondary data source to explore the topic at hand. The researchers used consistent dimensions to draw an evocative analogy between the investigated issues. Such research works are typically qualitative, with a description and explanation of written articles investigating and scrutinizing a phenomenon. As a result of this line of thought, the research is valid for such an approach. The work will show how that reflected on the future of cryptocurrencies and create awareness of the extreme changes happening in these currencies. Then this work will permit the scholars to learn and discover this topic as the research progresses. It thus leads to a different line of opinions or framing hypotheses for further research, since the researchers have no real data to evaluate the libra.

4   Results and Discussion

4.1   Libra's Impact on the Global Economy

Given the superiority that Libra can make on the technological level as it adopts a distinct mechanism in financial transactions, especially in light of the potential broad base of its users at the global level, the adoption of Libra as one of the cryptocurrencies for the implementation of financial transactions at the global level will change the global financial system in many aspects, including:

4.2   Impact on Financial Market

The basic idea of Libra is to determine an equivalent value against the U.S. dollar, and therefore, it may work to establish financial stability in the global market because it is one of the safest cryptocurrencies in the global financial system. Thus, the system of financial transactions worldwide will become more reliable under the new cryptocurrency, Libra. In order to prevent illegal operations from occurring when using Libra, financial transactions will be recorded according to the Libra blockchain technology, as well as all information related to financial transactions will be examined by the Libra Association and then recorded in the distributed ledger, which is a tool under which data are collected online [20, 37].

Thus, using the Libra blockchain system allows transactions to be permanently recorded and archived permanently in the Libra Association, which helps track transactions in an accurate and controlled manner. Thus, this tracking process will permanently reduce illegal activities, such as money laundering, fraud, and other illegal financial transactions. It will lead to smooth financial transactions and maintain financial stability, distinguishing the Libra process from other cryptocurrencies. [10, 15].

4.3   Impact on Global Financial System

If the currency of Libra goes into effect, it will operate within a monetary system that will be outside the control of governments around the world. Thus, Libra will be a virtual currency and the traditional currencies issued by governments around the world. It means that the Libra currency will have an exceptional standard similar to the traditional gold standard to overcome the defects of Bitcoin and other cryptocurrencies that have witnessed unprecedented fluctuations in their value [8, 19].

Within this data, Facebook proposes two assets: Libra Global Coin and Libra Investment Token to operate in the Libra environment. Facebook users will also be able to purchase international coins with the Libra Association. They will also be able to make financial transfers via the Internet; in return, the recipient will receive these currencies in exchange for giving up an equivalent of fiat currencies or keeping them for further use. Since the Libra process will have a fixed value, unlike other digital currencies, the Libra Association will invest the proceeds from financial transactions related to Libra in the purchase of some other traditional currencies such as the British pound, the euro, the U.S. dollar and the Japanese yen to benefit from the benefits associated with it in the short term [11, 12].

Additionally, Libra Global Coin faces real risks if the Libra Association fails to maintain the reserve requirements set out in the White Paper. For example, when the market value of the assets supporting the Libra currency decreases, this may require partners to use the Libra Global Coin as a means of paying for the value of goods and services. The potential massive use of Libra Global Coin could have real economic implications, significantly when the value of Libra depreciates. Likewise, the Libra Association could become a financial institution of great importance, whose failure could lead to a global financial crisis [15]. In this sense, it can be said that the Libra Association performs functions similar to that of a bank. The funds used to purchase

coins are similar to deposits, and the Libra Association acts as a lender for these funds [16, 27].

Also, for countries where the use of the Libra currency is significantly more than local currencies, then the central banks of those countries will be vulnerable to losing control of monetary policy, which increases the failure of these countries to control economic policies, especially in periods of depression, which require those countries to intervene and stimulate their economies. It may also affect the fulfilment of its sovereign debts or obtain future financing from international financial institutions. Therefore, it will be necessary to have an international monitoring system that monitors the Libra currency to be controlled to prevent complex economic problems [2, 9].

4.4 Impact on the Banking Sector

Libra association argues that Libra will improve sending money between countries over the Internet, making it faster and cheaper. In addition to improving financial services operations, those who do not have bank accounts can deal with traditional banking services, even if it is limited. Facebook argues that the Libra cryptocurrency will operate more flexibly than other cryptocurrencies, making Libra cryptocurrency more ideal and more quickly for transferring money. Because Libra may operate without central bank oversight, it may pose risks as it may be exploited for illegal purposes worldwide. The defenders of the traditional banking system justify that this traditional banking system works well, safe, and does not support illegal transactions [7, 19].

The traditional banking system creates many restrictions, especially for individuals who do not have traditional bank accounts that enable them to transfer money to their families in other countries. For example, A person who is working in one country may wish to transfer his salaries to other countries without resorting to traditional banking operations, which require days to complete the money transfer transaction through the bank and transfer fees as well that are not negligible, especially for those with limited income. Thus, Libra will constitute a quantum leap in bank transfers worldwide with faster and minimal transfer fees [15, 16].

4.5 Impact on Middle East Markets

Some say that Libra should not be feared and that banks need to adapt to the changing landscape, as emerging markets, such as the Middle East, are the key to Libra's great success. Financial analysts argue that Facebook's colossal database is not tried on this particular scale and that mass adoption can only happen when there is an extensive database of users, and that is what Facebook already provides. According to World Bank data, global remittances hit an all-time high of $529 billion in the last year 2019. In the UAE, the world's second-largest remittance sender, according to the central bank and World Bank data, workers in that country transferred $46 billion to their home countries in 2018. Taguinod, a UAE resident of Filipino descent, also opened a hair salon last year 2019 in Dubai and frequently transferred money to her home country. Libra aims to be more cost-effective for people like Taguinod to run its business.

However, for those who work in the industry, remittances, such as Al Ghurair Exchange, which has about 25 branches in the United Arab Emirates, is entirely different, where Depp said purchase, director of banking services at the company, "will be affected by the industry badly clearly because this will be a full replacement so that it will affect many jobs".

4.6   Libra Issuance, Other Cryptocurrency and Global Reaction

Libra is a digital currency has some similarity with both conventional and crypto currencies. It is similar to the traditional currencies in different features. It is centralized because it is associated with bank assets in several international banks. The use of libra is classified safe as dealing with the traditional currencies due to the provision of a Calibra wallet that is designed to protect funds, preserve user information and combat fraud. Libra is also having some important similarities with the other digital currency. Libra depends on Blockchain technology to authenticate and execute the related transactions. Another similarity between Libra and other cryptocurrency is the independence as long as, it is not affiliated with any country [21]. As Libra's transactions are anonymous so it is considered with high confidentiality degree which is a feature of the other cryptocurrency [23, 25]. This similarity leads to consider Libra and other cryptocurrency as true digital currencies that could function smoothly, easily, and less expensive than the conventional currency [24, 35].

The users, investors and beneficiaries will not pay fees on their transactions similarly to the transactions of the other cryptocurrencies. Libra is also doesn't a subject of any legal restrictions like the other cryptocurrency. In the other side, there are fundamental differences between Libra and other digital currencies. Libra depends on bank assets, which makes it more stable, unlike other digital currencies, which are always in sharp rise and fall. Libra's design for Calibra wallet makes it more secure than other cryptocurrencies. Having a cash cover for the Libra currency will help determine easier its value against the US dollar and other currencies. The rapid spread of the Libra currency, unlike other digital currencies that many individuals will not hear about, due to Facebook's global popularity [18].

Libra is backed by 28 international major companies around the world, unlike other digital currencies that are not recognized or supported by major companies. The previous comparison could lead to considering Libra as "Hybrid digital currency".

The effect of Libra shall disturb the cash market, payment system and the cryptocurrency stakeholders. This power of Libra is based on the number of related users which could reach more than 3 billion through different social media channels controlled or owned by Facebook such as Messenger, WhatsApp, and Instagram. The figure below shows the growth of the number of users for the period 2017–2025 (Fig. 1).
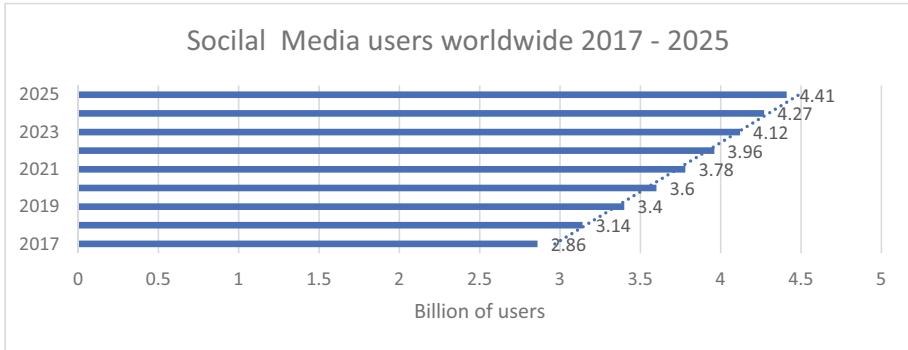
Fig. 1. Source: Statista (2021): https://www.statista.com/statistics.

The figure shows the expected growth in number of social media users in the coming years. The users of the Facebook linked channels constitute around 50% of the all social media users. This huge number of users allows libra and Facebook to dominate the online sales of services and products, meanwhile libra shall control also the online money transfer market and makes it the most used cryptocurrency [17, 25]. Libra plan also to conquer the market of unbanked adults which is estimated of 31% worldwide. These facts motivated libra association to act as a Libra Central Bank and planning to import the monetary policy of the central banks covered by libra's operations instead of issuing Libra independent monetary policy [34]. Such clear announcement from Libra association created serious concerns from different governments including the United States, France, England, Germany, and Japan [20, 37]. These opposers to libra claim that such currency imposes unanticipated high level of which could affect the entire financial system, and constitute a serious threat on the monetary policies of national central banks [26, 31, 36].

The national and international regulatory bodies started taking actions to reduce the expected effects of this currency or prevent its issuance at all [32]. The discussion on issuing a local digital currency has been raised and Sweden is considering the issuance of e-krona [5, 20]. This interference from the official bodies is also required for reinforce the power of the regulators on other cryptocurrencies as well [22, 24, 28]. For some researchers, the actions taken by the regulators and central banks could be only the first step of series of rules and regulations to control the new emerging currencies and their potential effects [6, 33]. The experts in the financial sector consider that such a tool shall affect their revenues and profit. The money transfer commission would be highly affected [30].

4.7 Advantages of Libra

The Use of Libra Digital Currency Can Have Many Features, the Most Important of Which:

1. The new digital currency will almost eliminate bank charges on remittances locally and globally, unlike central banks and Money trading companies such as PayPal and Western Union, which charge high fees for every purchase or transfer.

2. Calibra is responsible for managing and monitoring Facebook's currency trading, reassuring investors that there is a point of reference, unlike other currencies such as Bitcoin.
3. The purchase of Libra is through cash through Visa, MasterCard or any other electronic means, ensuring a cash cover for the new digital currency.
4. The great advantage of "Libra" is that it has a cash reserve to ensure the stability of its value.
5. Major technology and securities trading companies are members of the Libra consortium board such as Uber, Facebook, eBay, Lift, Vodafone and other companies and with a minimum of 10 million per company.
6. Libra will not experience the crazy value turmoil like bitcoin because it has a cash reserve like regular coins, which adjusts the price and makes the margin of rising or fall related to the monetary cover and not the fears and desires investors.
7. "Libra" will make purchases like send e-mail without any complicated procedures, according to the statements of Facebook CEO Mark Zuck 9. China and Japan decided to issue coins suitable for "Libra", which underlines the importance of the new currency and its role in the future of the global exchange. Libra targets billion people without bank accounts worldwide through Facebook, which has transformed from a social networking site to a global platform for buying, selling, advertising and social networking.

4.8   Disadvantages of Libra

Paid features that are dealing with a Libra digital, there are many disadvantages, including the following:

1. Data security:
   One of the significant risks mentioned in the report is data security and Information Technology. David Marcus, president of Calibra, has explicitly stated that Libra union members will not use transaction data for commercial purposes. However, it remains to be seen whether members of the Union will already have this statement or not.
2. Aspects of monetary policy:
   Aspects of monetary policy are also high risk, with analysts arguing that Libra could affect central banks' monetary policy measures. However, the size of the possible effects depends on the actual market value of Libra, which is currently difficult to determine since we expect that Libra will be more prevalent in development. In emerging economies than in industrialized countries, the short-term impact on ECB monetary policy will be limited.
3. Government bond market:
   The Libra consortium could develop into an essential player in the government bond market, one of the two asset classes included in the Libra Reserve. Therefore, Libra's investment decisions can affect the refinancing conditions of the governments concerned. Specifically, the Libra consortium is expected to hold approximately 1.5% of all outstanding short-term government bonds on the assumption that the Libra market capitalization will rise to us $250 billion. Therefore, the impact on

government bond markets around the world seems manageable. Of course, this would be different if Libra's market capitalization was ultimately higher, which is relatively unlikely at the moment.

4. Hypothetical risks:

Since the Libra Reserve also includes assets, such as government bonds, it is not surprising that there is a risk of default, and if someone defaults, the value of the Libra Reserve will decrease. However, the Libra consortium stated that it would only support its currency with government bonds issued by "stable economies" in its working paper". Therefore, the probability of defaulting on highly rated bonds, such as U.S. government bonds, seems only marginal.

5   Conclusion

According to Facebook, Libra wants to transfer money worldwide quickly as sending a text message and with the lowest possible fee on instant transfers. This idea will have significant implications for the global banking system, given the possibility of losing some of the control and control of the currency markets if the world adopts cryptocurrencies, especially Libra. However, on the other hand, there are many obstacles in the way of Libra. Many of the founding companies of Libra are starting to fidget about the Libra issue like MasterCard, PayPal, Visa and many others. In our view, Libra and similar digital currencies will have a significant positive impact as it facilitates remittance payments between countries of the world and within the country itself and reduces conversion costs, especially in light of the significant rise in them among some remittance companies. In our view, the launch of Libra will need to be more careful or gradual to ensure the integrity of operational processes and the ability to control data security.

The review summarizes the potential risks and macroeconomic implications, both nationally and internationally, including those associated with fragmented markets. It extrapolates key points to improve the dialogue centered on a new generation of governance innovations. Besides, Identify and address emerging trends, risks, and vulnerabilities with potential gaps between national fiscal and monetary policy and the capacity of nations to carry out such policies.

References

1. Adrian, T., Mancini-Griffoli, T.: The rise of digital money, international monetary fund (2019)
2. Basel Committee on Banking Supervision. Basel III: A global regulatory framework for more resilient banks and banking systems (2011). Accessed 3 Oct 2019
3. Pierpaolo, B., Schilling, L., Uhlig, H.: Cryptocurrencies, Currency Competition and The Impossible Trinity. CEPR Discussion Paper No. 13943 (2019)
4. Böhme, R., Christin, N., Edelman, B., Moore, T.: Bitcoin: economics, technology, and governance. J. Econ. Perspect. **29**(2), 213–238 (2015)

5. Markus, B., James, H., Landau, J.-P.: The digitalization of money. NBER Working Paper Series, no. 26300, National Bureau of Economic Research (2019). https://www.nber.org/papers/w26300.pdf

6. Caballero, R., Farhi, E., Gourinchas, P.-O.: The safe assets shortage conundrum. J. Econ. Perspect. **31**, 29–46 (2017)

7. Camera, G.: A perspective on electronic alternatives to traditional currencies. Sver (2017)

8. Carney, M.: The growing challenges for monetary policy in the current monetary and financial system. Speech by the Governor of the Bank of England, Jackson Hole Symposium (2019). Accessed 23 Aug 2019

9. Catalini, C.O.G., Hou, J.M., Parasuraman, S., Wernerfelt, N.: The libra reserve. Libra White Paper (2019)

10. Chiu, J., Wong, T.-N.: E-Money: efficiency, stability and optimal policy. Bank of Canada, Working Paper, 2014–16 (2014)

11. Fanni, R.: A scientists opinion: interview with Dr Iwa Salami about the Libra Project' The European Science Media Hub, 4 September 209 (2019). Accessed 3 Oct 2019, https://sciencemediahub.eu/2019/09/04/a-scientists-opinion-interview-with-dr-iwa-salami-about-the-libra-project/

12. Financial Actions Task Force (FATF). Recommendations (2019). Accessed 3 Oct 2019, http://www.fatfgafi.org/publications/fatfrecommendations/documents/fatf-recommendations.html

13. FINMA. "FINMA Publishes 'stable coin' guidelines" and "Supplement to the guidelines", Press Release (2019). Accessed 11 Sept 2019

14. Lettau, M., Madhavan, A.: Exchange-traded funds 101 for economists. J. Econ. Perspect. **32**, 135–154 (2018). www.libra.org

15. Libra Association. Libra White Paper (2019). Accessed 2 Sept 2019, https://libra.org/en-US/white-paper/

16. Libra Association. Libra Association Charter Press Release (2019). Accesseed 15 Oct 2019

17. Nessén, M., Sellin, P., Åsberg Sommar, P.: The implications of an e-krona for the Riksbank's framework for implementing monetary policy. Sveriges Riksbank Econ. Rev. **3**, 28–41 (2018)

18. Reuters. Facebook open to currency-pegged stablecoins for Libra project (2019). Accessed 20 Oct 2019

19. Sandbu, M.: How Facebook's Libra fuelled push for central bank-run digital currencies. Financial Times (2019). Accessed 23 Sept 2019

20. Taskinsoy, J.: This time is different: facebook's libra can improve both financial inclusion and global financial stability as a viable alternative currency to the U.S. Dollar. J. Account. Finan. Audit. Stud. **5**(4), 67–86 (2019)

21. Arner, D.W., Auer, R., Frost, J.: Stablecoins: risks, potential and regulation. Finan. Stability Rev. (39), 95–123 (2020)

22. Armelius, H., Guibourg, G., Levin, A., Söderberg, G.: The rationale for issuing e-krona in the digital era. Sveriges Riskbank Econ. Rev. **2**, 6–18 (2020)

23. Buckley, R.P., Arner, D.W., Zetzsche, D.A., Didenko, A.N., Van Romburg, L.J.: Sovereign digital currencies: reshaping the design of money and payments systems. J. Payments Strat. Syst. **15**(1), 7–22 (2021)

24. Copeland, R.: A global stablecoin: revolutionary reserve asset or reinventing the wheel? J. Payments Strat. Syst. **13**(4), 310–321 (2020)

25. Fantacci, L., Gobbi, L.: Stablecoins, central bank digital currencies and US dollar hegemony: The geopolitical stake of innovations in money and payments. In: Accounting, Economics, and Law: A Convivium, 1 (ahead-of-print) (2021)

26. Hofmann, C.: The changing concept of money: a threat to the monetary system or an opportunity for the financial sector? Eur. Bus. Organ. Law Rev. **21**(1), 37–68 (2020)
27. Hannoon, A., Al-Sartawi, A., Hhalid, A.: Relationship between financial technology and financial performance. In: Musleh, A.M.A., Al-Sartawi, (eds.) The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. SCI, vol. 974, pp. 337–344. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-73057-4_26
28. Kokkinis, A., Miglionico, A.: Open banking and Libra: a new frontier of financial inclusion for payment systems? Singapore J. Legal Stud. (Sep 2020), 601–629 (2020)
29. Leonard, D., Treiblmaier, H.: Can cryptocurrencies help to pave the way to a more sustainable economy? questioning the economic growth paradigm. In: Business transformation through Blockchain, pp. 183–205. Palgrave Macmillan, Cham (2019)
30. Limsakul, A., Kraiwanit, T.: Libra as a digital currency and its impacts on the Thai Economy. AU-eJ. Interdisc. Res. **5**(2) (2020). (ISSN: 2408-1906)
31. Olmos, B.A.: Will Central Banks Adopt the New World Economy of Cryptocurrencies? In: The PayTech Book: The Payment Technology Handbook for Investors, Entrepreneurs and FinTech Visionaries, pp. 119–121 (2019)
32. Read, O., Schäfer, S.: Libra project: regulators act on global stablecoins. Intereconomics **55** (6), 392–398 (2020). https://doi.org/10.1007/s10272-020-0936-7
33. Schäfer, S., Read, O.: Global stablecoins: aspects of financial and monetary stability. Credit Capital Mark. **53**(2), 159–185 (2020)
34. Sebastião, H.M.C.V., Cunha, P.J.O.R.D., Godinho, P.M.C.: Cryptocurrencies and blockchain: overview and future perspectives. Int. J. Econ. Bus. Res. **21**(3), 305–342 (2021)
35. Musleh Al-Sartawi, A.M.A. (ed.): The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. SCI, vol. 974. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-73057-4
36. Sunyaev, A., et al.: Token economy. Bus. Inf. Syst. Eng. **63**, 1–22 (2021)
37. Taskinsoy, J.: Facebook's Libra: big bang or big crunch? a technical perspective and challenges for cryptocurrencies. In: A Technical Perspective and Challenges for Cryptocurrencies (2019)

Haitian Cooperative of Savings and Credits: Social and Community Dimensions of Success

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Abstract. This research aimed at exploring the success factors that support the achievements of savings and credit cooperatives in Haiti. Research is based on a flexible and inductive exploratory approach with a focus on exploring, describing, discovery, and comprehension of the subject. Semi-directed interviews were conducted with three founding members of a Haitian savings and credit agency. Analysis of qualitative data was done within an interpretive perspective. The NVivo version 11 software was used for coding and it facilitated organizing ideas into analytical themes. This research demonstrated, among other things, that support organizations play an important role in providing moral and financial support, and consequently in guaranteeing the success of this type of socioeconomic initiative. It also showed that community rooting, goodwill, and unconditional citizen engagement often promote the success of local initiatives. Savings and credit cooperative (SACCOs) success involves the creation of a proximity effect, community rooting, and meeting of the needs of the environment. Financial training and education for members of cooperatives and the community have also significantly contributed to SACCOs success.

Keywords: Savings and credit cooperative · Factors of success · Proximity effect · Community rooting · Moral and financial support

1 Introduction

In developing countries, access to credit in the traditional banking system is limited for those with no reputation or notoriety. This has become a glaring problem in Haiti, a country that over the last two decades has experienced deep sociopolitical turmoil combined with recurrent natural disasters [7]. These conditions have even created situations of uncertainty and increased the level of credit risk in Haitian commercial banks [7]. This explains why Haitian financial institutions have been applying restrictive, discriminatory, and selective credit policies. The alternative for low-income people has been to rely on savings and credit cooperatives (Sacco) for banking services [13] SACCO exist for reasons that are in equal measure economic [14, 16]. SACCOs are owned by the shareholder-members who are both investors and users [8]. To this extent, [9] contend that social engagement through SACCOs generates a direct impact on demand for the organization's products, which in turn enables improved profitability. According to [12], SACCOs differ in relation to conventional banking by their

local control mechanisms and the fact that they use dividends as a differentiating factor. Consequently, there are strong social ties between the cooperative and its members. The principles of self-governance and reliance on volunteer work are other distinctive elements in relation to commercial banks [23]. Some researchers see in these distinctive features a source of complexity. [10] for example see this complexity on the level of various governance issues. [5] find that the complexity resides, among other things, in the members' dual status. [8] identifies another source of complexity in the diverging visions between volunteer members and the skilled employees that the cooperative hires as it develops. Despite the complexities mentioned, there are also incentives that offer competitive advantages to SACCOs [23, 26], these are factors of success. There are economic factors that enable savings and credit cooperatives to seek financial performance through mobilizing shareholder-members as regards savings [3, 21]. This can ensure the SACCOs' financial independence by creating a sentiment of trust and bringing out a notion of positive results in credit management [1, 4]. In addition, in order to reduce operational costs, SACCOs promote volunteer participation for certain tasks. This is an essential prerequisite for the cooperative's financial viability [23]. Other factors link SACCOs success to their capacity to sustain quality relationships with the adjacent territory and to create social ties [11, 27]. [6] highlight the fact that enhanced responsibility enables conflict management in relation to resource use within cooperatives.

This research explored the success factors that sustain the achievements of savings and credit cooperatives in Haiti. It examines empirically the lessons that can be drawn from the success story of a Haitian savings and credit cooperative. To this end, this study explores (a) the obstacles that can hamper SACCOs chances of success and (b) the factors that can guarantee their success.

2 Literature Review

2.1 Obstacles to the Success of Cooperatives

Obstacles include the set of elements that can prevent or slow the development of cooperatives and complicate the achievement of desired results. The first type of obstacles that savings and credit cooperatives can face are status-related. [19] contend that cooperatives were created to help the poorest of economic actors. Consequently, their success should be measured in relation to their capacity to serve a maximum number of beneficiaries rather than in relation to their financial success. The social objective therefore takes precedence, and by far, over the guarantee of financial success. [19] opine that the key objective of SACCOs is to make available intermediary and sustainable financial solutions to the most underprivileged economic actors. SACCOs' financial health thus becomes a priority of significant value.

[18], as well as [25] consider legal status and regulations as yet another type of barrier. In fact, in most developing countries, SACCOs have had difficulty adapting to the regulations in force. They usually suffer from a lack of independence, government interference, and anachronistic legal frameworks. In other countries, SACCOs are

limited by the absence of appropriate regulations and the regulatory authorities' poor capacity to provide support and supervision.

Some researchers [13, 17, 22, 25] have concluded that the primary obstacle facing SACCOs is related to agency. This manifests essentially in board members' weak governance and management skills [10, 20]. Obstacles have been attributed to poor governance, the absence of transparency in management, and ineffective human resources management, supervision, and guidance.

[13, 17, 22] have also mentioned the limited means and resources at hand as elements that plague SACCOs success. These include poor infrastructure, lack of financial and human capital, absence of performance standards, and limited product diversification. The shortage of means and resources usually influences the financial system in place and makes for inefficient accounting and audit [25].

Research conducted by [25] highlights two important barriers facing SACCOs. The first factor is psychological in nature, and it relates to the lack of conscientiousness on the part of members. The author has observed that in Ethiopia, SACCOs members are poorly informed of the principles and values underlying cooperation. Members are not united around their financial services institution. They perceive the institution as a tool for loan distribution from NGOs and the government. [7] have also brought to light this confusion and the difficulty among members to grasp, assimilate, and integrate the principles of the cooperative system.

The second barrier brought up by [25] concerns the limited outreach of savings and credit cooperatives. The author comments that despite the economic and social role played by SACCOs, adherence, outreach, and reserve ratios of Ethiopian SACCOs remain very limited and fall short of expectations.

The literature review enabled us to identify the various obstacles that SACCOs face, as well as the factors that can contribute to their success. However, few studies have addressed the role of the human factor. Research has also overlooked the impact of success factors on the social and community dimensions, an avenue that we intend to explore in the future.

3   Research Methodology

The research is focused on understanding the factors that are conducive to the success of cooperatives. A qualitative inductive approach was used. The goal of seeking to grasp the conditions for SACCOs success and to draw lessons can be appropriately met by using a qualitative inductive approach.

In order to understand the factors susceptible to lead to a cooperative's success [15]. Leadership and Strategic Plans Implementation: Comparative Study between Amica and Mentor Saccos in Murang'a Town., we sought to obtain information from the founders of a highly successful Haitian cooperative. The interviewed individuals had witnessed the cooperative's evolution since its founding and the various stages of its success. To this end, we used qualitative methodology for the study of a unique case study. This choice is inspired from [28] who argued that case studies are appropriate in cases where there is a "how" or "why" research question regarding a set of events over which the researcher has little or no control. Semi-directed interviews were thus

conducted with three founding members of the Haitian cooperative SACCO MEN ALE MEN VINI or MAMEV. The individuals chosen had over 17 years of experience and seniority with this cooperative. Interviews were used to explore new knowledge as suggested by [24]. The analysis of qualitative data was done following an interpretive approach. Once data was collected, we proceeded to their transcription and coding. The NVivo Version 11 software was used to code, but it also facilitated the organizing of thoughts into analytical themes. The analysis of success factors focused on the social and community dimensions and excluded the management and governance aspects which will be the subject of subsequent research.

4 Results

Community Rooting and Success
The success of the MAMEV cooperative is in part owed to the excellence of its community rooting strategy. Strategies for the cooperative's involvement within the community have made an important contribution to the reinforcement of community belonging. They took various forms, including the creation of a university fund and an internship program, community rootedness, and the offer of financial education programs.

Creation of a University Fund and a Professional Internship Program
When it started operating, MAMEV faced serious challenges relating primarily to its external environment. The cooperative found itself in a city where residents were poorly educated. The founders had difficulty recruiting skilled human resources. Therefore, from the outset, the founders decided that the cooperative had to play a key role in community development. One of our respondents, **JHC,** affirmed that in order to make a contribution, the cooperative had to establish a university fund and develop an internship program. Some of the cooperative's managers even benefited from this educational framework. The fund was used to grant scholarships for excellence to shareholder-members. It also served to help community schools experiencing financial difficulty and offer internships to university students residing in the area. By promoting education, professional training, and sharing of professional experience, MAMEV enabled the community to benefit from a new generation of skilled and competent professionals. A number of residents and managers received funding to pay for their university tuition. In addition, over the years, a number of people were trained at the cooperative to enable them to contribute to the improvement of the quality of the services offered to the population. Thanks to this program, the cooperative now has qualified human resources, ready and available to integrate staff.

Community Rooting for the Purpose of Reinforcing the Sentiment of Belonging
In order to develop and sustain the members' sentiment of belonging to their community, community actions have been carried out. For example, the cooperative funded, in part or in whole, community projects through community associations. According to our respondent **JHC**, the cooperative "was involved in the cultural sector by helping music groups (RARA) to participate in the large cultural event happening

each year in the region." This community involvement helped MAMEV develop a positive image for itself within the community. JHC also mentioned that this allowed the population to identify with the cooperative and build trust: "The various strategies applied increasingly brought the cooperative closer to the community and became a solid ground that protects it from the political disasters that the country faces."

MAMEV has also undertaken other actions to create proximity and community rooting, and to satisfy needs in its environment. The interviews conducted revealed that the cooperative organized raffles to raise awareness among members about the importance of participating in general assemblies, about engagement in general, and to invite them to become active members. Raffles enabled members to win prizes of value that made a difference in the members' quality of life. Winners have won kitchen appliances, motorcycles, tillers, and computer equipment, to cite only a few.

One of the interviewed individuals, **LJB,** also confirmed that the cooperative has contributed to community development by distributing food and hygiene kits to those citizens most affected by natural disasters. Most years, at the start of school, the cooperative distributed school material bearing its logo. According to **JHC**'s account, "these small gestures projected a positive image of the cooperative to an extent where community members consider it to be an institution that has stood up for them every time families were in need."

In addition to the area of culture, the cooperative has also been involved in agriculture and sports. MAMEV has always contributed financially to sports teams and helped competition organizers. It has funded basic infrastructure through community associations for part or all of community farming projects. That said, the manner in which community ties have been cultivated demonstrates the cooperative management's willingness to develop their local outreach and to develop proximity with the population. This approach has created a positive image for the cooperative and consolidated continued trust in shareholder-members.

Financial Education with a View to Influencing the Community

Financial education has been and remains a fundamental aspect of community development. The account of our respondent JHC confirms the founding members' sensitivity to education and training. He asserted: "we can't talk about development without training […], the basis of all development is education." The cooperative has thus provided managers and employees the possibility to take internal and external training. It makes exploratory visits and thus remains open to its environment and to technological and banking progress. MAMEV "sends managers and employees to visit cooperatives in the Dominican Republic in order to explore the way they work and to stimulate the desire to work on further developing their own institution." **JHC.**

Training is not offered only to employees and directors. According to JHC, "financial training and cooperative-related training are an obligation when taking membership with MAMEV." The cooperative organizes training for new members about the importance of cooperatives on a regular basis in order to impress on them the cooperative vision. In addition, every Friday, training sessions are conducted for new members. At the end of the mandatory training cycle, a member's notebook is given to members having met all the requirements. According to the individuals interviewed, the usefulness of training programs resides in the fact that they upgrade members'

knowledge about the cooperative movement in general. Training enables members to develop their knowledge on financial matters in order to better manage their personal finances and to become more independent and responsible. In order to promote financial education for the largest number of people possible and to increase the cooperative's visibility and outreach, MAMEV has taken part in the creation of an association bringing together all the cooperatives of the region, called PACOREP. This broad involvement is testimony to the willingness of the directors' team to direct their efforts and those of other cooperatives toward financial education. This association has also developed partnerships with other community organizations in order to encourage members to take charge of their financial situation. In all cases, the founding members of MAMEV believe that quality training for members will go a long way to guaranteeing their financial success and hence the success of the cooperative.

Stakeholders and Success

The federation of cooperatives (LE LEVIER), the Bank of the Republic of Haiti (BRH), and *Développement international Desjardins* (DID) have been the main stakeholders involved with the cooperative. They have established and sustained a positive relationship with MAMEV. They have also provided technical and psychological support in the form of regular supervision and control of regulatory bodies, member volunteering, and financial and psychological assistance.

Support from Regulatory Bodies

The Bank of the Republic of Haiti (BRH) and the *Fédération des caisses populaires haïtiennes* (federation of Haitian credit unions) have performed routine supervision and control under the 2002 legislation respecting the constitution, organization, auditing, and supervision of savings and credit cooperatives in Haiti. Through the *Direction de l'Inspection générale des Caisses populaires* (DIGCP), the BRH supervises and audits the cooperative on a regular basis. Inspections are followed by the formulation of recommendations which provide technical support to ensure the financial viability of the cooperative. It also wishes to ensure that MAMEV establish an auditing system to avoid financial fraud and drift. One of the interviewed individuals, **LJB**, believes that DIGCP inspections are generally perceived by the cooperative positively, as a form of technical support. The BRH's recommendations have been applied in order to comply with the Haitian monetary authority's guidelines. LGB also mentioned that the federation of cooperatives plays an important role in "[…] auditing savings and credit cooperatives […] and in the defense of the interests of savings and credit cooperatives." MAMEV is also member of the federation of cooperatives "Le Levier." As member thereof, it benefits from technical assistance through the audits carried out by the federation. Each year, auditors assess the degree of effectiveness of internal control mechanisms before providing their opinion on the liquidity and solvency of the cooperative. In addition, MAMEV receives training on cooperative strategic management and performance improvement. The interviewed individuals also affirmed that operations of the federation's credit union members have been modernized by applying innovative technologies provided by "Le Levier." Today, the cooperative's success depends in part on the technical assistance it receives from regulatory bodies. This technical assistance contributes to the improvement of the financial performance and optimization of the quality of services provided to the community.

Volunteering in the Community

Volunteering is of huge importance in the day-to-day life of the cooperative. It was a key factor in the start-up period and continues to be one as the cooperative develops. For the purpose of launching and moving in the right direction, the founders became involved on a voluntary basis. Our respondent RJO for example stated that "[…] the efforts that the pioneers made on a voluntary basis when MAMEV was starting up made an important contribution the cooperative's success." Within various committees, the founders expended effort on a voluntary basis to steer the cooperative in the right direction. The interviewed individuals affirm that the managers gave of their own time to make the cooperative an ideal place for saving and borrowing. The voluntary participation of shareholder-members enabled the cooperative to save. They volunteered to perform certain tasks in order to not have to hire external professionals. Thanks to their volunteer work, MAMEV has been able to offer services that are affordable and adapted to the needs of the population.

Assistance from Développement International Desjardins

Since 1995, *Développement International Desjardins*, or DID, has been providing assistance and support to Haitian savings and credit cooperatives. This assistance is essentially financial and it enables MAMEV to meet a number of administrative and financial needs. To this extent, **LJB** argues that when the cooperative started operating, DID took on the payment of an employee's salary and the cooperative's rent. DID also established a funding program for cooperatives experiencing financial difficulties. This is a financial incentives offer, conditional on the maintenance of a certain level of savings and a specific number of members. The mechanism developed by DID fostered a desire in the cooperative's founders to hire active members. At the same time, it allowed for the mobilization of the savings required for the granting of financial incentives. This generated the funds necessary to pay the rent and the employees' salaries during the challenging start-up period.

In addition to the financial component, DID has played an important role in resolving a sociological issue that the cooperative was facing. During the start-up period, the cooperative was experiencing a sense of incapacity and the burden of a heavy past that was very present in people's minds. Citizens did not expect concrete results for the residents of this community in particular and Haitians in general. **LJB** for example stated that "at the time of MAMEV's creation, a large number of people openly expressed the opinion that nothing can be accomplished in this community. They thought that MAMEV would not be around very long. It's a sociological issue for Haitians. The members of the team were aware of its importance." According to the interviewees, in order to address this problem, DID felt compelled to offer psychological assistance to the members of the cooperative. They were present and spoke at all community events in order to reflect a positive image and perception of the cooperative. They also attempted to send a message of reassurance and inspiration to citizens as regards the credibility of the young institution. **LJB** confirmed that the apprehension relating to incapacity "gradually disappeared as the population observed year after year that the foreigners representing *Développement International* Desjardins —DID regularly visited the cooperative. At general assemblies, they spoke to congratulate the managers and to encourage them to work toward the cooperative's

growth." This respondent also recalled that on the sociological level, Haitians like and trust foreigners. Myths therefore rapidly gave way to sustained trust within the cooperative. That said, the financial and psychological support offered by DID in the early days of the cooperative have made an invaluable contribution to its success. They made it possible for the cooperative to assume starting up expenses and to mitigate the sentiment of incapacity that impeded the motivation and aspirations of the community.

Strong Capacity to Meet Competition

To date, the arrival of new competitors has had no negative impact on MAMEV's performance. Its community rooting, the population's identification with it, and services adapted to meeting the members' various needs provide the cooperative with a strong competitive advantage. The distinctive features and various relationships with community organizations also strengthen the reasons for the cooperative's existence and complicate matters for potential competitors. Over the years, MAMEV has been able to sustain robust relationships of trust and therefore build client loyalty, and to reinforce the sentiment of belonging in the community. Furthermore, the quality of the relationship developed with users and owners has provided it with a solid footing against potential competition. This relationship is rooted in its community involvement and member mobilization. Unlike commercial banks, MAMEV has placed strong focus on the social dimension. Through the services it provides, it has sought to improve the social and economic reality of each member. Each loan granted to a member by the cooperative generates either economic or social spinoffs. In this vein, interviewee **JHC** stated that "cooperatives' mission differs from that of commercial banks. In contrast to commercial banks, cooperatives offer less stringent conditions for extending credit." In addition, it should be noted that among the cooperative's beneficiaries there are residents of the community, but also residents from Haiti's entire Ouest department. The interviewed individuals affirm that owing to MAMEV's reputation and notoriety, a large part of the institution's credit portfolio comes from members who are not residents of the municipality where it is based.

5   Conclusion

This research consists in exploring the dimensions of success of a savings and credit cooperative in Haiti. For the purpose of doing a case study, we chose MEN ALE MEN VINI (MAMEV), based in the department Ouest of Port-au-Prince, more specifically in the municipality of Gressier. Analysis of success factors was intentionally focused on the social and community dimensions, excluding management and governance. The study has shown that MAMEV's success derives essentially from the moral and financial support that it was offered during its start-up period. Its success is also tributary to the determination and commitment of its founders, shareholder-members, and members. It concludes that local support is often necessary in order to ensure success of local initiatives and citizen effort. As part of their social and economic development policies, governments of developing countries must not only rely on foreign aid. We have also found that NGO support always contributes to the strengthening of a sentiment of self-trust and allows the most disadvantaged people to gain faith in their hidden

abilities and potential. This research has enabled us to conclude that determination and unconditional citizen engagement foster the success of local initiatives.

In general, this research work allows us to understand that the success of a SACCO is multidimensional. The leadership and reputation of the administrators, the daily practice of good governance, the respect of the cooperative principles, the regular inspection and control of the regulatory bodies, the anchoring in the community, the involvement and the sustained commitment of the members are some of the success factors. Volunteering and membership are inseparable in the daily life of cooperatives. The involvement of volunteer members allows for the reduction of operating costs and affects the financial performance of a cooperative. The Factors of success of this Haitian cooperative could serve as a model for other cooperatives around the world. Finally, the success factors inventoried in this research are not specific to Haitian savings and credit cooperatives. They can be applied to a variety of local and international cooperatives in a wide range of areas and sectors. Future research needs to be applied on an international basis. The Haitian model could serve as a comparative model. It would also be appropriate to draw another research that focuses on the leadership and governing style and see if it contributed to the success of the SACCO.

References

1. Abadli, R., Kooli, C., Otmani, A.: Entrepreneurial culture and promotion of exporting in Algerian SMEs: perception, reality and challenges. Int. J. Entrep. Small Bus. **41**(2), 227–240 (2020)
2. Banque mondiale. Pour la réalisation d'un Projet d'appui à un programme de garanties partielles du risque de crédit post-séisme en Haiti. Rapport no. 56179-HT (2010)
3. CGAP. « Travailler avec les coopératives d'épargne et de crédit », Note sur la Microfinance N°25, Août (2005)
4. Fournier, et al.: Les coopératives d'épargne et crédit en Afrique : histoire et évolutions récentes. Revue Tiers Monde XXXVII, no **145**, 67–83 (1996)
5. Gianfaldoni, P., Jardat, R., Hiez, D.: La spécificité démocratique des coopératives bancaires françaises. La Revue des Sciences de Gestion **258**, 59–67 (2012)
6. Guillemot, J., Plante, S., Boisjoly, J.: Gouvernance et développement territorial en milieu insulaire: Le cas de l'Isle-aux-Coudres (Québec-Canada). Can. J. Reg. Sci. **31**(3) (2008)
7. Huppi, M., Feder, G.: The role of groups and credit cooperatives in rural lending. World Bank Res. Obs. **5**(2), 187–204 (1990)
8. JONET Christian et NOEL Benoît, «Entreprise, changement social et démocratie. Quel rapport?», Analyse Barricade, Liège: Barricade (2014)
9. Khlif, H., Guidara, A., Souissi, M.: Corporate social and environmental disclosure and corporate performance: evidence from South Africa and Morocco. J. Account. Emerg. Econ. **5**(1), 51–69 (2015)
10. Kooli, C.: Governing and managing higher education institutions: the quality audit contributions. Eval. Prog. Plan. **77**, 101713 (2019)
11. Kooli, C., Jamrah, A., Al-Abri, N.: Learning from quality audit in higher education institutions: a tool for community engagement enhancement. FIIB Bus. Rev. **8**(3), 218–228 (2019)
12. Leclerc, A., Doiron, M.: Les facteurs de réussite en développement coopératif: analyse de la perception des leaders du mouvement coopératif acadien (2012)

13. Marwa, N.W.: Efficiency and sustainability of Tanzanian saving and credit cooperatives. Doctoral dissertation, Stellenbosch: Stellenbosch University (2015)
14. Mathuva, D.M., Kiweu, J.M.: Cooperative social and environmental disclosure and financial performance of savings and credit cooperatives in Kenya. Adv. Account. **35**, 197–206 (2016)
15. Mbogo, J.N., Machogu, C., Otieno, R.J.: Leadership and Strategic Plans Implementation: Comparative Study between Amica and Mentor Saccos in Murang'a Town (2020)
16. McGrath, D.: Social accounting in the credit union sector: GRI readiness. In: Conference on Pacific Basin Finance, Economics, Accounting and Management (PBFEAM), pp. 1–22 (2008)
17. Mudibo, E.K.: Challenges and opportunities facing the Kenyan savings and credit co-operative movement. In: Presentation during the Africa Savings and Credit Cooperatives Conference, 3rd–6th October 2006 (2006)
18. Munene, E.C., Makori, J.: The challenges facing deposit-taking savings and credit cooperative societies' regulatory compliance in Kenya. Interdisc. J. Contemp. Res. Bus. **4** (12), 1013–1081 (2013)
19. Nyamsogoro, G.D.: Financial sustainability of rural microfinance institutions (MFIs) in Tanzania. Doctoral dissertation, University of Greenwich (2010)
20. Ndegwa, J.: The mediating effect of firm revenue on the relationship between board characteristics on financial distress of deposit taking saccos in Nairobi County, Kenya. Int. J. Finan. Bank. Stud. (2147–4486) **10**(1), 34–47 (2021)
21. Otii, L.O.: Process innovation promoters, firm performance and moderating role of service quality practices in SACCOs in Kenya. Int. J. Bus. Social Sci. **11**(8) (2020)
22. Ondieki, A.N., Okioga, C., Okwena, D.K., Onsase, A.: Assessment of the Effect of External Financing on Financial Performance of Savings and Credit Cooperatives in Kisii Central District, Kenya (2012)
23. Périlleux, A.: La gouvernance des coopératives d'épargne et de crédit en micro finance : un enjeu de taille. Reflets et perspectives de la vie économique (2008)
24. Savoie-Zajc, L.: L'entrevue semi-dirigée. Dans B. Gauthier (Dir.): Recherche sociale : de la problématique à la collecte de données (5e édition). Québec, Québec: Presses de l'Université du Québec (2009)
25. Tesfamariam, K.: Savings and credit cooperatives in ethiopia: development, challenges and proposed intervention. Int. J. Cooper. Stud. **4**(1), 1–8 (2015)
26. Wallace, C. K., Kilika, J.: Strategic innovations and competitiveness of saccos in South Imenti Sub-county, Meru County. Int. Acad. J. Innov. Leadership Entrep. **2**(2), 93, 117, 2 (2021)
27. Weber, J.: Au-delà du contrat la mobilisation du concept de valeur de lien dans la relation sociétaire-mutuelle d'assurance: le cas Macif. Revue Internationale de l'économie sociale: recma **321**, 62–80 (2011)
28. Yin, R.: Case Study Research Design and Methods, 5th ed, p. 282. Sage. Thousand Oaks (2014)

The Impact of Corporate Social Responsibility Disclosure on the Financial Performance of Banks Listed on the PEX and the ASE

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Abstract. The study aim was to investigate the impact of corporate social responsibility disclosure (CSRD) on the financial performance (FP) of Palestinian and Jordanian banks. All banks listed on the Palestine Exchange (PEX) and Amman Stock Exchange (ASE) during the period 2010–2019 were considered. The study employed regression model on a sample of 60 Palestinian bank-observations and 150 Jordanian bank-observations. While CSRD was measured using a disclosure index includes 30 items, return on assets (ROA), return on equity (ROE) and Tobin's Q were used to measure FP. Results of the study reported a significant positive relationship between CSRD and Tobin's Q (Q ratio). However, no relationships were identified between CSRD and the other two FP indicators. The study recommended to improve the quality of CSRD through extending the minimum regulatory requirements related to CSRD in Palestine and Jordan. Furthermore, all related parties must be educated about the importance of CSRD and its practices.

Keywords: CSRD · PEX · ASE · Financial performance

1 Introduction

Corporate Social Responsibility (CSR) is one of the most attractive strategy standards for business practices in today's economy. An adequate consideration of the CSR has a positive impact on the company's reputation, and hence, on its profitability, since CSR strategies are a success-key for a business [1]. However, it is not sufficient for businesses to simply involve in CSR activities; it is important to disclose information about these activities to stakeholders [2]. Corporate social responsibility disclosure (CSRD) is a process of providing information about interactions between companies with regard to environment, employees, society and consumer issues [3]. Notwithstanding, carrying out of social responsibility is not costless. Few economic benefits of CSR activities can be obtained compared with numerous costs [4]. Assuming social responsibility seems to be a controversial issue given the high cost associated with its activities [5].

The vital role and the economic importance of banks to societies, reasonably lead them to assume CSR. Moreover, CSRD has a special importance for banks since they constitute an indicator of countries' wealth and reflect the economic growth. While societies assume that banks are adequately socially responsible, banks seek to achieve

their profit-related objectives. Accordingly, it is important to understand the relationship between the relatively high level of the CSRD required from banks and their FP.

There is a limited research, reflecting inconsistent results, on CSRD and its effects on banks FP [5]. This research gab is more prominent in the developing countries, in general, and Palestine and Jordan, in particular [6]. Therefore, we tried to further shed the light on the relationship between CSRD and bank performance. This study focused on the banks listed on the Palestine Exchange (PEX) and the Amman Stock Exchange (ASE) during the period 2010–2019. Banks in Palestine and Jordan are regulated almost by similar regulations issued by the Palestine Monetary Authority and the Central Bank of Jordan. They also use the same accounting standards (International Financial Reporting Standards) when preparing their financial statements, and these financial statements are audited based on the same auditing standards (the International Standards on Auditing). In the both countries, banking sector is plays a considerable role in the economic structure. Moreover, the two countries have similar institutional, cultural, and legal contexts.

2   Theoretical Background

According to [7], CSR encompasses the economic, legal, ethical and discretionary expectations that society has of firms at a given point of time. It represents an integration of financial performance, environmental performance and social performance [8].

Information about CSR activities should be released to stakeholders and community [2], since disclosing CSR activities is believed to be essential to businesses. It enables stakeholders to decide whether the firm is socially active or not, which would rationalize its continued existence to them [9]. According to [10], CSRD is the "process of communicating the social and environmental effects of organizations' economic actions to particular interest groups within society and to society at large". Others e. g. [11] saw CSRD as voluntary or obligatory reporting of social information, ethical information and environmental information to stakeholders. Interest in CSR and CSRD has grown significantly over the past few decades and many theories address them [12]. The most dominant theories that have been used to explain CSR practices and disclosure are signaling, legitimacy, stakeholder and agency theories.

CSR practices can be considered as signals to stakeholders about corporate quality and capability. According to [13], practicing CSR may be interpreted by stockholders as a firm willingness to allocate reasonable resources to maintain a sustainable relationship with them. Management provides more information to signal that they have favorable results [14]. [15] reported that CSR practices create a positive moral capital that provide corporate with insurance-like protection. CSRD may indicate that the company is better than competitors. Accordingly, the company's reputation would be enhanced, and more investment would be attracted [16].

Legitimacy theory has a significant role in explaining and identifying social contract since a company is obligated to all society components [17]. Social contract is an arrangement in which firms agree to achieve the expectations of societal members in term of objectives and rewards. This action will ultimately guarantee firms continued

existence and the firm will be considered as legitimate [18]. When companies respond to demand for social activities, social legitimacy will come as an outcome [9]. Companies seek to ensure that they are perceived as operating within the bounds and ethics of their respective societies. Through this, they can ensure that their activities are perceived by society being legitimate. Additionally, [17] argued that only legitimate company has the right to utilize society's natural and human resources. In order to maintain their legitimacy, firms would respond to the expectations of the society members [19].

Stakeholder theory provides theoretical motivations for CSRD [9]. Corporations are considered to have responsibilities to society and therefore need to engage in CSR activities in order to survive and to gain support from stakeholders [20]. Companies may use CSR activities as a strategic tool to achieve financial benefits on the long run [12]. Moreover, the best way to understand CSR is through managing the corporations' relationships with stakeholders [21]. Therefore, corporations operate to provide benefits to their stakeholders since their existence is strongly influenced by its stakeholders. Accordingly, companies must disclose their CSR activities for stakeholders to evaluate the performance of the company.

According to agency theory, management is motivated to disclose more CSR activities to convince the stakeholders that they are behaving optimally on the stakeholder's behalf [22]. In agency relationships, managers are required to provide periodic reports of the company performance to its principal. In this respect, reporting is used as a means of transparency and accountability of management performance, and also for managerial compensation contracts [23]. In general, there is an agreement that social and environmental reporting helps organizations to attract new investors and obtain financing at a minimum cost [24].

3   Literature Review and Hypothesis Development

Over long period of time, theoretical and quantitative studies have investigated if a relationship exists between CSR/CSRD and FP. These studies reported mixed results. With regard to CSR-FP relationship, some studies established a negative relationship between the two variables since adopters of CSR are at a competitive disadvantage as they bear avoidable costs. Accordingly, CSR activities have few economic benefits and high costs leading to fall in the company's FP [25].

Notwithstanding, a company with good FP is likely to be good in social performance [26]. [27] reported that CSR is positively related to higher FP. Such results support the idea that CSR activities can be associated with a series of benefits. [5] showed that CSR-banks overwhelmingly outperform non-CSR banks in terms of ROA and ROE.

Other studies reported that social performance and FP are uncorrelated and thus, CSR would have no effect on the FP [26]. According to [28], many variables may intervene between the two variables and the relationship between them may result just by chance. Absence of any relationship between CSR and FP was reported also by Veld (2010). Consistently, [29] concluded that performing good CSR does not mean achieving good FP. So, CSR practices are not causally related to FP.

The CSRD-FP relationship has been examined widely by the existing literature. [30] revealed that level of CSRD in the annual reports of Libyan companies has positively impacted FP. In Thailand, [31] provided evidence on the positive relationship between CSRD and FP. Similar results reported by [32] who indicated that CSRD level could raise FP of the Saudi companies. Moreover, [33] showed that the level of CSR disclosed by companies listed on the Vietnam Exchange has a positive effect on ROA. Inversely, [34] revealed a significant negative relationship between CSRD and the FP of the Islamic banking industry of Pakistan.

Part of the studies suggested mixed results on the relationship between CSRD and FP. [35], for example, found that CSRD does not have an effect on sales growth. On the other hand, it has a positive and significant effect on ROA. Similarly, [36] reported mixed results in Iraq. While CSRD influences ROE in Indonesia, it does not influence ROA [37].

4   Methodology and Research Design

4.1   Sample and Data

The study sought to examine the influence of CSRD on the FP of Jordanian and Palestinian banks. All banks listed on the PEX and the ASE for which data is available during the period of (2010–2019) were considered. The total number of the banks included in this study was 21 banks (15 from the ASE and 6 from the PEX) with total 210 firm-year observations. Relevant data was obtained from the annual reports of the banks.

4.2   Measurement of the Study Variables

4.2.1   Independent Variable: CSRD

In this study, CSRD was measured by a disclosure index contains 30 items. As seen in Table 1, the items were classified into 4 categories (environment, employees, community and products). Items of the index were selected based on the results and arguments of several previous studies e.g. [6, 38–40]. These items were adjusted to reflect the settings exist in Palestine and Jordan and the CSRD practices of their banks.

The dummy procedure to compute the CSR disclosure score was employed. Each annual report was scanned to determine if the item was disclosed or not. Disclosed items were coded with '1', otherwise with '0'. Disclosure scores were computed by dividing the number of items disclosed by a bank to the total number of the items (30). Therefore, the CSRD score for each bank will be determined as a percentage that ranges from 0% if the bank does not disclose any items, to 100% if the bank discloses all the items in the index.

4.2.2   Dependent Variable: Financial Performance (FP)

Two types of indicators have been used in the accounting literature to measure FP, accounting-based and market-based indicators [41]. Accounting-based indicators capture only historical aspects of firm's FP. While market-based indicators are forward looking and emphasize on market performance [42].

Table 1. CSRD disclosure index

Items of CSRD disclosure	
A	**Environmental information**
1	Bank policy toward the environment
2	Environmental protection programs contribution
3	Natural resources conservation
4	Environmental regulations and requirements compliance
5	Bank financial contributions to organizations operating in environmental protection field
6	Bank support and finances clean and alternative projects (Renewable)
B	**Employee information**
1	Break-down of the employees by executive & non-executive
2	Amount spent on training employees
3	Number of employees trained during the year
4	Education facilities
5	Information on employee benefits
6	Health arrangements
7	Safety arrangement
8	Holidays and vacations
C	**Community involvement information**
1	Donations to arts, sports, etc
2	Sponsoring educational seminars and conferences
3	Sponsoring students educational scholarship
4	Providing job opportunities and helping reducing unemployment rate
5	Conducting projects in poor areas
6	Providing Cash rewards
7	Participating and financing celebration: National/ religious
8	Other communities involvement
D	**Products information**
1	Glossary/definition of products
2	Involvement in non-permissible activities
3	Providing returns within Shariah principles
4	Responsiveness to customer complaints
5	Provides its banking services through technology and the Internet)
6	Competitive position of the bank
7	Research projects set up by the bank to improve its services
8	Bank liable for Zakat

Accounting based indicators are available for all stakeholders and can be reasonably comparable [43]; they are preferable in measuring short-term FP. However, they may be biased if the sample includes firms from different industries. Also, they are only available for public listed firms [43]. ROA and ROE are the most common indicators

used to measure FP in the accounting literature. According to [44], they predict FP better than investor returns.

On another hand, market-based indicators, like Tobin's Q, reflect changes in CSR faster than accounting-based indicators [43]. They are better for measuring long-term FP, and they are considered as objective measures [42]. Tobin's Q is one of the stock market value perceptions of current and future company's earnings [45].

The ideal measurement for research on the relationship between CSR and FP would contain both accounting- and market-based measurements [46]. Therefore, this study used three indicators (ROA, ROE and Tobin's Q) to measure FP. Those indicators were calculated as follows:

$$ROA = Net\ Income\ before\ Tax/Total\ Assets$$

$$ROE = Net\ income/Shareholders\ Equity$$

$$Tobin's\ Q = (EMV + Liabilities)/Total\ Assets$$

$$EMV:\ Equity\ Market\ Value\,(closing\ Price\ of\ fiscal\ year\ end\ \times No.\ of\ outstanding\ shares)$$

4.2.3 Control Variables

[47] results asserted the importance of considering control variables when addressing the relationship between CSR and FP. Therefore, five variables controlled the relationship between CSRD and FP. Following the existing literature, control variables include bank **SIZE** [4], bank **TYPE** [48], level of **RISK** [4] and advertising intensity **ADVINT** [47]. Moreover, the CSRD-PF relationship was also controlled by the Exchange in which the bank is listed (**PEX/ASE**).

Size is a significant determinant of firm CSRD and FP [4]. We assume that size, represented by the natural logarithm of the total assets, is positively associated with FP [28]. Banks listed on the PEX and ASE are classified into Islamic and conventional banks. We introduce this classification as a control variable. If the bank is an Islamic bank it gets 0, otherwise it gets 1. Many researchers used risk as a control variable e.g. [26]. Risk could be checked through financial leverage which is measured by total liabilities to the total assets of the bank. Advertising expenses influence interest income and ROA though [49]. CSR affects FP strongly with high levels of advertising intensity [50]. Advertising intensity is measured by the advertising expense to interest revenues. Finally, in order to identify if the relationship between CSRD and FP is affected by the macro dimension, we considered the exchange in which the bank is listed as a control variable. If the bank is listed on PEX it is coded as 1 and as 0 if it is listed on the ASE.

Based on [47] model, our study model is:

$$BFPi = f\ (CSRDi,\ RISKi,\ ADINTi,\ TYPEi,\ PEX/ASEi)$$

Where:

BFPi = FP of bank i

CSRDi = corporate social responsibility of bank i

RISKi = the "risk" of bank i

ADVINTi = advertising intensity of bank i

TYPEi = type of bank is a dummy variable if the bank is Islamic it gets 0, if it conventional it gets 1

SIZE = the natural logarithm of the total assets of bank i

PEX/ASEi = the Exchange in which bank i is listed

5   Results and Discussion

5.1   Descriptive Statistics

Table 2 illustrates means and standard deviations of all study variables. As seen, the average of CSR disclosed by the banks is 54.5% of the index items. This result is consistent with the results of [39]. On the other hand, the mean values of ROA, ROE and Tobin's Q are 0.02224, 0.21319, and 5.13162, respectively.

Table 2. Means and standard deviations of the study variables

Variable	Mean	Std. deviation
CSRD	0.54448	0.183715
ROA	0.02224	0.064728
Tobin's Q	5.13162	18.807557
ROE	0.21319	0.87111
SIZE	1,849,880,833	1,743,739,687
RISK	0.82410	0.822364
ADVINT	0.2167	0.36149
TYPE	0.8095	0.39362

5.2   CSRD and FP

Given that three indicators were used to measure FP, the CSRD-FP relationship was examined by three models.

5.2.1   Model 1: ROA

Tables 3 and 4 present the regression results when ROA is considered. According to the results, ROA is not affected by CSRD. It is affected by RISK and TYPE since F for these variables is 536.380 and 328.194, respectively. The relationship between the two variables and ROA was significant with a significance value of 0.001 for the two variables. Moreover, the explanatory power of the two variables is high given that R^2 values are 0.721 and 0.760.

Table 3. Stepwise regression test (Model 1: ROA)

Dep. Var.	Indep. Var.	F	Sig.	Consonant	Df	R^2	R
ROA	RISK	536.38	0.001*	−0.009	1	**0.721**	
				0.072	208		0.849
					209		
	TYPE			−0.034	2	**.76**	
		328.194	0.001*		207		0.872
					209		

*The mean difference is significant at the 0.05 level

Table 4. Excluded variables from stepwise regression test Model 1

Dependent Var.	Independent Var.	Sig.
ROA	CSRD	**.761**
	PEX/ASE	**.650**
	SIZE	**.449**
	ADVINT	**.829**

5.2.2 Model 2: ROE

In the second analysis, we consider ROE as a PF measurement. The results presented in Tables 5 and 6 suggest that ROE, as a measure of FP, is not affected by the level of CSRD (Sig. value was **.467**). It is affected only by RISK (F value is 91.115 and Sig**.** is 0.000). Furthermore, R^2 equals (0.305) which means that it interprets 30.5% of the ROE behavior.

We notice that the two models failed to identify a relationship between CSRD and PF. This result is consistent with many previous studies e.g. [26, 29, 51]. In the same time, it is not in line with the findings of other studies e.g. [9, 27, 52]. We believe that the concept of CSR and related disclosures in Jordan and Palestine has not matured to the extent that it becomes a major determinant of FP.

Table 5. Stepwise regression test (Model 2: ROE)

Dep. Var.	Indep. Var.	F	Sig.	Consonant	Df	R^2	R
ROE	RISK	91.115	0.000*	0.552	1	**0.305**	
				0.560	208		0.552
					209		

*The mean difference is significant at the 0.05 level

Table 6. Excluded variables from stepwise regression test Model 2

Dependent Var.	Independent Var.	Sig.
ROE	CSRD	.467
	PEX/ASE	.724
	SIZE	.295
	ADVINT	.344
	TYPE	.264

5.2.3   Model 3: Tobin's' Q

In Table 7 and 8, the results reported a significant relationship between CSRD and PF when measured by Tobin's Q. The value of F is 27.6 and Sig. value equals 0.000. CSRD interprets 11.7% of the PF behavior since R^2 equals 0.117. Furthermore, the results indicate that FP is also affected by the size of the bank and its type.

We notice that the results do not differ if we consider the PEX/ASE variable. Regardless of the indicator that was used to measure FP, CSRD-FP relationship was always the same. This may be attributed to the several similarities in terms of political, cultural, social and economic aspects that exist in the two countries. Moreover, the Palestinian Monitory Authority and the Central Bank of Jordan regulate the banks using similar rules. These circumstances constitute a major influential factor in shaping the reporting characteristics [39, 53]. Although some differences (i.e. the Israeli Occupation of Palestine) exist [54], these differences do not have a direct effect on the setting in which banks are managed and regulated.

Table 7. Stepwise regression test (Model 3: Tobin's Q)

Dep. Var.	Indep. Var.	F	Sig.	Consonant	Df	R^2	R
Tobin's Q	CSRD		0.000*	0.342	1	**0.117**	
		27.609		0.440	208		0.342
					209		
	SIZE		0.000*	-0.352	2	**0.231**	
		31.152			207		0.481
					209		
	TYPE		0.000*	0.139	4	**0.299**	
		21.874			205		0.547
					209		

*The mean difference is significant at the 0.05 level

Table 8. Excluded variables from stepwise regression test Model 3

Dependent Var.	Independent Var.	Sig.
Tobin's Q	PEX/ASE	**0.413**
	RISK	**0.864**
	ADVINT	**0.248**

6 Conclusions

This study investigated the impact of corporate social responsibility disclosure (CSRD) level on financial performance (FP) of banks listed on the Palestine Exchange and Amman Stock Exchange, during the period 2010–2019. While a disclosure index of 30 items was developed to measure the level of the CSRD, FP was measured using ROA, ROE and Tobin's Q.

Mixed results were obtained from the regression analyses. While a statistical relationship between CSRD and FP was identified when Tobin's Q is used as a measure of FP, no relationship was identified when FP is measured by ROA or ROE. Furthermore, no differences were identified between the banks of the two exchanges (PEX and ASE).

Based on the findings, the level of CSR and its related disclosures in Jordan and Palestine should be enhanced. Education programs on the importance of CSR and related disclosure have to be conducted for related. Furthermore, policy makers and regulators are required to improve the extent of CSRD through extending the minimum regulatory requirements concerning CSR reporting in Palestine and Jordan. They are also encouraged to establish an official CSR index that can be used as a metric to evaluate and compare CSR practice and disclosure.

The study results should be interpreted cautiously. The use of an index to measure CSRD of the banks is a limitation. There is no agreement on the specific nature or quantity of information to be included in the disclosure index. Therefore, the CSRD score given to each bank is valid to the extent to which the applied index is appropriate. So, the over-riding research constraint we faced in conducting this analysis was the lack of a reliable measure of CSR.

Future research may provide qualitative analysis of CSRD information to provide more in-depth understanding of CSR activities, and information disclosed in annual financial reports. Such research may be oriented toward the accuracy and reliability of social responsibility information presented in banks' annual reports. Moreover, we recommend connecting CSR and CSRD with Digital banking.

References

1. Lichtenstein, D.R., Drumwright, M.E., Braig, B.M.: The effect of corporate social responsibility on customer donations to corporate-supported nonprofits. J. Mark. **68**(4), 16–32 (2004)
2. Holder-Webb, L., Cohen, J.R., Nath, L., Wood, D.: The supply of corporate social responsibility disclosures among US firms. J. Bus. Ethics **84**(4), 497–527 (2009)

3. Nour, A.I., Sharabati, A.A., Hammad, K.M.: Corporate governance and corporate social responsibility disclosure. Int. J. Sustain. Entrep. Corp. Soc. Resp. (IJSECSR) **5**(1), 20–41 (2020). https://doi.org/10.4018/IJSECSR.2020010102

4. Waddock, S.A., Graves, S.B.: The corporate social performance–financial performance link. Strateg. Manag. J. **18**(4), 303–319 (1997)

5. Shen, C.-H., Meng-Wen, W., Chen, T.-H., Fang, H.: To engage or not to engage in corporate social responsibility: empirical evidence from global banking sector. Econ. Model. **55**, 207–225 (2016)

6. Barakat, F.S.Q., López Pérez, M.V., Rodríguez Ariza, L.: Corporate social responsibility disclosure (CSRD) determinants of listed companies in Palestine (PXE) and Jordan (ASE). RMS **9**(4), 681–702 (2014). https://doi.org/10.1007/s11846-014-0133-9

7. Carroll, A.B.: A three-dimensional conceptual model of corporate performance. Acad. Manag. Rev. **4**(4), 497–505 (1979). https://doi.org/10.2307/257850

8. Baker, M.: Definitions of corporate social responsibility - What is CSR? (2004). Accessed 26 June 2017

9. Shihadeh, F.: Online payment services and individuals' behaviour: new evidence from the MENAP. Int. J. Electron. Bank. **2**(4), 275–282 (2020)

10. Gray, R., Owen, D., Adams, C.: Accounting & Accountability: Changes and Challenges in Corporate Social and Environmental Reporting. Prentice Hall, Upper Saddle river (1996)

11. Jenkins, H., Yakovleva, N.: Corporate social responsibility in the mining industry: exploring trends in social and environmental disclosure. J. Clean. Prod. **14**(3–4), 271–284 (2006)

12. Garriga, E., Melé, D.: Corporate social responsibility theories: mapping the territory. J. Bus. Ethics **53**(1), 51–71 (2004)

13. Barnett, M.: Stakeholder influence capacity and the variability of financial returns to corporate social responsibility. Acad. Manag. Rev. **32**(3), 794–816 (2007)

14. Hassanein, A., Hussainey, K.: Is forward-looking financial disclosure really informative? evidence from UK narrative statements. Int. Rev. Financ. Anal. **41**, 52–61 (2015)

15. Sanad, Z., Al-Sartawi, A.: Investigating the relationship between corporate governance and internet financial reporting (ifr): evidence from Bahrain bourse. Jordan J. Bus. Adm. **12**(1), 239–269 (2016)

16. Mahoney, L., Roberts, R.W.: Corporate social performance, financial performance and institutional ownership in Canadian firms. Account. Forum **31**(3), 233–253 (2007)

17. Ali, W., Rizwan, M.: Factors influencing corporate social and environmental disclosure (CSED) practices in the developing countries: an institutional theoretical perspective. Int. J. Asian Soc. Sci. **3**(3), 590–609 (2013)

18. Deegan, C.M.: Financial accounting theory/Craig Deegan. Account. Forum **20**(5), 63–73 (2013)

19. Woodward, D.G., Edwards, P., Birkin, F.: Organizational legitimacy and stakeholder information provision 1. Br. J. Manag. **7**(4), 329–347 (1996)

20. Nielsen, A.E., Thomsen, C.: Reporting CSR–what and how to say it? Corp. Commun. Int. J. (2007)

21. Clarkson, M.E.: A stakeholder framework for analyzing and evaluating corporate social performance. Acad. Manag. Rev. **20**(1), 92–117 (1995)

22. Harun, M.S.B.: The impact of corporate governance and its consequences on CSR disclosure: empirical evidence from Islamic banks in GCC countries (2016)

23. Reverte, C.: Do better governed firms enjoy a lower cost of equity capital?: evidence from Spanish firms. Corp. Gov. Int. J. Bus. Soc. **9**(2), 133–145 (2009)

24. Jizi, M., Salama, A., Dixon, R., Stratling, R.: Corporate governance and corporate social responsibility disclosure: evidence from the US banking sector. J. Bus. Ethics **125**(4), 601–615 (2013). https://doi.org/10.1007/s10551-013-1929-2

25. Friedman, M.: The social responsibility of business is to increase its profits. New York Times Magazine. The New York Times Company (1970)
26. Soana, M.-G.: The relationship between corporate social performance and corporate financial performance in the banking sector. J. Bus. Ethics **104**(1), 133–148 (2011)
27. Tsoutsoura, M.: Corporate social responsibility and financial performance. UC Berkeley. In: Center for Responsible Business (2004)
28. Al-Sartawi, A.: The effect of corporate governance on the performance of the listed companies in the gulf cooperation council countries. Jordan J. Bus. Adm. **11**(3), 705–725 (2015)
29. Nelling, E., Webb, E.: Corporate social responsibility and financial performance: the "virtuous circle" revisited. Rev. Quant. Financ. Acc. **32**(2), 197–209 (2009)
30. Bayoud, N.S., Kavanagh, M., Slaughter, G.: An empirical study of the relationship between corporate social responsibility disclosure and organizational performance: evidence from Libya. Int. J. Manag. Mark. Res. **5**(3), 69–82 (2012)
31. Jitaree, W.: Corporate social responsibility disclosure and financial performance: evidence from Thailand (2015)
32. Habbash, M.S.: Corporate social responsibility disclosure, financial performance and firm value: the case of Saudi Arabia. Arab J. Adm. Sci. **24**(1), 81–105 (2017)
33. Ta, H.T.T., Bui, N.T.: Effect of corporate social responsibility disclosure on financial performance. Asian J. Finan. Account. **10**(1), 40–58 (2018)
34. Rehman, Z., Zahid, M., Rahman, H., Asif, M., Alharthi, M., Irfan, M., Glowacz, A.: Do corporate social responsibility disclosures improve financial performance? a perspective of the Islamic banking industry in Pakistan. Sustainability **12**(8), 3302 (2020). https://doi.org/10.3390/su12083302
35. Martin, R., Yadiati, W., Pratama, A.: corporate social responsibility disclosure and company financial performance: do high and low profile industry moderate the result? Ind. J. Sustain. Account. Manag. **2**(1), 15–24 (2018)
36. Saud, M.A.O., Rohalia, B.Y., Azam, A.H.K.: The Relationship between Corporate Social Responsibility Disclosure and Financial Performance in the Iraqi Companies: Literature Review. Int. J. Engl. Literat. Social Sci. (IJELS) **4**(6), 1836–1841 (2019)
37. Al-Sartawi, A.: Does it pay to be socially responsible? empirical evidence from the GCC countries. Int. J. Law Manag. **62**(5), 381–394 (2020)
38. Hassanein, A.G. Lundholm, G.W., Young, C.: Corporate social responsibility and the Canadian international extractive sector: a survey (2006). Accessed 18 Sept 2008
39. Alia, M., Branson, J.: The effect of environmental factors on accounting diversity: a literature review, p. 04 (2011). https://ssrn.com/abstract1780479
40. Alia, M.J.A., Mardawi, Z.M.: The impact of ownership structure and board characteristics on corporate social responsibility disclosed by Palestinian companies. Jordan J. Bus. Adm. **17**(2), 245–277 (2021)
41. Al-Sartawi, A.: Institutional ownership, social responsibility, corporate governance and online financial disclosure. Int. J. Crit. Account. **10**(3/4), 241–255 (2018)
42. Oikonomou, I.: Empirical investigations of the relationship between corporate social and financial performance. PhD diss., University of Reading (2011)
43. Galant, A., Cadez, S.: Corporate social responsibility and financial performance relationship: a review of measurement approaches. Economic Research-EkonomskaIstraživanja **30**(1), 676–693 (2017)
44. Moore, G., Spence, L.: Small and medium-sized enterprises & corporate social responsibility: identifying the knowledge gaps. Editorial J. Bus. Ethics **67**(3), 219–226 (2006)

45. Khatib, S.F.A., Nour, A.N.I.: The impact of corporate governance on firm performance during the COVID-19 pandemic: evidence from Malaysia. J. Asian Finan. Econ. Bus. **8**(2), 943–952 (2021). https://doi.org/10.13106/JAFEB.2021.VOL8.NO2.0943

45. Al-Matari, E.M., Al-Swidi, A.K., Fadzil, F.H.: The measurements of firm performance's dimensions. Asian J. Finan. Account. **6**(1), 24 (2014)

47. McWilliams, A., Siegel, D.: Corporate social responsibility and financial performance: correlation or misspecification? Strateg. Manag. J. **21**(5), 603–609 (2000)

48. Nizam, E., Ng, A., Dewandaru, G., Nagayev, R., Nkoba, M.: The impact of social and environmental sustainability on financial performance: a global analysis of the banking sector. J. Multinatl. Finan. Manag. **49**, 35–53 (2019)

49. Acar, M., Temiz, Hüseyin.: Advertising effectiveness on financial performance of banking sector: Turkey case. Int. J. Bank Mark. **35**(4), 649–661 (2017). https://doi.org/10.1108/IJBM-03-2016-0036

50. Wagner, M.: The role of corporate sustainability performance for economic performance: a firm-level analysis of moderation effects. Ecol. Econ. **69**(7), 1553–1560 (2010)

51. Chih, H.-L., Chih, H.-H., Chen, T.-Y.: On the determinants of corporate social responsibility: International evidence on the financial industry. J. Bus. Ethics **93**(1), 115–135 (2010)

52. Lin, C.-H., Yang, H.-L., Liou, D.-Y.: The impact of corporate social responsibility on financial performance: evidence from business in Taiwan. Technol. Soc. **31**(1), 56–63 (2009)

53. Alia, M., Branson, J.: Environmental obstacles associated with the adoption of the IFRS in the Arab world: Evidence from Jordan. World Account. Sci. (Muhasebe Bilim Dünyası Dergisi) 13(1), 23–85 (2010)

54. Jabarin, M., Nour, A., Atout, S.: Impact of macroeconomic factors and political events on the market index returns at Palestine and Amman Stock Markets (2011–2017). Investment Management and Financial Innovations **16**(4), 156–167 (2019). https://doi.org/10.21511/imfi.16(4).2019.14

Effect of Adopting the Criterion of Revenue from Contracts with Clients on Accounting Conservatism

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Abstract. This paper investigate revenue from contacts at different levels of accounting conservatism postulate as well as the factors affecting those levels of the Accounting Conservatism while preparing Financial Reports. The results of the study indicated a Low accounting conservatism level in most financial reports. The size or number of contracts has had an impact on the level of the accounting conservatism; small firms are found to be more conservative in their accounting policies than large firms. Furthermore, debts' factor had no effect on the level of the accounting conservatism upon reporting. Finally, this study concluded that Accounting Organizers and authorities supervising companies should take measurements to make them abide by an acceptable level of accounting conservatism in addition to increasing financial market control and other relevant parties to ensure transparency & credibility of financial statements and their abilities to predict future.

Keywords: Criterion of revenue · Contracts · Clients · Accounting conservatism postulate

1 Introduction

Accountants nowadays adhere to one of the most important accounting postulates, external auditors pay special attention to its application, this postulate is the postulate of accounting conservatism or what is known as the principle of caution. Conservatism is a controversial concept from the beginning of the last century up to date, and despite criticisms directed to this postulate, it plays an important role in accounting practices and today in the midst of suspicions in financial reports, adherence to this postulate has become a basis for companies' differentiation in their Financial statements' transparency and a standard for classifying countries by the degree to which their accounting policies and procedures reserve.

Accounting conservatism is the recognition of the expected losses without expected profits. Inder [1] believes that a conservatism places a constraint on accountants in presenting data, so that the minimum values of assets and revenues, and the higher values of liabilities and expenses are included in cases of uncertainty.

The measurement of accounting conservatism contributes to show the efficiency of the reports as some studies indicated that when the financial reports enjoy conservatism in a market, this indicates the realization of the market efficiency hypothesis, which states that the stock price reflects all the information available about it in a timely manner. Measuring the level of accounting conservatism that financial reports enjoy contributes to evaluating the financial disclosure transparency in these markets through being away from exaggerations in evaluation and accounting measuring. It provides accurate and appropriate information to assess the status of the company also it gives capability to predict its future. The importance of measuring accounting conservatism in the emerging financial markets increases as it affects the decisions of many parties like the financial market regulators, investors and other relevant parties.

The purpose of this research is to clarify the effect of adopting the revenue criterion from contracts on the level of accounting conservatism upon preparing the financial reports by answering the following two questions:

– What is the level of accounting conservatism in the financial reports?
– What are the factors affecting the level of this conservatism?

2 Accounting Practices of the Accounting Conservatism

According to the International Accounting Standards IFRS/IAS despite the removal of the caution feature from the conceptual framework of the International Accounting Standards Board for the year 2010, this does not mean that the accounting practice according to the standards is devoid of the accounting conservatism concept and this can be illustrated through the international accounting standards as follows (IASB):

IAS no. 8 Accounting Policies, Changes in Accounting Estimates and Errors: We see that in accordance with this standard management must use its judgment and appreciation for events and circumstances for which there is an international standard applied to it through the application of accounting policies that produce appropriate and reliable information which is consistent with the concept of conservatism that refers to the use of personal judgment to estimate circumstances and uncertainties.

IAS no. 16 Property, Plant and Equipment: According to Paragraph 30 to record any cost or loss that reduces the value of property, plant and equipment, in addition to Paragraph 31 that requires property, factories and equipment to appear in the company's assets with a re-valuation amount equal to the fair value minus accumulated depreciation subsequent or any expected future losses that lead to a decrease in the value of the asset which is at the heart of the accounting conservatism that requires expediting the recognition of expected and potential losses which would lead to a decrease in the value of the company's assets and an increase in its costs.

IAS no. 17 Concerning Lease Contracts: Through the paragraphs of Standard No. 17, we find that it stipulates that the gains resulting from sales and leaseback operations will not be recognized within the revenue of the period but it will be postponed and exhausted in addition to recording the remaining value estimates that are not guaranteed as costs recognized in the solution in addition, if the lease is repeated, if the sale price is less than the fair value, the decrease is recognized as a loss on the spot which is in line with the essence of the accounting conservatism that requires recognition of the potential losses and postponing the recognition of the expected profits.

IAS 37 Allocations, Liabilities and Potential Assets: In accordance with Standard No. 37, which relates to recognition of provisions and liabilities which is the postulate of discretion as an exercise of discretion to arrive at estimates in circumstances and conditions of uncertainty, it stipulates how and the conditions for estimating the commitment allocations and risks that the company may face In the future, taking them into consideration, estimating the timing of their occurrence and not overestimating the values of costs or obligations, we find that this standard represents the essence of the accounting conservatism that requires anticipating and recognizing potential losses.

IAS 38 Intangible Assets: Through paragraphs of Standard No. 38 we find that it stipulates on the recognition of gains when there is reasonable evidence using personal judgment to assess the degree of certainty of the possibility of future benefits flowing out of the Intangible asset, in addition to not recognizing the goodwill generated as an asset and Recognition of research expenditures as a voluntary expense in the research stages of the internal project, so we can say that the foregoing is a clear practice of the accounting conservatism concept.

IFRS No. 5 for Reporting Non-Current Assets: In accordance with International Standard No. 5, we find that it measures the assets that meet the conditions for their registration as assets held for sale on the basis of fair or book value or whichever is less deducted from the cost of sale in addition to the issue of loss Acknowledgment in its value and how to adjust the value of non-current assets after adjusting their value which is clearly included in the accounting conservatism policies that require recognition of value losses and their fair presentation in the financial statement.

3 The Most Important Methods and Policies of Accounting Conservatism:

Healy and Wahlen [2] mentioned several areas or methods available to management to practice accounting conservatism within the framework of applying accounting policy alternatives:

– Estimating a number of future economic events such as estimating the useful life of assets, Values Salvage, pension and liability obligations, deferred taxes, estimating bad debt losses, Impairments Assets.
– The choice of accounting policy alternatives within the GAAP framework for general economic transactions as in the choice of depreciation method, commodity inventory valuation.

- Applying opinions determining desired levels of working capital such as determining stock levels, controlling the timing of shipments or the purchase of goods and policies relating to the repayment of debtors.
- Selecting administrative decisions that suit the situation such as allocating costs and net returns, capitalizing or spending some types of costs such as research & development, advertising, and maintenance expenses.
- Choosing how to carry out certain types of deals such as the use of alternatives to accounting methods in cases of joining Combinations, lease contracts that can be made as OFF Balance-sheet accounts [3].
- Application of the cost or market base whichever is lower when assessing the (previously) commodity inventor.
- Using decreasing or accelerated depreciation methods to determine premiums for depreciation of fixed assets.
- The use of the last-in-first-out (LIFO) method in pricing commodity inventory movement as it is a conservative method especially in inflation conditions.
- Failure to acknowledge internal self-forming goodwill. It is recorded only when it is purchased then expedited its amortization even though goodwill is an asset of increasing value and not a declining asset.
- Amortization of incorporation costs over periods of less than the company age usually 3–5 years.
- Considering research and development expenditures as expenses in the period of their spending due to uncertainties that extend their benefits to future periods [4].

4   Research Hypotheses

In an attempt to embody a certain perception to answer the above questions, we formulated the following hypotheses that will be tested in this study (Fig. 1):

H1: The new standard was issued under the umbrella of the convergence efforts between the bodies responsible for setting American accounting standards and those responsible for setting international accounting standards.
H2: The appropriate level of conservatism for the company reflects all the information available through the stock price.
H3: There are deficiencies in the studies that linked the revenue criterion from revenue contracts and the extent of the accounting conservatism.

Independent variable
Revenues' Standard from contracts with clients

Dependent variable
Accounting conservatism
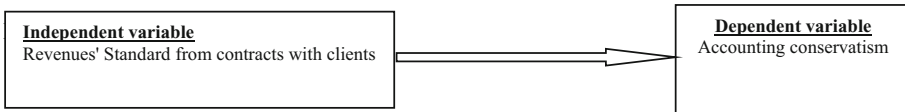
Fig. 1. Research model

5 Results

5.1 The First Topic

Standard of Revenue from Contracts with Clients
IFRS15 was issued in May 2014 and it is entitled "Revenue from Contracts with Customers". It eliminated two of the international standards that were the backbone of the standards. These are the international standard No. 11 entitled Construction contracts and the international standard No. 18 Entitled Revenue. This new standard was issued under the umbrella of the convergence efforts between the competent authorities to set the American accounting standards and the bodies competent to develop international accounting standards. This standard was scheduled to be in effect from January 2017 with the companies being allowed to apply early but recently was voted by The International Accounting Standards Board on a decision to postpone the application of the IFRS15 to January 1st; 2018 instead of January 1, 2017 [5].
We will present in a scientific manner how to apply this standard by explaining the postulate related to the standard.

First: Recognition of Revenue
In practical terms, accountants need to know how revenue is recognized by unifying the rules of any professional practice that will definitely help professionals to know the rules by which revenue will be recognized according to activity variations whatever it will be. Although IFRS no. 15 did not contain all kinds of revenues, where some exceptions have been treated in other standards and not treated with in this standard such as:

1- IAS 17 International Accounting Standard on Leasing.
2- IFRS 4 International Insurance Contracts.
3- International Financial Reporting Standard IFRS 9, IFRS 10, IFRS 11, IAS 27 and IAS 28.

However, the IFRS.15 sets us five basic steps that help us determine the values that should be recognized as revenue. They are as follows:

1- Identify the contract: It is a written or oral agreement between the seller and the buyer that gives rise to some legal rights of the two contracting parties. It clarifies the obligations of the seller and the customer because of one or more performance obligations.
2- Identify the performance obligations: It is a promise to convert a recognizable good or service that can be identified separately.
3- Determine the transaction price: The price of the transaction means that it is the total price agreed upon in the contract and that the seller will receive from the customer in the event of completion of performance obligation.
4- Allocate the transaction price: The seller allocates the transaction price on the performance obligations based on Standalone selling prices on each performance obligation.
5- Recognize revenue when performance obligation is satisfied.

Revenue is Recognized in Two Ways

The First Way: Recognition at a single point of time. It is applied when control is transferred to the customer. Control here may mean the emergence of an obligation to pay the seller, transfer of legal ownership of the asset or possession, placing a hand on the asset or the transfer of risks and benefits of ownership to the customer, or accept the asset.

The Second Way: Revenue recognition over a period of time. It is applied when the customer consumes the benefits whenever the work is done or when the customer controls the asset whenever the asset is created or manufactured or when the seller manufactures or assembles the asset for which there is no alternative use other than selling it to a specific customer and therefore the seller has the right to receive payments in return of Work done.

Second: Explaining the Steps to Recognize the Revenue
There are several steps to recognize revenue [5].

The First Step: Determining the contract: For this purpose, the contract according to IFRS 15 is an "agreement between two or more parties that results in the creation of enforceable rights and obligations", and so that we can address the revenue generated. For contracts according to IFRS 15, the following conditions must be met the following:

1- The contracting parties must sign and approve the contract and commit to perform their obligations contained in the contract.
2- The company can define the rights of each of the party regarding goods and services transferred.
3- The company must specify the payment terms for the transferred goods and services.
4- In essence, the contract should be classified as a commercial contract.
5- It is probable that the company will obtain the price according to the contract for the goods and services that will be transferred to the customer.

The Second Step: Determining performance obligations: Defining performance obligations is the second step in recognizing revenue. In general, performance obligations can be considered as an accounting unit whose purpose is to implement IFRS 15 and for this we must define, an important term that will lead us to define performance obligations and this is promises. Promises in contracts may be explicit and may be implicit. These promises create an expectation that the company will provide the customer or customers with goods and services in the context of usual business practices and based on established policies or may be based on specific conditions or determinants. Hence, the process of understanding the company's policies and practices is important to accurately identify promises.

According to IFRS 15, the company must define the goods and services promised in the contract and it must be considered as an obligation to fulfill each of the promises to transfer:

– A separate good or service, or a package of independent goods or services.
– A group of independent goods and services with a sequential supply chain that are essentially the same and which take one or more modes of transfer for customers.

Based on the foregoing, every independent merchandise or service in the contract is itself a performance obligation and on the contrary, every non-independent merchandise or service can be considered as a clause in a package or a combination of independent goods and services. Accordingly, the merchandise package and services that contain non-independent items can be considered as a single performance obligation.

There are also some cases in which the company supplies independent goods or services sequentially over a period on similar stages. For example: daily cleaning services where these goods and services are considered a single performance obligation if they have the same patterns of supply to customers [6].

In order to describe a certain good or service item as an Independent good or service item, some conditions must be met as follow:

1- The good or service must be independent.
2- The clause of the good or service is independent in the context of the contract.

From the above, the promise can be considered as a performance obligation in the event that it is an item of independent goods or service or a package of independent goods and services (the package is a set of items of goods and services that may be independent or not independent).

The First Condition: The item of the goods or service is independent. For example, and not as a limitation, if the customer can use the item alone by selling it at a value greater than the value of the scrapping, or the customer can use the item alone by consumption, or the customer can keep the item alone in a way that can generate benefits, Or the client can benefit from the item alone or in conjunction with other resources, whether these resources are available in the company or with others or were previously supplied, or if the item is sold separately in normal conditions.

The Second Condition: The item of the goods or service is independent in the context of the contract. If it is for example and not for limitation, the item is not one of the inputs used in the supply or installation of a specific exit specified in the contract, or the item is not sed in the modification or installation of specific items of goods and other services In the contract, or the item by its nature is not considered to be largely affiliated or significantly related to the terms of the goods and other services specified in the contract.

The two preceding conditions are important to have them together so that we can evaluate the good or service item as a separate item and therefore a performance obligation and in the event that the good or service item is not independent, this is an evidence that this item of the goods or service is part of a combination or package of non-independent goods and services will be among them a package of goods and services that can then be considered as a single or sole performance obligation.

Finally, we must set this rule, which is that as long as the good or service item is not independent, the company will continue to mix and tune this item of the non-independent good or service with other goods until the Bundle package is deemed to be

considered as a single performance obligation within the obligations The performance of the contract in the case of multiple obligations to perform the contract or even in case the contract contains a single individual performance obligation.

The Third Step: Determine the transaction price: The transaction price is the value that is allocated to the performance obligations that are specified in the contract and, accordingly, the transaction price reflects the amount of revenue that will be recognized when the performance obligations are fulfilled.

Upon determining the transaction price, those values collected on behalf of external parties such as sales taxes and on the other hand the transaction price may be direct such as if the contract contains a certain return value for a fixed number of goods and services that will be supplied in a relatively short time and the transaction price may be complicated when there are some cases that relate to:

1- When the return is variable.
2- When the return is not in cash.
3- When there are important financing elements.
4- When there is a return due to the customer.

The Fourth Step: Allocating the transaction price to the performance obligations: We have previously mentioned that performance obligations can be considered as an accounting unit and as a complement to the above, we can complete the definition of performance obligations as nothing more than an accounting unit intended to allocate the transaction price to them.

The transaction price that will be allocated on the performance obligation means the stand-alone selling price, and it is defined as that price at which the company can sell the goods or service independently to the customer.

There are cases in which the price of the stand-alone sale can be determined whereas there are other cases where we cannot determine the price of the stand-alone sale. In this case, we can use more than one approach or method to determine the price of the stand-alone. Perhaps the next articles will explain these cases, but here in this article, we will assume that the stand-alone selling price is known and specified.

The rule stated in IFRS 15 is that "the company must allocate the transaction price to each performance obligation based on the ratio and proportion between the selling prices of the products and services valued at the stand-alone sale price."

The Fifth Step: Recognition of revenue [7].
The IFRS15 International Financial Reporting Standard defines two basic methods for recognizing revenue if the second method i.e. the method of recognizing revenue over a period is the first to be tested. If no condition of recognition of revenue has been applied over a period, the recognition of revenue will be automatic in a way to recognize revenue at a particular point of time.

The first way - recognition of revenue at a single point of time: Recognition of revenue at a single point of time indicates that the fulfillment of the obligation to fulfill is done at a single moment of time. For example, the delivery of the required goods once and there are many limitations that help professionals determine that recognition of revenue takes place at a single point of time, which is:

- Transfer of the ownership of the original with legal evidence.
- The creation of an obligation to pay the seller.
- Possession or placing a hand over the original.
- Transferring the risks and benefits of ownership to the client.
- Accept the original.

The second way - recognition of revenue over a period: Recognition of revenue over a period indicates that the fulfillment of the performance obligation is carried out at frequent moments of time or over a period, i.e. delivery of the goods or the completion of the service is done in stages to fulfill the one performance obligation. For example providing some services such as auditing or consulting services Or long-term contracting contracts and all of these are examples of cases that must be recognized revenue over a period of time, and there are many determinants that help specialists in determining that recognition of revenue takes place over a period of time. These determinants are as follows:

- When the customer simultaneously obtains and consumes the benefits that were provided by the performance of the company whenever the performance is done - for example, when a cleaning company provides cleaning services based on an annual contract.
- When the customer controls the asset whenever it is created or manufactured at any stage of it - for example, when the contractor builds a building on land belonging to the customer.
- When the seller manufactures or assembles the asset for which there is no alternative use other than selling it to a specific customer and thus the seller has the right to receive payments for the work done - for example when a manufacturer designs a special machine that manufactures plastics with special customer's specifications.

THIRD: Presentation and Disclosure
In IFRS 15, some new terms related to presentation and disclosure in financial statements have been approved as in the statement of financial position, the company recognizes the assets or liabilities of contracts when the delivery of the goods and or the performance of the service precedes the process of receiving the amount due and here, we will have two cases[1]:

The First Case: When the company supplies the goods or performs the service before receiving the due amount, then this event will give rise to an asset related to the contract or receivables belonging to the contract. In the event that there are conditions other than the passage of time for the eligibility of the agreed consideration to supply the goods or perform the service then we will be in regard to "contract assets" but in the event that there is only a time requirement to pay the agreed compensation for the supply of goods or the performance of the service, we will be in connection with "receivables".

The Second Case: When the company receives the due amount before supplying the goods or performing the service, this event will give rise to an obligation regarding the contract.

THE SECOND TOPIC: Accounting Conservatism

First, the concept of accounting conservatism:

The term accounting conservatism is used in general to give the meaning that the lowest values of assets and revenues and the higher values of liabilities and expenses should be reported as much as possible and this also means expediting the recognition of expenses and postponing recognition of revenue therefore it is preferable to evaluate the assets with lower values, and calculate the income that leads to the lowest value of a group of alternatives is available. Others believe that the accounting conservatism is the accountant's preference for the methods that lead to report lower values of equity and some explain it by the existence of the company's undeclared goodwill so that the accounting conservatism reduces the book value of the assets relative to their market value or profit response to bad news faster than responding to good news, as good news requires a higher degree of verification by accountants [8].

Second, interpretations of accounting conservatism:

Suleiman [9] Distinguished between four interpretations of accounting conservatisms: The first interpretation of a contractual accounting conservatism for a conservatism. It is one of the oldest interpretations of accounting conservatism. There are many parties that are interested in the work of the company that seek to achieve their interests including shareholders and lenders who seek to guarantee their interests through the accounting conservatism as it ensures to shareholders the continuity and quality of future profits in addition to the fact that it provides creditors with a greater guarantee of payment of obligations, and limits management's use of personal interests at the expense of shareholders and creditors.

The second interpretation of the accounting conservatism is the interpretation of litigation as the managers tend to reserve in declaring profits and the higher values of assets to avoid their exposure to litigation by parties that rely on accounting information to make their investment decisions if management's failures of profits fail.

The third interpretation of the accounting conservatism is the tax interpretation as the accounting methods used affect the advertised income which in turn affects the value of the tax therefore some tax laws contribute to the increase or decrease of the accounting conservatism for example despite the fact that the decreasing premium method in recognition of consumption contributes to accounting conservatism support but it is rarely approved by tax laws.

The last interpretation of an accounting conservatism is the regulatory interpretation as the regulation of financial markets and financial transactions has a direct impact on the nature of accounting disclosure through instructions and disclosure requirements approved by the securities authorities that had a role in directing the accounting conservatism.

Third: Types of Accounting Conservatism:

There are two types of conservatism:

The first: Is conditional discretion, i.e. it is the acceleration of recognition of economic losses.

The second: It is the unconditional conservatism and it means lowering the net asset values or disclosing the lower book values of the property rights [10]. The importance of the conservatism postulate was re-affirmed by issuing a set of standards that include a large amount of conservatism including the issuance of the American Accounting Standards Board (FASB) for a standard Contingent Liabilities, the standard for pensions and the standard for impairment of assets [11].

Fourth: Accounting Conservatism Measurements:
There are four measures of accounting conservatism that are among the most common ones:

1- The scale of the relationship between profits and dividends: This model assume that the accounting conservatism requires a higher degree to verify the gains compared to the losses - which is the essence of the accounting conservatism - as the gains lead to an increase in net assets while the losses lead to a decrease in them. The conservatism is measured through noticing the quick response of accounting to these gains and losses i.e. the accounting conservatism works on the timing of recognition of economic events. They are not the same as the bad news is reflected in profits faster than good news. It has been predicted that negative stock returns will be fully reflected in the profits of the same period while returns of due equity will be incomplete in the same period [12].

2- The book value entry to the market value: This entry is known as the measurement of net assets as the ratio of the book value to the market value is used to examine the value of the firm's share by comparing its book value with its market value. Several studies have indicated [13] to the fact that the proportion decrease of the book value to the market value of to less than one is true over a period of time indicates to the company's use of preservative accounting policies towards recognition of profits and higher values of assets as the accounting conservatism works to reduce the book value of the company against its market value, meaning that the company is valued at the lower than it should which is the essence of the conservatism (that was called for by the accounting theory).

3- Entry based on receivables: - Receivables are the difference between operating cash flow and net profits as the emergence of receivables at a negative value over a period of time indicates the continuity of cash flows more than profits, in other words the existence of conservatism accounting policies that reduced the declared profits of the company, while Cash flows were maintained as a result of unrecognized good profits.

4- Conservatism entrance Index: - aims to measure the effect of accounting conservatism on the balance sheet, given the ratio of hidden reserves to net operating assets. The increase in hidden reserves at a higher rate than net operating assets indicate that the company uses conservative accounting policies upon declaring the value of its assets. Therefore, an increase means an increased degree of conservatism [14].

6   Conclusions

This study aimed to measure the impact level of the revenue criterion from contracts with clients on the accounting conservatism upon preparing financial reports for companies. Consequently, searching within the factors affecting this conservatism level. They are three factors: the activity sector (measuring the relationship between profits and returns of shares), the size of the company (The entrance of the book value to the market value), and the debt (represented by the input document based on the dues and the standard of revenue from contracts with customers). Therefore, there were three hypotheses formulated to test the relationships. Results showed that all expected constructs are important and positive influences in predicting accounting conservatism. Such a result supports all hypotheses, as shown in the research model. The findings of this study cannot be justified as the key drivers of accounting conservatism in general. Therefore, the findings explanation should be very loose. Therefore, a suggested model is validated for understanding accounting conservatism, the current work encourages future research to verify and replicate the generalization of the model in further countries as well as with other economies. Thus, additional works are definitely required enhance and verify the validity and applicability of this framework by applying it in different contexts.

Finally, it is worthy to mention that all worldwide started increasing their interest in the development of the information technology (IT) and communications sector. Artificial intelligence (AI) helps the organizations developed by technology; it also helps institutions to improve the circulation of information and data between their different units. AI works with human intelligence through computer programs that keep pace with human behaviors. These programs are characterized by intelligence, speed of electronically processing operations (EPO), and providing users with the necessary information and data in numerous decisions very quickly. Al now has the ability to define the best potential ways to get a proper answers; it also can use routine operations that give the best outcomes, besides to evaluating the input data, classifying it according to advanced accounting systems and downloading document automatically. Al is free from errors, does not know fatigue, and does not feel tired.

References

1. Inder, K., Wang, K.: International mergers and acquisitions laws, the market for corporate control, and accounting conservatism. J. Account. Res. **57**, 241–29 (2018)
2. Healy, P.M., Wahlen, J.M.: A review of the earnings management literature and its implications for standard setting. Account. Horiz. **13**, 365–383 (1999)
3. Zucchi, K.: Understanding Off-Balance Sheet Financing, Corporate Finance & Accounting (2019)
4. Abed, S., Al-Badainah, J., Abu-Sedaneh, J.: The level of conservatism in accounting policies and its effect on earnings management. Int. J. Econ. Finan. **4**(6), 78–85 (2012)
5. KPMG. Revenue Issues in-Depth, Second Edition, IFRS and US GAAP, pp. 1–387 (2016)
6. Young, E.: Global IFRS, A closer look at the new revenue recognition standard (2015)

7. PWC. Revenue from Contracts with Customers: The Standard is Final – A Comprehensive Look at the New Revenue Model, pp. 1–25 (2014)
8. Haque, A., Mughal, A., Zahid, Z.: Earning management and the role of accounting conservatism at firm level. Int. J. Econ. Finan. **8**(2), 197 (2016)
9. Salami, S.: Debt contracting and conditional accounting conservatism. Int. J. Account. Res. **5**, 1–3 (2017)
10. Ball, R., Shivakumar, L.: Earnings quality in UK private firms: comparative loss recognition timeliness. J. Account. Econ. **39**(1), 83–128 (2005)
11. Liberto, D.: Accounting Conservatism, Corporate Finance & Accounting (2019)
12. Chen, L., Folsom, D., Paek, W., Sami, H.: Accounting conservatism, earnings persistence, and pricing multiples on earnings. Account. Horiz. **28**(2), 233–260 (2014). https://doi.org/10.2308/acch-50664
13. Givoly, D., Hayn, C.: The changing time-series properties of earnings, cash flows and accruals: has financial reporting become more conservative? J. Account. Econ. **29**(3), 287–320 (2000). https://doi.org/10.1016/S0165-4101(00)00024-0
14. Penman, S., Zhang, Xiao-Jun.: Accounting conservatism, the quality of earnings, and stock returns. Account. Rev. **77**(2), 237–264 (2002). https://doi.org/10.2308/accr.2002.77.2.237

The Banking Sector Role Against the Risks of Currency Floating "A Comparative Study"

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Abstract. The research is represented in highlighting the role of the Banking sector in facing the risks of currency flotation and its negative repercussions on the performance of economic activity through the impact of those risks on the change in exchange rates, especially in the parallel market (the black market), which is reflected in the movement of commodity and service prices towards an increase in It leads to the occurrence of inflation at those price levels, and thus the effect on the purchasing power of the level of per capita income and then the effect on the size of the GDP as a whole. There is no doubt that the devaluation of the local currency resulting from the floatation against foreign currencies not only makes exports more competitive, but also enhances the ability of various economic sectors, especially the tourism sector, and also relieves pressure on the central bank in draining foreign exchange reserves that may Hold back. However, adjusting the value of the currency is not an easy thing, as there is a period in which things get worse. Given the experiences of countries that took the step of free floating of their currencies, this step has proven its feasibility.

Keywords: Currency · Floating · Banking · Risk

1 Introduction

It can also be formulated in a fundamental question which is:
"How can policies that highlight the role of the banking sector in facing the risks of floating the currency and its impact on the exchange rate change be maximized?"

This essential question is divided into a group of questions, including:

1- What are the most important risks and challenges resulting from the shift to a floating currency system?
2- What are the most important various economic impacts and repercussions resulting from adopting the currency float system in light of international experiences?
3- What are the most important lessons learned from the experiences of comparison countries (Russia, Brazil) in facing the effect of floating currency?

4- What are the most important mechanisms that the banking sector uses to face crises in general and the risks of flotation in particular?

5- How can the Egyptian economy in general and the Egyptian banking sector in particular use the appropriate mechanisms and tools that contribute to reducing the risks of floatation and promoting growth and economic stability?

6- Can the Egyptian banking sector achieve a balance between the risks resulting from floating the currency, and the extent of this reflection on the performance of economic activity?

Importance of the research:
The importance of this research can be addressed according to the following division:

(A) Scientific significance:

– The scientific importance of this research stems from the scientific importance of this topic in modern economic thought, as many countries have tended to switch to the floating currency system, in addition to the importance of the exchange rate as one of the basic information for many parties[1].

– The importance of this research also stems from the seriousness of the problems and challenges resulting from the adoption of the system of floating currency, as the adoption of the exchange rate regime in the first periods of application results in severe fluctuations in the exchange rate, significant increase in inflation rates, and other economic problems.

– Identify the modern mechanisms and tools in economic thought that the banking sector can use in facing risks and crises.

– Dealt with one of the modern research fields, which writings are scarce in the Arab environment in general, and the Egyptian research environment in particular, and the business environment under study and analysis, in a manner that contributes to more communication with the global research movement [2].

(B) Practical significance:
The practical importance of this research is as follows:

– Trying to identify the challenges and changes that the banking sector may face due to the adoption of the currency float system, based on the practical experience of the comparison countries, Russia and Brazil.

– Contribute to identifying the main components needed to anticipate the floating currency system.

– Determining the appropriate policies and mechanisms that can be used in maximizing the role of the banking sector to face the risks of floatation in light of international experiences [3].

– Identify the most important lessons learned from international experiences to float the currency and benefit from it in overcoming the challenges facing the Egyptian economy in general and the banking sector in particular, in a way that contributes to achieving more economic stability.

– The current research is an extension of previous studies that dealt with the impact of float risks on the economy as a whole and the banking sector in particular, as it is the core of the economy and studies that have dealt with the importance of applying

governance principles as a mechanism to improve the performance of the banking sector by limiting exposure to many risks through the optimal use of monetary policy tools..

– The results of this research benefit the parties concerned with economic affairs in general and the banking sector in particular by making use of the most important practical recommendations for research in this area.

Research Objectives:
The main objective of the research is to develop frameworks that work to maximize the role of the Egyptian banking sector in facing the risks of floating the currency due to its impact on the exchange rate and then some macroeconomic indicators.

The main objective is divided into the following sub-goals:

1. Identifying the most important risks and challenges resulting from the conversion to the floating currency system [4].
2. Studying and analyzing the most important various economic impacts and implications resulting from adopting the currency float system in light of international experiences and the Egyptian economy.
3. Determining the most important mechanisms that the banking sector uses to face crises in general and the risks of floatation in particular [5].
4. Identifying the most important obstacles and risks facing the Egyptian economy and identifying the most important mechanisms and appropriate tools that the Egyptian economy in general and the Egyptian banking sector in particular can use the mechanisms and tools that contribute to reducing the risks of flotation and promoting growth and economic stability.
5. Identifying the extent to which the Egyptian banking sector can achieve a balance between the risks resulting from floating the currency, and the extent of this reflection on the performance of economic activity [6].

2 Research Methodology

In the framework of trying to achieve the objectives of the research and test his hypotheses, the researcher follows a theoretical side and a practical side as follows:

A- The theoretical study
In this study the researcher will rely on the inductive approach, through extrapolating the writings and academic studies, reviewing Arab and foreign references and periodicals to review previous theoretical and applied studies in the field of currency float risks and trying to extract the factors and mechanisms most affecting the banking sector's vulnerability to the change of the exchange rate, defining a concept for it and determining entries to infer those risks[7].

B- Practical study
In this study the researcher will rely on the results and indicators of various economic variables in an attempt to focus on the impact of that decision on various variables, for example exchange rates, inflation, growth rates of the GDP, the balance of payments,

and the movement of exports and imports, in light of the experience of each country separately. From the practical reality of the numbers of those indicators in light of the reports issued by the central banks of these countries, the economic bulletins and the various reports, so that the researcher can identify the phenomena of the problem from the practical reality and the various economic effects in light of those reports and statistics [8].

3   In What was Dealt with in the Research, the Following Results Can be Drawn up

1. The existence of a large trend in most developed and developing countries to shift from a fixed exchange rate system to a free exchange rate system, and by leaving the exchange rate of their currency to be determined according to the forces of supply and demand.
2. The most important types of currency floatation systems are of two types, the first type: free float, which is complete freedom to change and determine the exchange rate according to the forces of supply and demand, and the other type is the round float, and in this type there is interference in directing the currency in specific directions [9].
3. The success of the currency float system depends on the availability of a set of basic components, the most important of which are: the existence of a strong currency exchange market with high strength and liquidity for foreign currencies, coherent intervention policies, an alternative nominal anchor, an effective risk management and assessment system, and the use of effective monetary policies and tools, And control the movement of capital funds [10].
4. The transition to a floating exchange rate system remains surrounded by many risks, the most important of which are: extreme fluctuations in the exchange rate, high rates of inflation and unemployment and exacerbation of other problems, the problem of resource allocation, an increase in the debt burden on the state and then an increase in the deficit in the general budget, which may affect Negatively, the growth rates were not well planned.
5. Fluctuations in the exchange rate and the extent of its increase in intensity depend on many factors, including: the rate of inflation, deficit or surplus in the balance of payments, interest rates, transactions in the stock market, money supply, political conditions, and other factors.
6. The banking sector has a big role in general and the Central Bank in particular in facing the risks of floating currency, through its main role as responsible for implementing monetary policy [11].
7. The central bank's adoption of effective monetary policies based on quantitative and qualitative tools appropriate to the risk of flotation contributes to reducing the risks of flotation, such as interest rates, loan framing and directing to vital sectors and other tools in line with other economic policies [12].
8. The inflation targeting strategy is considered as one of the main frameworks for monetary policy, one of the modern and emerging strategies in facing the risks of

floatation, as it depends on targeting inflation directly, and this strategy has achieved great success in many countries, especially Brazil [13].

9. Despite the negative effects of adopting the decision to float in Egypt, especially after 2016, such as high inflation and increasing debt burdens, this decision has begun to reap its benefits in improving growth rates, stabilizing the exchange rate, reducing speculation on the exchange rate, and the ability of the Egyptian economy to withstand shocks. Foreign Affairs, especially in the recent Corona virus crisis [14].

4   Recommendations

In light of what the research has covered and the results it has reached, many recommendations can be made that can be achieved in the short and long terms, according to the following:

First: short term:

1. The necessity of the availability of the main components for the success of the exchange rate liberalization system, the most important of which is the provisions of control over the exchange market, and the choice of coherent and effective monetary policies, with the provision of an alternative nominal anchor, with a good system for assessing and managing risks.

2. The necessity to provide a high level of transparency with the public about all economic challenges and obstacles in light of the transition to the exchange rate system and how to face them

3. It may be appropriate at times during the flotation period and its negative effects to impose customs and non-tariff barriers, such as imposing a complete ban on many commodities to support and support emerging local industries.

4. Controlling the inflows of foreign capital during the crisis period, and this may require imposing a tax on these movements temporarily during that period.

Second: long term:

1. Taking into account the balance between solving problems related to social justice and poverty, while also taking into account the rights of the rich class in order to protect and preserve local and foreign investors in a manner that contributes to improving economic growth rates and preserving the poor classes.

2. Following a strong monetary policy strategy to reduce the effects of the flotation, especially inflation, such as following the inflation targeting strategy, because it targets inflation directly, and this policy succeeded in reducing inflation rates to very low rates and led to an increase in international reserves in the countries that adopted the flotation.

3. Relying on various, integrated and effective monetary policy tools that contribute to reducing the problems resulting from the flotation, such as the interest rate, where the interest rate plays a large role in facing inflation, it may be appropriate, at least in the short term, to raise interest rates to reduce inflation, but in the long term

experiences have proven that policies of lowering interest rates are more feasible from an economic point of view.

References

1. Bailliu, J., Lafrance, R., Perrault, J.: Exchange rate regimes and economic growth in emerging markets. In: Sesssion 5 Implications for Emerging-Market Economies, pp. 317–350 (2001)
2. Barguellil, A., Ben-Salha, O., Zmami, M.: Exchange rate volatility and economic growth. J. Econ. Integr. **33**(2), 1302–1336 (2018)
3. Caputo, R., Pedersen, M.: The changing nature of the real exchange rate: the role of central bank preferences. Econ. Model. **90**, 1–20 (2019)
4. Chulia, H., Fernandez, J., Uribe, J.: Currency downside risk, liquidity, and financial stability. J. Int. Money Finan. **89**, 83–102 (2018)
5. Gilenko, E.: The "Sudden" transition to the free floating exchange rate regime in Russia in 2014. J. Rev. Glob. Econ. **6**, 181–192 (2017)
6. Jo-Wei, W., Jyh-Lin, W.: Does a flexible exchange rate regime increase inflation persistence? J. Int. Money Finan. **86**, 244–263 (2018)
7. Lai, J., Chen, H., McNelis, P.: Macroeconomic adjustment with managed exchange rates and capital controls: some lessons from China. Econ. Model. **91**, 759–768 (2019)
8. Ministry of Foreign Trade. Monthly Economic Bulletin; Ministry of Economy, Quarterly Economic Digest (2016)
9. Mendonca, H., Moraes, C.: Central bank disclosure as a macroprudential tool for financial stability. Econ. Syst. **42**, 625–636 (2018)
10. Monfared, S., Akın, F.: The relationship between excange rates and inflation: the case of Iran. Eur. J. Sustain. Dev. **6**(4), 329–340 (2017)
11. Montes, G., Ferreira, C.: Does monetary policy credibility mitigate the fear of floating. Econ. Model. **84**, 76–87 (2020)
12. Bahmani-Oskooee, M., Aftab, M.: Asymmetric effects of exchange rate changes on the Malaysia-China commodity trade. Econ. Syst. **42**(3), 470–486 (2018)
13. Shetty, A., Manley, J., Kyaw, N.: The impact of exchange rate movements on mergers and acquisitions FDI. J. Multinatl. Finan. Manag. **52**, 1–14 (2019). Article 100594
14. Vural, B.: Determinants of Turkish real effective exchange rates. Q. Rev. Econ. Finan. **73**, 151–158 (2019)

Shariah Resolutions and Issues on Islamic Repo

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Abstract. The primary objective of this study is to examine the Shari'ah resolutions and issues on Islamic repo. This study adopts a library approach consisting of several data collection methods: library research and document review. While the gap between the Shari'ah requirements and practicality of Islamic repo remains unresolved in the market, it is found that the opinions among the Islamic jurists on the practice of Islamic repo tend to be mixed. For instance, while international scholars widely criticize it, the Shariah Advisory Council (SAC) of Bank Negara Malaysia (BNM) has permitted the use of bilateral promise in Islamic repo using a sell and buy back (SBBA) structure. This study also identifies and discusses vital Shariah issues related to Islamic repo, namely, the existence of *bay' al- 'inah* elements in Islamic repo and the use of *wa'ad* in a sale transaction. Besides, this paper includes Shariah's deliberations on the application of repo, such as the existence of *bay' al- 'inah* in a repo transaction, the use of *wa'ad* in the contract of sales, and the accounting treatments for Islamic repo transactions.

Keywords: Repos · Shari'ah issues · Bay al-Inah · Wa'ad

1 Introduction

Both repos and reverse repos steadily gain traction from the global market, especially in Europe and the US, reaching up to EUR 5,378.5 billion in size, according to a survey conducted by the International Capital Market Association (ICMA) on 67 institutions as of June 8, 2016 [1]. It is, however, not the case for the Islamic repo markets. In Malaysia, for instance, the recent trends show that central Islamic banks have been leaning towards other money market products such as Sukuk and Shariah-compliant commercial papers for short-term liquidity purposes. Mohamad Safri Abdul Hamid, the previous acting CEO of CIMB Islamic, stressed that "repos are not a popular product as Islamic banks still prefer to use other money market instruments." Despite the SAC of BNM's Shariah resolution permitting the SBBA transactions involving various Shariah-compliant underlying assets such as Sukuk.

The main reason behind this sluggish growth of Islamic repo markets is the lack of consensus on its permissibility from a Shariah standpoint among practitioners and scholars. Based on the authors' observation, differing views on the permissibility of SBBA exist among Shariah Committee members and Shariah officers of different Islamic banks and between two other Shariah functions (e.g., Shariah compliance unit and Shariah advisory unit) of an Islamic bank. This observation is supported by Vizcaino and Hamzah [2]. They opined that developing "Islamic repos" has been slow due to a lack of consensus among bankers, regulators, and scholars on what structures would be both religiously permissible and financially effective. As a result, these differing Shariah opinions may be translated into incongruent practices of Islamic repo among market participants. For instance, the Malaysian way of SBBA has been shunned by many Gulf Cooperation Council (GCC) Islamic banks, which argue the transfer of ownership of assets in SBBA is not executed.

In the spirit of promoting the global acceptance of Islamic repo as a viable liquidity management tool for Islamic banks, a series of ongoing discussions and debates on the permissibility of Islamic repo from Shariah's point of view has taken place at both domestic and international levels. For example, Shariah interpretations of SBBA or Islamic repo had been revisited in *Muzakarah Penasihat Syariah Kewangan Islam*, KLIFF, in 2010. In the intellectual discourse, Shariah scholars raised their concerns that today's practice of SBBA may trigger several Shariah issues, namely: Is the use of *wa'ad* (undertaking) to purchase back the underlying assets at a pre-agreed price in the future permissible? And whether or not the element of *bay' al- 'inah* is present in the current practice of SBBA?

The very phrase "Islamic repo" is least preferred among some Shariah scholars. It fears replicating its conventional counterparts without addressing Islamic transactions' objectives (*muamalat*) and meeting a real economic need. Shariah scholars' vigilance towards expressing their opinions on the permissibility of Islamic repo could be due to a fear of abuse of the product and ruse to circumvent the prohibitions in Islamic finance, just like in the case of winding-up of Lehman Brothers. Previously, repo was used by Lehman Brothers as a tool to reduce the level of indebtedness in its financial statements in the months leading up to its collapse [3].

Unfortunately, these Shariah concerns related to the Islamic repo's permissibility have yet to be resolved up to this date. The Islamic finance standard-setting bodies (SSBs) and regulators seem to have disagreed on Islamic repo's legitimacy and practical aspects despite being a hot topic in many discussions for years [18]. Even worse, some may view that religious principles are likely to constrain the use of Islamic repo [4]. For instance, calculating margin calls on repos would be almost impossible since it can be seen as using an implicit interest rate. Shariah's restrictions over trading repo underlying assets with a third party (*bay' al-dayn*) and pure monetary speculation - which investors in money markets have long practiced - makes Islamic repos even less attractive economically. Apart from that, a Shariah requirement that actual ownership of underlying assets is transferred to repo buyers is argued to limit Islamic repo's penetration within the international markets. Another limitation is the practice of netting in the repo, which may not be recognized by regulators and the Shariah advisory council of many GCC countries where Islamic repos are mostly traded. Thus, the objective of this study is to examine the Shari'ah resolutions and issues on Islamic repo.

2   Specific Shariah Rulings on Repo

To the best of the researcher's knowledge, there is no discussion among classical *fiqh* scholars regarding repo transactions' permissibility, which has only begun to be practiced in the modern financial world from Shariah's point of view. Later, in the contemporary financial marketplace, two Shariah resolutions specifically address repo transactions up to this date issued by the SAC of BNM and the Shariah Board of the AAOIFI, respectively; discussed in the following subsections [18].

2.1   The SAC of BNM's Resolution on the Application of "Sale and Buy Back" Contract

BNM's SAC, at its 21st meeting on April 10, 2000, and its 30th meeting on January 30, 2002, has resolved that a "sale and buy back" contract on different dates is permissible and not equivalent to a *bay al- 'inah* contract. The resolution first defines a "sale and buy back" contract as:

> *"a sale contract between two contracting parties followed by a promise (wa'd) by the original seller to buy back the asset on a different date if the buyer decided to sell the asset to the original seller"* [5].

2.2   AAOIFI's Shariah Rulings on Repurchase

In paragraph 4/1 of the Shariah standard, the Shariah Board of the AAOIFI has resolved that:

> *"repurchase, according to "parameters," is deemed a type of permissible combination of contracts"* [6].

In respect to the transfer of ownership of the purchased assets, the Shariah standard in paragraph 4/2 prescribes, in case the buyer retains the legal deed of the purchased support, a signed document proving the buyer's ownership, such as a counter-deed or the like, shall be obtained, provided that the seller's retention of the deed shall not affect the buyer's ownership of the purchased asset and his entitlement to receive its benefits (e.g., increase in value) and shall bear the loss of its destruction. Although the buyer's possession of the asset is fiduciary, it is permissible for the buyer to stipulate that it is used as collateral at its deferred price or placed with a custodian. It is also acceptable for the buyer to appoint the seller as his agent to receive its increase in value (growth), such as proceeds, cash payouts, and bonus shares. Likewise, for re-investing the receipt in favor of the buyer, the buyer can appoint the seller as his agent in proxy voting at the general assembly and on other occasions.

Meanwhile, the legitimacy of the tri-party structure, paragraph 4/4 of the Shariah standard mentions. It is not permissible to buy a commodity on cash terms to sell it on deferred terms to a third party if all parties involved collide to re-sell it to the first seller for a cash price lesser than the deferred fee.

3 Shariah Rulings on Bay' Al-Wafa'

This section scrutinizes the permissibility of *bay' al-Wafa* from the Shariah point of view. *Bay' al-wafa'* is a classical Shariah contract that has been discussed in depth by Islamic jurists and argued to have direct relevance to today's application of repo in the market. Like collateralized *murabahah* repo, Rahn (collateral) is an element in the *bay' al-Wafa'*s arrangement so that assets transferred to the buyer are perceived as a pledge attached to a sale transaction. In other words, the two contracting parties' contractual relationship can be seen not just as between seller and buyer but also between mortgagor and mortgagee. Apart from that, while there is a bilateral undertaking in Islamic repo for assets to be sold back to the original seller, in the *bay' al-wafa'* contract, there is a condition imposed on the buyer for not selling the asset to a third party until maturity. The only difference in *bay' al-wafa'* is that the redeemed price paid by the original seller during the reacquisition of the asset at the maturity date must be equivalent to the actual price received by the seller when the asset was first sold to the buyer.

3.1 Definition of Bay' Al-Wafa'

3.1.1 Literal Definition of Bay' Al-Wafa'

The term '*bay' al-Wafa*" comprises of two Arabic words, namely, *bay'* and *Wafa.*' In general, the name *"bay"* refers to any form of business dealings, as mentioned in the Holy Quran in *Surah Al-Jumu'ah* that says:

> *"O you who have believed, when [the adhan] is called for the prayer on the day of Jumu'ah [Friday], then proceed to the remembrance of Allah and leave trade. That is better for you if you only knew"* (62:9).

Imam al-Shawkani [7] implied that the word '*bay*" covers all types of transactions. In specific, the term '*bay*" means a sale**s** transaction as the Prophet Muhammad (p.b.u.h) referred to both contracting parties (e.g., seller and buyer) in a sale**s** transaction as '*bayyi*" in the following hadith:

> *"It was narrated from Ayyub, from Nafi from Ibn Umar, who said: The Messenger of Allah says, "The two parties to a transaction both have the choice so long as they have not separated or chosen to conclude the transaction." or perhaps Nafi said: "Or one of them has said to the other: "Decide!"* (Al-Nasa'i: 4470).

Meanwhile, the word '*Wafa*" means accomplishment or fulfillment of conditions and agreement [8, 9]. Being an antonym of the word '*ghadr*' (betrayal), the term '*Wafa*" means loyalty and fidelity [10].

3.2 The Origin of Bay' Al-Wafa'

Some evidence shows that the contract of *bay' al-Wafa'*s had been practiced in Islamic jurisdiction since the first century. For instance, the ruling made by Ibrahim al-Nakha'i, who died in 96 AH as follows:

"Mughirah narrated from Ibrahim a case of a person who buys a house and afterward told the seller: whenever I return the paid the price, the house shall be returned to me. He (Ibrahim) then said: the condition is void, but the sale is permissible" [11]

Meanwhile, [12] argued that the *bay' al-Wafa's* contract had only come into existence since 1090 BC. Early evidence confirms the *bay' al-Wafa's* agreement in Islamic jurisprudence is recorded in the fatwa of Imam Malik, who died in the second century (179 AH). Imam Malik was asked by one of his students, saying that:

"...if a person buys a female slave with the condition that whenever the seller comes back with the price, the right of ownership on the female slave returns to him. Is that permissible in the opinion of Malik? He (Malik) then said: no. I (Malik's student) asked: why? He (Malik) said: because this becomes like a sale with lending (bay' wa salaf)."

3.2.1 Contemporary Shariah Rulings of Bay' Al-Wafa'

There are several contemporary fatwas and resolutions about *bay' al-Wafa's* such are as follows:

i. The Council of the Islamic *Fiqh* Academy:
   In their 7th meeting held in Jeddah, Kingdom of Saudi Arabia, from 7 -12 *Dhul Qi'dah* 1412H (on 9 – 14th May 1992), this sale was resolved, a loan that generated a profit *(qardh jarra manfa'ah)*. Therefore, it is a fraudulent practice of riba' and is considered unsound by the majority of *ulama,'* and the Council considered this contract prohibited in Shariah.
ii. Shariah Board of the AAOIFI
    The AAOIFI's Shariah standard no. 25 stated that *bay' al-Wafa's* is a stratagem of riba'**;** hence, it is not permissible. According to the standard, combining two or more contracts to achieve any dubious result is deemed invalid as the legal maxim saying: "means fall by the fall of the intents."
iii. Shariah Advisory Council (SAC) of Securities Commissions (SC):
     In its 11th meeting on November 26, 1997, passed a resolution that *bay' al-Wafa's* is permissible under Islamic jurisprudence and can be developed as a principle to develop products in the Islamic capital market. The following are the illustration given in the SAC of SC resolution on *bay' al-Wafa's*:

"To illustrate bay' Wafa': A sells a property to B on the condition that if A pays back the cost of the asset, B will return the asset to A. Both parties fix the price, and the buyer can use the asset and enjoy its benefits as long as he does not transfer the ownership right to a third party".

"To illustrate the application of bai' Wafa' in the capital market – ABC company gets a shipbuilding contract, and the order is estimated to be ready in two years. The company can issue Sukuk using the Bai 'Wafa' principle by securitizing the two-year dayn (debt). By giving the Sukuk, the company can obtain liquidity to run other projects using the existing capital. The Sukuk issued is a joint funding effort by investors of the shipbuilding project. When the project is completed, ABC will buy back the Sukuk from the investors plus the profits, as agreed. For Sukuk, the gains are already known by the investors because the capital and costs have been determined."

4 Discussion on the Shariah Issues on Repo

4.1 Is the Structure of Islamic Repo Tantamount to Bay' al- 'Inah?

4.1.1 Definition of Bay' al- 'Inah

Bay' al-inah refers to a sales transaction with the immediate repurchase. According to some Maliki scholars, the term '*al- 'inah*' is originated from a root word of '*al- 'aunu*' (assistance), referring to financial service (e.g., cash loan) given by the seller to the buyer. Other Maliki scholars believe that the word '*al- 'inah*' is derived from the word '*al- 'ain*' (cash), reflecting the purpose of obtaining money in a sale transaction [13]. However, other Islamic schools of thought do not use '*bay' al- 'inah*' to explain a similar contract type. This contract occurs when a person sells an asset on credit and immediately buys back the asset on a cash basis at a different price. Instead, al-Shafi'i [14] and al-Barbati [15] of the Hanafi school, for instance, discuss this type of contract as a deferred sale issue and deem it a void sale.

In practice, *bay' al- 'inah* is a contract that involves selling and buying back an asset by the seller. In this transaction, the seller agrees with the buyer to sell the asset to the buyer on a cash basis, and subsequently, the seller will buy back the asset with a higher deferred price on the same date. It can also be vice versa, whereby the seller sells the asset at a high deferred price and then buys back the asset on a cash basis at a lower price on the same date. Due to the market players' urgent needs in Malaysia, the concept of *bay' al- 'inah* was accepted as part of Islamic banking and ICM during the early development of the Malaysian Islamic finance industry. However, the practice of *bay' al- 'inah* has gradually been reduced as other *Shariah* contracts are introduced.

4.1.2 The Views of Classical Scholars on the Permissibility of Bay' al- 'Inah

There were diverged opinions among the Islamic schools of thought about the permissibility of *bay' al- 'inah.* The majority of the Hanafi, Maliki, and Hanbali scholars thought that *bay' al- 'inah* is unlawful. On the other hand, two generations of Shafi'i schools had two different rulings. Later Shafi'i scholars, such as al-Nawawi, viewed bay' al-'inah as a discouraged transaction contrary to the earlier Shafi'i ruling against *bay' al-'inah* [16]. In general, the jurists who ruled against *bay' al- 'inah* justified their resolution on two bases. First, prohibition is indicated in the *fatwa* of Companions (*athar*) and *hadith. S*econd, the contract practice is seen merely as *hliah* (legal stratagem) to circumvent riba prohibition. The former relates to a question posed to Aishah (r.a.) about the transaction conducted by a slave who sold another slave on behalf of her master, Zaid bin Arqam, at 800 *dirhams* on credit bought back the slave at 600 *dirhams* on cash. Aishah (r.a.) replied:

> "*it was a terrible sale and informed Zaid that his conduct had eliminated all his rewards for participating in jihad with the Prophet if he does not repent.*"

In addition to the above *athar*, the Hanbalis justified their ruling based on a *hadith* that showed condemnation of the contract by the Prophet. Narrated by Ibn Hanbal on the authority of Ibn Umar, the Prophet was reported as saying:

"*If people are busy with counting every single dinar and dirham, trading based on al-Inah, following behind cows (i.e., farming activities), and abandoning the duty of jihad for the sake of Allah, Allah will make misfortune befall them, and will not remove it from until they return to their religion*" [17].

4.2   The Use of Wa'ad (Promise) in Contract of Sales?

4.2.1   Definition of Wa'ad

The term '*wa'ad*' is an Arabic word that means a promise. In the Murabahah, the buyer promises to purchase a specified asset from the seller once the assets have been purchased from a third party.

4.2.2   Permissibility of Wa'ad from Shariah Perspectives

Islamic jurists have different views on the legality of the use of *wa'ad* in a sale contract. Contemporary scholars such as Syeikh Mustafa al-Zarqa, Dr. Yusuf al-Qaradawi, and Dr. Hasan al-Shadhli agree that a *wa'ad* related to a commercial transaction is binding under Shariah. On the contrary, this is not the case for the classical Islamic jurists, such as Abu Hanifah and al-Shafi'i.

Next, the Islamic Fiqh Academy has decided that the *wa'ad* is "obligatory not only in the eyes of God but also in a court of law" if: (i) it is made in commercial transactions; (ii) it is a unilateral promise; and (iii) it has caused the promisee to incur liabilities. The IFA agrees that the promisee can also claim an actual loss if the promisor refuses to fulfill his *wa'ad*.

Paragraph 2/3/3 of Standard No. 8 of the AAOFI Shariah Standards mentions that the bilateral promise is permissible whenever it includes an option to cancel the contract. The choice may be given to both parties and one of them.

Paragraph 2/3/4 of Standard No. 8 of the AAOIFI Shariah Standards also states that it is possible to change the terms of the promise if both parties agree to such change. No party can solely change the terms of the contract. However, a change cannot be affected if the parties have executed obligations under the Murabahah (or the relevant agreement).

The more recent Shariah standard of the AAOIFI on repurchase no. 58 has prescribed specific requirements on imposing *wa'ad* to repurchase as follows:

- **Paragraph 5/1 -** Subject to item 3/3, Shariah standard No. (49) on Unilateral and Bilateral Promise, it is permissible for the seller to sell and unilaterally make a promise to repurchase or for the buyer to unilaterally make a promise to re-sell, according to the following parameters:
- **Paragraph 5/1/1 -** The two contracts (first sale and repurchase) shall be made on spot payment.
- **Sect. 5/1/2 -** The promise to repurchase or re-sell shall be separately documented (not linked to the first contract).
- **Paragraph 5/1/3 -** The ownership transfer shall be affected at the time of promise execution rather than merely by the promised document.
- **Paragraph 5/1/4 -** That the second party (the promisee) shall not be under obligation to enter into the second contract by law or customary practice or collaboration, or the like.

- **Paragraph 5/1/5 -** That the promise shall not be made by a partner in a contractual partnership (*Sharikat al-Aqd*), a *mudarib,* or an investment agent (*Wakeel al-Istithmar*), in a manner that capital is wholly or partially guaranteed.
- **Paragraph 5/1/6 -** It is impermissible to make the promise binding on the promisor if the asset's destruction is subject to the commitment to sell or the promise to buy.
- **Paragraph 5/1/7 -** In case of default by the promisor, the promisee shall have the right to claim the actual damages he incurred due to default by the promisor, which shall not include opportunity costs concerning the price subject matter promise. And in case of a commitment to purchase, the actual damages shall be tallied as the difference between cost and selling price in a transaction with a third party on the day of promise execution; see Shariah standard No. (49) on Unilateral and Bilateral Promise. It is impermissible to stipulate that a promisor in default keeps part of the price. In case of a promise to sell, the actual damage shall be tallied as the difference between the commodity's selling price on the promise execution date and the promise's price subject matter.

5 Conclusion

In summary, the issuance of AAOIFI Shariah Standard No. 58 on repurchase is hoped to shed some light on the unresolved matters about the permissibility of Islamic repo and its application in today's Islamic banking and finance. Simultaneously, there are mixed views of classical and modern Shariah scholars on aspects related to the repo. The market regulators need to be aware of some Shariah issues on Islamic repo as discussed in this paper, including the existence of *bay' al-'inah* in Islamic repo structures and the use of *wa'ad* in repurchase transactions. Resolving these Shariah issues is highly necessary to promote structuring Shariah-compliant money market instruments in the future. This study proposes that amendments need to be made to the Guidance Notes on SBBA by BNM in facilitating SBBA transactions using *bay' al-'inah* structures. This study found that there are certain areas of the Guidance Notes that are not in line with the SAC of BNM Resolution and the Exposure Draft on the *Bay' al- 'Inah* Guidelines, as well as the circular on the Implementation of SAC of BNM's Resolution on *Bay' al- 'Inah*.

References

1. ICMA. European Repo Market Survey (2016). Accessed 3 Sept 2017, https://www.icmagroup.org/Regulatory-Policy-and-Market-Practice/repo-and-collateral-markets/ercc-publications/repo-market-surveys/
2. Vizcaino, B., Hamzah, A.A.: Islamic finance set to tackle long-standing repo challenge (2014). Accessed 6 Sept 2017, https://www.reuters.com/article/islamfinancing-reform/islamic-finance-set-totackle-long-standing-repo-challengeidUSL6N0T40AZ20141124
3. Hunter, G.S.: NBAD to pioneer Sharia-compliant repo loans (2011). Accessed 4 Sept 2017, https://www.thenational.ae/business/nbad-to-pioneer-sharia-compliant-repo-loans-1.416855

4. Vizcaino, B.: Islamic repo agreements struggle for traction (2012). https://www.Reuters.Com/Article/Islamic-Finance-Repos/Islamic-Repo-AgreementsStruggle-For-Traction-Idusl5e8g8gt720120510

5. Bank Negara Malaysia Annual Report (2010). https://www.bnm.gov.my/-/ar2010

6. AAOIFI. Shariah Standard No. 58 on Repurchase, Bahrain (2017)

7. Al-Shawkani, M.A.: Fath ul-Qadir al-Jami'u Baina Fannayy il-RIwayah wa-Ddirayah Min 'Ilm al-Tafsir, vol. 5. 'Alam al-Kutub, Lebanon (1994)

8. Ibn Faris, A.B.: Mu'jam Maqayis al-Llugha. Dar al-Fikr, Bayrut (1979)

9. Al-Razi, M.A.: Mukhtar al-Sihah. Maktabat Lubnan Nashirun, Bairut (1995)

10. Al-Jurjani, A.B.: Al-Ta'rifat, 1st ed. Dar al-Kitab al-'Ilmiyyah, Bairut (2000)

11. Shaibah, I.A.: Al-Musannaf, vol. 6, pp. 107–108

12. Al-Janayini, A.A.I.: Bay' al-wafa' wa tatbiqatuhu al-ma'asirah : dirasah muqaranah bayna al-fiqh al-Islami wa al-qanun al-wad'i. Dar al-Fikr al-Jami'I, Al-Iskandariyah (2010)

13. Al-Hatab, M.M.A.R.: Mawahib al-Jalil fi Sharh Mukhtasar al-Khalil, vol. 4. Dar al-Fikr, Beirut (1992)

14. Al-Shafi'I, A.-U.: Vol. 3. Dar al-Kutub al-'Ilmiyyah, Beirut (1993)

15. Al-Babarti, M.M.M.: Al-Inayah sharh al-hidayah, vol. 7. Dar al-Fikr, Beirut

16. Al-Ramli, M.S.D.: Nihayah al-muhtaj ila sharh alfaz al-minhaj, vol. 3. Dar al-Fikr, Beirut (1984)

17. Ibn, Q., Ahmad, A.A.I., Al-Din, M.: Al-Mughni, vol. 6. Dar-Alam al-Kutub, Al-Riyad (1999)

18. Al-Sartawi, A.: Shariah disclosure and the performance of islamic financial institutions. Asian J. Bus. Account. **13**(1), 133–160 (2020)

Financial Performance Analysis of Firms: A Focus on Oil and Gas Industry Sustainable Practices in Oman

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Abstract. This study examines production management practices and operational risk on sustainability practices in the oil and gas industry. In addition, the objective of this research is to investigate the mediate influence of operational risk between production management practices, sustainability practices, and financial performance in the oil and gas industry. As well, the current study aims to explore the factors that predict firms' financial performance. This research is based on secondary data from three oil and gas firms' annual reports in Oman (2017–2020). The financial indicators were extracted from the annual report of three oil and gas companies, which includes Shell Marketing, Petroleum Development Oman (PDO), and Oman Liquidated Natural Gas (OLNG); the data then analyzed by using Excel and SPSS software. The findings were represented using figures and tables of firm financial performance using frequency, mean, and standard deviation. The revealed findings demonstrate that firm's financial performance is highly linked to the standards of sustainability practices a firm developed and implemented. Additionally, the analysis of the collected data elucidates that the performance of the firm was financially affected by risk conditions, which sheds light on the importance of improving sustainability practices of the oil and gas firms. This research will provide the oil and gas industry with a clear understanding of the critical predictors influencing firms' financial performance by focusing on sustaining the firm practices. Also, policymakers and investors will benefit from this study by observing the firm's performance and developing the strategies used through the suggested recommendations. It is worth mentioning that this study contributes to the existing knowledge with valuable conceptual model development, findings, and suggestions.

Keywords: Financial performance · Oil and Gas · Operational risk · Production management · Sustainability · Oman

1 Introduction

In global standards, energy sources demand such as oil and gas witness an incredible increase during the last few decades and expected to witness about 50% increase in the next fifteen years [1, 2]. However, the industry of oil and gas internationally plays a

significant role in inducing the economic conditions and reflecting the countries' prosperity [3–6]. The efficient utilization of the oil and gas industry feeds the economic status improvements and matches the social demands and needs [7–9]. The increasing reliance on gas and oil as energy sources imposes a range of core challenges, including heavy fuel production to meet the high-energy consumption. Hence, the overall amount of consumption of oil and gas energies raised [2, 5, 10–12].

Accordingly, petroleum products' processing of converting raw oil has also increased [5, 9, 10]. Shedding light on the emerged challenges and constraints represented mainly in managing production and pertinent risks [6, 13–16]. As precise practices of production of oil and gas products dramatically help mitigate or increase the production risk. Meanwhile, adopting sustainability strategies is organized basically by management decisions, including the management of information, the flow of capital, returns, and liquidities, as well as the management of production practices [3, 8, 9, 17–19]. Risk is also managed and highly influenced by the way production practices are managed. Many empirical studies found that risk level is significantly associated with the firm financial performance [6, 9, 13, 14, 17, 19, 20].

Regardless of the paramount role of oil and gas firms in the Sultanate of Oman in facilitating social, environmental, and economic activities, the environmental and operational risks of production practices are poorly covered by previous research [21–24]. In the past few years, more attention has been paid to examine the effect of production management practices on operational risks. Moreover, sustaining production practices is a significant difficulty faced by Omani oil and gas companies concerning their effect on their financial performance [22, 23, 25, 28]. The practices the firm organized and the level of risk avoided and managed to constitute a fundamental influence on sustaining the production practices, which consequently affects firm success, more importantly in financial terms [21, 29, 31]. However, a limited number of studies emphasized understanding and identifying the critical factors impacting oil and gas firms [25, 32]. Companies' sustainable practices need competent companies to control significant sustainability drivers such as risk management, which production practices influence. Various empirical research proves the significant relationship between production practices, risk, and sustainability practices in the oil and gas industry context that could impact financial performance [27, 28, 31, 32]. A better understanding of these factors is needed to fulfill the research gap. Given the sacristy of studies conducted to examine the effect of the mentioned factors in Oman and the lack of stakeholders understanding the embedded effect, this study examines the impact of production management practices and operational risk on sustainability practices in the oil and gas industry. In addition, the objective of this research is to investigate the mediate influence of operational risk between production management practices, sustainability practices, and financial performance in the oil and gas industry. As well, the current study aims at exploring the factors that predict a firm's financial performance.

This research paper will dramatically contribute to the existing knowledge by investigating the novel development of the conceptual framework. This study will help the managers and practitioners in the oil and gas industry adjust their strategies and working mechanisms to a more efficient and effective mechanism to mitigate the

operational risk and reflect on sustaining the practices and increasing the firms' revenues and profit. This study was conducted in the oil and gas industry, a significant GDP contributor to Oman; this study may be constrained by limited financial-based information.

2   Literature Review and Hypothesis Development

2.1   Production Management Practices

Over the world, management practices include knowledge exchanging and experience that improves production practices [1, 17, 18]. The mechanism of production management is sought as the main issue that determines and shapes the management of risk. The initiatives of managing the production of oil and gas products constitute a significant driver of green production [24, 28, 29]. In contrast, other factors such as governmental policies and regulations were found as a second influential factor influencing production management [6, 26, 33]. Moreover, oil and gas products are a fundamental producer for several industries, including manufacturing, transportation, and other sectors.

Interestingly, several studies conducted in Oman evidence that production management practices have a paramount role in enhancing the safety of the practice and reducing the negative effect of oil and gas companies' production practices on the natural environment. Thereby keeping the surrounding environment for oil and gas companies less risky [21, 22, 28, 30]. In order to perfectly manage sources, it is imperative to effectively and efficiently assess any possible utilization of available resources and potential effective improvement [27].

2.2   Production Management Practices and Operational Risk

Each firm within any industry worldwide should observe, determine, assess, and monitor the possible factors that could formulate a risk in various environmental, economic, and social aspects. Operational risk management in oil and gas production plays a pivotal role in sustaining the production process [6, 14, 18, 34]. However, revealing more comprehensive management of production and operational risk is remarkably associated with the planning and implementing appropriate production management practices [6, 13, 14, 17]. From another perspective, employee collaboration, proactive individuals and team's behavior, and rising management competitiveness, as well as risk-taking are among the factors that help establish safe precautions, reduce environment pollution when producing petroleum products, and prevent any possible operational accidents [1, 5, 8, 16].

2.3   Production Management Practices and Sustainability Practices

The adherence to sustainability practices application essentially drives the implementation of sustainable practices in oil and gas firms. Meanwhile, the firms should constitute a high level of sustainable practices performance through providing capable

management of production and converting the commitment in sustaining the practices into the strategic implementation of several adhered actions [2, 11, 17, 20]. Many studies argue that sustainable practices of production are highly influenced by commitment performance, which is also affected by the team's effective communication and collaboration, employee innovativeness, and risk-taking [1, 5, 12, 35]. In Oman, [23, 28] found that firms who adopt sustainable productions practices on a large scale are simultaneously capable of improving and gaining a new innovative sustainability practices mechanism mainly through their sustainable, innovative culture, especially in oil and gas companies' context.

2.4   Operational Risk and Sustainability Practices

Sustaining the energy sources concerns the scholars, managers, and practitioners in related filed globally. Generally, sustainability is an environmental phenomenon that each firm aims to attain and maintain. Sustainability practices are measured through specific systems and indicators such as financial performance indicators [8, 29, 30, 36]. It is leveraging sustainable firm practices sought as an exciting topic debated by various parties, including decision-makers. Scholars focus on examining the significant factors affecting sustainability practices in an industrial context and their impact on firms' financial performance and survival [13, 14, 18, 21, 33, 36]. Thus, the entire implementation of production operations such as materials supplies, processes, and the adopted system must be well planned, organized, and shaped within the integrated assessment of all production and monitor sections and all related departments to work in the harmonized system [10, 19, 20, 31]. However, multiple challenges take a considerable place in managing firm practices sustainability [9]. One of the difficulties faced by oil and gas firms in Oman is the complexity of the procedure when making a decision, as well as the critical trade-off existence that challenges the decision-makers [10, 11, 21, 29]. Moreover, operational risk management evidence that it induces firms' sustainability in various aspects; more importantly, it leverages oil and gas industry logistics [28, 29, 36]. By considering the above discussion, the following development of the conceptual framework is drawn by the researcher (Fig. 1):
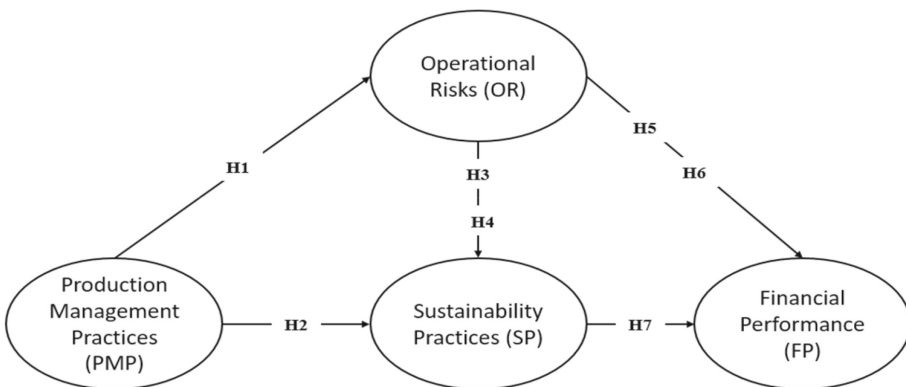
Fig. 1. Study framework developed based on the literature review

Hypotheses

H1: There is a relationship between production management and operational risk in the oil and gas industry.

H2: There is a relationship between production management and sustainability practices in the oil and gas industry.

H3: There is a relationship between operational risk and sustainability practices in the oil and gas industry.

H4: Operational risk has mediated effect between production management practices and sustainability practices in the oil and gas industry.

H5: Operational risk influences production management practice and financial performance in the oil and gas industry.

H6: There is a relationship between operational risk and financial performance in the oil and gas industry.

H7: There is a relationship between sustainability practices and financial performance in the oil and gas industry.

3 Methodology

This study developed an updated conceptual framework that drowns to examine the sustainability practices of oil and gas companies proposed to be affected by production management practices and operational risk and impacts on oils and gas firms' financial performance. However, this research is a qualitative-based method mainly focused on three oil and gas companies in the Sultanate of Oman, including PDO Company, Shell Marketing Company, and Oman LNG Company. Moreover, the method of this study depends on analyzing the content of oil and gas companies' annual reports. The data was collected from a secondary source, the annual report published by the three mentioned companies on their official websites. The collected data was mainly from the balance sheet of the companies, focusing on the last four years (2017 to 2020). Two oil companies were excluded from the analysis because of incomplete data for further analysis. An analysis of oil and gas financial firms' performance from 2017 to 2020 was conducted. Excel Sheet and SPSS software were used for analysis purposes. Descriptive analysis conducted with the representation of graphs and charts was drown using Excel sheet to evaluate the firm's financial performance such as revenue, profit after tax, dividends, cash, and short term investments, cash and short term investments growth, total assets, retained earnings, and earnings total equity. SPSS statistical software was utilized to enter the data and analyzed the mean and standard deviation of various financial indicators mentioned in the balance sheet of the last four years.

4 Findings, Analysis, and Discussion

The sustainability practices are indicated mainly from company performance, including social, environmental, and economic indicators. However, this study will focus on the economic aspect as an indicator of the sustainability practices implemented by the firms

in Oman concerning the firm financial performance. Also, the firm's financial performance will indicate how it can manage the production process and risk precautions, especially in the oil and gas industry. The main focus of this study is on three oil and gas companies, namely; Shell Marketing, Petroleum Development Oman (PDO), and Oman Liquidated Natural Gas (OLNG). The following analysis shows the financial indicators from the firm's annual reports during the last four years from 2017 to 2020. The financial indicators provide revenue, profit after tax, dividends, cash and short-term investments, total assets, retained earnings, total equity.

Figure 2 represents Shell's marketing revenue, profit after tax, and dividends payment during 2018 and 2019. The analysis demonstrates that no dividends were paid in 2018 and 2019, and no profit after tax was recorded during these two years. Moreover, the overall revenues were higher in 2018 than 2019 as the findings demonstrate that the revenues in 2018 attained more than one million, while a remarkable decrease was witnessed in 2019 with less than six hundred thousand. Similarly, Fig. 3 elucidate no dividends paid during the period from 2018 to 2019 from OLNG Company. The revenues and profit after tax were less in 2019 than the reported revenues and profit after tax in 2018 for OLNG Company. The revealed results demonstrate that the risk management plans and sustainability practices in 2019 were not efficiently implemented and no improvement embarked, affecting the general financial firms' performance. The effect of the COVID-19 pandemic could also illustrate this spread worldwide, which in turn impacted the production of all industries, especially the oil and gas industry, as evidence by [9]. As a result, companies were forced to change their production strategies under exceptional and unpredictable situations caused by the epidemic crisis, which requires modified plans against the emerged risk. Additionally, the results evidence that a low level of sustainability practices embarked in both Shell Marketing Company and OLNG Company due to the apparent significance of COVID-19 pandemic spread, as shown in Figs. 2 and 3. This debate is supported by [1, 3, 8, 11, 17].
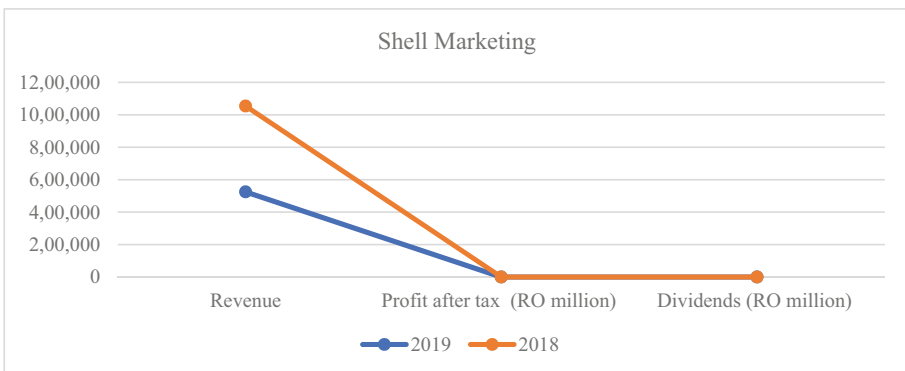
Fig. 2. Shell marketing financial performance
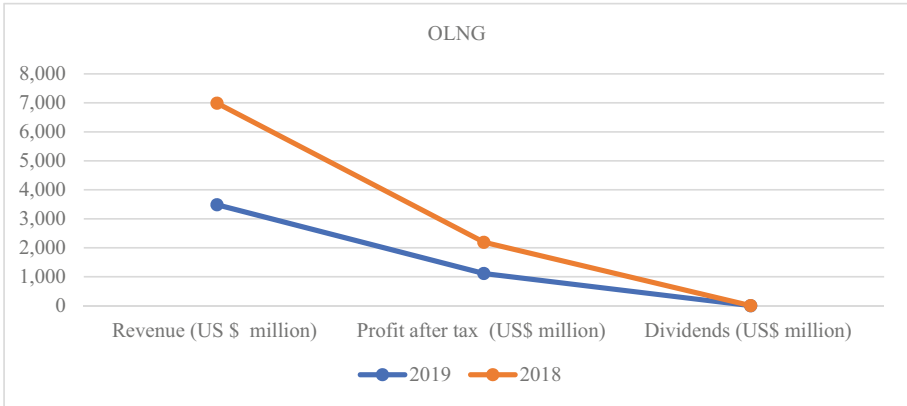
Fig. 3. OLNG company financial performance

Figure 4 illustrates PDO Company's financial performance during the last four years from 2017 to 2020. The revealed results from the analysis demonstrate that the lowest financial performance recorded in 2019 with a considerable decline in the retained earnings attained to minus 8 million. The total equity and total assets witness a decline in 2019, which could also be elucidated by the pandemic prevalence impact as evidenced by [28], who conclude that sustainability practices are fundamental for firm survival and success. Many studies discussed the influence of managing production process and risk management impact on sustaining the company success that is presented through their financial performance [2, 5, 9, 13, 19, 20, 35]. However, PDO recovers its sustainable practice in 2020 as observed in the gained retained earnings presented in Fig. 4 and details shown in Fig. 5. The retained earnings of PDO Company reached one million in 2020 compared to the drop in 2019 that reached near minus 1 million. Moreover, cash and short-term investment, total assets, and total equity reports increase in 2020. While no notable activities in cash and short-term investments growth during the previous years.
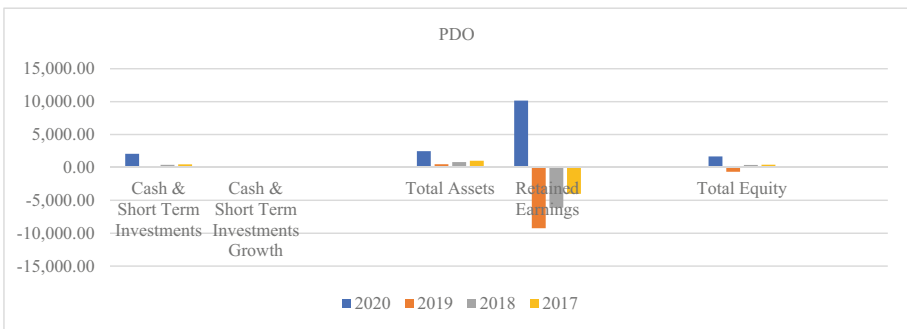
Fig. 4. PDO company financial performance

Fig. 5. PDO company retained earnings. **Note:** the result of 2019, 2018, and 2017 are in negative

Tables 1 and 2 represent the financial performance of Shell Marketing Company and PDO Company using indicators such as cash and short-term investment, cash and short-term investment growth, total assets, retained earnings, and total equity. The below tables and Fig. 6 and 7 shows the mean and standard deviation of these indicators from 2017 to 2020. The results demonstrate the weakest financial performance recorded by cash and short-term investments growth as per the results shown in the below tables and the above figures of Shell Marketing Company and PDO Company. Figure 6 reports the mean and standard deviation for the financial performance of Shell Marketing Company from 2017 to 2020, total assets records the highest performance. While the significant difference between the total assets and retained earnings as well as the total equity. At the same time, cash and short-term investment and cash and short-term investment growth remain low.

Figure 7 elucidate the mean and standard deviation for the financial performance of PDO Company from 2017 to 2020. The retained earnings recorded the lowest performance, showing a considerable difference between retained earnings and total assets. The cash and short-term investments, cash and short-term investments growth, and total assets range somehow in the same financial level. Previous studies supported the findings that discussed the practical production process and risk management on sustaining firms' financial performance in the long term. The fluctuation of financial performance of firms depends on how they set their sustainable plans and strategies and whether these plans serve the firms in the long term and against various circumstances [17, 28, 33, 36].

Table 1. Mean & Std. deviation of shell marketing company

Company						
Year/scale	2020	2019	2018	2017	Mean	Std. deviation
Cash & short term investments	4,607.00	7,513.00	23,233.00	19,477.00	13707.5000	9040.89249
Cash & short term investments growth	*−38.68%*	*−67.66%*	*19.28%*	*80.51%*	−1.6375	65.61725
Total assets	129,860.00	157,534.00	124,440.00	120,472.00	133076.5000	16752.88762
Retained earnings	36,302.00	40,318.00	36,531.00	33,002.00	36416.5000	2991.51248
Total equity	49,889.00	53,905.00	50,118.00	46,589.00	50003.5000	2991.51248

Table 2. Mean & Std. deviation of PDO company

Company						
Year/Scale	2020	2019	2018	2017	Mean	Std. deviation
Cash & short term investments	2,063.90	75.9	398.8	470.7	752.3250	891.08303
Cash & short term investments growth	*2619.56%*	*−80.97%*	*−15.27%*	*−48.63%*	618.6725	1334.19466
Total assets	2,468.30	480.6	818.4	1,011.00	1194.5750	876.99165
Retained earnings	10,159.00	−9,248.20	−6,131.10	−4,019.30	−7389.4000	2832.35559
Total equity	1,670.60	−657	383.3	422.1	454.7500	952.26929
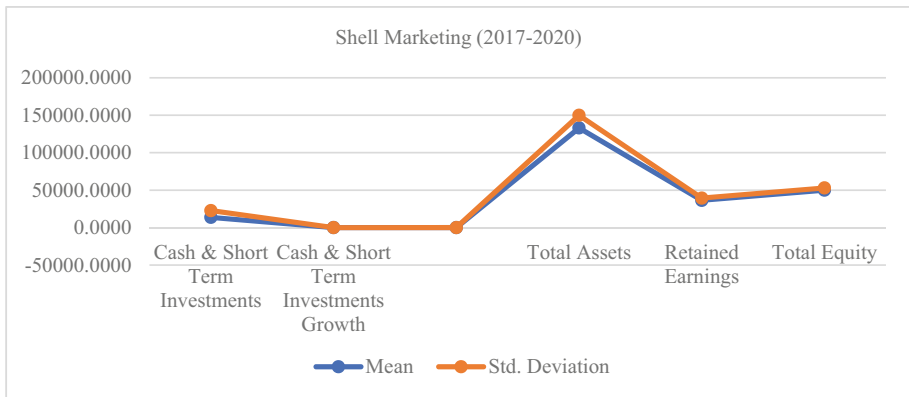
Fig. 6. Mean & Std. deviation of shell marketing company
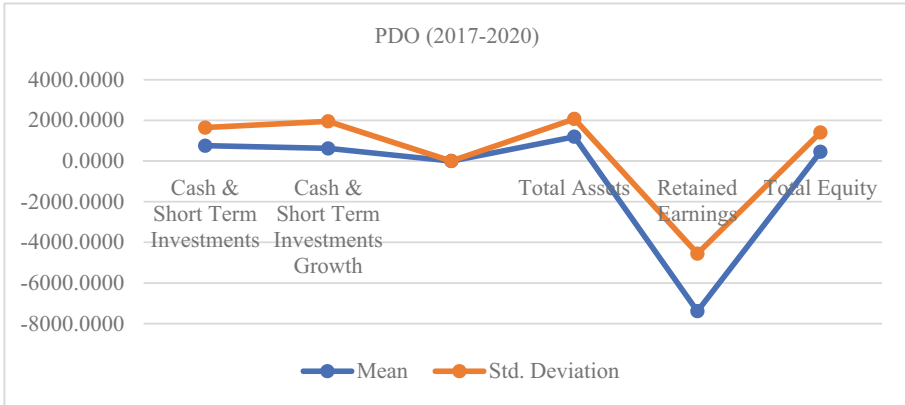
Fig. 7. Mean & Std. deviation of PDO company

5   Managerial Implications

This research identifies and examines how oil and gas firms' financial performance is affected by the firm's sustainability practices and the factors that influence oil and gas firms' sustainability. In this regard, the results attained that sustainability practices drive oil and gas firm's financial performance as indicated from the analysis. Meanwhile, sustainability practices are affected by the extent of production management practices and operational risk developed by the company. The findings of this study shed light on the impact of sustainable practice on the general financial performance of the firms. These results provide managers, practitioners, business owners and organizations, and regulators with a set of practical implications. The findings provide managers with the capability to develop high-quality plans concerning managing production and operational risk. Based on the results, it is suggested that decision-makers and investors in this sector use these results and adjust their directions in the future regarding the mechanism of setting and implementing sustainable practices to gain financial revenues and profit best. Practitioners and stakeholders can clearly and easily identify the most critical factors affecting the sustainability of the firm [37]. Thereby, they should improve their competitiveness through sustainable strategies. Investors from other countries besides Oman can benefit from this research in their decision-making regarding the targeted investment area of the company. Finally, this research results will help regulate and enhance the leveraged level of sustainability by standardizing updated policies capable of facing and working under different circumstances.

6   Conclusion

This study investigates the effect of production management practices and operational risk on oil and gas companies' sustainable practices as indicated by oil and gas firms' financial performance. However, the oil and gas industry is considered among the

industries that can generate energy and raise the GDP of the Sultanate of Oman. The sustainability of production practices in the oil and gas industry has become one of the major priorities that the firm has taken upon itself. As per the research purpose, the results indicated from oil and gas firms annuals report including PDO Company, Shell Marketing Company, and OLNG Company, demonstrate that the production management practices and operational risk are among the critical factors impacting sustainability practices in the oil and gas industry which also reflects the overall financial performance of the firm. In summary, firm financial performance is affected by the way the firms manage their activities.

The findings and results from this research can benefit several parties in the oil and gas industry as the oil and gas companies can benefit from this research to evolve better production policies and adjust the embarked regulations in a more efficient way that serves and aligned with the sustainability plans. Additionally, this study will help managers and practitioners manage the operational risk and preserve sustainable plans with better avoidance of any potential risk either in macroeconomic or microeconomic factors. As a result, firms' operational production process and other procedures will be maintained through sustainable practices, thereby enhancing the firm's financial performance positively. Also, the findings will constitute guidance for oil and gas industry firms to measure their performance in the long-term base. Other industries such as the manufacturing and marketing industry could benefit from this research by establishing their sustainability plans and compare their financial performance.

Few limitations confine this study. These limitations represented the generalization of the limited results due to the data collection method of this study, as data was solely collected from the published annual reports of oil and gas companies using financial indicators mentioned within the firm's balance sheet. This study also emphasized only firms from the oil and gas industry, while other sectors also play a significant role in enhancing the economic status of Oman, such as the banking sector. Thus, future research avenues arise for scholars. It is recommended to conduct further qualitative research aim to investigate factors affecting sustainable production practices in the oil and gas industry. Additionally, researchers should focus on conducting a comparative study to compare the financial performance of different oil and gas companies. Also, collecting quantitative data from other production-based industries in Oman is recommended.

References

1. Wan Ahmad, W.N.K., Rezaei, J., Tavasszy, L.A., de Brito, M.P.: Commitment to and preparedness for sustainable supply chain management in the oil and gas industry. J. Environ. Manag. **180**, 202–213 (2016). https://doi.org/10.1016/j.jenvman.2016.04.056
2. Absi Halabi, M., Al-Qattan, A., Al-Otaibi, A.: Application of solar energy in the oil industry —current status and future prospects. Renew. Sustain. Energy Rev. **43**, 296–314 (2015). https://doi.org/10.1016/j.rser.2014.11.030
3. Orazalin, N., Mahmood, M.: Economic, environmental, and social performance indicators of sustainability reporting: evidence from the Russian oil and gas industry. Energy Policy **121** (June), 70–79 (2018). https://doi.org/10.1016/j.enpol.2018.06.015

4. Le, T.H., Chang, Y.: Effects of oil price shocks on the stock market performance: do nature of shocks and economies matter? Energy Econ. **51**, 261–274 (2015). https://doi.org/10.1016/j.eneco.2015.06.019

5. Sueyoshi, T., Goto, M.: DEA environmental assessment in time horizon: radial approach for Malmquist index measurement on petroleum companies. Energy Econ. **51**, 329–345 (2015). https://doi.org/10.1016/j.eneco.2015.07.010

6. Annamalah, S., Raman, M., Marthandan, G., Logeswaran, A.: Implementation of enterprise risk management (ERM) framework in enhancing business performances in oil and gas sector. Economies **6**(1), 4 (2018). https://doi.org/10.3390/economies6010004

7. Zhong, M., Bazilian, M.D.: Contours of the energy transition: investment by international oil and gas companies in renewable energy. Electr. J. **31**(1), 82–91 (2018). https://doi.org/10.1016/j.tej.2018.01.001

8. Thoumi, G.: Palm oil: mitigating material financial risks via sustainability. In: Walker, T., Kibsey, S.D., Crichton, R. (eds.) Designing a Sustainable Financial System. PSSBIAFE, pp. 289–326. Springer, Cham (2018). https://doi.org/10.1007/978-3-319-66387-6_11

9. Bento, F., Garotti, L., Mercado, M.: Organizational resilience in the oil and gas industry: a scoping review. Saf. Sci. **133**, 105036 (2021). https://doi.org/10.1016/j.ssci.2020.105036

10. Mohammed Atris, A.: Assessment of oil refinery performance: application of data envelopment analysis-discriminant analysis. Resour. Policy **65**, 101543 (2020). https://doi.org/10.1016/j.resourpol.2019.101543

11. Cagno, E., Neri, A., Howard, M., Brenna, G., Trianni, A.: Industrial sustainability performance measurement systems: a novel framework. J. Clean. Prod. **230**, 1354–1375 (2019). https://doi.org/10.1016/j.jclepro.2019.05.021

12. Ma, X., Zheng, D., Shen, R., Wang, C., Luo, J., Sun, J.: Key technologies and practice for gas field storage facility construction of complex geological conditions in China. Pet. Explor. Dev. **45**(3), 507–520 (2018). https://doi.org/10.1016/S1876-3804(18)30056-9

13. Shad, M., Lai, F.-W.: Enterprise risk management implementation and firm performance: evidence from the Malaysian oil and gas industry. Int. J. Bus. Manag. **14**(9), 47 (2019). https://doi.org/10.5539/ijbm.v14n9p47

14. López, J.R.-C.: How can enterprise risk management help in evaluating the operational risks for a telecommunications company? J. Risk Finan. Manag. **14**(3), 139 (2021). https://doi.org/10.3390/jrfm14030139

15. Veland, H., Aven, T.: Improving the risk assessments of critical operations to better reflect uncertainties and the unforeseen. Saf. Sci. **79**, 206–212 (2015). https://doi.org/10.1016/j.ssci.2015.06.012

16. Gómez, C., Green, D.R.: Small unmanned airborne systems to support oil and gas pipeline monitoring and mapping. Arab. J. Geosci. **10**(9), 1–17 (2017). https://doi.org/10.1007/s12517-017-2989-x

17. Shad, M.K., Lai, F.W., Fatt, C.L., Klemeš, J.J., Bokhari, A.: Integrating sustainability reporting into enterprise risk management and its relationship with business performance: a conceptual framework. J. Clean. Prod. **208**, 415–425 (2019). https://doi.org/10.1016/j.jclepro.2018.10.120

18. Singh, N.P., Hong, P.C.: Impact of strategic and operational risk management practices on firm performance: an empirical investigation. Eur. Manag. J. **38**(5), 723–735 (2020). https://doi.org/10.1016/j.emj.2020.03.003

19. Podgórski, D.: Measuring operational performance of OSH management system - a demonstration of AHP-based selection of leading key performance indicators. Saf. Sci. **73**, 146–166 (2015). https://doi.org/10.1016/j.ssci.2014.11.018

20. Frandsen, T., Boa, S.Ø., Raja, J.Z.: Pricing structures for solutions: an exploratory study within the oil and gas industry†. Int. J. Prod. Res. **57**(22), 6977–6992 (2019). https://doi.org/10.1080/00207543.2019.1572933

21. AlSiyabi, N.H., Goel, N.: The effectiveness of knowledge management and business intelligence for increasing financial performance. (a case study: petroleum development Oman). J. Student Res., 1–7 (2020). https://doi.org/10.47611/jsr.vi.855

22. Khadem, M.M.R.K., Piya, S., Shamsuzzoha, A.: Quantitative risk management in gas injection project: a case study from Oman oil and gas industry. J. Ind. Eng. Int. **14**(3), 637–654 (2017). https://doi.org/10.1007/s40092-017-0237-3

23. Al-Badi, A.H., Malik, A., Gastli, A.: Sustainable energy usage in Oman - opportunities and barriers. Renew. Sustain. Energy Rev. **15**(8), 3780–3788 (2011). https://doi.org/10.1016/j.rser.2011.06.007

24. Al-Sheyadi, A., Muyldermans, L., Kauppi, K.: The complementarity of green supply chain management practices and the impact on environmental performance. J. Environ. Manag. **242**(May), 186–198 (2019). https://doi.org/10.1016/j.jenvman.2019.04.078

25. Garbie, I.H., Al-Shaqsi, R.: Building sustainable models and assessments into petroleum companies: theory and application. Int. J. Ind. Syst. Eng. **33**(4), 473–512 (2019). https://doi.org/10.1504/IJISE.2019.104275

26. Anwar, P.S., Ankit, P.A., Fattah, T.A., Bin, H., Smart, M.: A comparative case study on corporate social responsibility practices in Oman LNG and OMIFCO at Sur City in Oman. Innov. Arab. **10**, 86 (2017)

27. Ismail, A., Rahman, A., Hezabr, A.: Determinants of corporate environmental disclosure quality of oil and gas industry in developing countries. Int. J. Ethics Syst. **34**(4), 527–563 (2018)

28. Garbie, I.: Sustainability in service sector: oil and gas industry. In: Garbie, I. (ed.) Sustainability in Manufacturing Enterprises, pp. 217–236. Springer International Publishing, Cham (2016). https://doi.org/10.1007/978-3-319-29306-6_17

29. Zubairu, N., Dinwoodie, J., Govindan, K., Hunter, L., Roh, S.: Supply chain strategies as drivers of financial performance in liquefied natural gas networks. Supply Chain Manag. (2021). https://doi.org/10.1108/SCM-08-2020-0389

30. Alshehhi, A., Nobanee, H., Khare, N.: The impact of sustainability practices on corporate financial performance: literature trends and future research potential. Sustainability **10**(2), 494 (2018). https://doi.org/10.3390/su10020494

31. Chen, J., Wang, N., Tang, H., Li, J., Xiong, B.: Impact of sustained low oil prices on China's oil & gas industry system and coping strategies. Nat. Gas Ind. B **3**(3), 181–186 (2016). https://doi.org/10.1016/j.ngib.2016.05.001

32. Elhuni, R.M., Ahmad, M.M.: Key performance indicators for sustainable production evaluation in oil and gas sector. Procedia Manuf. **11**(June), 718–724 (2017). https://doi.org/10.1016/j.promfg.2017.07.172

33. Länsiluoto, A., Järvenpää, M.: Pressures for sustainability practices in an oil and gas company: evidence from Sudan. Qual. Res. Account. Manag. J. Manag. Dev. Iss Int. J. Public Sect. Manag. Iss Account. J. **5**(6), 184–206 (2008). https://doi.org/10.1108/09513570610709890

34. Bourareche, M., Said, R., Zidani, F., Ouazraoui, N.: Improving barrier and operational risk analysis (BORA) using criticality importance analysis case study: oil and gas separator. World J. Eng. **17**(2), 267–282 (2020). https://doi.org/10.1108/WJE-04-2019-0129

35. Zeinalnezhad, M., Chofreh, A.G., Goni, F.A., Klemeš, J.J.: Critical success factors of the reliability-centred maintenance implementation in the oil and gas industry. Symmetry (Basel) **12**(10), 1–14 (2020). https://doi.org/10.3390/SYM12101585

36. Al Breiki, M., Nobanee, H.: The role of financial management in promoting sustainable business practices and development. SSRN Electron. J. (2019). https://doi.org/10.2139/ssrn.3472404

37. Hannoon, A., Al-Sartawi, A., Khalid, A.: Relationship between financial technology and financial performance. In: Musleh Al-Sartawi, A.M.A. (ed.) The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. SCI, vol. 974, pp. 337–344. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-73057-4_26

Islamic Banking Strategies in the World of Fintech: Success Story of Bahrain

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Abstract. Global economy, modern innovation and wide use of technologies have changed the strategies of banking industry worldwide. In present scenario banks have started to compete beyond financial services. "Fintech or Financial technology" emerged in the 21st century is a financial service sector have become an integral part of banking industry. It incorporates" advances in financial education, retail banking, investment and crypto-currencies and provides innovative Payment Capabilities, Information Management Solutions and Business Process Outsourcing services" that increase value to the financial sector and other participants to achieve their business objectives efficiently. This chapter present extensive study in current strategies of Islamic banking industry and use of financial technology, experience of leading Islamic banks in Bahrain. Fintech can enable "Islamic finance to attract more customers, increase productivity, cut costs and offer a more extensive range of products, facilitating the sector become more useful against conventional finance without negotiating on benefits".

Keywords: Islamic banking · Financial technology (Fintech) · Perspectives in Bahrain

1 Introduction

The Islamic banks are typically smaller in comparison to conventional rivals, with the industry's "high fixed costs, putting Sharia-compliant lenders at an inconvenience due to the relative lack of scale" [2]. Banking strategy to implement fintech includes "Stock trading apps and websites, Peer-to-peer lending sites that open competition for loans, thereby reducing rates, Robo-advisor services that provide online, algorithm-based portfolio management, All-in-one online personal finance management, and Budgeting tools". Islamic banking strategies to implement fintech to reduce the gap and level of competition by lessening Islamic banks' managerial expenses and increasing security [6].

For the past twenty-one years, the "BENEFIT Company" has contend a vital role in strengthening the service potentialities of the banking and economic sector, simplifying the payment processes for people and businesses, and conducive to Bahrain's evolution as a business-friendly destination. "BENEFIT's range of services supported by GCCNet in countries within the region include operating of Automated Teller Machines (ATM), Point of Sale (POS), GCCNet, The GCCNet Dispute Management System, Bahrain Credit Reference Bureau (BCRB), Electronic Fund Transfer System (EFTS), Telecom Bill Payment (Tele BP), Payment Gateway (PG), Bahrain Cheque Truncation System (BCTS) and Benefit Pay as a national e-wallet across Bahrain". The Central Bank of Bahrain introduced a "regulatory sandbox that will allow FinTech firms and digitally-focused financial institutions around the world to test and experiment with its banking ideas and solutions".

"Bahrain FinTech Bay (BFB) has launched the Global Islamic & Sustainable FinTech Center (GISFC), with local, regional, and international members attaining to boost the implementation of fintech towards the next phase of progress in Islamic finance". It aims to gather key stakeholders within the business facility to assist "shed light on how FinTech will help accomplish such development" in a balanced and reliable manner. Bahrain is at the forefront of "driving Islamic and sustainable Fintech as a leading regional FinTech and global Islamic finance hub".

"GISFC's launch partners include the Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI), the Islamic Corporation for the Development of the Private Sector (ICD), Al Baraka Banking Group, Al Salam Bank Bahrain, Arab Financial Services, Arcapita, Bahrain Institute of Banking and Finance, Bahrain Islamic Bank".

The structure of this study will be divided into four parts. Part one is brief introduction of the basics of Islamic banking or Shariah financing system and comparison with conventional banking system. Part Two discusses "What FinTech is and how it relates to modern banking, particularly Islamic banking. Part three enlightens the Islamic banking strategies to implement Fintech in Bahrain and the last section concludes the research study and discusses the direction of future work" [3].

2   Fintech in Islamic Banking

Fintech is described as the financial services of the twenty-first century [3]. "Fintech is new technology applications and innovations that aim to provide new and improved methods in the delivery of financial services which offer financial services by making use of software and innovative technology originates from the contraction of the words finance and technology". Companies are now pushing the payment industry to the next level with the help of modern tools. "Smartphones for mobile banking, online international money transfer, credit scoring services that leverages social media" are the recent developments. Fintech is more convenient "leading to a better customer experience with wider reach to more segments of society, by creating various opportunities such as more automated and user-friendly financial transactions, including even the unbanked or under-banked population".

"Fintech and Islamic Fintech having similar objectives, but the Shariah (Islamic Law, specifically the branch dealing with transaction in the economy) rules must be observed in the latter. Fintech is impermissible if there is clear evidence that they are against the basic rules of the Shariah. It is significant to emphasize that from an Islamic perspective, any "business activities including Fintech are deemed as permissible, except when there is a clear text which forbids it" [1].

2.1   Digital Transfer of Islamic Finance

- Practice of "Fintech utilities such as KYC/AML, Blockchain and DLT, Cyber, Payments, Big Data & Machine Learning" in Islamic Finance
- Any "FinTech in a Muslim market demography that delivers an unmet financial need and or financial inclusion" objective
- Any "Shariah compliant FinTech fund investing in digital infrastructure or economic development" anywhere in the world [4].

According to "IFSB secretary-General Jaseem Ahmad, there are incredible prospects for Islamic Fintech and Islamic banking institutions (IBIs) are taking up Islamic Fintech to reach out and enhance the desirability of their products at a lower cost. Currently the share of Islamic banking industry reaches approximately 100 million. The potential market is six times and Fintech can tap this gap. Islamic Fintech can help the unbanked to create a new form of credit history and moving from there, at the next phase they can then be served by the larger IBF industry [7]".

2.2   Services Offered in Islamic Fintech Firms

The important services provided by Islamic Fintech are "peer-to-peer (P2P) lending, crowdfunding, money transfer, mobile payments, trading platforms and services for other sub-segments such as wealth management, insurance, etc." [4].

Leading Islamic Fintech providers among others include "Singapore-based EthisCrowd.com & KapitalBoost.com, US-based Wahed Invest LLC and UK-based Yielders in the segments of P2P lending, crowdfunding and investment robo-advisory". Some Islamic Fintech companies are new and worth noting are "US-based Ovamba, an Islamic trade finance platform, which is launching a Shariah compliant Initial Coin Offering (ICO) which allows for fees and risk-sharing backed by halal instruments using a token and CBX Unit which is a Shariah compliant universal payment system backed by grains".

2.3   Islamic Fintech and Financial Inclusion

"With the presence of Fintech, nearly two billion adults who are presently unbanked will now have access to financial solutions (World bank)". Currently only 27% of the region's 600 million individuals have a bank account and nearly 40% of the unbanked are Muslims in the Southeast Asian (SEA) region, which "motivates for Islamic Fintech in tackling financial inclusion". Fintech establishes prospects for "individuals and SMEs who require financing but thus far do not qualify for financing from traditional

IBIs" with the accessibility of Shariah-compatible crowdfunding and P2P financing tools [8]. "Singapore-based Islamic Fintech Company KapitalBoost, offers SMEs, who are often underprivileged in their access to funds for business development, short-term financing alternatives with fast and friendly approval process and at competitive rates". Shariah-compatible financing structures such as "Murabaha, Qard, Wakalah etc. moving to US-based Ovamba and encourage fellow entrepreneurs in Africa and the Middle East" by providing them with the access to finance needed in order to flourish their businesses [6, 10]. They are solving problems, "firstly, banks are slow and ill-equipped to adapt to meet the demands of fast moving African small businesses; and secondly, banks' limited due diligence procedures make it hard for entrepreneurs with no previous track record to get started".

Financial services are transforming through advanced technologies from blockchain to artificial intelligence. Islamic finance is no different. "Sharia-compliant fintechs are popping up in Islamic and non-Islamic nations alike, promising to win over millions of young Muslims and extend financial services to the underbanked" [14] (Table 1).

Table 1. Type of financial service and Islamic fintech

Financial Services	Islamic Financial Services	Islamic Fintech Examples
Funding	Includes: • Custody-based deposits (can also be based on *Qard*) • Investment accounts • *Shari'a*-compliant payment, collection, and liquidity management	• PayHalal (Souqa Fintech Sdn Bhd, Malaysia) • AmalPay (Malaysia) • Investment Accounts Platform (IAP – Malaysia)
Trade Finance	Includes: • *Murabaha* working capital • *Murabaha/Wakala/Mudaraba*/Letter of Credit	• Waqfe – Bahrain (Digital banking platform provider)
Financing	Includes: • *Murabahah/Mudaraba/Musharaka/ Salam/Istisn'a/Ijara* Financing • Islamic Microfinance	• Ethis Crowd – Singapore, Indonesia, Malaysia, Australia • Blossom Finance
Capital Market	Includes: • Islamic Bank Treasury • *Sukuk* (Islamic Bonds)	• Adab Solution (Crypto exchange)
Wealth Management	Includes: • *Shari'a*-compliant wealth management for retail and HNWIs	• Wahed – US (Robo-advisory investment platform) • HelloGold (blockchain-based gold investment)
Insurance	Includes: • *Takaful* • Re-*Takaful*	• Uplift Mutuals • Insure Halal

Source: World Bank – 2020

3   Fintech Improvements in Bahrain

There are currently ninety-three Shariah fintech companies primarily providing financial facilities [5], followed by wealth management and funding (Dinar Standard). Fintech companies got opportunities and cooperation from Bahrain to expand their technologies. "Islamic financial institutions operating in Bahrain and throughout the GCC are associates with the Bahrain Fintech Bay" [9].

The "first comprehensive digital fintech lab FinHub 973, powered by Fintech Galaxy's FinX22 platform, which is a cloud-based open innovation platform that complies with the best international technical standards and the FinX22 platform offers an open banking API sandbox that enables fintech startups to develop, test and deploy fintech solutions has launched by Central Bank of Bahrain(CBB), in cooperation with the Bahrain Economic Development Board, Bank ABC, ila Bank, BENEFIT, National Bank of Bahrain (NBB) and Bahrain Islamic Bank (BisB)".

The new platform regulated by CBB promoting innovation and supporting integration between financial institutions and fintech startups along with collaborative ecosystem in the fintech sector by establishing a gateway for investment opportunities in Bahrain.

As per latest annual Islamic Finance Development Indicator (IFDI, 2020). Bahrain ranked in the world's top five Islamic finance economies and third place globally and leading MENA in all eight IFDIs among 135 countries. "The high ranking of Kingdom is due to its robust and supportive regulation for IFIs as well as increases in Islamic banking and its assets" [12].

"Bahrain was the first in the region to develop a strong banking community and is now building one of the most concentrated FinTech ecosystems in the world. The Islamic finance sector has been a key part of that development, with ninety-six billion dollars of assets held in the Kingdom, which accounts for 124% of Bahrain's GDP. (EDB, Bahrain)".

3.1   Operation of Digital Banking and Cryptocurrency by Islamic Banking Industry Bahrain

As per survey published by the "Bahrain-based General Council for Islamic Banks and Financial Institutions in May 2018", IFIs are progressively involved in utilizing fintech and digital transformation as extremely vital factors for tactical decisions. Kingdom is seeking to set its status as a "regional financial center by becoming a leader in Islamic fintech, and global center for Islamic finance". [7, 14] has highlighted the use of smart contracts to safeguard products or services of the Islamic financial industry as Shariah compatible.

3.2   Cryptocurrencies

In July 2018 "Islamic advisory corporation Shariah Review Bureau, which is licensed by the Central Bank of Bahrain (CBB), provided US-based cryptocurrency platform Stellar with authorization for both the platform itself and its blockchain-based cryptocurrency Lumens and in December 2018 the CBB issued draft rules on the use of

cryptocurrencies for consultation, further highlighting Bahrain's openness to the technology" [9, 13].

3.3   New Platforms

In August 2017, the "CBB allowing SMEs to boost funds via both conventional and sharia-compatible crowdfunding, making the kingdom the only country with a regulatory structure for the latter". Regional organizations are also seeking to build other Islamic fintech proposals. In December 2017, the "Bahraini subsidiary of Kuwait Finance House and the Bahrain Development Bank initiated the world's first Islamic banking consortium for sharia-compatible fintech, called ALGO Bahrain". Crowdfunding program for "small and medium-sized enterprises (SMEs)" was the consortium's first initiative.

3.4   Digital Banking

Regional Islamic organizations are also gradually keen to offer conventional banking customer services through digital platforms. In March 2018 "Bahrain Islamic Bank introduced both a mobile app and a new online portal for its corporate clients, conventional Gulf International Bank (GIB) launched a digital sharia-compatible retail banking service called Meem, following its acquisition of a retail license in the kingdom in June 2017 and Jazeel that was developed by Waqfe" [15] (Fig. 1).

Fig. 1.   Digital bank platforms, Bahrain. *Source:* Bahrain FinTech Ecosystem Report 2018

"Arab Banking Corporation (ABC Bank) has launched its mobile-only challenger ila Bank. The neobank is offering users an instant virtual card for electronic operations, flexible financing alternatives, in-app card regulations and accounts which will allow clients to store money in foreign currencies and earn more interest the more they save" [15, 16].

"Al Baraka Banking Group, has introduced, the first interest-free digital only bank in Germany through its Turkish subsidiary under the name 'insha', the digital bank will initially serve Turkish Muslims and then to the whole Muslim inhabitants of Germany".

"Al Baraka Banking Group, Kuwait Finance House, and Bahrain Development Bank also introduced the first global Islamic FinTech consortium, ALGO Bahrain, which permit Islamic banks to do research, transform, and operationalize FinTech results in a cost-efficient manner in an effort to boost the Islamic finance industry". ALGO Bahrain aims to launch 15 FinTech banking proposals by 2022 [10].

Success Story of Bahrain

June 2017
Introduction of the CBB's Regulatory Sandbox

July 2017
Bahrain issues crowdfunding regulations for conventional and Shari'a compliant markets

August 2017
PayTabs raises $20 million for global expansion plans

September 2017
AWS announces plans to launch operations in Bahrain early 2019

October 2017
Launch of the CBB's FinTech and Innovation Unit

December 2017
Three Bahraini banks launches the first Islamic FinTech consortium Algo

January 2018
Launch of Batelco and Arab Financial Services' new mobile wallet bWallet

February 2018
Launch of Bahrain FinTech Bay

March 2018
Launch of Sadad and Viva's new mobile wallet VIVA Cash

April 2018
Announcement of national e-KYC utility tool for financial services

Launch of "meem", the first Shari'a-compliant digital bank in the region

May 2018
Kuwait Finance House launches it digital account platform Jazeel

Launch of the national P2P payments service BenefitPay

Source: Bahrain FinTech Ecosystem Report 2018

4 Conclusion

Islamic Fintech has the potential to disrupt all features of the industry. It has the potential to reflect the development of the macro-Fintech environment and enhance the Sharia compliant nature of business and consumer financing [4, 11]. The expansion of Islamic Fintech is driven by government initiatives, startups, and clients, establishing cost-effective value chain. Government efforts can play a crucial role in the growth of Islamic Fintech system and current initiative by companies such as "Dubai International Finance Center (UAE), Malaysia Digital Economy Cooperation (Malaysia), Bahrain Fintech Bay (Bahrain)". There is a demand for digital technology-based product offering among Muslim consumers which is likely to grow in the upcoming future. Islamic Fintech has a lot of potentials to safeguard Sharia compliant products offered in the global market which can enhance the effectiveness of the industry and its product offerings. Expansion of the Islamic fintech, however, will require the advancement of suitable Sariah guidelines by relevant regulatory bodies [5, 13]. Central Bank of Bahrain and Bahrain Fintech Bay have taken measures to improve essential guidelines to ensure effective monitoring of Islamic fintech firms. Findings provided by this study is expected to shed new light in this relatively new field of research.

References

1. Elasrag, H.: Blockchains for Islamic finance: obstacles & challenges. Munich Pers. RePEc Arch. **03**, 1–39 (2019)
2. Fintech Futures. BankingTech Lloyds first to launch open banking app for credit cards and savings (2019). Accessed 23 June 2019, https://www.bankingtech.com/2019/06/lloyds-first-to-launchopen-banking-app-for-credit-cards-and-savings/
3. Todorof, M.: Shari'ah-compliant Fintech in the banking industry. ERA Forum **19**(1), 1–17 (2018)
4. Al-Sartawi, A.: Shariah disclosure and the performance of islamic financial institutions. Asian J. Bus. Account. **13**(1), 133–160 (2020)
5. Al-Sartawi, A., Reyad, S., Madbouly, A.: Shariah, presentation and content dimensions of Web 2.0 applications and the firm value of Islamic financial institutions in the GCC countries. J. Islamic Mark. (2021)
6. Karolak, M., Razzaque, A., Al-Sartawi, A.: E-services and M-services using IoT: an assessment of the Kingdom of Bahrain. In: Abdalmuttaleb, M.A., Al-Sartawi, M., Razzaque, A., Kamal, M.M. (eds.) Artificial Intelligence Systems and the Internet of Things in the Digital Era: Proceedings of EAMMIS 2021, pp. 523–533. Springer International Publishing, Cham (2021). https://doi.org/10.1007/978-3-030-77246-8_48
7. https://www.tradearabia.com/news/BANK_374189.html,https://openknowledge.worldbank.org/handle/10986/34520, License: CC BY 3.0 IGO.
8. https://oxfordbusinessgroup.com/analysis/taking-leap-islamic-banks-venture-new-technological-solutions
9. https://www.bahrainfintechbay.com/fintech-ecosystem-report
10. https://www.cbb.gov.bh/fintech/
11. https://www.fintrail.co.uk/news/tag/Shariah+Compliant+FinTech
12. https://www.gulf-insider.com/bahrain-leads-islamic-fintech-startup-ecosystem-in-mena/
13. https://www.startupbahrain.com/news/central-bank-of-bahrain-launches-finhub-973-to-boost-the-kingdoms-fintech-ecosystem/
14. https://www.startupmgzn.com/english/news/bahrain-ranked-in-worlds-top-five-islamic-finance-economies-by-the-islamic-development-bank/
15. https://www.zawya.com/mena/en/business/story/Spearheading_a_digital_future_in_Bahrain_Islamic_finance-SNG_171857899/

Computing Financial Performance of Road Freight Transportation (Trucking) Industry in India Using Mathematical Tool

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Abstract. Mathematics is regarded as the second language for the people of economics. Using mathematics or its component in the field of transport economics as tools for precise and accurate analysis is of great help given the role of transport in general and road transport in particular in Indian contexts. As we all are aware that transport plays a crucial role in ensuring sustained economic growth trucking industry act as key factors in the development process of economy like ours, it is very important to make sure the optimum and efficient utilization of available capacity to turn any business proposition viable in order to have long run sustainability and survival of an economic system in general and transportation business in particular. Therefore, in this paper an attempt has been made to use the simulation exercise as a mathematical tool/technique for the trucking Industry in India in order to find out operational viability on the various routes given specific distance and carrying capacity. Also attempt has been made to use a cost model in order to calculate profitability of truck operator keeping in mind the cost profile via cost model.

Keywords: Transportation · Financial efficiency · Economic analysis · Viability · Development

1 Introduction

Given the topography of our country, transport in general and road goods transportation in particular proved to be an important supportive system. This can be seen with reference to the share of transport in GDP in general and share of road transport in GDP in particular [6]. [5] indicates that the share of transport is around 6.5% in our GDP whereas share of road transport is around 4.6% in our GDP. More and better transport has no doubt been one of the main factors in India's economic development during last six decades or more of economic planning [3].

Further to have continuous support from road transport in general and Road Goods Transport Industry in particular for economic growth, it is necessary that the operation must be viable. Although, it is not that easy and simple to get precisely, the viability analysis or calculations. However, with the use of certain tools and techniques

especially from mathematics it can be done precisely and accurately. This is because the Mathematics is considered as a second language for Economics students [8]. Thus Mathematics is yet another important subject closely related to Economics. For estimating various economic relationships, predicting relevant economic quantities and using them in decision making and forward planning, mathematics is highly useful.

Hence, knowledge of certain mathematical tools and concepts are relevant part of economic analysis.

Moreover, to turn any business activity viable for its survival, it is necessary to make sure that an optimum and efficient utilization of available capacity is must [1, 2]. Hence in this regard simulation as one of the important tools of mathematics being used to find out viability of trucking operations on some of the identified routes have considered the distance kms of the route, existing freight rate, cost profile of operation via appropriate cost model, etc. [1].

Further literature suggests that almost on regular basis over a period of time, many economists in their study relating to transportation has utilized mathematics and its various components as a tool to solve complicated problems. Having solution through usage of mathematical tool proved to be of great help for economy in general and solution to the specific problem in particular. Specially, in the field of transport economics, which is a part of applied economics, one cannot proceed for an appropriate, precise and accurate solution without using mathematical tools. However, now a day subject like Econometrics which is considered as a combination of Mathematics, Statistics and Economics, being used in wider way in the form of analytical tools like SPSS, R, STATA etc.

Literature [3] also suggests that mathematical tools has been proved to be of great help in solving the transportation problem like financial analysis, congestion problem, peak load pricing, asset utilization, operational efficiency etc. Thus, on the basis of this, the current study has been undertaken with an objective of finding out viability of trucking operation on various routes with various pay load capacity given specific distance while using simulation as a mathematical tool for the betterment of economy in general and trucking industry in particular.

2 Objectives

- To examine the role of Mathematics and its various components in the field of economics.
- To empirically examine the financial efficiency of trucking operation using simulation as one of the components of Mathematics.
- To look at the current status of trucking industry in India.
- To suggest policy guidelines and recommendations on the basis of the study.

3   Methodology

The methodology includes relevant literature review to gather insights, secondary data use, collection of primary information through field survey/observations etc. As the main objective of this study is to look at the current status of trucking industry in India and empirically examine the viability of trucking operation using simulation as one of the components of mathematical tools, we attempted a critical understandings of nature of trucking industry and application of possible mathematical tools having considered various routes of operation keeping in mind the distance in terms of kilometers, load carried on annual basis, freight rates on these routes and cost components. Thus, given the importance of trucking industry in our domestic economy and importance of viability of operation, the significance of our study can be considered from a future policy framework perspective.

4   Results and Discussion

The road good transport(trucking) industry in our country is entirely in private domain and is dominated by small road transport operator, majority of whom own a single truck or two (basically unorganized). Given this, basically unorganized appearance, trucking industry is almost a neglected segment as a part of transport sector in India [9].

However, in recent times, especially from last one decade or so, given the realization of importance of trucking industry in our economic growth and development, Government of India has taken many initiatives with regard to infrastructure development, policy reforms, legislative and regulatory measures, etc. But despite of this, due to certain lacks, even in past as well as current context also truck operators are facing serious problem of viability of operation, especially the small operator [11].

Further, given the growth in number of trucks in past some time, the population of truck operators also increased but this is given in context with number of small operators as also discussed in many earlier studies given the nature of trucking industry [10]. Moreover, the industry has a two tier structure. Tier 1 consists of freight aggregators which account for the bulk of the freight traffic because of their access to information about freight and fleet availability. The other tier (Tier 2) comprises small operators with 1–5 trucks and practically no market power and who provides the services and support to the other Tier [7].

Although, the share of the road mode in total freight movement in India has been increasing over the past three decades due to its certain inherent features such as customer tailored schedules, easy availability, small cargo acceptance, flexibility in operation [4]. Door to door services and many more, the trucking industry still face the problem of viability of operation in many respects. Therefore, it is necessary and important to look at this issue very seriously and develop a mechanism by using various tools to counter the problem of viability [6]. Thus, by using simulation as a mathematical tool and apply it for trucking industry, it is quite possible to determine viability of operation very precisely and accurately.

Further, longer a truck operator can stay profitable; the better is viability [9]. Thus, in the context of viability of trucking operation, the factors relating to the productivity

of truck operators such as fleet size, fleet utilization, and availability structure etc. plays an important role. Moreover, the productivity of the system (say trucking industry) can be improved considerably if efforts are made towards the formation of viable units among operators i.e. viability of trucking operators [1].

Hence, in order to study the viability of trucking operation very accurately, the analysis of freight rate and operation cost is most important. Analysis of freight rate gives an idea about the prevailing freight on various routes and between two different places. This basically indicates the revenue component of trucking operators. The freight rates are taken into consideration to find out revenue per tonne kilometer on specific route along with checking trend in freight rates to examine profitability using simulation.

Further, analysis of operator cost gives an idea about the cost profile of trucking operations with reference to per tonne kilometer. While considering cost of operation of truck, it is classified into the fixed costs and variable costs. Further, the use of cost model for current study comprises of various components of fixed costs and variable costs relating to trucking industry or trucking operators [9].

The cost model is used to examine returns to truck operators operating on different routes with varies distances and payloads, as per norms. Further, in regard to the simulation exercises, in this study, conducted for the various categories of trucks with different carrying capacity in terms of RLW (pay loads) i.e. 9 tonne, 16 tonne and 28 tonne, it was observed that a truck with less RLW has more cost per tonne kilometer as compared to a truck with higher RLW. Given below is the cost per tonne km table.

Table 1. Cost per tonne Km

Distance covered per annum			
Payload	75,000	1,00,000	1,25,000
9 tonne	4.74	3.95	3.49
16 tonne	3.19	2.64	2.31
28 tonne	2.08	1.71	1.49

Source: Our estimates

Analysis given in Table 1 primarily based on undertaken parameters for estimating the costs per tonne kilometers for truck operation. The analysis simply indicates that a truck with higher load carrying capacity is more cost effective as compared to the truck with less load carrying capacity provided one takes into account the distance covered, fuel costs, capital costs, repayment issues etc. However, it has also been observed that over period of time, per tonne kilometer cost also increased due to various reasons.

Further, having use of an analytical model (cost model) the study undertaken has attempted to find out the profitability/viability of operations for freight rates on the different routes (taken into consideration for this study). This has been done on the basis of simulation exercise, which takes into account varying payloads, different distances in terms of total annual operations along with some deviations in the interest charged on truck loans.

Moreover, in terms of pay loads, we have taken these to be 9, 16 and 28 tonne (RLW) while in terms of distances we have considered annual movements of 75,000 kms, 1, 00,000 kms, and 1,25,000 kms and much more. Given below in tables is the profitability of the operations on different routes from Delhi- Mumbai, Delhi- Bangalore, Delhi-Ahmadabad, Delhi- Chennai considering the different combinations of the payloads and annual movement.

Table 2. Profitability measure for Delhi-Mumbai Route

Payload	75,000 kms	1,00,000 kms	1,25,000 kms
9 tonne	−35.86	−23.03	−12.89
16 tonne	−4.70	15.15	31.60
28 tonne	46.15	77.77	104.02

Source: Our estimates

Table 3. Profitability measure for Delhi-Bangalore route

Payload	75,000 kms	1,00,000 kms	1,25,000 kms
9 tonne	− 34.38	− 21.26	−10.88
16 tonne	−2.50	17.80	34.63
28 tonne	49.51	81.87	108.72

Source: Our estimates

Table 4. Profitability measure for Delhi-Ahmadabad Route

Payload	75,000 kms	1,00,000 kms	1,25,000 kms
9 tonne	−44.30	−33.16	−24.35
16 tonne	−17.24	0	14.28
28 tonne	26.92	54.38	77.18

Source: Our estimates

Table 5. Profitability measure for Delhi-Chennai Route

Payload	75,000 kms	1,00,000 kms	1,25,000 kms
9 tonne	−26.16	−11.39	0.28
16 tonne	9.71	32.57	51.51
28 tonne	68.29	104.67	134.89

Source: Our estimates

The profitability measures given in Tables 2, 3, 4 and 5 indicates that the operation of the trucks with less payload i.e. 9 tonne (RLW) was not viable, whereas the operation of the trucks with higher payload i.e. 16 tonne (RLW) is viable and further higher payload i.e. 28 tonne (RLW) is even more profitable. Further in this study, we found that in case of trucking operation on routes like Delhi-Mumbai, Delhi-Ahmadabad,

Delhi-Bangalore and Delhi-Chennai operation of truck with payload of 9 tonne and distance of 75,000, 1,00,000 and 1,25,000 kms annually is not viable. It is only with the higher load with 16 tonne and the distance of around 100000 kms can make the operation possible on these routes, the exception only with Delhi-Chennai route where even with payload 16 tonne and distance 75000 kms, the operation is marginally profitable. With the movement of any distance say 75000 kms, 10000 kms or 125000 kms annually brings super normal profit to the trucking operations.

5   Conclusion

To conclude the study, it was found that in order to get precise and accurate solution to any of the problems in economics in general and Road Goods Transport Industry in particular, using Mathematical tools is of great help. This is because economics or any other economic theory does not provide any numerical measure of the relationship between any two or more economic parameters or components. The main concern of mathematics or any mathematical tools in the field of economics is to express economic theory or economic components in mathematical forms (equations) and further put these equations in such a form that they lend themselves to empirical testing. However, this conversion of economic components in the forms of equations via Mathematical tools such as simulation exercise and so requires great deal of practical skill especially in order to look at issues like viability of operation of not only Road Goods Transport Industry but say many more, wherever it could be applicable.

The study also conclude that given the nature of trucking industry especially with reference to ownership pattern despite of growth in trucking population and infrastructural development in terms of roads and road network in India, in case of cost of operation, the multi-axle.i.e. the truck with high payload (say 16 tonne RLW or more) is viable on various routes under certain conditions whereas the operation of truck with fewer payloads (say 9 tonne RLW) is not viable on the routes taken for the study under any condition. It is further concluded that a higher level of movement to the extent of 1, 50,000 kms or even more could enable operations to be viable even for lower payload i.e. 9 tonne RLW.

However, the question is whether a higher level of movement by trucks on daily basis is possible given some of the existing barriers to free trade flow on an interstate basis, although recent GST could prove to be of some help or support. In order to understand these issues, further studies required in the areas of structure of the industry in terms of the market, its players, regulatory and legislative scenarios, taxation, etc.

References

1. Asian Institute of Transport Development: Trucking operations in India. Ministry of Surface Transport, Government of India (1999)
2. Central Institute of Road Transport: Road Goods Transport in India – A Study of its Structure and Organization. Pune: Central Institute of Road Transport (CIRT) (1994)
3. GoI: Report of the National Transport Policy Committee. New Delhi: Planning Commission, Government of India (1980)
4. Government of India: Vision 2020 Transport. New Delhi: Planning Commission, Government of India (2002)
5. GoI: Working Group Report, Twelfth Five Year Plan, Government of India, Delhi (2012)
6. National Council of Applied Economic Research: Road Transport Industry. New Delhi: National Council of Applied Economic Research (NCAER) (1979)
7. Sriraman, et al.: Competition Issues in the Road Goods Transport Industry in India with special reference to The Mumbai Metropolitan Region, New Delhi: Competition Commission of India (CCI) (2006)
8. Gujarati, D., Sangeetha: Basic Econometrics, Tata McGraw Hill, New Delhi, 4th Ed (2007)
9. Parihar, M.: Viability Analysis of Trucking Operations in India, Supply Chain Pulse, ITM Centre for Supply Chain and Logistics Research, Navi Mumbai v.5, Issue 2 (2014)
10. Parihar, M.: Entrepreneurship and Financial Need: A Case of Road Freight Transportation in India, Bookwell Publication, New Delhi (2018). ISBN 978-93-86578-1
11. Singh, A., Parihar, M.: Analysis of issues relating towork life balance in trucking operation: a human resource perspective: Int. J. Comput. Sci. Eng. E-ISSN: 2347–2693 5(8) (2018)

Computing Causality Between Macro-economic Indicators and Indian Financial Markets

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Abstract. Numerous studies conducted on emerging market economies have suggested that equity and debt markets truly reflect the economy's financial health. Macroeconomic events have an influence on financial markets. In order to effectively diversify our portfolio, it is imperative to analyse the various financial market interrelationships. During turbulent times these inter dependencies are supposedly stronger between markets as compared to the calmer financial periods. This fact was especially visibly evident, during the global financial crisis. Hence, the predictability of stock return interrelationships is a critical topic that is frequently discussed in empirical studies. The paper considers the role of macroeconomics indicators in order to understand the dynamics of various interrelationships that exist in financial markets. The main aim of this study is to examine the relationship between market returns and a set of macroeconomic variables for different economies using annual data from the year 2000 to 2020. The results of the study primarily prove that there is co-integration between some macroeconomic variables and different stock indices which are indicative of a long-run relationship. The study highlights the impact of macroeconomic variables on the stock market performance of a developing economy, whose performance can be measured by the macroeconomic variables. It also confirms the presence of autocorrelation in different markets and macro-economic variables implying that markets fall into a form of Efficient Market Hypothesis. It suggests that any change of exchange rate, interest rate and other indicators significantly influences the stock market in the economy and vice versa. The study delineates the unidirectional causality moving from international stock markets to domestic stock markets, exchange rates, interest rates, and inflation rates indicating substantial impact on the stock market movement for our considered study period.

Keywords: Macroeconomics · GDP · Foreign exchange rate · Inflation · Interest rate · Unemployment · Nifty · Sensex

1   Introduction

Financial markets are markets in which financial goods and services are exchanged. The financial market of any country tends to depict the health of its economy. They play a very crucial role in facilitating operations in the economy by creating liquidity and allocating resources efficiently. Markets are essential as they attract investments (both domestic and international) which in turn helps in the progression of the economy and the country as a whole [4].

Economic indicators are instruments that help investors to decipher and understand what is happening in the economy. Broadly, there are two types of indicators - micro and macro. This paper concentrates on the macroeconomic indicators namely GDP, IIP, Inflation, Interest Rate, Monetary Policy, Unemployment Rate etc. These indicators are further categorized as leading, lagging and coincident indicators in relation to financial, especially equity markets. Leading indicators can help forecast events that can happen in the future whereas lagging indicators convey the events that have already occurred. GDP can be defined as the standard measure of the value created, added through the production of goods and services in a country during a certain period including the income earned from the production, and the total amount spent on final goods and service and excluding the imports [10].

The next indicator which is of importance to the manufacturing sector of the economy is IIP. IIP is a lagging indicator as the data produced has a lag of 6 weeks from the reference period. This ever-changing relationship between the macroeconomic variables and market returns have caught a high amount of attention from economists, analysts, investors and policymakers for a long time. Over a period of time, these indicators help in identifying the prevailing market trends.

This paper attempts to establish by analyzing the past trends and relationships between these indicators and Markets, several decisions can be made. The methodology includes performing causality and correlation tests between the indicators and market returns to find which set of indicators have the most influence over returns of the market and the magnitude. Applying regression to the data of 10-year bond yields and the market index value will establish the type of relationship the interest rate of the country and the market index have, enabling us to understand and be prepared for future events.

2   Literature Review

Very recently, [1] studied the Effect of Inflation on Stock Market Returns and clarified the effect of inflation on the securities exchange (stock market) returns thus; it can help the market members. They established a significant relationship between inflation and returns for Austrian Index (ATX), Belgium Index (BEL20), Canadian Index (GSPTSE), Chile Index (IPSA), Chinese Index (SSEC), France Index (FTHI), Indonesian Index (JKSE) and Japanese Index (Nikkei) with negative relationship. However, for Ireland (ISEQ), Mexico (MXX), Spain (IBEX) and Turkey (XU100.ES) they found a negative correlation coefficient without any statistically significant relationship. For Brazilian Index (Bo Vespa) they found a positive

correlation coefficient and statically insignificant relationship. Their research confirms that there exists an inverse connection between the stock market returns and inflation. Based on this, firms can elevate their prices by altering gains.

Another recent study by [9] analyzes the impact of Gross Domestic Products (GDP) on Stock Market Returns in India by utilizing last ten years BSE SENSEX Index, which is a strong variable of GDP. The study showed that there is a straight or positive or strong connection between GDP Growth Rate and the SENSEX in India. When the SENSEX is increased; GDP's growth rate is likewise increased. Relationship between factors is huge. GDP is a predictable factor for Indian stock market returns. Conclusively, the government should attempt to keep up the growth rates of GDP and liquidity in the primary, secondary and derivatives market of stock exchange. [11] attempted to determine an association amongst the macroeconomic factors and the BSE Sensex using correlation, unit root tests as well as the Granger causality test. Their study showed that the market index, exchange rate, IIP and WPI hold a unit root and was integrated to an order of one. This was arrived at by first conducting ADF (Augmented Dickey-Fuller) Test and when it was conclusively ascertained that there was no unit root problem and discrepancies amongst the variables under consideration only then was the Granger Causality test conducted to establish the causality.

Upon visualizing the correlation matrix from the result obtained from the ADF and causality tests, correlation almost all the factors was found to be high, i.e., all of them moved in the same direction; however, a similar pattern wasn't observed from results of the causality analysis, thus they were not fundamentally supported by each other and almost contradictory in nature indicating ambiguity. The causality test indicated that IIP was the only variable which had a causal relationship with the Sensex and there was conclusive evidence of a strong correlation between BSE Sensex and IIP, WPI and the Sensex but not between exchange rate and Sensex. A strong correlation existed between WPI and the Sensex but they also had unilateral causality amongst themselves. In simpler terms, IIP was the only indicator that provided conclusive evidence of having an impact on the equity markets whereas the other two variables viz, WPI and exchange rate did not have a similar effect.

Study by [12] found that the market reacts to various segments reaching out from monetary political, and, socio-cultural. The stock prices of listed organizations are impacted by various variables happening inside or without the financial framework. The study also asserted about the effect of Gross Domestic Product (GDP), Interest Rate (INT) and Inflation Rate (INF) on the stock costs of listed organizations from 1997 – 2009 Stock prices using Stock Market Value Index. They also used a regression investigation which showed that the informative factors have 95.6% of the variety in stock prices. While a decrease in interest and inflation rate brings about expanded stock prices, expanded DGP has a positive effect.

A study by [8] asserted that stock trade and interest rate are two crucial elements of monetary development of a nation. Their investigation shows observational connection between stock file and interest rate for fifteen developed and developing nations including Australia, Bangladesh, Canada, Chile, Colombia, Germany, Italy, Jamaica, Japan, Malaysia, Mexico, Philippine, South Africa, Spain, and Venezuela. Stationarity of market return is tested and it is discovered that none of these exchanges follow a random walk model, which means they do not have weak form efficiency. For the

entirety of the nations, it is discovered that interest rate has noteworthy negative relationship with share price and for six of the nations, it is discovered that changes in interest rate has critical negative relationship with changes in offer price. The first test showed that none of the markets were in weak efficient form, while the F-test showed that share price had a significant relationship with interest rate at 0.0001 significance level. The third F-test showed that at 0.006 significance level, there was a significant relationship between change in share price and change in interest rate. Along these lines, if the interest rate is impressively controlled for these nations, it will be incredibly advantageous to these nations' stock market.

Another study by [7] scrutinizes the stimulus behind the repeated behaviour of unemployment and employment vacancies, the relation between job-creation incentives of firms and stock market valuations. The study is carried out by modelling the time-varying risk as a compact and varying chances of an economic disaster. During riskier durations, the market valuations are on the lower side, while unemployment rises. The model elucidates the volatility in both labour and equity markets and their correlation. The paper studied the actual business cycle framework. The DMP model with search and matching frictions was applied to study the labour market. Equilibrium models (General and partial) were applied to evaluate the stock market. The disaster probability and its effects on unemployment and stock prices was analysed. It was observed that employment incentives of stock market valuations and the firms are highly correlated. The relationship between the stock and labour market was conclusive due to the equilibrium model.

Further, study by [6] examined the trend of stock prices and various macro-economic variables between the time periods 1997 to late 2007. The GDP growth in India had been growing consistently, touching the highs since Independence from 2003 to 2007, and was strongly backed by the growth of the manufacturing and services sector. The methodology used was very simple and straightforward and involved using standard deviations and returns of securities measured using the GARCH Model (Generalized Autoregressive Conditional Heteroscedasticity) in the Indian share market and comparing the SD and return profiles of the benchmarks to the benchmark GDP growth rate and various other factors viz. Balance of Payments, IIP, etc. Furthermore, a quantitative approach was adopted to measure the conditional risk prevailing in the market throughout the given period and digressing it with effective market hypothesis. A positive correlation was found to exist between benchmark stock index returns and the Gross Domestic Product for the same period. A simple lagged regression demonstrated that the stock index growth predicted the macroeconomic indicators such as gross domestic product growth, manufacturing growth, service sector growth, index of industrial production, investment growth significantly.

Again, one of the recent studies by [5] analytically examines the influence of anticipated and unanticipated unemployment rates on the share prices. The tests used for the study are Granger causality and quantile regression-based tests. The findings demonstrate expected unemployment rate has a significant impact on share prices. The study finds out that with increase in rate of unemployment, there is a decrease in the bank interest rate, which in turn increases the stock market prices. The nonlinear Granger causality test was applied to detect causality at any level (quantile) of the conditional distribution of stock returns. The Quantile Regression Model was used for

analysis of results to seek out a correlation between securities market and unemployment rate. The impact of anticipated and unanticipated unemployment rates on the distribution and quantiles of stock prices was analysed. The effects of the anticipated unemployment rate on stock returns are usually diverse across quintiles. An increase in the anticipated unemployment rate is good news for stock prices. It explains to a certain extent why and how the unemployment rate affects stock prices. The results of Fisher and Phillips curve equations show that a high unemployment rate is followed by changes in monetary policies. When there is a higher level of unemployment rate, financial agencies reduce the interest rates, leading to high stock prices.

Moreover, one of the working researches by [3] explains how the news of rising unemployment may help in rising stock prices, since the economy is in the expansion phase. But during economic contractions, the same may prove to be bad news for stock markets. The phenomenon is explained, as the interest rates affected by unemployment may fall and thus help boost stocks. The study focuses on response to stock prices and bond prices to the news of unemployment. A statistical model was used to study the anticipated and unanticipated news components of the unemployment figures. Gordon's constant growth model for security valuation was used to study the influence of these parameters on stock prices. The risk premium was not affected by unemployment news. To measure this, stock price volatility and interest rate were assessed, and regression results were tabulated. The response of different classes of stocks like public utilities and cyclical were studied. The study helped to conclude that stock returns respond positively to good news and negatively to bad news during the contraction period. However, during expansions, stock returns respond negatively to good news and positively to bad news.

Again, with aims to investigate the theory laid down by financial analysts that a negative correlation exists between unemployment rate and stock prices, study undertaken by [2] examines the relationship in three of the largest economies in the world– USA, China, and Japan. Augmented Dickey-Fuller Test and Granger co-integration and causality test were performed. The analytical study based on co-integration and Granger Causality tests discussed that there exists a relationship wherein a decrease in the unemployment leads to an increase in the economy, thereby increasing the demand for goods, resulting in profits and high stock prices. There exists a causal relation where either a negative or positive correlation may exist for certain periods but it would be inappropriate to assume a long term relation. The paper considers unemployment and financial markets of developed economies.

Thus, along with studied mentioned in relevant literature review undertaken several other papers published earlier have also spoken about the relationship between these indicators and markets. However, most of them studied only developed economies. The paper aims to understand if such a relationship exists for developing countries especially India. It aims to study the interdependence between markets. For this, monthly and quarterly data has been collected from 2000 to 2020. Hence, on the basis of literature review following objectives been set for the conduct of current study.

3   Objectives

1. To ascertain the degree of impact of leading, lagging and coincident indicators on equity markets.

     i. **Leading** - Auto sales, Retail activity, Homeownership
     ii. **Lagging** - GDP, Inflation, Interest rate
     iii. **Coinciden**t - IIP, Monetary policy, Unemployment rate

2. To examine the short run and long run dynamics of the variables for the Indian market.
3. To study the effect of new monetary policies on markets.
4. To recommend policy guidelines on the basis of the study.

4   Methodology and Data

Methodology adopted for study includes literature review, secondary data for all the indicators namely - GDP Growth, Nifty 50 Returns, Inflation Rate and Unemployment Rate have been taken from 31st December, 2000 to 31st December 2019. Nifty data is collected from www.nseindia.com and other economic indicators data were collected from www.tradingeconomics.com. The statistical tests performed on the data include Co-integration, Regression and Granger Causality test. Moreover, the Co-integration test performed on the data was used to establish if there was a relationship between several time series variables. The main aim of the study was to study the impact macroeconomic indicators that significantly impact the financial market performance. The Granger causality test is a statistical measure to determine whether one time series can be used to predict another time series. The Granger causality model was implemented to test whether the lagged value of one variable help to predict future value of other time series variables. Thus, given the methodology used following hypothesis has been set for the study:

4.1   Hypothesis

    I. H0- The change in leading economic indicators does not affect equity markets significantly.
       HA- The change in leading economic indicators affects equity markets significantly.
    II. H0- There is no significant relationship between 10-year bond yields and 10-year Nifty Returns
       HA- There is a significant relationship between 10-year bond yields and 10-year Nifty Returns
    III. H0- The change in lagging economic indicators does not affect equity markets significantly.

HA- The change in lagging economic indicators affects equity markets significantly.

IV. H0- The change in coincident economic indicators does not affect equity markets significantly.

HA- The change in coincident economic indicators affects equity markets significantly.

5   Results and Discussion

Several tests were conducted to support the theory and find the causality between Macro-economic indicators and Financial Markets (Fig. 1).
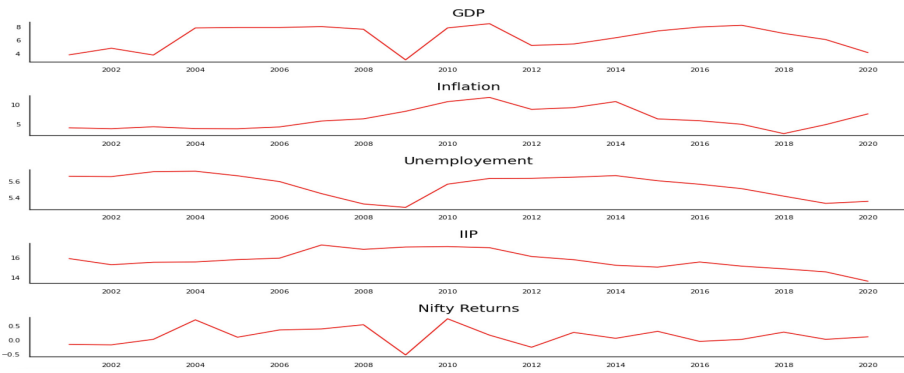
Fig. 1. Relationship between macroeconomic indicators and financial market. Source: Our Study

The unemployment rate in India has witnessed extremes from 2001 to 2020. It was on peak in 2002 to 2004 came down and reached at bottom on in 2009 again increased during 2012 to 2014 and gradually came down. Sharp rises and falls in the GDP numbers have been accompanied by equally sharp movements in the Nifty returns. One may intuitively think that equity market returns reflect the underlying real economy growth gauged by GDP; however, it is noteworthy to mention that real earnings of the constituents of the benchmark index did not face severe fluctuations as indicated by the moves in the Nifty time series chart and can be largely attributed to pessimism induced by GDP numbers. Another plausible explanation to support this argument is that in emerging market indices like India the constituents of Nifty reflect the better set of the underlying economy and hence do not face the brunt of the drop in economic activity. This was especially evident during the 2016-2020 period where the GDP numbers were somber and the Nifty returns remained range bound for the same time period however real earnings of the constituents remained buoyant.

The broad trend of IIP numbers reflects the general subdued trend of the Nifty returns, which has been especially reminiscent in the past decade. A similar argument can be made for CPI data and Nifty returns. These results also depict that the impact of macro variables on sectoral indices is greater when compared to the benchmark indices. Ergo, this study can act as a tool for investors to track their holdings by studying the trend of macro indicators and their impact on individual sectors and the overall market.

5.1   Co-integration Test

Co-integration test is useful to identify long term relationship between two or more time series variable. The test is first proposed by Nobel Laureates Robert Engle in 1987. This test is considered far superior to correlation test in identifying relationship. Sometimes correlation can be spurious and show false strong relation however, co-integration test does not show wrong relationship. For this study co-integration test has been conducted to find out the relationship of GDP, Inflation, Unemployment and IIP numbers with Nifty Returns. Data for all these variables are taken for twenty years from December 2000 to December 2019 (Fig. 2).

```
In [2]: runfile('/Users/shashwat/Desktop/College/Semester X/Capstone/Capstone.py',
wdir='/Users/shashwat/Desktop/College/Semester X/Capstone')
Name    ::  Test Stat > C(95%)    =>    Signif
-------------------------------------------
GDP     ::  70.91     > 60.0627  =>    True
Inflation ::  44.24     > 40.1749  =>    True
Unemployement ::  24.78     > 24.2761   =>    True
IIP     ::  8.44      > 12.3212  =>    False
Nifty Returns ::  0.8       > 4.1296   =>    False
```

Fig. 2. Co-integration test result. Source: Our Study

Co-integration test result shows that there is long term relationship of Nifty returns with GDP, Inflation and Unemployment rate. However, IIP numbers did not show any relationship. The reason may be lag in time of declaration of IIP nos.

Granger Causality: Granger causality test help us in determining whether we can forecast one time series variable (Y) with the help of other time series variable (X). The result shows which variable causes which other variable in changing values, Can the future values of one variable Y be predicted based on the prior values of another variable X? To calculate causality, data of GDP, Inflation, Unemployment rate and IIP variables are taken for twenty years from December 2000 to December 2019. The table below shows the p-value for the variable x to cause variable y. We can see that for 95% significance only IIP has any significant causation towards Nifty Returns (p-value = 0.0005) (Fig. 3).

Index	GDP_x	Inflation_x	nemployement	IIP_x	Nifty Returns_y
GDP_y	1	0.7957	0.2296	0.0069	0.8296
Inflation_y	0.2875	1	0.0025	0.105	0.7084
Unemployement_y	0	0.0702	1	0.2624	0.0001
IIP_y	0.6145	0.0516	0.3855	1	0.2774
Nifty Returns_y	0.5046	0.1707	0.8159	0.0005	1

Fig. 3. Granger causality result. Source: Our Study

6   Conclusion

When Economy is doing good it is reflected in various economic indicators, stock market indices are known as barometer of economy follow the economy. However, same has been proved otherwise during the recent covid19 pandemic. During pandemic economic indicators are showing downtrend on the other hand stock market indices are going up. Market return is not supported by economic factors but driven by high level of liquidity in the market. In this paper, causality and long- term relation between the Indian Stock Market and different economic indicators were studied. 20 years Nifty50 returns data were collected from NSE website. Other data of like Inflation Rate, Unemployment Rate, IIP as well as the GDP for the corresponding time period was gathered from the website of tradingeconomics.com. Granger Causality were used to find out the long-term causality between the different indicators and Nifty returns. Result shows that only Unemployment rate is causing Nifty returns and is useful in predicting future values. Co-integration test were conducted to find out long term relationship of economic indicators with stock market return. The result shows that GDP, Inflation as well as Unemployment Rate have long term relation with index returns.

References

1. Sathyanarayana, S., Gargesa, S., et al.: An analytical study of the effect of inflation on stock market returns. IRA Int. J. Manag. Social Sci. **XIII**, 48–64 (2018)
2. Farsio, F., Fazel, S.: The stock market/unemployment relationship in USA, China, and Japan. Int. J. Econ. Finan. **5**(3), 24–29 (2013)
3. Boyd, J.H., Jagannathan, R., Hu, J.: The Stock Market's Reaction to Unemployment News: Why Bad News is Usually Good for Stocks. The National Bureau of Economic Research, ssrn.com (2001)
4. Kumar, A.: Co-integration of Indian stock market with US stock market. Int. J. Commer. IT Manag. **6**(6), 56–60 (2016)
5. Taamouti, A., Gonzalo, J.: Published in UC3M Working Papers, Economics. The Reaction of Stock Market Returns to Unemployment (2017)
6. Kanakaraj, A., et al.: Stock prices, nicro reasons and macro economy in India: what do data say between 1997–2007? SSRN Electron. J. ssrn. 1035861 (2008)

7. Kilic, M., Wachter, J.A.: Risk, unemployment, and the stock market: a rare-event-based explanation of labor market volatility. Rev. Finan. Stud. (2016). https://economicdynamics.org/meetpapers/2017/paper_129.pdf

8. Alam, M.M., Uddin, M.G.S.: Relationship between interest rate and stock price: empirical evidence from developed and developing countries. Int. J. Bus. Manag. **13**(8), 43–51 (2009)

9. Chavda, K.N., Kumar, S.T.M.: Analysis of impact of gross domestic products (GDP) on stock market returns in India. Int. J. Creat. Res. Thought **6**(2), 678–683 (2018)

10. Abhay, K.: Co-integration of Indian stock market with the markets of European countries. Paripex Ind. J. Res. **5**(12), 217–220 (2016)

11. Singh, D., et al.: Causal relationship between macro-economic variables and stock market: a case study for India. Pak. J. Social Sci. **30**(2), 263–274 (2010)

12. Lokeswar Reddy, D.V., et al.: Impact of inflation and GDP on stock market rates in India. Int. J. Adv. Res. Manag. Social Sci. **1**(6), 120–136 (2012)

Does Interest Rate Parity Hold Good for INR-USD Exchange Rate? Analysing via Computational Technique

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Abstract. Interest rate parity has a very crucial role in the markets of foreign exchange, which deal with foreign exchange rates, spot exchange rates, and interest rates. It is a theory, which states that the differential of the rates of interest between any two nations is equivalent to the difference between the rate of foreign exchange and the spot exchange rate. It can also be described as the basic equation that controls the association between currency and interest exchange rates. Parity is generally put to us by the forex traders to look for opportunities for arbitrage and making a profit out of it. Interest rate parity is important because, without parity of rate of interest, banks would find it very convenient to make use of the differences that are there in the currency rates and exploit this fact and then make easy money. The very concept of interest rate parity is based on the belief that the returns that are made on any particular investment are free from risk. However, in reality, it is impossible to have an investment that does not include the very factor of risk. Nevertheless, investors can feel extremely assertive and certain about their returns on treasury bonds, given that the economy and the monetary systems of the countries are stable. Through this paper, we aim to analyze whether the interest rate parity holds good for the exchange rate between INR and USD.

Keywords: Arbitrage · Interest rate parity · Exchange rate · Forward premium · Forward discount · Spot rate

1 Introduction

The stability of the exchange rate is a very crucial indicator of the economic strength of any country. Till the economic crisis of 1991, our country, India, followed the regime of the fixed exchange rate. Subsequently, after 1992, the policies of structural adjustment program and liberalization were followed, which made the currency, Rupee to be convertible partially on the current account. Thereafter, India has observed massive fluctuation in the exchange rate of the Rupee. The cause of this massive fluctuation was an increase in trade and also, the financial relationship of the country with its extensive partner in terms of trading, i.e. the United States of America. Further, interest rate parity can be explained as a condition of no-arbitrage that represents a balanced state

underneath which the investors would be unconcerned about the rate of interest available on the investment that would be available between any two countries. However, this condition may not hold constantly and also provides various responsibilities to get a riskless profit.

There are two essential assumptions to interest rate parity, which are: perfect substitutability of domestic and foreign assets and capital mobility. The condition for Interest rate parity is that the return that is expected on any domestic asset would be identical to the adjusted expected return on foreign currency assets. The investors later cannot receive the gains of arbitrage by lending from a country that has a rate of interest that is lower and then exchanging for a foreign currency, and then again investing in a foreign country that has a rate of interest which is higher, because of profits or losses that are made by exchanging back to their domestic currency at the state of maturity.

There are two characteristic types of interest rate parity: Covered interest rate parity and Uncovered interest rate parity. Covered interest rate parity can be defined as the condition within which a contract that is a forward contract has been used to reduce the exposure to the risk of the exchange rate. On the other hand, uncovered interest rate parity can be defined as the condition of parity within which the vulnerability to risks of foreign exchange (sudden conversion in the exchange rate) is uninhibited.

Although the spot and forward rates of exchange are not at a balanced state (in the state of equilibrium) and the interest rate parity is not holding well, there is a probability to gain a profit that is completely riskless by using covered interest rate arbitrage. Generally, short-term funds of investors overseas are covered by interest rate parity. The investors want to steer clear of the risk that comes in hand with any foreign exchange. It gives relatedness among the forex markets as well as money markets in distinct currencies.

The relationship between India and America has undergone a prominent and noticeable transformation in the past few years. A very vital component of the speedily increasing and many- sided relationship between India and the USA is trade and commerce. According to the Embassy of India, the bilateral trade in the department of merchandise goods saw an increase from $ 5.6 billion in 1990 to $ 62.9 billion in 2012, which is a very impressive growth of 1023.2% in just 22 years. Imports from and exports to the USA have also seen a continuous rise, of 316.07% of imports and 488.38% of exports. The trade of bilateral merchandise was at $44.06 billion between January and August 2013 between India and the USA, with a surge in the exports of merchandise from India and imports from the USA by 3.6% and 9.5% respectively in comparison with the same period from the preceding year. Bilateral trade has increased since the 2000 s because of the closer business ties between the two countries. As far as the investment front is considered, the United States of America shelters almost all the sectors in our country, which is looking for opportunities from private participants. The USA is the 5th biggest investor in our country. Hence, the current India-USA tie-ups are at the gateway of unparalleled progress as well as advancements. However, some of the relevant literature in this context provides certain guidelines to set up the tone for the study undertaken to proceed further.

2 Literature Review

[1] put the efforts to find out the relevance of the Interest Rate Parity Hypothesis. Their main focus was on the estimation of how much financial integration is present between India and the rest of the World. It does so by emphasizing the degree of financial integration between the Indian money markets and global markets. In other words, they studied Financial Openness which is also termed as Financial Integration i.e. a situation where a particular asset has only one identical price for all the traders, be it domestic or foreign residents. An integration like that is advantageous as it provides liquidity enhancement as well as risk diversification, both of which undoubtedly help make our markets efficient and also helps in the smooth transition of funds from those who have a surplus to those in need. Another study by [2] examined five parity relations which are UIP, PPP, CIP, Forward Rate Hypothesis and Fisher Effect between India and USA, Europe, and China, and validates that tests of the relations as mentioned above using a Joint testing approach is better suited as it will allow a dynamic interaction for the determination of prices, exchange rates, and interest rates. Further, in the Rupee-Dollar case (which is taken by this paper), interaction among these variables does not validate the parities as the growth of the US economy in the previous decade was not much impressive i.e. the last decade has proven to be among the least growing economic periods for the USA.

[3] studied about Real Interest Parity Hypothesis (RIPH) for a few selected developing countries and industrialized countries and asserted that for the incredibly dominant part of the nations, mean inversion in frees (Real Interest Rate Differentials). Further, the study also found that as the mean inversion is of high speed, the real distinguishers can be expected to be brief. Thus, whenever took into account the chance of basic earns back the original investment more limited-lived deviations from balance will be found. Hence, the authors had the option to dismiss the unit root hypothesis or else to acknowledge the invalidity of stationary for all nations utilizing various techniques. Another study by [4] studied capital constraints, counterparty risk, and deviations from covered interest rate parity and revealed that if in case the forward exchange rates were not dependent on the interest rates, then arbitrageurs could take advantage by quickly changing money in the cash market. Further, this would increase the spot rate and decrease the forward rate, aligning the forward premium to the interest differential. Thus, empirical examination demonstrates that there are few differences from Covered Interest Parity (CIP). These deviations are conceivable because of the essence of exchanges cost, differential tax collection across nations on the profits from putting resources into monetary business sectors, government control, and political danger associated with putting resources into various nations. Notwithstanding, these deviations are sufficiently little to accept that CIP remains constant precisely in reality information. Accordingly, we can say that benefit looking for exchange exercises kills benefit openings in the forex markets.

Moreover, one of the studies from [5] tried to review experimental and hypothetical examination since 1995 taking into account the nominal exchange rates. It incorporates advancements to displaying models on new understandings about macroeconomic factors and monetary policymakers. Further, the study also asserted that while a lot of

findings have been attempted which expands our understanding of the impacts of conventional macroeconomic basics on trade rates, significant improvements that inspect the function of non- customary determinants, for example, market dynamics or foreign exchange risk premium have also been registered. Thus, based on the review of relevant literature our study set up the following objectives keeping in mind the relevance of the study in the current context.

3   Objectives

   I. To look over the possibility of profit by arbitrage between INR and USD
  II. To find out whether interest rate parity holds good between INR and USD
 III. To suggest guidelines on the basis of the study.

4   Methodology, Data Source and Hypothesis

This study is descriptive and analytical. We have considered two hypotheses, the null hypothesis being that interest rate parity holds for USD and INR and the alternate hypothesis is that the interest rate parity does not hold for the same.

- H0: Interest Rate Parity holds well between USD and INR
- H1: Interest Rate Parity does not hold well between USD and INR

    With the aim of analysis for the same, we have taken spot rates of India from the central bank of the country, Reserve Bank of India (RBI - https://www.rbi.org.in/), and 3-month forward rates have been taken from www.tradingeconomics.com. For spot rate and 3-month forward rate of USD, we have taken the data from www.data.imf.org. Since the research is about interest rate parity, we also have taken interest rates of both the countries, India and the United States of America. The interest rates of India were taken from the official website of the State Bank of India (SBI - https://www.sbi.co.in/) and the interest rates of the USA were taken from the official website of the International Monetary Fund (IMF - https://data.imf.org/).

    The variables taken into consideration for this analysis are – spot rates, 3-month forward rates, and interest rates. We have taken into account the past ten years of data of spot and 3-month forward exchange rates of both countries. The interest rates have been taken in the form of a yearly average for India as well as the United States of America.

    To analyze whether interest rate parity holds between USD and INR or not, the very first step was the collection of the previous ten-year data of 3-month forward rates, spot rates, and interest rates of both the countries. Following that, the next task was to put the data collected in an organized and detailed, date-wise manner. The difference between the interest rates of both the countries was calculated next, and then the difference between the spot rates and 3 month forward rates of both the countries. These differences were calculated to collect data for performing regression to inspect whether interest rate parity holds between India and the United States of America. After

the classification of all of this data that was collected was done, the monthly average of the interest rate differentials and spot rate and 3-month forward rate differentials was taken for all the data calculated, from 1st January 2011 to 31st December 2020.

The average of the difference of the spot rate and 3-month forward rate and the average interest rate differential data was accumulated in an organized manner in a separate excel sheet to perform regression on this scrutinized data. The regression was performed using excel itself. We have considered the Average Interest Rate Differential as the independent (predictor) variable and the average difference between the spot rate and 3-month forward rate was considered as the dependent variable (predicted variable). The coefficient of the independent variable shows the magnitude of the impact of this variable on the dependent variable, holding all other factors (other independent variables) constant. Indeed 'small change' may influence output 'significantly'. These two are not in contrast; small changes may have a significant impact while, on the other hand, large changes may be insignificant.

According to the theory of interest rate parity, the future exchange rate is denoted by the formula: $F = S [(1+ih)/(1+if)]$, where F is the future rate, S is the Spot rate, and it and if is the interest rate in the home country and interest rate in the foreign country respectively.

5   Analysis and Results

Based on the study and analysis, we observe that interest rate parity does not hold for currencies of India and the United States of America. Hence, we reject our null hypothesis stating that Interest Rate Parity holds well between USD and INR. In the regression analysis, we found that there is no relationship between the average differential of the interest rate and the average difference between spot rates and 3-month forward rates. From the analysis, we also found that there is an upward trend in the exchange rates between INR and USD (Figs. 1 and 2).

SUMMARY OUTPUT								
Regression Statistics								
Multiple R	0.26335301							
R Square	0.069354808							
Adjusted R Square	0.061467984							
Standard Error	0.506430577							
Observations	120							
ANOVA								
	df	*SS*	*MS*	*F*	*Significance F*			
Regression	1	2.255351733	2.255351733	8.793756653	0.003658753			
Residual	118	30.26368763	0.256471929					
Total	119	32.51903937						
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	3.034969577	0.208048019	14.58783214	3.50904E-28	2.622977863	3.4469613	2.622977863	3.44696129
X Variable 1	0.105106856	0.035444089	2.965426892	0.003658753	0.03491791	0.1752958	0.03491791	0.175295802

Fig. 1. Analysis of results Source: Our Study
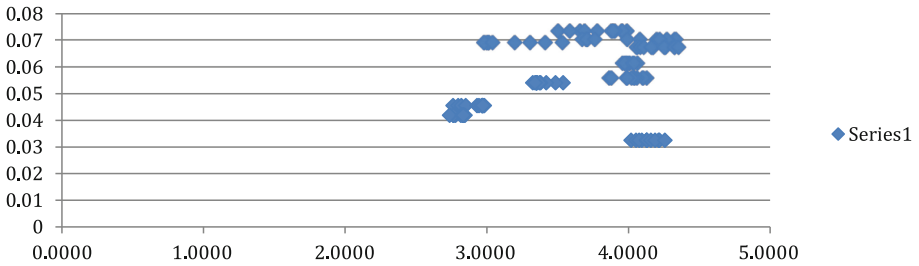
Fig. 2. Regression analysis Source: Our Study

Since there is no constant and no trend in the results of the regression analysis, we can say that the interest rate parity does not hold and is not dependent upon the difference between the spot and 3-month forward exchange rates. Both of the variables that are considered here are non-stationary. Since the theory of interest rate parity did not hold, it can be said that there might be a possibility of the presence of a risk premium puzzle in the foreign exchange market. There can be various reasons because of which our null hypothesis does not hold. The major one being that of the transaction costs involved, along with the possibility of political risks always existing between the two countries taken into consideration here. Apart from these, there is a differential between the tax rates of the two countries and also the judgments of the future interest rate.

In addition to this, since the Interest rates of India are comparatively higher than that of the United States of America, Rupee has undergone depreciation against USD.

6   Limitation of the Study

Although the study undertaken has its relevance about the ongoing scenario. However, the study has certain limitations too. One of the most important limitations is that the study undertaken has considered only two currencies and their exchange scenario. The study could have been extended to some more currencies. However, this can be taken up as future scope of the study to a larger extent i.e. the study can be further extended to other country currencies. Another utmost limitation is the time taken into consideration for data purposes i.e. the study is limited only to 10 years time horizon and it can be extended to other time horizons too.

7   Conclusion

Interest rate parity is a theory that suggests that the difference between the exchange rate of two countries should be equal to the difference between the forward exchange rate and the spot exchange rate for the same countries taken into consideration. This theory plays quite an essential role in the foreign exchange markets because it serves as a point of the conjecture of spot exchange rates, forward exchange rates, and interest rates between any two countries. With the help of the analysis done before, we can

conclude that there is no possibility of interest rate parity in the exchange rate of USD and INR. We took data from the last ten years and performed regression to prove the same. Hence, our null hypothesis does not hold and the alternate hypothesis has been accepted as a part of this research. No parity brings opportunity for Forex traders and Banks to make money by exploiting the opportunity in the forex market. They can make a risk-free profit by currency arbitrage. Non Parity may reflect higher volatility in the forex market increasing the risk. The investors of foreign sovereign bonds, Foreign corporate bonds, Investment in foreign equity, Indian Depository Receipts are to maintain a balanced portfolio to minimize the forex risk.

References

1. Ferreira, A.L.: Does the real interest parity hypothesis hold? evidence for developed and emerging markets. Department of Economics, University of Kent (2003)
2. Chan, D.P.: Covered interest arbitrage under the linked exchange rate: does it exist? An evidence from the Hong Kong foreign exchange market (1991)
3. Mohammed, A.H.: Covered interest arbitrage: a comparative study of industrialized countries and selected developing countries. J. Int. Bus. Res. **4**(4), 2–5 (2016)
4. Hrung, W.B., Sarkar, A.: Capital Constraints, Counterparty Risk, and Deviations from Covered Interest Rate Parity, Niall Coffey, FRB of New York Staff Report No. 393 (2010)
5. Juhl, T., Miles, W.: Covered Interest Arbitrage: Then vs. Now, NBER Working Paper No. w10961 (2004)
6. Vij, M.: International financial Management, 3rd Edition, Excel Books (2011). ISBN 978-81-7446-821-5
7. Jeff, M.: International Financial Management: Abridged, 8th Edition. Thomson South-Western, Mason (2007). ISBN 0-324-36563-2
8. Flood, R.P., Rose, A.K.: Uncovered interest rate parity in crisis. IMF Staff Paper **49**, 252–66 (2002). https://doi.org/10.2307/3872485
9. Flood, R.P., Rose, A.K.: Fixes: of the forward discount puzzle. Rev. Econ. Stat. **78**(4), 748 (1996). https://doi.org/10.2307/2109962
10. Sharma, A.K., Mitra, A.: What drives forward premia in Indian FOREX market. In: Igidr Conference (2006)
11. Ames, M., Bagnarosa, G., Peters, G.W.: Violations of uncovered interest rate parity and international exchange rate dependences. J. Int. Money Finance **73**, 162–187 (2017)
12. Akram, Q.F., Rime, D., Sarno, L.: Arbitration in foreign exchange market: turning on the microscope. J. Int. Econ. **76**, 237–253 (2008)
13. Ané, T., Geman, H.: Order flow, transaction clock, and normality of asset returns. J. Finance **55**(5), 2259–2284 (2000)
14. Alexander, C., Lazar, E.: Normal mixture GARCH(1,1): applications to exchange rate modelling. J. Appl. Econ. **21**(3), 307–336 (2006)

The Impact of Fintech Phenomenon on Economic Development: The Case of Bahrain

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Abstract. This study illustrates the progress financial technology made in the recent years in terms of digital payments in Bahrain. It emphasises on the roles of Bahrain FinTech Bay and Central Bank of Bahrain in terms of regulations, operations and monitoring the establishment cycle of electronic payment systems. This study examines the impact of the newly electronic payment systems on Bahrain economy development due to the high demand for digital payment options and transferring into a cashless society, and the fast continuous growth of the financial technology services. The findings indicates that digital payment systems have impact on Bahrain social welfare and overall economic development.

Keywords: Fintech · Economic development · Digital banking

1 Introduction

The establishment of Bahrain FinTech Bay was back in 2017. A year after launching, Bahrain FinTech Bay has been officially recognized as "MENA FinTech Hub of the year" globally. This huge step is home for innovation of financial technology ecosystem. Hence, the growth of Fintech (financial technology and innovation), rose significantly along with it's impact on the economy of Bahrain [10].

Central Bank of Bahrain role is to manage the FinTech and Innovation Unit in Bahrain. It looks over the process participants go through seeking approval along with supervising, monitoring technical and regulations development on the region. In order to achieve the previous responsibilities, CBB launched Regulatory Sandbox Framework and to meet these regulations FinTech initiatives must be a) Innovative and offer new technology to the market b) Customer Benefit in many forms e.g. security, efficiency, or customer experience c) must be ready to regulate testing and have clear plans and solutions to risks.

Based on Bahrain FinTech Bay regulations report (2019), laws and regulations need to be updated regularly in order to keep up with the new innovation and development growth. This paper also demonstrates on the importance of FinTech for regulatory compliance. As it includes technologies such as artificial intelligence, big data, robotics process automation, cloud computing, distributed ledger technology, and cryptography which are now used to build simplified and efficient RegTech solutions to manage risk and compliance. These RegTech can be done in forms of regulator reporting, risk management, identify management and control, compliance, and transactions monitoring. This report also concentrates on Bahrain FinTech Regulations. Bahrain invested USD 22.5 Capital and the most common FinTech Verticals are: Payments, Digital Banking and Crypto-assets.

The purpose of this study is to measure the effect of financial technology on social welfare of Bahrain. Moreover, its emphasis on how far the human behaviour in Bahrain depends on technology to conduct any financial transactions. As a result of shifting to a digital lifestyle, technology made the whole industry to shift as well. Since FinTech have been established back in 2017 in Bahrain, the country economic development recorded a high contribution of the financial sector in Bahrain gross domestic product (GDP).

2   Literature Review

2.1   Overview of the Financial Service Sector on Bahrain's Economy

The financial inclusion rate on MENA [2] is only 20% covering four factors: access to finance services, credit, savings, and payments. Bahrain rating on the four factors is 59%, 17%, 31%, and 51% Respectively. Bahrain financial inclusion rate is the second highest on MENA at 39% following the UAE at 46%. According to Bahrain Economic Development Board (2020), over the last decade Bahrain has been offering major opportunities for new institutions of finance, Fintech, asset wealth management to insurance and Islamic finance firms reaching over 400 domestic and international corporations by now. This industry plays an important role on Bahrain Economy growth as it is the second largest non-oil contributor to Bahrain's real gross domestic product at 16.7% to total GDP. Also, it is ranked first in MENA in terms of finance freedom.

The financial industry [4] includes 93 Insurance ancillary providers, 19 Currency exchange services, 8 Financing companies, 6 Card processing service providers, 6 Payment service providers, 3 Fund administrators, 3 Trust service providers, and 2 Micro-finance institutions. This growth of financial institutions allow Bahrain to host the region's highest concentration of licensed financial institutions and benefits from the skills.

Based on Bahrain Economic Development Boards annual reports: In 2016, the financial sector contribution to Foreign Direct Investment reached USD 26,760,659 that is equal to 9% of the total FDI where the contribution of the same sector to the real GDP is 16%. The Bahraini economy has expanded by 3% with growth in the non-oil sector by 3.7% with a contribution of the same sector to the real GDP of 80.7%. On the

same year the financial hub was established and regulatory set by central bank of Bahrain was set for new Fintech companies. [6]. In 2017, Islamic Finance was ranked second globally. The financial sector investments increased to USD 31 million of total investments of USD 733 million. This has increased the number of new companies established and the number of new jobs offered in the kingdom. Bahrain EDB concentrate on four sections which are Ancillary Services, FinTech, Wholesale Banking and Asset Management. Bahraini market provides many attractive advantages compared to the neighbors, some of which include competitive operating costs and a deep pool of skilled and trained local talent [4]. In 2018, The financial sector contribution to Direct Investment accelerated to USD 64,412,201. This result in establishing new 18 companies and creating over 300 jobs in the market. In the same period, FinTech Hub was awarded FinTech Hub of the year in MENA by digital group finance platform. New initiatives were made such as Trusts Law, Open Banking, and e-KYC (Electronic Know Your Customer) initiative. [9]. In 2019, The financial sector contribution rose to USD 99,873,000 at 12% of the total contribution on Direct Investment. This created new 575 jobs and 22 new companies. Bahrain financial services has been ranked first Top Islamic Finance Destination in MENA and was ranked first Cryptocurrency Asset-Platform in the Gulf. Also, The Fraser Institute's Economics Freedom of the World Index ranked Bahrain second in MENA for Economics Freedom and second in MENA for Regulations. Moreover, S&P Global ranked Bahrain top two Most Advanced FinTech Ecosystem in MENA [8].

2.2 Forms and Trends of Financial Technology

2.2.1 Artificial Intelligent (AI)

A great sample of Fintech is Artificial Intelligence where software's are used to process data, conduct statistical operations and models in financial reporting. According to [5, 19] study, AI development has increased significantly in past 4 years as it has started as only machines adapting work functions but now the automatic algorithm created opportunities for financial websites to send automatic recommendations as well as taking creative decisions based on the consumer data history and record. The above study prove how the process of AI grew swiftly.

2.2.2 Crypto-Currencies

A study by [16] analyzed the impact and performance of electronic currencies on Georgia's Economy. They discussed the growth in the number of consumers using digital currencies like Bitcoin that recorded 400% in only one year from 2015 to 2016. Not only individuals but there are many large organizations that use crypto currency as brand-new payment method. The study also concentrates on how services and goods are available more than ever before. The history of digital currencies goes back to 2008 after the global financial crisis. Since then, a lot of investors internationally relied on digital currencies to invest in as they are liquid with lower risk potential.

2.2.3 Digital Banking

According to [7, 12, 20] the shifting process from traditional banking to digital banking has had many changes in banks operations performance. They indicate that this change

had a positive outcome as smart devices like ATMs, PDA (personal digital assistant), software and banking mobile applications gave consumers access to variety of services and conduct transactions within seconds. This extraordinary & fast consumer experience influences their behavior which then will be reflected on the gross domestic product positively. The advantages of communications and information technologies will increased in the technological growth in unpredictable way.

2.2.4   Block-chain

On [1] study focused on how the usage of Block-chain effects India's Economy: it is necessary to distinguish those digital currencies are not the same as block-chains in fact digital currencies is one of the products that uses block-chain. It is history goes back to 1991. The security of a block-chain is gotten from its imaginative utilization [24] of verification of work and hashing. Additionally, the unified system of information conveyance gives the simplicity of versatility and openness of information among all the clients utilizing the block-chain. Besides that, it gives a distributed which permits any of the clients to join a block-chain. Having a fundamental agreement of the block-chain innovation it would be a basic to comprehend and inspect the background of Indian computerized economy which would empower a far-reaching assessment of the current advanced foundation.

2.2.5   Insurance Technology

According to [23] report, insurer can use digital technology to their advantage via real-time visualization and monitoring. Such opportunity can impact the relationship insurers have with their clients significantly. For instance, if insurers were allowed by their client to keep track of data of their behavior, they are more likely to reduce risks. The disadvantage here is when insurer have a lot of data of their clients, it can increase possibility of anti-selection risk specifically for health and life insurance. Therefore, insurance technology is one of the essential components of economic growth and development.

2.2.6   Regulation Technology

Based on regulation report (2018), there are two sides for technology in regulations: 1) it helps reducing enforcement costs and compliance costs of any current laws. 2) regulations can discourage some entrepreneurial discoveries as a result of impeding the growth of new technologies. These can have an impact on economy: if new technologies were found it can shift the regulations and come up with new ones that might affect the effectiveness of regulations. It is crucial to adopt an innovation that is has been permitted to new technologies and public policies.

2.2.7   Crowd-Funding

Another determinate of financial technology is [11] discussed the 4 types of crowd-funding: (donation-based, reward-base, lending, and equity). Each has certain characteristics upon the availability of information between the investor and fundraiser as well as the legal positions. Here FinTech links financial institutions with information technology and financial intermediaries.

2.3   Determinants of Economic Growth and Financial Technology:

2.3.1   Gross Domestic Product

A study conducted by [13] about how digital finance impacted Nigeria Economy. To determine the economic development of Nigeria, this report used GDP as the dependent variable and representation of economic growth. Another research [22] in Sub-Saharan Africa measured the economic growth by using the annual % GDP per capita from 2011–2017. Gross Domestic Product shows the annual percentage growth rate for the country. Both studies indicate that an increase in GDP shows a healthy economy and a decrease in GDP means that there is a decline in the performance of the nation's economy, higher unemployment rate and decrease in productions and investments.

2.3.2   Payments, Transfers and Remittances

According to [6] report, the MENA online Payment volume has been recorded at $68 billion in 2020 and online payments, transfers and remittances takes up to 84% of the Top FinTech Vertical. Both of these huge figures indicate an outstanding and massive contribution to the economy. In fact, it was also recorded that electronic payments contribution to Bahrain gross domestic product at around $100 billion back in 2017. Moreover, this huge demand on online payments has cause the demand for smart phones increase to almost 4 billion users in 2017.

2.3.3   RTGS: Real Time Gross Settlement (Consumer and Interbank) Transactions

One of digital payment system elements is RTGS, [19] discussed different types of instant payments and their influence on Polish economy. According to his study, RTGS is one of the technology solutions that drastically impacted Polish economy and noticed security improvements in conducting transactions efficiently and effectively. Another study by [21] emphasis on digital payments system in India, RTGS is used as one of the growing methods of electronic payments and emerged significantly in the recent years at India. Hence, RTFS is used as an indicator of digital payments besides the growth of internet usage which allowed new payment technologies to evolve and emerge in the market.

The below graphs show the daily average volume and value of each digital payment element from 2016–2020. H1 means period from 1st January to 30th June first half of the year, H2 means 1st July to 31st Dec is the second half of the year.

Figure 1 shows in H1 2019 RTGS daily average value reached it is peak at BD338.4 million per day while the lowest value was during H1 2016 at BD226 million. The difference in RTGS value from H1 2019 to H1 2020 recorded a decline by 16% which can be explained as a result of Covid-19.
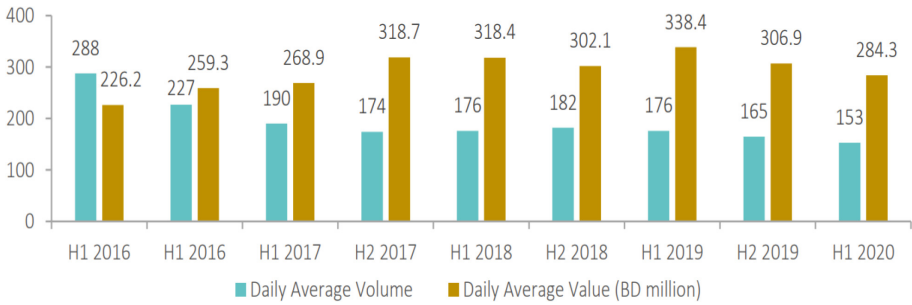
Fig. 1. According to CBB financial stability report (2020), the value and volume daily average for RTFS bank transfer over the past 5 years.

2.3.4   BCTS: Bahrain Cheque Truncation System

Another indicator of digital payments used is BCTS. According to [15] study findings, usage of BCTS in India is more likely to increase in the future and it holds the advantage of transparency and cost effective in conducting financial transaction via BCTS. It has also discussed some issues in case this technology does not evolve and lack of awareness from the customer side point in usage prior to implementation. It ends in explaining how such technology has strengthened India financial stability overall. Another study by [3] emphasis on the how CTS have been adopted by various countries across the world as it develops the operation process in banks and minimize fraud along with faster settlements of credits and funds services which is a great service in a digital world.

Central Bank of Bahrain wanted to eliminate traditional paper cheques and speed up the clearing process efficiently. BCTS allowed corporates customers and individuals to obtain their funds safely and collect their money the same day which is more convenient. From Fig. 2, we can notice the daily average value was higher in 2016 & 2017 and this value started to depreciate eventually with the upcoming years from BD41.6 million in H1 2016 to only BD30.1 million in H1 2020 which is a decline by 27.6%.
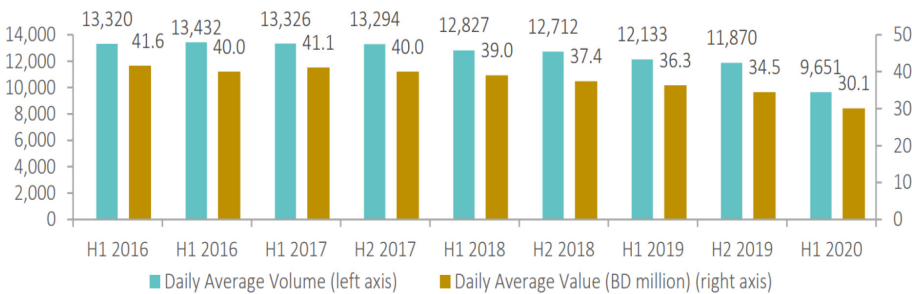
Fig. 2. According to CBB financial stability report (2020), the value and volume daily average for BCTS over the past 5 years.

2.3.5   EFTS: Electronic Funds Transfer System (Fawri + and Fawri)

According to [14] study, EFT indicator of digital payments is widely used as corporations and individuals have access to such online services. It includes inward and outward transactions. Thus, using such technology appears to be highly effective and as a result it is impact on the electronic payment systems and the economy overall is rising. [14], also captured the consequences of EFT and how proper safety, and privacy of data should be taken seriously.

Figure 3 shows a sharp increase in the total average daily value of Fawri + year by year. And from H1 2016 to H1 2020 it has recorded a surge rise by 6545%.
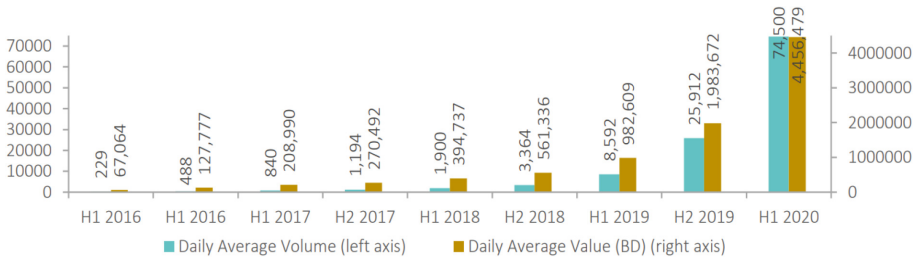
Fig. 3. According to CBB financial stability report (2020), the value and volume daily average for Fawri + over the past 5 years.
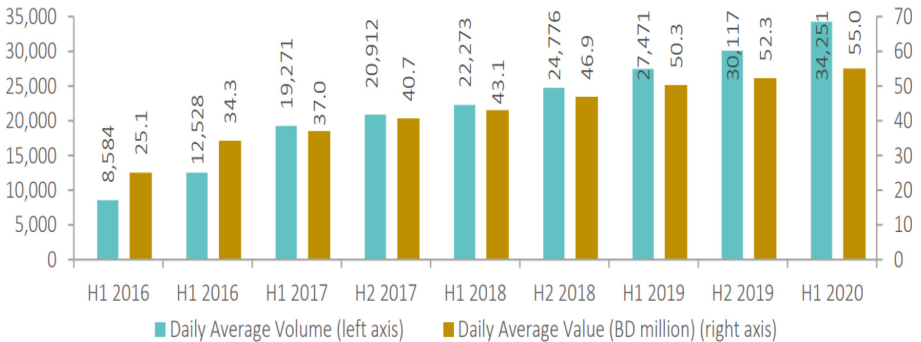
Fig. 4. According to CBB financial stability report (2020), the value and volume daily average for Fawri over the past 5 years.

Figure 4 presents a gradual inward slopping for Fawri from 2016 to 2020. The increase in average total value for this period was by 119% from BD25.1 million to BD55 million, respectively.

2.3.6   EBPP: Electronic Bill Payment and Presentment (Fawateer)

Based on [18] study, BPP is a one of digital payments indicators as fund transfers between bank and consumers have been easier since the popularity of online transfers.

It encourages transparency in business transactions and time saver to consumers. Finally, such technology resulted a positive impact on Indian Economy. Figure 5 represents EBPP overall trend, daily average value in 2016 started at only BD38, 827 million to reaching a BD1, 214,307 million which is an increase by 3027%.
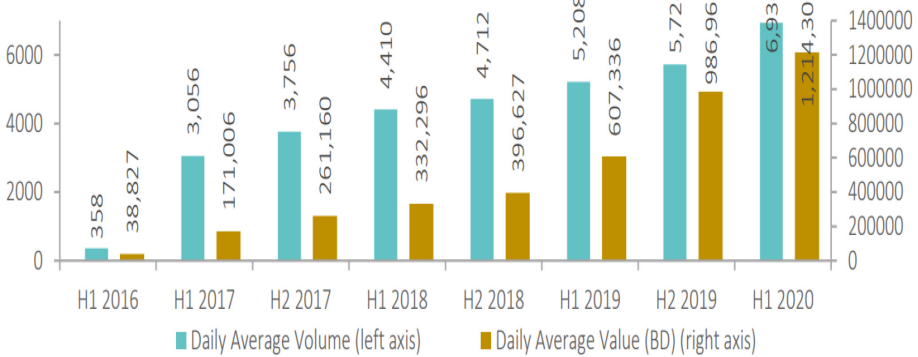
Fig. 5. According to CBB financial stability report (2020), the value and volume daily average for Fawateer over the past 5 years.

Figure 7 presents an upward trend over the 5 years' period of using EFTS and EBPP. Fawri + and Fawateer recorded similar movements during 2016, 2017 and 2018. However, Fawri + reached a peak and surge at the end of 2019 and 2020 by 425. 5% rise. Fawri shows a gradual positive trend ending with a slight drop in 2020 (Fig. 6).
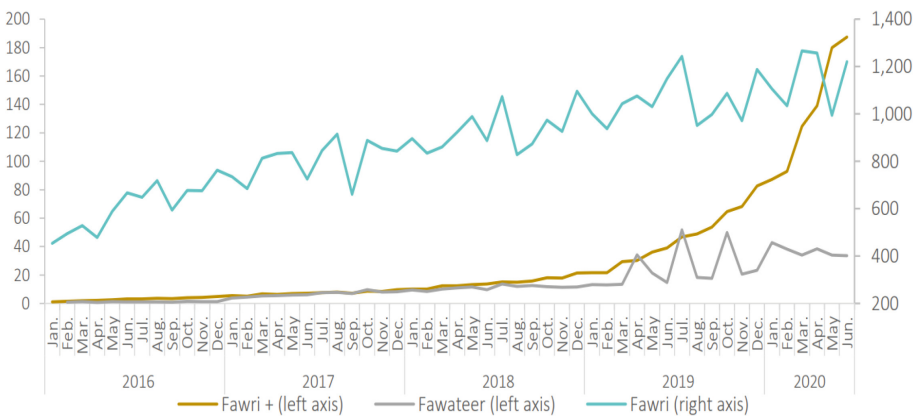
Fig. 6. According to CBB financial stability report (2020), the value for EBPP & EFTS over the past 5 years.

2.4   Conclusion and Recommendations

Overall, with people having access to internet and smart phones, it has shifted an entire industry to a brand-new sector called FinTech. This sector has been supported and regulated by Central Bank of Bahrain which helped further increase the efficiency of financial technology services and secure any financial transaction conducted online. The range of beneficiaries of digital financing and transferring of funds includes but not limited to Banks, insurance companies, exchanges, corporations, and individuals. The second significant contributor sector to Bahrain gross domestic product is the finance sector.

Some recommendations include: 1) CBB legal team to obtain a constant update of regulations to keep up with day-to-day changes in FinTech and invest in cyber-securities systems to eliminate any online fraud or cyber-crime possibilities. 2) CBB must ensure all online payment platforms providers maintain a strong security policy to protect consumer's data and to establish a risk management authority expertise in eliminating and handling viruses and computer systems back-ups. 3) CBB must ensure all online payment platforms providers install latest versions of technologies and software's to maintain control of data and to provide smooth consumer experiences.

References

1. Varghese, J., Sharma, D., Singh, N.: Analyzing the impact of block-chain technology in India's digital economy. Global J. Enterp. Inf. Syst. **10**(3), 94–99 (2019)
2. FinTech Consortium, Mena Financial Inclusion Report 2020, Bahrain Fintech Bay, Jordan Fintech Bay, pp. 18–21 (2020)
3. Anidiobu, G.A., Agu, B.O., Ezinwa, C.E.: Essence of cheque trunction system towards efficient financial service delivery in Nigeria. J. Policy Dev. Stud. **10**(1597–9385), 72–78 (2016)
4. Bahrain EDB, Annual Report 2018 Bahrain EDB, Business Friendly Bahrain, pp 4–14 (2018)
5. Hannoon, A., Al-Sartawi, A., Khalid A.: Relationship between financial technology and financial performance. In: Musleh Al-Sartawi A.M.A. (eds.) The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. Studies in Computational Intelligence, vol. 974, pp 337–344. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-73057-4_26
6. Bahrain EDB, Bahrain FinTech Ecosystem Report 2018, Business Friendly Bahrain, p. 16 (2018)
7. Alansari, Y., Al-Sartawi, A.: IT governance and E-banking in GCC listed banks. Procedia Comput. Sci. **183**, 844–848 (2021)
8. Bahrain EDB, Annual Report 2019 Bahrain EDB, Business Friendly Bahrain, pp. 5–17 (2019)
9. Bahrain FinTech Bay, Bahrain FinTech Regulations Report 2019, FinTech Consortium, pp. 13–38 (2019)
10. Bahrain FinTech Bay News, Bahrain FinTech Bay: moving to the next generation of banking, Arab Banker 2019 (2019). https://www.bahrainedb.com/latest-news/bahrains-fintech-bay-moving-to-the-next-generation-of-banking/. Accessed 23 Nov 2020

11. Biancone, P., Secinaro, S., Kamal, M.: Crowdfunding and FinTech: business model sharia compliant. Eur. J. Islamic Finance **12**, 1–9 (2019)
12. Allen, D., Berg, C.: Regulation and Technological change, Australia Red Tape Crisis Court Publishing, pp. 219–229 (2018)
13. Igoni, S., Onwumere J., Ogiri, I.: The Nigerian digital finance development and its economics growth: pain or gain. Asian J. Econ. Finan. Manage. **2**(2), 1–10 (2020). Article no. AJEFM. 190, pp. 5–8
14. Jain, S.: Electronic Fund Transfers: A Critical Study in Indian Context with Special Reference to Security & Privacy Issues, Delhi High Court, pp. 25–30 (2013)
15. Manoj, P.K.: digital transformation in indian banking: a study of cheque trunction system and other technological advances. Int. J. Emerg. Trends Technol. Comput. Sci. **6**(6), 172–178 (2017)
16. Lekashvili, E., Mamaladze, L.: Crypto currency – a new challenge for the economy of Georgia. Copernican J. Finan. Account. **7**(4), 87–97 (2018)
17. Turegun, N.: Impact of technology in financial reporting: the case of Amazon Go. J. Corp. Account. Finance **3**, 90–95 (2019)
18. Roshan, Y.: Impact of fund transfer on Indian economy. Int. J. Humanit. Arts Med. Sci. **3**(10), 189–196 (2015)
19. Sadlakowski, D.: The role of instant payment systems in the polish economy. Copernican J. Finan. Account. **6**(2), 59–67 (2017)
20. Musleh Al-Sartawi, A.M.A. (ed.): The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. SCI, vol. 974. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-73057-4
21. Shailza, Sarker, M.P.: Literature review on adoption of digital payment system. Global J. Enterp. Inf. Syst. **11**(3), 62–67 (2019)
22. Thaddeus, K., Ngong, C., Manasseh, C.: Digital financial inclusion and economic growth: evidence from Sub-Saharan Africa (2011–2017). Int. J. Bus. Manage. **8**(4), 212–217 (2020)
23. The Geneva Association, Insurance in the digital age: a view on key implications for the economy and society, International Association for the study of insurance economics, 16 p. (2018)
24. Musleh Al-Sartawi A.M., Razzaque A., Kamal M.M. (eds.) Artificial Intelligence Systems and the Internet of Things in the Digital Era. EAMMIS 2021. Lecture Notes in Networks and Systems, vol. 239. Springer, Cham. https://doi.org/10.1007/978-3-030-77246-8

An Empirical Investigation of the Influence of the Pandemic on Albanian Internet Banking Service Usage

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Abstract. This paper aims to analyse the pandemic impact on internet banking services offered to Albanian customers. We will examine the online banking environment and the latest trends in Albania based on secondary data from the Bank of Albania reports. Based on a focus group interview with banking customers, we used some variables from the technology acceptance model (TAM), indicating the pandemic impact on online banking services acceptance and usage among private banking customers in Albania. The study utilized a questionnaire design based on a 7-point scale to obtain primary data from a sample ($n = 384$). Our results show that age, education, income level, perceived credibility, and safety are essential factors that influence its use. Perceived usefulness, perceived ease of use, and gender were not significant. The findings will be helpful to both scholars and practitioners seeking to understand the pandemic effect's challenges.

Keywords: Internet banking · Pandemic · Impact · TAM · Adoption

1 Introduction

Innovations in electronic financial technology have resulted in new means of handling financial transactions, primarily via online banking (banking services that allow bank clients or other financial institutions to conduct banking operations from home or the office via an electronic connection). The shift to digital, mobile, and online banking is now the most visible trend in the financial services sector.

During the last two years, the pandemic had made several changed in our daily lives. One of the most affected sectors was online banking. Among the pandemic-prevention measures adopted were the immediate closure of businesses and schools and various travel and mobility limitations. Nonetheless, new opportunities emerged. Many firms began to adapt by allowing workers to work remotely using meeting platforms. Online education and medical services have risen in popularity. Banks and other financial service providers were forced to close their branches and urged their customers to use more e-banking platforms, which appear to be even more critical than before. They promoted internet banking by extending the types of transactions that customers could conduct remotely. Several banks worldwide experienced a shift in

consumer preference toward digital or electronic banking throughout the pandemic [2, 10, 20, 28].

In a similar vein, the pandemic caused banks in Albania to take numerous preventive measures, which increased the number of internet banking services offered. It is natural to ask whether these online banking services will be a temporary solution to the pandemic challenges or whether banks will offer and extend similar services in the future. [27] demonstrated that service providers and staff must understand their customers' experiences and the elements that keep them satisfied and committed to e-banking services. Although several empirical studies have been conducted in various countries to investigate the factors that impact consumer acceptability and uptake of internet banking in Albania, only a few studies capture those components, particularly during the pandemic.

This study examines online banking services in Albania using an empiric interpretation of primary and secondary data. We aim to assess consumers' internet banking services before the pandemic and the pandemic's impact and factors that impact internet banking acceptance. The outcomes of this study will assist banks in establishing strategic strategies to market products or services and build helpful and straightforward systems.

2 Literature Review

The banking industry is leading the charge in adopting innovation to reduce bank operating expenses and improve customer service. Combining conventional and online services, financial institutions, and the digital revolution has broadened the range of services offered. Banking and finance are ahead of other industries to leverage the internet and technology to connect with customers through e-banking services.

2.1 Factors Influencing Online Banking

The examination of literature enables us to discover the elements that influence customer interest, acceptability, and internet banking adoption.

Socioeconomic and Demographic Factors: Several empirical studies evaluated these factors. Through a chi-square study, [15] determined that demographic elements such as age, educational qualification, computer knowledge, profession, income, and banking relationship duration were positively associated with the degree of satisfaction of bank clients in e-banking no association for gender. Instead, [13, 14] discovered that males outnumbered women as e-banking customers. [24] found that mobility and credibility have a more substantial effect on building trust for male clients, while protection and customization significantly impact confidence for female clients. According to [3], e-banking services' factors include age, education, and the complexity of e-banking services used. Elderly consumers use e-banking services in smaller amounts than the younger [13]. [13, 26, 29] revealed empirical results of a positive impact of income on e-banking adoption.

Internet-Related Technology Perception: The apparent ease of use, the availability of the specific technology, the time required to use it, and access to high-speed internet are all key concerns. Consumers tend to equate fast Internet connections with transaction security. [17] discovered that trust, high-quality internet, network and operation, protection, good receipts, personal receipts, and security receipts affect online service acceptance. Among these, they discovered that trustworthiness and security were the most important criteria. The security dimension is positively related to utilizing electronic banking services, [7]. [11, 18] found that users are more likely to be tempted to use technology that they see is easy to use and requires fewer technological features. People are more inclined to trust a product or service that they believe is simple to use, which might eventually drive them to follow the product or service.

Security and Safety Perception: The users perceived credibility and safety reflect their security and privacy concerns when using internet banking. The rise of e-banking in recent decades has attracted both legitimate and criminal internet banking activity. Among the unlawful activities is the theft of online banking credentials. Because of internet access, the banking industry has also faced cyber risks such as transaction security, client account privacy concerns, and banking system security [9]. [8] conducted research and discovered that the perceived ease of use is less critical than internet banking platforms' privacy standards and protection in influencing online banking customers. The relationship between creating an online account and the perceived level of security associated with internet transactions is one of the most critical variables affecting customer adoption [22].

Individual Choices and Internet Engagement: Perceived behavior control and the growing need for control and automation of bill payment, subjective norms, and the bank account homepage customization. Speed, remote access ease, 7/24 availability, and price incentives are all essential motivators for online banking. E-banking raises significant privacy problems for consumers when there is no in-person contact [25]. Online banking product's simplicity will encourage consumer acceptance. [26] found that high-status (professional) clients are more likely to use electronic banking equipment, implying that work status is related to e-banking preference.

3   E-banking Environment in Albania

The Balkan countries have one of Europe's lowest levels of e-commerce readiness due to a lack of information and communication technology infrastructure. Regardless, Albania is in a better situation. In 2003, the first online banking services were made available via internet banking. The 12 banks have currently built systems where clients may execute online operations via their bank's main website or smartphone applications based on their convenience/practicality.

A few empirical studies evaluated the reasons why Albanian clients are hesitant to adopt internet banking. According to [16, 23], Albanian clients are concerned about the level of transaction security. Commitment to traditional banking procedures, a lack of understanding of the operation's benefits and drawbacks, convenience, perceived value, expenses of using the service, such as technology costs and commissions on bank-to-bank financial transactions, and credibility are among the other factors (Fig. 1).
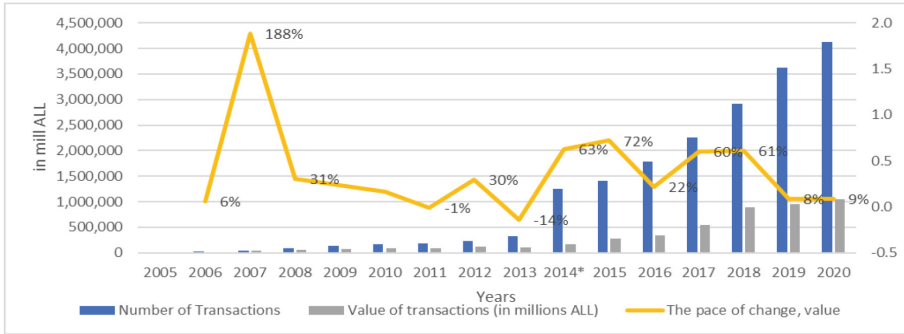
Fig. 1. Home banking transactions in Albania (2005–2020) Source: Bank of Albania

At the start, the e-banking application process was long, requiring the client to apply in the bank offices and to go back again to get the security credentials, but everything can be done remotely now. Banks' digital banking systems are modern, equivalent in functionality, access method, and appearance to those given by banks in industrialized western nations. Checking the balance or movements of the account, different transfers, payment of energy bills, water supply or taxes, and replenishment of transferable credits are some of the most common services. Opening an internet deposit, applying for a loan, or a credit card is less prevalent. The number of accounts that can be accessed online has enormously expanded[1]. Foreign residents have higher access to online banking due to the culture and perception of online service usage benefits. The significant increase in 2020 is explained mainly by the pandemic.

4   Methodology

The primary goal of this research is to raise awareness about the usage of e-banking services and to track and analyze factors influencing behavioral changes in account holders throughout the pandemic. A standardized questionnaire was tailored for collecting responses. A questionnaire was distributed to 30 randomly selected respondents as part of pilot research. According to it, minor changes were made to the questionnaire before the final data collection. Three hundred eighty-four online questionnaires obtained the data was completed during January 2021. We used a 7-point Likert scale. The data obtained from the questionnaires are gathered and processed using the statistical database in the SPSS.

4.1   Conceptual Framework

TAM has been used as an instrument in numerous empirical researches, mainly based on its effectiveness over the other models explaining attitudes about adopting an

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[1] https://www.bankofalbania.org/Payments/Payment_systems_statistics/.

information system [19]. According to [4], prior research indicates that there are two factors of how well a user adopts information technology: perceived utility (PU) and perceived ease of use (PEOU). This component depicts how individuals use or do not use an application based on their belief that it would help them perform better. However, it is insufficient to forecast whether a user would embrace the technology. We created the study model (Fig. 2) to investigate the relationship between the dependent variable, internet banking service usage by customers of Albanian commercial banks during the pandemic, and four demographic variables: age, gender, education, and income level, as well as three other variables: perceived credibility and safety, PU, and PEOU.
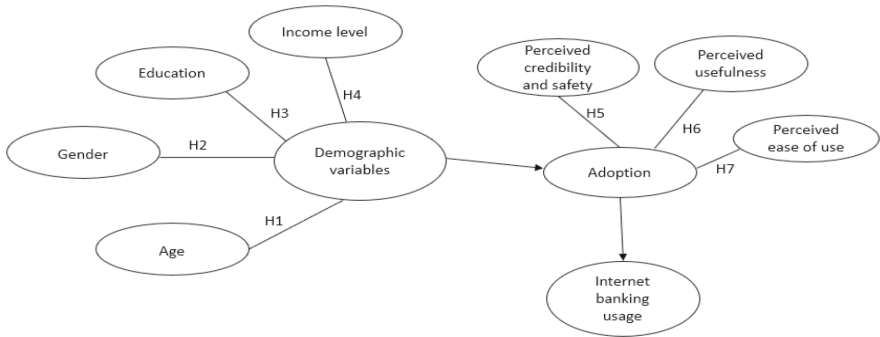
Fig. 2. Proposed model of the study. Source: Author's work

4.2   Empirical Analysis

To address the research problems and to achieve the main and specific objectives, this study was performed by testing the following hypotheses:

- *H1: Age affects internet banking usage.*
- *H2: Gender affects the use of internet banking.*
- *H3: Education affects internet banking usage.*
- *H4: Income level affects internet banking.*
- *H5: A higher level of perceived credibility and safety affects internet banking usage.*
- *H6: A higher level of perceived usefulness affects internet banking usage.*
- *H7: A higher level of perceived ease of use affects internet banking usage.*

4.2.1   Demographic Profile of Participants

Based on age group, individuals between the ages of 18–30 had the highest share (42.5%), followed by those between the ages of 31–45. (35,7%). 54.7% of those polled were female. Most poll respondents were well educated, with 47.1% possessing a university degree. In terms of personal income, 66.7% earned 30–50.000 ALL each month. Out of 342 respondents who have used online banking services in the previous six months, 70.7% indicate they utilized online banking services before the pandemic,

while 29.3% say they began using online banking during the pandemic. 39.2% (49.5% male and 50.5% female) use it more frequently after. When asked if they had used internet banking services in the previous six months, 342 respondents said yes and completed the questionnaire, while the remainder had not; as a result, we paused the survey with these persons.

The data in Table 1 support the study's reliability and validity. Cronbach's Alpha was used to assess reliability by assessing internal consistency across multiple-item scales. The dependability was greater than .80, much over the cutoff threshold of .60.

To test the hypotheses, we used Chi-Square tests with the statistical software SPSS.20 (Table 2).

Table 1. Summary table of reliability statistics.

Cronbach's Alpha	Cronbach's alpha based on standardized items	N of Items
.759	.816	8

Source: Author's elaboration

Table 2. Results of chi-square tests

Hypothesis	Statistics value of chi-square	Pearson chi-square	Likelihood ratio	df	Asymp. Sig. (2-sided)	Conclusion (acceptance or rejection of the hypothesis)
H1: Age	93.463	93.463	100.450	2	0.000	Accepted
H2: Gender	0	0.000	0.000	1	0.986	Not accepted
H3: Education	65.407	60.949	65.407	3	0.000	Accepted
H4: Income level	64.147	56.956	64.147	3	0.000	Accepted
H5: Perceived Credibility and Safety	12.158	10.808	12.158	2	0.002	Accepted
H6: Perceived Usefulness (PU)	3.393	2.669	3.393	1	0.065	Not accepted
H7: Perceived Ease of use (PEOU)	2.824	2.436	2.824	2	0.244	Not accepted

Source: Author's elaboration

4.2.2   Discussion of Findings

From the statistical analysis using Chi-square results, we evaluated that gender, PU, and PEOU did not influence customer attitudes towards using internet banking through the pandemic. Our results are contrary to [1, 6], where PU and PEOU, both internal factors of TAM, were critical in customer acceptance. The other four hypotheses H1, H3, H4, and H5, are accepted.

Age affects online banking acceptance and usage during the pandemic. These services are more likely to be used by younger individuals. They have greater access to new technology, are more receptive, and are more knowledgeable about them. Because the number of elderly individuals who participated in the study was limited, this hypothesis may have some drawbacks. Gender influence was not supported. In the Euro Area, averagely, men tend to use e-banking: 56% against 52% of women.

The utilization of internet banking services is influenced by education. Because of their expertise and comfort with digital technologies and their assessment of the benefits and costs of utilizing online services, more informed people are more inclined to utilize internet banking services. Our findings are consistent with data from EU countries, which show that illiterate individuals use internet banking less frequently as a faster and less expensive means of doing so. During the pandemic, income level influences the usage of online banking as well as two other significant factors: technological skills and internet access prices. Individuals with higher income levels who have access to the most effective and dependable internet connection utilize e-banking services more frequently.

The perceived credibility/safety of internet banking is one of the most critical elements affecting its utilization. Clients typically resist internet banking because they fear that their personal or financial information may be exposed and utilized fraudulently. When completing online banking activities, creating a new account, using a credit or debit card, and so on, banking customers must feel at ease and secure. The perceived usefulness of online services does not affect online banking during the pandemic. In general, in other countries, the convenience of using e-banking is found above all in the greats versatility of using the service at times more compatible with everyday work. The ease of using online services does not affect the use of online banking during the pandemic. Consumers are more likely to use technology if they believe and know that the technology tools are valuable and straightforward to use. As a result, if a customer believes that the bank's system is simple to use, they will be more likely to use online services.

5   Conclusions and Recommendations

The United Nations 2030 Agenda's Sustainable Development Goals (SDGs) were introduced in 2015.[2] Corporations, governments, and civil society actors would all share responsibility for charting a more sustainable path and pursuing global development goals such as poverty eradication, gender equality, empowering the vulnerable, providing a high-quality education that is inclusive and equitable, climate change mitigation, and sustainable cities. During the pandemic, digital solutions like online conferences and education, remote employment, e-commerce, and banking digitalization were employed to keep society running. The digital revolution is increasingly becoming a driving factor in societal development. It has been especially significant in the banking industry, where digital banking (online and mobile) has become one of the

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[2] https://sdgs.un.org/2030agenda.

most crucial channels utilized by bank customers. The COVID-19 pandemic has accelerated the advancement of digital banking in Albania too. Smartphones and high-speed internet connections have increased many people's desire for extra online services. When delivered ethically and sustainably in a well-regulated environment, the digital revolution not only promotes prosperity but also allows speedier progress toward many of the other SDGs. Banking Digitalization is related to the social (Goal: 03 Good Health, Goal: 04 Quality Education, Goal: 05 Gender Equality, Goal: 11 Sustainable Cities and Communities), environmental (Goal: 13 Climate Action), and economy (Goal: 08 Good Jobs and Economic Growth, Goal: 09 Innovation and Infrastructure) sustainability dimension.

The main characteristics of internet banking usage increase during the pandemic is customers' perception of credibility and safety, age, education, and income level. Gender, PU, and PEOU are not significant variables that impact internet banking usage during the pandemic. Our results confirm the earlier researchers' findings, such as [5], regarding age and income as the main factors influencing online banking usage. [21] showed the negative influence of safety perceptions in online banking usage. [12] discovered an excellent link between a higher educational level, income level, self-employment, increased banking operations frequency, and internet banking. We recommend banks conduct more extensive marketing initiatives to raise client knowledge of the advantages and benefits of internet banking services. They need to increase customer security levels because many individuals do not feel safe using online banking services (increased safety and awareness campaign that offering online services is secure). Also, concerning internet banking services, the banking system shall provide a wide range of services that increase simplicity. However, there are opportunities to expand the variety of services supplied and the technology to attract non-e-banking customers to join the plan. To increase the number of e-banking customers in the future and their confidence level in online services, we recommended that banks maintain a cautious approach to information safety management and personal training and improve high-quality internet banking services.

5.1   Limitations and Future Research

To further assess people's opinions of internet banking, a more thorough open-ended questionnaire would be required and a higher number of respondents. Future research should consider the frequency of online banking use and the number and value of transactions for each client to understand better the elements that influence its use.

References

1. Alagheband, P.: Adoption of electronic banking Services by Iranian Customers Master thesis. Sweden, Luleå University of technology (2006)
2. Baldwin, R., Mauro, B.W.D.: Economics in the Time of COVID-19. CEPR Press, Washington (2020)

3. Boshkoska, M., Sotiroski, K.: An empirical study of customer usage and satisfaction with e-banking services in the Republic of Macedonia. Croatian Rev. Econ. Bus. Soc. Stat. **4**(1), 1–13 (2018). https://doi.org/10.2478/crebss-2018-0001

4. Davis, F.D.: Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Q. **13**(3), 319–340 (1989)

5. Flavián, C., Guinaliu, M., Torres, E.: How bricks and mortar attributes affect online banking adoption. Int. J. Bank Mark. **24**(6), 406–423 (2006). https://doi.org/10.1108/02652320610701735

6. Gholami, R., Clegg, B.T., Al-Somali, S.A.: Internet banking acceptance in the context of developing countries (Aston Business School research papers). Aston University. Available at Research Gate (2008)

7. Gerrard, P., Cunningham, J.: The diffusion of internet banking among Singapore consumer. Int. J. Bank Market. **21**, 16–28 (2003). https://doi.org/10.1108/02652320310457776

8. Guangying, H.: An experimental investigation of online banking adoption in China. J. Internet Bank. Commer. **14**(1), 1–12 (2009). https://aisel.aisnet.org/amcis2008/36

9. Hussain, Z., Das, D., Bhutto, Z., Hammad-u-Salam, M., Talpur, F., Rai, G.: E-banking challenges in pakistan: an empirical study. J. Comput. Commun. **5**, 1–6 (2017). https://doi.org/10.4236/jcc.2017.52001

10. Hannoon, A., Al-Sartawi, A.M.A.M., Khalid, A.A.: Relationship between financial technology and financial performance. In: Musleh Al-Sartawi, A.M.A. (ed.) The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. SCI, vol. 974, pp. 337–344. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-73057-4_26

11. Islam, T., Saif-Ur-R., Abid, C., Muhammad, S., Ahmer, Z.: How perceptions about ease of use and risk explain intention to use mobile payment services in Pakistan? The mediating role of perceived trust. Pakistan J. Commer. Soc. Sci. (PJCSS) **14**(1), 34–48 (2020). http://hdl.handle.net/10419/216863

12. Jiménez, J.R.Z., Aguiar-Díaz, I.: Educational level and Internet banking. J. Behav. Exp. Finance **22**, 31–40 (2019). https://doi.org/10.1016/j.jbef.2019.01.004

13. Karjaluoto, H., Mattila, M., Pento, T.: Factors underlying attitude formation towards online banking in Finland. Int. J. Bank Mark. **20**, 261–272 (2002). https://doi.org/10.1108/02652320210446724

14. Katz, J., Rice, E.R., Aspden, P.: The Internet, 1995–2000 access, civil involvement, and social interaction. Am. Behav. Sci. **45**(3), 405–419 (2001). https://doi.org/10.1177/00027640121957268

15. Kavitha, S.: Factors influencing satisfaction on e-banking. AIMS Int. J. Manage. **11**, 103–115 (2017). https://doi.org/10.26573/2017.11.2.2

16. Kripa, E., Seitaj, M.: Brief survey on use of e-banking in Albania. Acad. J. Interdis. Stud. **4**(2), 407–420 (2015). https://doi.org/10.5901/ajis.2015.v4n2p407

17. Kumar, A., Adlakaha, A., Mukherjee, K.: The effect of perceived security and grievance redressal on continuance intention to use m-wallets in a developing country. Int. J. of Bank Market. **36**(7), 1170–1189 (2018). https://doi.org/10.1108/ijbm-04-2017-0077

18. Maeroufi, F., Nouri, H., Iman, K.Z.: Examination of the role of factors influencing the acceptance of e-banking. J. Appl. Sci. **15**(6), 845–849 (2015). https://doi.org/10.3923/jas.2015.845.849

19. Mathieson, K.: Predicting user intentions: comparing the technology acceptance model with the theory of planned behaviour. Inf. Syst. Res. **2**(3), 173–191 (1991)

20. Naeem, M., Ozuem, W.: The role of social media in internet banking transition during COVID-19 pandemic: using multiple methods and sources in qualitative research. J. Retail. Consum. Serv. **60** (2021). https://doi.org/10.1016/j.jretconser.2021.102483

21. Nasri, W.: Factors influencing the adoption of Internet banking in Tunisia. Int. J. Bus. Manage. **6**(8), 143–160 (2011). https://doi.org/10.5539/ijbm.v6n8p143

22. Polasik, M., Piotr Wisniewski, T.: Empirical analysis of internet adoption in Poland. Int. J. Bank Market. **27**(1), 32–52 (2009). https://doi.org/10.1108/02652320910928227

23. Saraçi, P., Shterbela, S.: E-banking usages in albania: case study of shkodra region. Int. J. Econ. Commer. Manage. **5**(3), 370–379 (2017). http://ijecm.co.uk/wp-content/uploads/2017/03/5328.pdf

24. Shao, Z., Zhang, L., Li, X., Guo, Y.: Antecedents of trust and continuance intention in mobile payment platforms: the moderating effect of gender. Electron. Commer. Res. Appl. **33** (2019). https://doi.org/10.1016/j.elarap.2018.100823

25. Shankar, A., Jebarajakirthy, C.: The influence of e-banking service quality on customer loyalty. Int. J. Bank Market. **37**(5) (2019). https://doi.org/10.1108/IJBM-03-2018-0063

26. Stavins, R.N.: An Approach to Developing a Research Agenda for Environmental Economics Washington, DC US Environmental Protection Agency Science Advisory Board (2001)

27. Ulhaq, I., Awan, T.: Impact of e-banking service quality on e-loyalty in pandemic times through interplay of e-satisfaction **17**(1/2), 39–55 (2020). https://doi.org/10.1108/XJM-07-2020-0039

28. Wójcik, D., Ioannou, S.: COVID-19 and finance: market developments so far and potential impacts on the financial sector and centres. Tijdschr. Econ. Soc. Geogr. **111**(3), 387–400 (2020). https://doi.org/10.1111/tesg.12434

29. Alansari, Y., Al-Sartawi, A.: IT governance and E-banking in GCC listed banks. Procedia Comput. Sci. **183**, 844–848 (2021). https://doi.org/10.1016/j.procs.2021.03.008

Influence of Liquidity, Solvency on Banks' Profitability: The Moderating Role of Net Revenues

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Abstract. The evaluation of liquidity and solvency are vital to ensure the banks' profitability and competitive advantage. Consequently, the research's proposed model in the current paper investigated the interaction relationships between liquidity, solvency on banks' profitability based on the trade-off theory which is moderated by net revenues. To enhance our understanding of the components of working capital management (WCM) on the commercial banks listed on the Amman stock exchange (ASE) pre and post the global financial crises. The result has confirmed the postulated hypotheses that banks' profitability is significantly influenced by liquidity and solvency. Contrary to what is expected, net revenues do not moderate the relationship between liquidity and solvency and banks' profitability; and hence the related hypotheses were rejected.

Keywords: Banks' profitability · Liquidity · Solvency · Jordanian banks · ASE and WCM

1 Introduction

Working capital management (WCM) is an essential topic in corporate finance [39]. While considering working capital, research usually focuses on profitability and liquidity management (e.g., [40, 32]. Yet, one concern regarding the WCM is the tradeoff between profitability and liquidity. Bank profitability is simply the ability to generate different types of revenues for a bank over its expenses [24]. Yet, management of liquidity is concerned with the management of current assets and liabilities. Liquidity management is considered as vital method for the management to manage the ability of a company to pay off its debts on the short term (i.e., the cost of goods sold and operating expenses) [21].

There are various liquidity ratios that financial analysts and financial managers use to evaluate the liquidity of a company (i.e., current and quick ratios, cash ratio and defensive interval ratio) which might impact the firm's performance [33]. Another line of the financial ratio analysis is concerned with solvency. Solvency ratios help managers to identify long-term sustainability opportunities. Moreover, it indicates the ability of the company meet the long-term obligations and liquidity is concerned with meeting short-term abilities, achieving adequate liquidity rates in the short-term periods is important for preserving long term solvency [15].

The financial crisis, in 2007 had a major impact on banks in terms of liquidity, since most of the banks that were looking for higher profitability ignoring the liquidity problems that might happen. Profitability measures how much the company's revenues exceed its expenses. The indicators of profitability are used to examine the ability of management to make a profit from the company's core business. Future and current investors and customers are interested in dividends and the market value of the company's stocks, so they heavily focus on the profitability indicators. Since the crises expected to have impact on the liquidity and solvency of the banks in the Jordanian context, we aimed to test the prior hypotheses before and after the financial crises.

While the financial crisis had a negative impact on credit that directly affected Jordanian banks. This negative impact made Jordanian banks face a problem in liquidity in that period of crisis [30], the association between solvency, liquidity and profitability have not been examined before and after the financial crisis. It is essential to test this relationship as banks need to keep liquidity within certain limits, where poor liquidity or solvency of any bank will in turn negatively impact financial performance due to the lack of operational plans implementation, and hence, the financial performance is considered an important scale of success for the banking sector in Jordan [6].

Therefore, the study sought to empirically study the relationship between liquidity and profitability and the relationship between solvency and profitability to come to a more understanding of the trade-off theory between the main two variables in this study, liquidity and profitability, in the period between (2001–2006) and (2010–2016) as a comparison between the period before and after the financial crisis (2007–2008). Also, this study will introduce NR as a moderator to the liquidity/profitability relationship as well as solvency/profitability relationship.

This paper proceeds as follows: Sect. 2 discusses the relevant literature and develops hypotheses. Section 3 describes the methodology while Sect. 4 shows the descriptive statistics and Sect. 5 outlines the results. Finally, Sect. 6 presents the conclusions.

2   Literature Review and Hypotheses Development

Banking activities are dissimilar from other economic activities in the variety of the products and services they produce [7, 9]. As financial institutions, banks should accomplish the demand for liquidity in a suitable approach in order to carefully run their business and avoid liquidity problem [3]. The main difficulties in managing the liquidity mainly occur because of mismanagement in the funds' management or bad economic conditions that might lead depositors to perform unpredictable withdrawals

[21]. It is well documented that maintaining managing liquidity properly is difficult in view of the current economic challenges and the presence of several sensitive players in the market [21].

In fact, the financial crisis in 2007–2008 resulted from the collapses in securities markets (i.e. derivatives) which impact the banks abilities to pay its short-term obligations to the third parties [36]. The bank's ability to estimate the required liquidity is a key element in the company's ability to continue its routinely businesses. If a bank fails to balance between liquidity and profitability, liquidity difficulties might happen such as high-interest rate risk, high bank reserves or capital requirement, and lower bank's reputation [21]. As [12] pointed out that liquidity created by banks created the liquidity in the whole economy. Thus, liquidity is considered a key factor in achieving the welfare of society in general, as it enables borrowers to buy low-liquid commodities and contributes to finance entrepreneurial activities, therefore, moving the wheel of the economy in general.

In the try to reduce the failure risk in meeting short term obligations, effective liquidity management should include effective monitoring of current assets and current liabilities. This should be done through avoiding excessive or inadequate investment in these assets. This is owed partly to the reduction of the possibility of having small amount of cash. The working capital method to liquidity management has long been the prominent procedure used to plan and control [18]. Liquidity creation is an important drive that is accomplished by financial mediators. In addition, keeping an appropriate level of liquidity to meet possible liabilities in time is vital to keep attracting additional capital through renewing current policies. Firms with enough cash and capitalized assets on hand can be considered more stable and attract more clients. The requirements of high liquidity are caused by the firms' failure to forecast expected losses and expenses from disastrous losses and they wish to maintain their reputation for maintaining financial strength and reliability. Banks with high liquidity are considered significant for the economy, as without such banks it is very rigid to maintain a running economy.

Liquidity Management is one of the serious issues that should be deliberated by the financial management of business firms to cover their financial obligations. This position is more serious for financial institutes in specific in the Middle East [5, 8]. Overall, banks liquidity is crucial to encounter client withdrawals. Banks must preserve enough cash and other liquid assets, and moreover maintain potential borrowing positions to meet expected and conditional liquidity demands, to deliver funds for potential growth [16]. In addition to the liquidity, profitability is considered as one of the most important measures for financial analysis and for analyzing financial statements; it's also important for examining companies' performance. Banks need to keep the appropriate profitability level to create income for their constant existence and growth [26]. There are a few ways to improve the profitability of banks. For example, allowing banks to concentrate certain type of their client base (i.e. the profitable sector), and to attract more customers by supporting a small number of profitable customers [20].

The relationship between liquidity and profitability has been always a dilemma that motivated academics to test that relationship in many sectors. In this paper, we focus on recent literature that has been done in the emerging market. On the one hand, [34] studied the relationship between liquidity and profitability in sixteen banks listed in the

Colombo Stock Exchange in Sri-Lanka for the period between 2009 and 2013. The results showed that there is an impact of liquidity on banks profitability. In specific, the study revealed that 30% of the variation in profitability measured by Return on Assets (ROA) is explained by the change of liquidity of the banks in Sri Lanka in the period of the study. In addition, [3] confirmed the presence of a cause-effect relationship between liquidity and profitability in trading companies in Sri.

On the other hand, there are few studies that failed to find a relationship between liquidity and profitability. For instance, [4] studied the relationship between liquidity and profitability in the banks of Bangladesh. Yet, the study has shown a weak relationship between liquidity and profitability in the banking sector while the study failed to find any between liquidity and profitability in all other sectors. [28] confirmed the lack of relationship between profitability and liquidity on a sample of five banks in Tanzania from the time period between 2006 and 2013. Moreover, [29] studied the causal relationship between liquidity and profitability in deposit banks in Nigeria and the results failed to show a significant causal relationship between the variables. Lastly, Moreover, [26] examined the relationship between liquidity and profitability in the banking sector in Pakistan. This study was conducted during the time period 2009–2013 on twenty-two private sector banks and showed no significant relationship between liquidity and profitability as shown in Fig. 1.
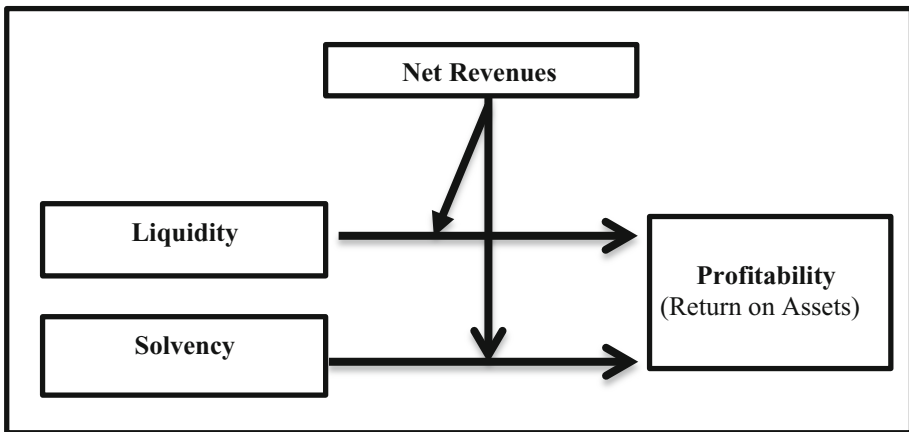
Fig. 1. Research model

The contradicting results in the beforementioned papers have motivated the academics to test the relationship in Jordan. For instance, [1] examined the effect of working capital management on firms' performance on a sample from ASE for the period between 2000 and 2008. The study has shown that profitability is affected positively by the cash converting cycle as an indicator of liquidity. Moreover, [22] tested the impact of the liquidity on the performance of 49 industrial companies listed in ASE in the period between 2005 and 2009, where the results have shown a positive relationship between liquidity and performance. Yet, [17] examined the relationship

between liquidity and profitability ratios on eight of the food industrial companies listed in ASE. The study failed to find a relationship between liquidity ratios all together and gross profit margin but the study found a weak positive relationship between current ratio and both of (profit margins and net profit margins) as indicators of profitability. The study has also revealed a positive relationship between defensive interval ratio, Quick ratio as indicators of liquidity and the operating cash flow margin. Lastly, [16] examined the impact of solvency on banks profitability by using a sample from fifteen banks listed in ASE in the period between 2012 and 2014. The results confirmed that profitability is significantly and negatively influenced by liquidity. The mixed results in emerging markets in general and in Jordan in particular in addition to the lack of the evidence from recent years have motivated us to test the following hypothesis:

H1: There is a Relationship between Liquidity and Profitability.

Solvency and Profitability
Similar to studies that investigated the relationship between profitability, studies that have examined liquidity and solvency had mixed findings. For instance, [2] have examined the relationship between financial leverage, and profitability on a sample of Pakistani companies in the Cement sector. The results showed a significant impact of financial leverage on profitability. While related to the Jordanian context, [35] examined the relationship between profitability and solvency on the tourism-related companies listed in ASE. The results displayed that solvency has a statistically significant impact on profitability. Furthermore, [16] examined the impact of solvency on banks profitability by using a sample from fifteen banks listed in ASE in the period between 2012 and 2014. The results showed that liquidity has a negative significant impact on profitability, while there was no impact of solvency on profitability. Again, it is clear from the previous literature that the presence and direction of the association between solvency and liquidity are not clear enough. Therefore, in this paper, we aim to contribute to the existing body of literature by examining the relationship between solvency and profitability. Hence, the second hypothesis is.

H2: There is a Relationship between Solvency and Profitability.

The Moderating Role of Net Revenues:
In the banking sector, the attention is located on services other than opening basic accounts. Though, more money is made from selling products with common accounts, more focus is brought towards selling a broader set of services and new product improvements. Moreover, banks do more than selling loans or opening savings accounts, banks can also provide services such as investment advice, insurance, payment of bill facilities and online banking. Hence, banks can attract customers in many methods, however, the feasibility and profitability of each method remains in doubt [20]. Liquidity of the firm can be measured by using cash gap in days and current ratio. Firm size (moderator) measured by net sales, total assets and market capitalization [10, 11, 14]. The moderating effect of firm size which was measured by (net sales, total assets and market capitalization) was examined on the relationship between liquidity and profitability [14], to be in the line with previous studies the moderating effect of net

revenues was examined on the relationship between liquidity and profitability however this will be more proper in the circumstances to the Jordanian banking sector. In order to examine the moderating effect of the firm size on the relationship between liquidity, profitability and solvency, we aim to test the following hypotheses:

H3: Net Revenues Moderates the Relationship between Liquidity and Profitability.
H4: Net Revenues Moderates the Relationship between Solvency and Profitability.

3   Research Methodology

The research model was developed based on previous studies such as [14, 17, 18]. The independent variables in the model are the liquidity and solvency. The liquidity is measured by four ratios Quick ratio, Debt service coverage Ratio, Operating cash flow ratio and Loans to Deposits Ratio while the solvency is measured by two ratios; Debt to Assets and Debt to Equity. The dependent variable is the profitability, which is measured by ROA ratio, while the moderating effect net revenue will be introduced to the relationship between liquidity, and profitability as well as the relationship between solvency and profitability. Based on the variables explained earlier the empirical models will be as following:

Liquidity Ratios: Liquidity is the basic mechanism that shows how fast the company can transfer assets into cash, liquidity ratios can provide some indicator whether the company will be able to meet its short-term debts or not, mainly focus on the cash flows. Management of liquidity, hence, can be achieved is assets are used effectively [13]. Liquidity ratios include:

Quick Ratio: Quick ratio indicates liquidity for the firm on the short term, where higher quick ratio indicates better liquidity position of the company [27]. This ratio is important especially for banks because it shows percentage of the institution's debt that can be paid off by assets that can quickly be changed into cash. This ratio indicates the liquidity of a firm, and the more liquid was the firm the better equipped it is to adapt with changing conditions in the business environment.

Debt Service Coverage Ratio (DSCR): This ratio measures how much net income covers debt service while it equals principal payment plus Interest Plus lease payment. A DSCR of less than 1 means that there is less than 100% net operating income to cover total annual debt payments.

Operating Cash Flow Ratio: This ratio measures liquidity in banks it's measured by dividing cash flow from operations by current liabilities. It measures how many times cash flows from operations cover current liabilities.

Loans to Deposits Ratio (LODEP): This common liquidity measure for bank divides the banks total loans by bank's total deposits, it is also known as the (LODEP) ratio. Too high LODEP indicates poor liquidity, while too low LODEP might single that bank are not getting as much as they could be. This ratio is an important ratio of banks liquidity that calculated net loans to total customer's deposits.

Solvency Ratios: solvency ratios allow the company to evaluate the companies' ability to cover long-term debt. The following are ratios used to measure solvency.

Debt to Equity Ratio: This ratio shows the degree of financial leverage being used by the firm and has both short and long-term debt, the increase of this ratio, the increase of this ratio is an indicator of high interest and debt expense and after a certain point, and it may affect the firm's ability to raise debt.

Debt to asset ratio (leverage): this ratio is a leverage ratio; it determines the total amount of debt to assets. This allows for a comparison between the leverage between different companies. The higher the leverage, the higher the leverage, and hence the financial risk. This ratio is broad and includes short- and long-term liabilities as well as all assets.

Profitability (Return on Assets): It refers to a relationship between net profit and assets. The rise in the ratio refers to an effectiveness of the employment of assets by the company [13]. Return on Assets (ROA) will be calculated to measure the profitability, which indicates the net income produced by total assets during a period by comparing net income to the average total assets [19]. The following table contains the measures of all the ratios and variables used in the study (Table 1 and Table 2):

Table 1. Variables measures

Variables	Symbol	Full name	Measures
Liquidity ratios (Independent)	QR	Quick ratio	Cash + short-term marketable investments/Current Liabilities
	DSCR	Debt service coverage ratio	EBIT/Debt service
	CFO ratio	Operating cash flow ratio	Cash flow from operations/Current liabilities
	LODEP	Loans to deposits ratio	Total loan and advanced/Total deposits
Solvency ratios (Independent)	DA	Debt to assets	Total debt/Total assets
	DE	Debt to equity	Total debt/Total equity
Profitability	ROA	Return on Assets	Net income/Total assets
Net revenues (Moderating)	(NR) This is the moderating variable and (log) will be used on it		

Normality Test

Normality test in this study will be investigated to examine whether the study results are representative of the entire population or not. Accordingly, the Kolmogorove-Smirnov test will be conducted to examine the normality of the study variables. Therefore, the results in the above table show that the (Sig) value of most of the factors is lower than (0.05). However, to overcome this issue, the skewness was conducted for them and the results show that the statistics values of the Skewness test are between 2 and −2 [25]. This indicates that the study variables are normally distributed [37].

Table 2. Normality of the study variables

Study variables	Kolmogorove-Smirnov		Skweness	
	Sig.	Statistics	Statistic	Std. error
ROA	0.000	0.110	−0.531	0.194
Quick ratio	0.070	0.069	0.033	0.194
DSCR	0.000	0.161	1.519	0.194
CFO	0.200*	0.057	−0.006	0.194
LODEP	0.027	0.076	0.534	0.194
DA	0.200*	0.059	0.261	0.194
DE	0.000	0.147	0.863	0.194
LOG(NR)	0.000	0.118	0.544	0.194

Descriptive Statistics

The descriptive statistics were conducted to show the overall trends of the study variables. We include; minimum, maximum, mean and standard deviations. Table 3 below shows the descriptive statistics of research variables used.

Table 3. Descriptive statistics of the dependent variable

DV (Profitability)	Minimum	Maximum	Mean	Standard deviation
ROA	0.01	2.32	1.299	0.493
Table 5: Descriptive statistics of the independent variables				
Independent variable (Liquidity)	Minimum	Maximum	Mean	Standard deviation
QR	0.2	0.68	0.436	0.129
DSCR	−0.31	20.56	4.424	4.528
CFO	−0.45	0.53	0.091	0.184
LODEP	0.3	1.24	0.67	0.174
DA	0.809	0.949	0.873	0.03
DE	−8.12	21.42	7.609	3.619
Table 6: Descriptive statistics of the Moderating Variable				
The moderator (Net Revenues)	Minimum	Maximum	Mean	Standard deviation
LOG(NR)	6.824	9.106	7.937	0.472

As many research test the relationship between profitability and liquidity, most of them measure profitability by (ROA), return on assets the mean of that variable has been different in each according to the sector of the research and the country and time zone. ROA's mean was calculated to be 6.64 [14], and it was (3.69) in the research by [3], Although it was (21.27) when studied by [23] also [22] calculated the Mean of

(ROA) as (0.0665) when studying the association between profitability and (WCM) in the context of Jordan. For liquidity, the most common liquidity ratio that has been used as a measurement of liquidity was the quick ratio (QR) and the mean was 1.142 in trading companies in Sri Lanka as [3], and the mean was 173.3 in the chemical sector in Pakistan [23].

Multi-collinearity Diagnostics

The multicollinearity results in case of a high correlation between more than two variables. Moreover, perfect collinearity occurs when one or more predictor variable has a perfect linear relationship with another variable in the same model. Meaning that the two perfectly correlated independent variables values of β are interchangeable. Hence, we provide the collinearity diagnostic test to investigate the research hypotheses and ensure that we do not have multi-collinearity problems in the model design. We provide the Variance of Inflation (VIF) in Table 4. The table shows that the values do not exceed 2 which is much less than (10) the threshold that might indicate multi-collinearity. Moreover, having that the tolerance values are much higher than (0.1) indicates no collinearity problems between the independent variables used in this study [31].

Table 4. Multi-collinearity diagnostics

	Variables	Tolerance	VIF	DV
Model (1)	QR	0.884	1.132	ROA
	DSCR	0.993	1.007	
	OCFR	0.933	1.072	
	LODEP	0.876	1.142	
Model (2)	DE	0.551	1.814	ROA
	DA	0.551	1.814	

4   Correlation Matrix

To test the first and the second hypothesis, the correlation matrix was conducted as a first step in order to know if there is a statistical relationship among the study variables for model one and two or not. Moreover, the correlation matrix is used to examine the association between the variables used as predictors in the study and the dependent variable. Then, the regression analysis implemented to examine the overall all correlation between the independent and dependent variables. Also, the regression analysis will be used to confirm the results of the correlation through conducting the model summary, ANOVA and coefficient tables. Additionally, the correlation matrix was conducted to confirm that there is no perfect correlation between the independent variables of each model.

Table 5. Correlation matrix

	DE CRISES	DA. CRISES	LODEP. CRISES	CFO. CRISES	DSCR. CRISES	QR. CRISES	LOG (NR)	DE	DA	LODEP	CFO	DSCR	QR	ROA
ROA														10
QR													1	−0.068
DSCR												1	−0.032	.164*
CFO											1	0.082	−0.132	−0.036
LODEP										1	−.164*	−0.009	.288**	.308**
DA									1	−.440**	−0.008	0.063	.516**	−.280**
DE								1	.670**	−.349**	0.008	−0.029	.402**	−.250**
LOG(NR)							1	0.057	−0.052	−0.129	0.002	0.105	−0.133	−0.021
QR. 0CRISES						1	.356**	−.335**	−.484**	0.149	.204*	0.113	−.620**	−0.035
DSCR.CRISES					1	.607**	.272**	−.176*	−.247**	0.092	.199*	.627**	−.403**	0.088
CFOR.CRISES				1	.324**	.392**	0.073	−0.103	−0.118	−0.041	.835**	0.116	−.268**	−0.042
LODEPCRISES			1	.321**	.568**	.914**	.268**	−.358**	−.525**	.285**	0.137	0.067	−.785**	−0.014
DA CRISES		1	.972**	.390**	.595**	.951**	.297**	−.344**	−.493**	.183*	.195*	0.08	−.785**	−0.027
DE. CRISES	1	.969**	.920**	.405**	.603**	.915**	.299**	−.267**	−.363**	0.146	.215**	0.106	−.753**	−0.055

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

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

It can be seen from the above table that (DSCR) have a positive significant association with the (ROA) and the value of the relationship is (r = 0.164*) and it is significant at (0.05). Additionally, the results show that the (LODEP) has a positive significant relationship with the (ROA) and the value of the relationship is (r = .308**) and it is significant at (0.01). This indicates that (DSCR) and (LODEP) as liquidity measures are positively associated with profitability which is measured by (ROA). The results indicate perfect correlation between the study independent variables of each hypothesis which is in lined with the Collinearity Diagnostics tests. It's also seen from the results that (DA) has a significant negative association with the (ROA) with value of (r = −.280**). Additionally, the results show that (DE) has a significant negative relationship with the (ROA) with a value of (r = −.250**). However, the results reveal that both (DA and DE) have no significant relationship with ROA after the Financial Crises. Furthermore, the results reveal that there is no perfect correlation among the independent variables of each hypothesis (there are no correlation higher than (0.9) between the measures of the same variables. Since relationship between profitability and liquidity and between profitability and solvency were examined separately the correlation between the measurements of solvency and liquidity were not taken into consideration. However, the above results show the correlation among the study variables, therefore, to investigate the overall correlation and to come to the final conclusion; the regression analysis will be shown below:

Table 6. Multiple regression analysis for the first hypothesis

Variables	T	Sig.(P-value)	Beta
Constant	1.534	0.217	0.693
QR	−0.559	0.577	−0.370
DSCR	1.474	0.143	0.018
CFO RATIO	0.908	0.365	0.358
LODEP	4.288	0.000	1.135
QR.CRISES	−0.201	0.841	−0.201
DSCR.CRISES	0.225	0.822	0.004
CFO.CRISES	−1.064	0.289	−0.501
LODEP.CRISES	−1.841	0.068	−1.021
Model summary		ANOVA	
R	R2	F-value	Sig.
0.400	0.160	3.099	0.002

Table 6 shows that R = 0.400 which indicates a positive correlation between Liquidity ratios and ROA. Moreover, the value of $R^2 = 0.160$ meaning that the Liquidity ratios can explain around (16.0%) of the variation in ROA. Furthermore, Table 6 shows the probability of (F-value) and it is significant at 0.05, this indicates that the liquidity ratios together have a significant effect on (ROA). Additionally, the value of (R multiple correlation coefficients) is significant which shows the overall relationship between the dependent variable and the independent variable. This indicates that there is a relationship between liquidity ratios together and (ROA). To judge the liquidity ratio separately, the results in the coefficient table shows that the (P-value (0.000)) of (LODEP) and it is lower than (0.05). Moreover, the impact value of the (LODEP) is (0.400). This means that if the (LODEP) increase with the one unit; it is expected that the (ROA) will increase with (0.400) holding the other values constant.

5   The Second Main Research Hypothesis

To test the second hypothesis, the correlation matrix was conducted as a first step in order to know if there is a statistical relationship between the study variables for model two or not. Moreover, the correlation matrix will be used to examine the relationship between the independent variables and the dependent variables individually by the model summary and separately by the correlation matrix. Afterwards, the regression analysis will be investigated to examine the overall correlation between the independent variables and the dependent variable. Also, the regression analysis will be used to confirm the results of the correlation through conducting the model summary, ANOVA and coefficient tables. Additionally, the correlation matrix will be conducted to confirm that there is no perfect correlation between the independent variables. It can be seen from Table 5 that (DA) has a negative significant association with the (ROA) with value of (r = −.280**). Additionally, the results in the Table 5 show that (DE) also has

a significant negative relationship with the (ROA) with value of $(r = -.250^{**})$. However, the results reveal that both (DA and DE) have no significant relationship with (ROA) after the Financial Crises. Furthermore, the results reveal that there is no perfect correlation between the independent variables. However, the above results show the individual correlation between the independent and dependent variables. Therefore, to show the overall correlation and affect the regression analysis is conducted below.

Table 7. Multiple regression analysis for the second hypothesis

Variables	T	Sig. (P-value)	Beta	
Constant	3.838	0.000	7.584	
DA	−3.008	0.003	−6.939*	
DE	−0.803	0.423	−0.12	
DA.CRISES	0.839	0.403	4.448	
DE.CRISES	−0.156	0.876	−0.013	
Model summary			ANOVA	
R	R Square	Adjusted R Square	F-value	Sig.
0.364	0.132	0.104	4.580	0.001

Table 7 show that the multiple correlation coefficient R = 0.364 indicating that there is a positive correlation between Solvency ratios and (ROA). Also, the value of $R^2 = 0.132$ meaning that the solvency ratios can account (13.2%) of the variation of the (ROA). Moreover, table 7 shows the probability of (F-value) and it is significance at 0.05, indicating that the solvency ratios together have a significant effect on (ROA). Additionally, the value of (R multiple correlation coefficients) is significant which shows the overall relationship between the dependent variable and the independent variable. This indicates that there is a relationship between solvency ratios together and (ROA). To sum up, the results show that both (DA) and (DE) have a significant negative relationship with the (ROA) before the Financial Crisis. However, (DA) is the only variable which has a significant effect on the (ROA) before the financial crisis. Additionally, the results showed that there is an overall relationship and overall effect of both (DE) and (DA) together on (ROA).

The Moderating Effect of NR:
The moderating effect is characterized as an interaction that can be conducted between an independent variable and another factor that identifies the suitable conditions for its operation [12]. Therefore, moderation can happen when we expect that an association between two variables is dependent on a third variable and that the third variable is considered the moderator. Accordingly, three step hierarchical regression processes were conducted to test the moderating effects, this method was adopted by [39]. Following [38], a pure moderation would exist if b (Indep) and b (indep*moderator) are significant and b(moderator) is non-significant. While, quasi moderation would exist if b (indep), b (moderator) and b (indep*moderator) are significant [38].

The Third Main Research Hypothesis: The main hypothesis assumes (Net Revenues moderates the relationship between liquidity and profitability). And as liquidity was

measured by four ratios, the related sub hypotheses for relationship between these ratios and profitability were stated. Hierarchical regressions result of the moderating effect of LOG (NR) on the relationship between Liquidity and Profitability (ROA)

Table 8. Net revenues as moderator of the relationship between liquidity and profitability

Model summary			
R	0.400	0.403	0.460
R^2	0.160	0.163	0.212
Adjuster R^2	0.109	0.105	0.115
R^2change	0.160	0.002	0.049
F-change	3.099	0.402	1.231
Sig. F change	0.002	0.527	0.290

The dependent variable is ROA.
*Regression is significant at the 0.05.
**Regression is significant at the 0.01.

Pure moderation would exist if the beta of the independent variable is significant in step (3) and the beta of the interaction between the independent variable and the moderator is also significant also the moderator is not significant [36]. In this case and as the table shows (LODEP) was significant in step (1) and step (2) but it wasn't after the crisis, In the other hand in step three and after the interaction with the moderating variable LOG(NR) the results showed that the variable LOG(NR) does not moderate the relationship between (LODEP) and (ROA). But the results showed that (QR) became significant in step (3) after introducing the Moderator LOG (NR) Although (QR) is significant in step (3) the interaction was not significant. So we can't fully say that LOG (NR) moderates the relationship between (QR) and (ROA) (Table 8).

The Fourth Main Research Hypothesis: The main hypothesis assumes (Net Revenues moderates the relationship between solvency and profitability). And as solvency was measured by four ratios, the related sub hypotheses for relationship between these ratios and profitability were stated.

Table 9. Hierarchical regressions of the moderating effect of LOG (NR) on the relationship between Solvency and Profitability (ROA).

Model summary			
R	0.364	0.367	0.387
R^2	0.132	0.135	0.150
Adjuster R^2	0.104	0.100	0.098
R^2 change	0.132	0.002	0.015
F-change	4.580	0.353	0.887
Sig. F change	0.001	0.553	0.449

*Regression is significant at the 0.05.
**Regression is significant at the 0.01.

As the results show in the Table 9, DA was significant in step (1) and (2) but after introducing the moderator and the interaction DA has no significant impact on (ROA). That indicates that LOG (NR) doesn't play the role of a moderator on the relationship between solvency and profitability.

6   Research Discussion and Conclusion

This paper investigated the relationship between liquidity, solvency, and profitability before and after the financial crisis on commercial banks listed in ASE. Moreover, the paper examined the moderating effect of the net revenue on the relationship between liquidity, solvency, and profitability. In this study, we first found a positive relationship between liquidity and profitability, which means that if liquidity increases, the profitability of banks will increase. This relationship stands before and after the financial crisis which means that the financial crises did not affect the relationship between variables. That may be justified by the argument that the banks have to keep mandatory reserves held in equity and in order to improve profit and performance, liquidity and profitability must be balanced. Although, these results are not consistent with the previous studies that concluded no relationships between liquidity and profitability [29], or the studies that concluded a negative relationship between liquidity and profitability [16], but it came consistent with the results of [23, 24] which indicated that the relationship between liquidity and profitability is positive. Second, we found negative relationship between solvency and profitability, that means if solvency increased profitability would decrease. Nonetheless, these results are not consistent with former studies that concluded that there is no relationship between solvency and profitability [16], the results are consistent with [2] and [22] who found a negative relationship between solvency and liquidity. Lastly, our results in the previous section concluded that net revenues neither moderate the relationship between liquidity and profitability, nor moderate the relationship between solvency and profitability. This might be explained by the central bank regulations and heading toward hedging.

7   Limitations and Recommendations

One main limitation of this study is that conclusions of the study should be taken with caution if applied to different industries (i.e., manufacturing or agriculture industry or service companies) since it was applied on the banking sector. In future studies regarding solvency, liquidity, and profitability it would be advised to use different measurements and ratios than the ones used in this research to check the consistency of these results. In addition, it should be noted that in 2018 IFRS9 will become mandatory it also would be counseled to study the impact of this change on the banking sector liquidity and profitability.

References

1. Abuzayed, B.: Working capital management and firms' performance in emerging markets: the case of Jordan. Int. J. Manage. Finan. **8**, 155–179 (2012)
2. Ahmad, N., Salman, A., Shamsi, A.: Impact of financial leverage on firms' profitability: an investigation from cement sector of Pakistan. Res. J. Financ. Acc. **6**(7), 2222–1697 (2015)
3. Ajanthan, A.: A nexus between liquidity & profitability: a study of trading companies In Sri Lanka. Eur. J. Bus. Manage. **5**(7), 221–237 (2013)
4. Akter, A., Mahmud, K.: Liquidity-profitability relationship in Bangladesh banking industry. Int. J. Empirical Finance **2**(4), 43–151 (2014)
5. Al Ajlouni, A.T.: Interest free liquidity management scheme (time-weighted debt units). Int. J. Islamic Middle East. Financ. Manage. **10**, 60–76 (2017)
6. Al-Okaily, A., Abd Rahman, M.S., Al-Okaily, M., Ismail, W.N.S.W., Ali, A.: Measuring success of accounting information system: applying the DeLone and McLean model at the organizational level. J. Theor. Appl. Inf. Technol. **98**(14), 2697–2706 (2020)
7. Al-Okaily, A., Al-Okaily, M., Ai Ping, T., Al-Mawali, H., Zaidan, H.: An empirical investigation of enterprise system user satisfaction antecedents in Jordanian commercial banks. Cogent Bus. Manage. **8**(1), 1918847 (2021)
8. Al-Qudah, A.A., Al-Okaily, M., Alqudah, H.: The relationship between social entrepreneurship and sustainable development from economic growth perspective: 15 'RCEP'countries. J. Sustain. Financ. Investment 1–18 (2021)
9. Alzorqan, S.: Bank liquidity risk and performance: an empirical study of the banking system in Jordan. Res. J. Financ. Acc. **5**(12), 155–164 (2014)
10. Al-Sartawi, A.: The effect of corporate governance on the performance of the listed companies in the gulf cooperation council countries. Jordan J. Bus. Adm. **11**(3), 705–725 (2015)
11. Al-Sartawi, A.: Institutional ownership, social responsibility, corporate governance and online financial disclosure. Int. J. Crit. Acc. **10**(3/4), 241–255 (2018)
12. Baradwaj, B., Shao, Y., Dewally, M.: Institutions, capital control, and liquidity creation. J. Financ. Econ. Policy **8**, 396–422 (2016)
13. Benson, K., Faff, R., Smith, T.: Injecting liquidity into liquidity research. Pac. Basin Financ. J. **35**, 533–540 (2015)
14. Bibi, N., Amjad, S.: The relationship between liquidity and firms' profitability: a case study of Karachi stock exchange. Asian J. Financ. Acc. **9**(1), 54–67 (2017)
15. Colombini, F., Ceccarelli, S.: Liquidity, solvency and cash flow simulation models in nonlife insurance companies: the Italian experience. Manage. Finance **30**(5), 76–96 (2004). https://doi.org/10.1108/03074350410769083
16. Dahiyat, A.: Does liquidity and solvency affect banks profitability? Evidence from listed banks in Jordan. Int. J. Acad. Res. Account. Financ. Manage. Sci. **6**(1), 35–40 (2016)
17. Durrah, O., Rahman, A.A.A., Jamil, S.A., Ghafeer, N.A.: Exploring the relationship between liquidity ratios and indicators of financial performance: an analytical study on food industrial companies listed in Amman bursa. Int. J. Econ. Financ. Issues **6**(2) (2016)
18. Eljelly, A.M.: Liquidity-profitability tradeoff: an empirical investigation in an emerging market. Int. J. Commer. Manage. **14**(2), 48–62 (2004)
19. Gibson, C.H.: Financial Reporting and Analysis. Nelson Education, Toronto (2012)
20. Hart, A., Smith, M.: Customer profitability audit in the Australian banking sector. Manage. Audit. J. **13**, 411–418 (1998)
21. Ismal, R.: Assessment of liquidity management in Islamic banking industry. Int. J. Islamic Middle East. Financ. Manage. **3**, 147–167 (2010)

22. Kaddumi, T., Ramadan, I.: Profitability and working capital management the Jordanian case. Int. J. Econ. Finance **4**(4), 207–226 (2012)
23. Khidmat, W., Rehman, M.: Impact of liquidity & solvency on profitability chemical sector of Pakistan. Econ. Manage. Innov. **6**(3), 34–67 (2014)
24. Lartey, V.C., Antwi, S., Boadi, E.K.: The relationship between liquidity and profitability of listed banks in Ghana. Int. J. Bus. Soc. Sci. **4**(3) (2013)
25. Lutfi, A., Al-Okaily, M., Alsyouf, A., Alsaad, A., Taamneh, A.: The impact of AIS usage on AIS effectiveness among Jordanian SMEs: a multi-group analysis of the role of firm size. Global Bus. Rev. 0972150920965079 (2020)
26. Malik, M.S., Awais, M., Khursheed, A.: Impact of liquidity on profitability: a comprehensive case of Pakistan's private banking sector. Int. J. Econ. Financ. **8**(3), 69 (2016)
27. Mushtaq, H., Chishti, A., Kanwal, S., Saeed, S.: Tradeoff between liquidity and profitability. Int. J. Sci. Res. Manage. (IJSRM) **3**(5), 2823–2842 (2015)
28. Mwizarubi, M., Singh, H., Prusty, S.: Liquidity-profitability trade-off in commercial banks: evidence from Tanzania. Res. J. Financ. Acc. **6**(7), 93–100 (2015)
29. Olarewaju, O.M., Adeyemi, O.K.: Causal relationship between liquidity and profitability of Nigerian deposit money banks. Int. J. Acad. Res. Acc. Financ. Manage. Sci. **5**(2), 165–171 (2015)
30. Otieno, S., Nyagol, M., Onditi, A.: Relationship between credit risk management and financial performance: empirical evidence from microfinance banks in Kenya. Res. J. Financ. Acc. **7**(6), 2222–2847 (2016)
31. Porter, D.C.: Essentials of econometrics. McGraw-Hill/Irwin, New York (2010)
32. Raheman, A., Nasr, M.: Working capital management and profitability–case of Pakistani firms. Int. Rev. Bus. Res. Pap. **3**(1), 279–300 (2007)
33. Robinson, T.R.: International Financial Statement Analysis. Wiley, Hoboken (2015)
34. Shafana, M.A.C.N.: Liquidity and profitability of financial institutions in Sri Lanka. Int. J. Sci. Res. **4**(6), 589–593 (2015)
35. Shamaileh, M.O., Khanfar, S.M.: The effect of the financial leverage on the profitability in the tourism companies (analytical study-tourism sector-Jordan). Bus. Econ. Res. **4**(2), 251 (2014)
36. Siddiqui, K.: Financial crisis and its impact on the economies of China and India. Res. Appl. Econ. **1**(1) (2009)
37. West, S.G., Finch, J.F. and Curran, P.J.: Structural Equation Modeling: Concepts, Issues and Applications. SAGE Publications. Thousand Oaks (1995)
38. Sharma, S., Durand, R.M., Gur-Arie, O.: Identification and analysis of moderator variables. J. Mark. Res. **18**(3), 291–300 (1981)
39. Sharma, A., Kumar, S.: Effect of working capital management on firm profitability empirical evidence from India. Glob. Bus. Rev. **12**(1), 159–173 (2011)

Zakat Banking: Giving Loans Without Interest

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Abstract. Conventional bank charges interest on loans to make profits. But, Islam prohibits interest. To avoid interest, Islamic bank gives financing using trade-based contracts instead of loans by charging profit rate to achieve its profit objectives. For that reason, critics say Islamic bank is no different from the conventional bank and it failed in achieving social objectives. Yet, Islamic bank proponents are clamming maqasid shariah to justify. Irrelevant to the validity of such a claim the problem that both banking systems do not give loans without interest is still prevailing. Islamic banking is a progression from the concept of the Islamic economy that began to develop in the modern era during the second quarter of the 20th century. The idea of Islamic economic was credited to Maududi as part and parcel of his idea of creating Islamic society at large. Maududi rationalises that "the scourge of interest can be replaced and removed by a social order based on zakat and sadaqat". If that is so, this case study is the first attempt to prove such rationalisation in a new social banking conceptual framework that applies the prescribed social order of zakat and sadaqat. It requires bank depositors to voluntarily contribute zakat daily at 2.5% per annum converted to a daily rate, based on the available outstanding balance and bank shareholders to voluntarily sadaqat their shares to become waqf-shares that entitle no dividends. This study will have a major social and economic impact on Islamic society once readers understand that there is a possible solution to enable banks to give loans without interest and by the same token willing to contribute to the development of this new concept. Perhaps the proposed Zakat banking model would have not been possible before the Era of the Digital Economy.

Keywords: Zakat banking · Banking · Zakat and Waqf

1 Introduction

"From ancient Mesopotamia to present-day China," Ferguson [1] observes, "the ascent of money has been one of the driving forces behind human progress: a complex process of innovation, intermediation, and integration that has been as vital as the advance of science or the spread of law in mankind's escape from the drudgery of subsistence agriculture and the misery of the Malthusian trap". Ferguson chronologically tells the story of money, credit, and debt of which the evolution "was as important as any technological innovation in the rise of civilisation, from ancient Babylon to present-day Hong Kong" and the birth of banking in Italy in the fourteen century before spreading to the North European nations until to the rest of the world. The intertwining of these

three basic elements of society that are money, credit, and banking he claims is at the root of all old and new order of financial calamities.

Considering the role of banking, Werner [2] explains that "three different theories of banking were dominant at different times:" (1) The financial intermediation theory, (2) The fractional reserve theory, (3) The credit creation theory of banking. However, he found that the credit creation theory of banking is consistent with his empirical observations. Werner [3] also claims "banks' function as the creators and allocators of about 97% of the money supply" by "combine lending and deposit-taking operations under one roof" and that makes banks different from other firms.

In that contact Bikker and Bos [4] assert "To be sure, standard theory tells us that a bank's shareholders are claimants for its profits and it is thereby in their interest to maximize these profits". Thus at this introduction stage finally come to the key question of how does bank earns profits, DeYoung and Rice [5] give a straightforward answer "Banks make money by charging interest on loans, of course".

2   Problem Statement

Generally, banks do not give loans without interest and that is the problem. Despite its prohibition by four world's major religions (Judaism, Christianity, Hinduism, and Islam) having the following of more than two-thirds of the world's population, the entire international financial system is now based on interest [6]. Quoting Schein [7] "Yet, the Bible did not abolish loans altogether and loans without interest are the basis for the biblical system of charity instead of grants". However, Bayindir and Ustaoglu [8] observe out of the three Abrahamic religions (Judaism, Christianity, and Islam), the prohibition in Christianity and Judaism was weakened over time and eventually was lifted except Islam as the only religion that still preserved the interest ban. Zakir Hossain [9] clearly stated that "Interest is prohibited in Islam as it appears explicitly in the Holy Qur'an and the Sunnah of the Prophet". Quoting Sayyid Qutb [10] in his famous In the Shade of The Quran, "No other issue has been condemned and denounced so strongly in the Qur'ān as has usury (interest); nor has any practice come in for stronger warnings, spelling out fearful doom".

The Islamic bank does not solve this problem either. Islamic banking avoids giving loans to avoid interest and used trade-based contracts instead. Islamic banking relies heavily on legal tricks (hiyal) to circumvent shariah prohibition on interest [11]. According to Ibrahim and Alam [12] Islamic banking initially emphasises a partnership-based risk-sharing system but later mark-up pricing-based contracts has become dominant. In Roszaini and Mohammad [13] finding they describe this situation as the sacred intention have been distorted with secular goals and the objectives of Islamic law (maqasid shariah) has been unduly used to justify the innovation of banking product to compete with a conventional bank. This is why Chong and Liu [14] said "We find that Islamic banking is not very different from the conventional bank". Similarly F. Khan [15] said that "….much of IBF (Islamic Financial Institutions) remains functionally indistinguishable from conventional banking". Abdul-Baki and Uthman [16] even accept the fact that Islamic banks fail in achieving their social objectives.

The proponent of Islamic banking however justified their action base on maqasid shariah. Abubakar Siddique and Rashid [17] argue that shariah scholars have often been issuing the license of legality to several Islamic bank products based on the Shariah maxim of hajah that served maqasid shariah. The framework of maqasid shariah is explicated further by Mohamad and Hafas [18] to justified Islamic banking practices as the means (wasil) to achieve the wider shariah objectives by realizing maslahah (benefit) and preventing or repelling mafsadah (harm). On the similar aspect of maqasid shariah Syed and Omar [19] argue that Islamic financial institutions are forced to adopt hiyal in the predominant conventional system as the normative exits (makharij). However, despite Islamic banking deem failure, criticism, or even justification as claim by the proponents, the fact remains that Islamic banking does not solve the problem that banks do not give loans without interest since the last four decades of its existence. As such, the problem remains unsolved.

Now, Islamic finance is facing serious problem claims Al-Jarhi [20] because it is converging to conventional finance and recommending reforming in all aspects. Al-Jarhi [21] and Al-Jarhi [22] argues that waqf and zakat play a more significant role in Islamic finance. Similarly, Asutay [23] argue that it is important for Islamic finance to fulfil the foundational principle of Islamic economic which are shaped by three kinds of measure namely, zakah, waqf, and prohibited riba. Asutay [24] criticises Islamic banking as a social failure. Nienhaus [25] also observed that Islamic finance is moving closer to the conventional status quo, therefore, attention needs to be drawn to specific Islamic economic institutions such as zakat and waqf.

Whereas, Akram Khan [26] in his prediction for the future of Islamic economics mention about Islamic banking needs to "search for a satisfactory alternative to interest". He further stresses that "zakat has a bright future" and "The future of waqf lies in re-activating this institution". Ariff and Rosly [27] said it clearly "It is time that Islamic finance looked beyond such traditional modes as Murabaha (markup), mudarabah (profit sharing), musyarakah (partnership), and ijarah (leasing) as the spirit of Islamic finance demands it to reach out the masses in a caring manner. Finally, Siddiqi [28] also criticises that "The practice of Islamic Finance significantly departs from its theory" and "call for restructuring the Islamic finance industry along a different line" as "Humanity will be better off with everybody caring about everybody else" to achieve "Qard Hasan is a solution that presumes a paradigm other than the conventional one that limits financial institution to profit-oriented activities".

There are three conclusions, first, conventional banking systems do not give loans without interest is the problem. Second, despite an attempt made by Islamic banking, it seems that the solution to give loans without interest is still unknown. Yet, scholars seem to want to know more about zakat, waqf, and loan without interest particularly on how these Islamic economic teachings can be practised in the mainstream economy.

3   Islamic Economic

It is important to get a fair review of Islahi [29] findings regarding the contribution of Muslim scholars to economic thought and analysis during the period of 632–1500 A.D. The first phase, the Formation Period from 632–718 A.D. whereby the Islamic

economic thought was based on internal sources just after the cessation of the revelation to the end of the Companion era. The second phase, the Translation Period from the 8th–11th century A.D. when Muslims benefit from the intellectual and practical works of other nations such as classical masterpieces of Greek ideas was translated into Arabic. The third phase, the Retranslation and Transmission Period from the 12th–15th century A.H. when Greco-Arab Islamic ideas came to Europe when Muslin civilization, intellectual and political power reached its zenith which afterwards receded into oblivion.

Yet, in explaining Islamic economics as social science, Choudhury [30] emphasises that it has a distinct foundation from the mainstream Western economy. According to Choudhury, there has been an evolution of the field of social science where compartmentalisation occurred in the eighteen century in Europe. This happened after the peak days of moral philosophy during the age of Scholasticism and Enlightenment. Choudhury finds that Adam Smith is the last remnants of the moral economic concept as those who were to follow Smith have distorted the ethical message of moral sentiment. Choudhury blames Catholic Church for failing to explain the relevance of divine law in the realm of reality to the scientific community. He said "the growing cleavage between the Church and the scientific community sharpened in the hands of Kant" that lead to the separation of matters of religion from the secular realm of positivistic scientific truth in the nineteenth century. However, after two hundred years, having gone through the agonising social and economic experience there has been a reawakening to incorporate ethics and value in the intellectual inquiry. In comparison with the Islamic approach, there is no separation between spiritual and scientific matters with the central principle of God as the Creator and Sustainer.

According to Islahi [29] "Modern development of Islamic economic began during the second quarter of the 20th century". However, the growing field of modern Islamic economics is criticised by Mahomedy [31] as lacking the philosophical underpinnings. He finds "Islamic economists, recognising that their mission has remained unfulfilled, have variously suggested different approaches to regenerate the process and chart the way forward". He also observes that "The Islamic economists have had little success in articulating a sound and coherent theoretical paradigm for the discipline, let alone in demonstrating how it would find practical expression in the real economy". Therefore, to demonstrate its relevance to the real economy he suggested Islamic economics proponents must resolve its theoretical and practical discontinuity by clarifying its Weltanschauung to develop appropriate content and form.

Since the concept of Islamic economics still going through a verification process A. Khan [32] argue that work in this area mainly consists of Islamic economic teaching. He gives the example of riba which the Qur'an declares illegal. Although, Islamic finance has been growing to fight against banking interest, in actual practice, "the Islamic finance institutions have adopted methods and procedures so similar to interest that is difficult to tell if they succeeded in eliminating riba from their transactions" which to him has created more controversy.

According to Visser [33] the origins of the Islamic economics idea were introduced by Sayyid A'la Maududi (1903–79) from Pakistan. Others would include Sayyid Qurb (1906–66) from Egypt and Muhammad Baqir ai-Sadr (1931–1980) from Iraq which is coherent with Mahomedy's view. Visser opines that the motivation for developing such

an economic idea is due to Islam was seen as backward by the European dominant. Visser also gives credit to Maulana Maududi (p. 5) for launching his idea of Islamic economics as part and parcel of creating Islamic society at large.

Therefore, it is commendable to turn into the work of Maududi in particular his book entitled "First Principles of Islamic Economics" published in 1969 as the key theory behind this paper. According to Maududi, mankind's economic problems have been made unnecessary more complicated and enigmatic. This is because the issue of the economy has been handle in isolation from the greater issue of moral being. The importance of economics has ignored the man's goal in life as if that of the cattle objective of lush green grass to keep stomachs full. Maududi said, "The starting point of economic problems is selfishness that transgresses the boundaries of moderation" and continues "…there is nothing integrally wrong with private ownership or with some people enjoying a better position in life than others" (p. 9). Yet, the rich refused to accept the right of those were deprived and under-privileged. Again quoting Maududi "it is absurd to pontificate and presumes that the scourge of interest cannot be removed and replaced by a social order based on Zakat and Sadaqat" (p. 172). Finally, it suffices to conclude Maududi with the following two key points;

1. There is nothing wrong with the conventional banking system other than interest (riba) charged by the bank. Banking services are need by society.
2. Interest can be replaced with Zakat and Sadaqat. To Maududi zakat is the antithesis of interest. To abolished interest, the zakat system needs to be in operation to take the place of interest.

Sitorus [34] also argue that the single important characteristic to differentiate conventional economy and Islamic economy is the prohibition or riba. Therefore, he further argues that the only possible way to abolished riba is to established zakat and sadaqat in the Islamic economic system. Similarly, Ahmad [35] calls for the reinstitutionalise of the zakat management system from collection to distribution. He emphasises that besides the current financial intermediation which is interest-based it is the non-functionary of zakat institution that has caused division in the society. He pointed out that reinstitutionalise zakat into constructive channelization of wealth can achieve a more balanced society. Farooq [36] in explaining the self-interest of Homo Islamicus and Homo economicus suggests that "relevant theoretical constructs must be developed and tested empirically" so that a better model than the current Islamic Financial Institutions may become possible so that "human behaviour can transform to the desired ideal". Farooq finding is supported by Zaman [37] presenting his argument that Islamic economic require institutional structure to achieve transformation towards the normative ideal. This needs changing human behaviour from pursuing material to moral and spirituality when he said "Whereas the bank is designed to bring depositors the earning of this world, Waqf is designed to generate earning of the hereafter".

4   Zakat Banking Conceptual Framework

To bridge what appears to be the gap between the Islamic economic teaching and the current banking practice, this paper proposes a new social banking conceptual framework that is capable of giving loans without interest as a practical expression in the real economy. This will require changing of behaviour by five (5) banking main stakeholders; 1) Depositors, 2) Shareholders, 3) Borrowers, 4) Government, and 5) Religious Authorities. The proposed new social banking framework will be generally defined as Zakat banking to be seen as the practical progression from the attempt made by Islamic banking in combating riba as shown in Fig. 1 below.
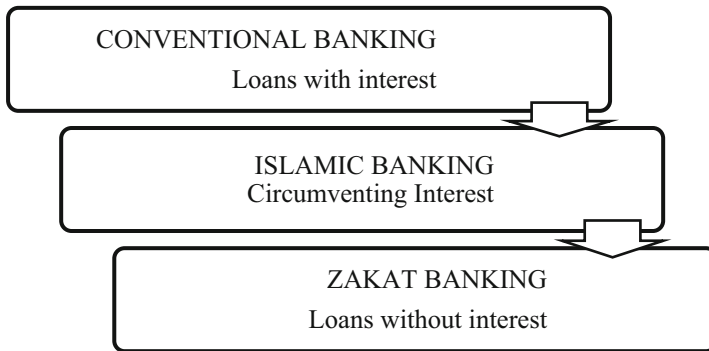
Fig. 1. Progression toward Zakat banking, giving loans without interest.

This study is contemplating Zakat banking as a social enterprise business organization. H. Haugh [38] observes that social enterprise has become a new phenomenon in the current global practice. She argues that this phenomenon was given due recognition by the Nobel Prize committee. One was in 2006 when it was awarded to Muhammad Yunus and the second was in 2009 when it was awarded to Elinor Ostrom for their community projects.

The significance of social enterprise was further demonstrated by the establishment of Community interest Company (CIC) a new organizational structure for social enterprise in the United Kingdom (UK) in 2005 [39]. This legal structure is a kind of hybrid between a company and charitable law in the UK, whereby CIC is allowed to do trading for social purposes and at the same time company assets can remain in perpetuity. As such, social enterprises have dual missions, social mission and financial sustainability [40]. Similarly, social enterprise business organizations can maximize ethical value as an alternative to the current neo-classical paradigm that purely pursues self-interest in the profit-motivated private enterprise [43]. Although such activities are currently term as social enterprises, MacDonald and Howorth [41] say some evidence shows the concept has been developed since 1600 AD in Europe. Unfortunately, activities rarely continue beyond the life of its founders.

There are two key drivers for a social enterprise, one is the entrepreneur and the second is the business model [43]. Having the right business model, social enterprise

can be made financially sustainable [44, 45]. The purpose of the business model is to explain how enterprises serve their customers at sustainable costs [46]. To her, a business model must be able to tell the narrative story about the social objective it wants to achieve and it must make sense. Secondly, the model must be able to generate its revenue and cover the cost.

The new business model of Zakat bank as shown in Fig. 2 is based on the following assumption on five (5) key stakeholders as part of the narrative story in transforming human behaviour into the desired ideal.

1. **Depositors:** That there is a market segment of depositors who would voluntarily agree to make zakatable deposits in the Zakat bank. Depositors allow the bank to collect zakat on their deposit daily at 2.5% per annum converted to a daily rate for the distribution to the eight categories of asnaf; (1) The poor (2) The needy (3) Zakat administrators (4) The new Muslim (5) Those in bondage (6) The debt-ridden (8) In the cause of Allah and (9) The wayfarer. The benefit is, it allows depositors to contribute zakat daily as the amount of the deposits always fluctuate. It is more efficient, accurate and a better system than paying zakat once a year which is made possible with the advancement of digital technology.

2. **Shareholders:** That there is a market segment of the general public who would voluntarily agree to subscribe to waqf-shares of the Zakat bank. Since Zakat banking is a social enterprise, it will require the shareholders to waqf their equity which entitles no dividend. The amount of the shareholding must be able to continue to grow by receiving new waqf donations from the public as and when the Zakat bank requires capital enlargement in tandem with its business growth.

3. **Borrowers:** That there is a market segment of borrowers who would voluntarily agree to become muzakki borrowers of the Zakat bank. As borrowers enjoy loans without interest, they are required to deposit their money only in zakat bank to make the money creation work by the banking system as described by Werner [2]. They also cannot be become depositors of other private banks to prevent arbitrage.

4. **Government:** That the government (in the Malaysian context) would agree to give a full income tax rebate on zakat paid through Zakat bank, either to individuals or companies. The government will be short-changed because the government will be able to cut yearly fiscal expenditures that are targeted to the asnaf by a similar amount. Also, depositors should not be victimised for paying "double taxation".

5. **Religious Authority:** That the State Islamic Religious Council (in Malaysian context) would agree to appoint the Zakat bank as amil for the collection and distribution of zakat digitally on monthly basis to the asnaf thus make them inclusive so that financial tracking is available for monitoring purposes. As amil, Zakat bank is entitled to 1/8 of the zakat collection and another 1/8 to be utilised by the bank to cover the uncollectable loans from the category of the debt-ridden.
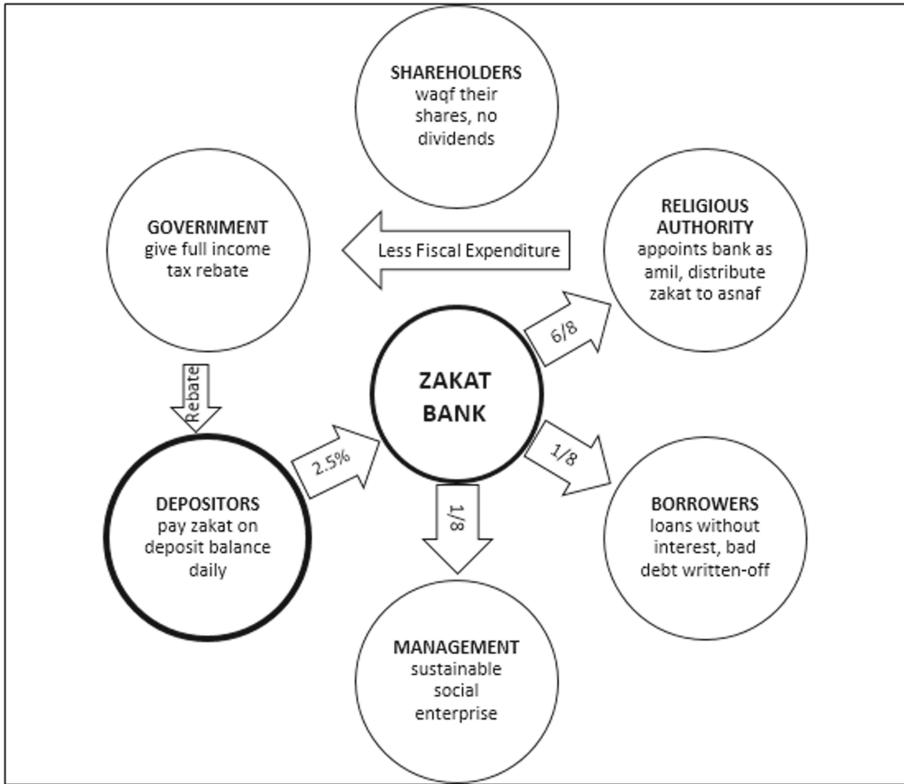
Fig. 2. The proposed business model of Zakat bank – stakeholders' new behaviour.

5 Financial Simulation

Even though the five (5) assumptions that the stakeholders want to change their behaviour may be true the real test is in financial sustainability or the numbers test. The financial sustainability Zakat banking conceptual framework can be simplified into the following empirical formula;

$$ZB = f (ZD, WS, MB, TR, and BA)$$
$$ZB = Zakat\ Banking - financially\ sustainable$$
$$ZD = zakatable\ deposits - depositors\ agree\ to\ pay\ zakat$$
$$WS = waqf\text{-}shares - shareholders\ agree\ to\ waqf\ their\ shares$$
$$MB = muzakki\ borrowers - borrowers\ agree\ to\ keep\ zakatable\ deposits$$
$$TR = tax\ rebates - government\ agree\ to\ give\ full\ tax\ rebates$$
$$BA = bank\ as\ amil - State\ Islamic\ Religious\ Council\ appoint\ Zakat\ bank\ as\ amil$$

To carry out the numbers test, this paper has to rely initially on data that is readily available in the audited account. According to the report by Bank Negara Malaysia, there are eleven (11) locally incorporated Islamic Banks. These banks are listed in

Table 1 below together with their respective 5-year annual average financial results for the year 2015 to 2019. Using the average is to eliminate short term data volatility for each bank. The financial performance of each eleven banks is then summed together to represent the total market performance for Islamic banking.

Table 1. Islamic Banks 5-year performance.

No	Malaysia local islamic banks	5-Year annual average: audited account 2015–2019 (RM '000)			
		Deposits from customers (DfC)	Net income	Operating cost	Profit before tax & Zakat
1	Affin islamic bank	14,344,690	308,872	181,008	127,864
2	Alliance islamic bank	36,015,837	1,208,223	605,078	603,145
3	AmBank islamic	28,532,819	830,352	500,646	329,706
4	Bank islam malaysia	51,461,101	1,743,014	978,739	764,275
5	Bank muamalat malaysia	19,703,869	595,796	411,030	184,766
6	CIMB islamic bank	64,742,305	1,465,062	620,071	844,991
7	Hong leong islamic bank	24,268,120	524,986	198,387	326,599
8	Maybank islamic	154,013,938	3,860,674	1,542,625	2,318,049
9	MBSB bank	32,126,774	1,408,674	809,638	599,036
10	Public islamic bank	48,817,643	951,293	396,370	554,923
11	RHB islamic bank	39,069,497	843,525	316,540	526,985
	Total sum	513,096,593	13,740,472	6,560,133	7,180,339

The Net Income represents the Islamic banks' profit spread between profit gain from giving financing to customers and profit paid to depositors. After deducting Operating Costs then the banks realised Profit before Tax & Zakat amounting to RM7.18 billion. The Total Sum data from Table 2 is then simulated based on the new Zakat bank formula;

1. Depositors pay daily zakat at 2.5% per annum converted to a daily rate. From this zakat collection, Zakat bank is entitled 1/8 as amil and another 1/8 to cover bad debt as income.
2. Borrowers receive loans without interest, therefore, bring no income to the Zakat bank.
3. Operating Costs for Zakat bank is assumed to be similar to the of Islamic banks.

The result of the preliminary financial simulation is shown in Table 2 below. It appears that Zakat bank will not be profitable but will suffer losses of (RM3.353)

billion. This is because the Income from Zakat is not able to cover the Operating Cost. In other words, to be sustainable, Zakat banking needs to find out a new way on how it could reduce the Operating Cost.

Table 2. Financial simulation.

Financial results	11 Islamic banks (Actual)	Zakat bank (Simulation)
Deposits from Customers (DfC)	513,096,593	513,096,593
Net Income (profit spread)	13,740,472	–
Income from Zakatable deposits	–	3,206,854
Operating costs	6,560,133	6,560,133
Profit/Loss before tax & Zakat	7,180,339	−3,353,279

6   Conclusion

Zakat banking framework is based on social enterprise to give loans without interest. To do that its demand a new business model which requires new behaviour from the key stakeholders. Assuming the stakeholder willingly agreed to the new role play as narrated then the bank must make sure its Operating Cost must be below the Income from Zakat. The simplified financial simulation does not show that Zakat bank is financially sustainable as it is expected to suffer losses unless the bank can cut its Operating Cost.

Although the new business model for Zakat banking narration may make sense it looks like its fail in the preliminary numbers test. As Stirzaker et al. [46], has mentioned earlier a social enterprise has two key drivers the business model and the entrepreneur. Therefore, there is an opportunity for future research to play the role of an entrepreneur to analyse the detailed Operating Cost of banking services in a case study of a particular bank to pinpoint the potential area of cost-saving. Entrepreneurship is about creating a new banking model as the work of innovation in achieving its social objective.

This paper is calling researchers, practitioners and regulators with an entrepreneurial mindset to carry more researches that might be able to reach the cost-saving needed to make Zakat banking a reality in the Era of the Digital Economy.

References

1. Ferguson, N.: The ascent of money: a financial history of the world. Int. J. Law Manage. **52** (4) (2008)
2. Werner, R.A.: A lost century in economics: three theories of banking and the conclusive evidence. Int. Rev. Financ. Anal. **46**, 361–379 (2016)

3. Werner, R.A.: How do banks create money, and why can other firms not do the same? An explanation for the coexistence of lending and deposit-taking. Int. Rev. Financ. Anal. **36**, 71–77 (2014)
4. Bikker, J.A., Bos, J.W.B.: Trends in competition and profitability in the banking industry: a basic framework. In: SUERF - The European Money and Finance Forum (2005)
5. DeYoung, R., Rice, T.: How do banks make money? The fallacies of fee income. Econ. Perspect. **28**(4), 34 (2004)
6. Chapra, M.U.: The case against interest: Is it compelling? Thunderbird Int. Bus. Rev. **49**(2), 161–186 (2007)
7. Schein, A.: Of biblical interest, brotherhood and charity. Int. J. Soc. Econ. **30**(7–8), 788–797 (2003)
8. Bayindir, S., Ustaoglu, M.: The issue of interest (riba) in the Abrahamic religions. Int. J. Ethics Syst. **34**(3), 282–303 (2018)
9. Zakir Hossain, M.: Why is interest prohibited in Islam? A statistical justification. Humanomics **25**(4), 241–253 (2009)
10. Qutb, S.: In the Shade of the Quran, Islamic Foundation (1999)
11. Mansoori, M.T.: Use of hiyal in Islamic finance and its shariah legitimacy. J. Islamic Bus. Manage. **1**(1), 69–92 (2011)
12. Ibrahim, M.H., Alam, N.: Islamic economics and Islamic finance in the world economy. World Econ. **41**(3), 668–673 (2017)
13. Roszaini, H., Mohammad, H.: Islamic finance: from sacred intentions to secular goals? J. Islamic Account. Bus. Res. **1**(2), 85–91 (2010)
14. Chong, B.S., Liu, M.H.: Islamic banking: interest-free or interest-based? Pac. Basin Finan. J. **17**(1), 125–144 (2009)
15. Khan, F.: How Islamic is Islamic banking? J. Econ. Behav. Organ. **76**(3), 805–820 (2010)
16. Abdul-Baki, Z., Uthman, A.B.: Exploring the social failures of Islamic banks: a historical dialectics analysis. J. Islamic Account. Bus. Res. **8**(3), 250–271 (2017)
17. Abubakar Siddique, M., Rashid, A.: The fatāwá in Islamic banking and financial industry: explaining the use of darūrah (dire necessity) and hājah (need) maxims. J. Islamic Bus. Manage. (JIBM) **9**(2), 355–367 (2019)
18. Mohamad, A.L., Hafas, F.: Developing Islamic finance in the framework of maqasid al-Shari'ah: understanding the ends (maqasid) and the means (wasa'il). Int. J. Islamic Middle East. Finan. Manage. **6**(4), 278–289 (2013)
19. Syed, E.A., Omar, M.: Hiyal in Islamic finance: a recognition of genuine economic need or circumvention of Riba? Qual. Res. Finan. Mark. **9**(4), 382–390 (2017)
20. Al-Jarhi, M.A.: Islamic finance at crossroads. Int. Islamic Univ. Malaysia **26**, 431–462 (2018)
21. Al-Jarhi, M.A.: An economic theory of Islamic finance. ISRA Int. J. Islamic Finan. **9**(2), 117–132 (2017)
22. Al-Jarhi, M.A.: Gaps in the theory and practice of Islamic economics. J. King Abdulaziz Univ. Islamic Econ. **26**(1), 243–254 (2013)
23. Asutay, M.: A political economy approach to Islamic economics: systematic understanding for an alternative economic system. Kyoto Bull. Islamic Area Stud. **1**(2), 3–18 (2007)
24. Asutay, M.: Conceptualising and locating the social failure of Islamic finance: aspirations of Islamic moral economy vs the realities of Islamic finance. Asian Afr. Area Stud. **11**(2), 93–113 (2012)
25. Nienhaus, V.: Method and substance of Islamic economics: moving where? J. Abdulaziz Univ. Islamic Econ. **26**(1), 175–208 (2013)
26. Akram Khan, M.: The future of Islamic economics. Futures **23**(3), 248–261 (1991)

27. Ariff, M., Rosly, S.A.: Islamic banking in Malaysia: unchartered waters. Asian Econ. Policy Rev. **6**(2), 301–319 (2011)
28. Siddiqi, M.N.: Islamic banking and finance in theory and practice: a survey of state of the art. Islamic Econ. Stud. **13**(2), 2–48 (2006)
29. Islahi, A.A.: History of Islamic economic thought: contributions of Muslim scholars to economic thought and analysis. In: History of Islamic Economic Thought: Contributions of Muslim Scholars to Economic Thought and Analysis (2014)
30. Choudhury, M.A.: Islamic economics as a social science. Int. J. Soc. Econ. **17**(6), 35–59 (1990)
31. Mahomedy, A.C.: Islamic economics: still in search of an identity. Int. J. Soc. Econ. **40**(6), 556–578 (2013)
32. Khan, A.: Methodology of Islamic economics: from Islamic teachings to Islamic economics. Turkish J. Islamic Econ. **5**(1), 35–61 (2018)
33. Visser, H.: Islamic finance, principles and practice. J. Chem. Inf. Model. **53**(9) (2009)
34. Sitorus, I.R.: Riba vs zakat dalam perpektif ekonomi Islam. Al-Intaj J. Ekonomi dan Perbankan Syariah **5**(1), 102 (2019)
35. Ahmad, B.: Philanthropy in practice: role of zakat in the realization of justice and economic growth. Int. J. Zakat **1**(1), 64–77 (2016)
36. Farooq, M.O.: Self-interest, homo Islamicus and some behavioral assumptions in Islamic economics and finance. Int. J. Excellence Islamic Bank. Finan. **1**(1), 52–79 (2011)
37. Zaman, A.: Introduction to Islamic economics. Introduction Islamic Econ. 1–30 (2017)
38. Haugh, H.: The importance of theory in social enterprise research. Soc. Enterp. J. **8**(1), 7–15 (2012)
39. Haugh, H.M.: Social economy advancement: from voluntary to secure organizational commitments to public benefit. J. Manage. Hist. **27**(2), 263–287 (2020)
40. Doherty, B., Haugh, H., Doherty, B., Haugh, H., Lyon, F.: Social enterprises as hybrid organizations: a review and research agenda. Int. J. Manage. Rev. **16**(4), 417–436 (2014)
41. Bull, M., Ridley-Duff, R., Foster, D., Seanor, P.: Conceptualising ethical capital in social enterprise. Soc. Enterp. J. **6**(3), 250–264 (2010)
42. MacDonald, M., Howorth, C.: Roots of social enterprise: entrepreneurial philanthropy, England 1600–1908. Soc. Enterp. J. **14**(1), 4–21 (2018)
43. Stirzaker, R., Galloway, L., Muhonen, J., Christopoulos, D.: The drivers of social entrepreneurship: agency, context, compassion and opportunism. Int. J. Entrepreneurial Behav. Res. **27**, 1381–1402 (2021)
44. Al-Sartawi, A., Reyad, S., Madbouly, A.: Shariah, presentation and content dimensions of web 2.0 applications and the firm value of Islamic financial institutions in the GCC countries. J. Islamic Mark. (2021)
45. Osberg, S.R., Martin, R.L.: Two keys to sustainable social enterprise. Harv. Bus. Rev. **93**(5), 86 (2015)
46. Magretta, J.: Why business models matter. Harv. Bus. Rev. **80**(5), 86–92 (2002)

The Need for Revitalization of Islamic Social Finance Instruments in the COVID-19 Period in Nigeria: The Role of Digitalization

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Abstract. The COVID-19 pandemic has seriously damaged the socio-economic development of Nigerians. Meanwhile, the country is in a debt crisis, which is largely attributed to the fall in the price of crude oil revenue that is used to finance its budget. This makes it difficult to provide sustainable support towards poverty alleviation in the country during the pandemic. Thus, the objective of this study is to explore various technological applications to apply in the revitalization of Islamic social finance instruments in Nigeria. Through a review of literature, the study provides various fintech applications that are essential for reviving the role of Islamic social finance instruments, particularly zakat and waqf institutions for sustainable poverty alleviation in the country. Besides, the benefits of supporting Islamic social finance instruments with technological applications were also provided for the efficient and effective administration, collections and distributions of Islamic social funds. Hence, the study recommends the adaption of the best practices found in Malaysia, Indonesia, Bahrain, the U.A.E, etc. Besides, five specific recommendations have been proffered for the successful digitalization of Islamic social finance instruments in Nigeria. These recommendations can feasibly be implemented as it currently has a Ministry of Communications and Digital Economy, which is saddled with the responsibility of transforming the country into a fully digital economy.

Keywords: COVI-19 pandemic · Islamic social finance · Fintech · Poverty alleviation · Nigeria

1 Introduction

The emergence of the Novel Corona Virus (COVID-19) commenced from Wuhan, China and caused health, social and economic problems and swiftly skyrocketed to a pandemic state, a major disaster for the global community [16]. Nigeria is one of the countries that most suffered the consequences of the COVID-19 pandemic, particularly on socio-economic development. The COVID-19 pandemic crisis met Nigeria at the time it had just recovered from an economic recession, which seriously caused damage to its economy and managing its debt profile.

Sales proceeds from crude oil is the major source of revenue to the country. Crude oil export alone accounted for 66.38% of the total exports as of the first quarter of 2021 [11]. The Nigerian government heavily depends on oil revenue to finance its budget for

the provision of social amenities to the populace. Consequently, the country's debt profile has become a topical issue for policymakers and development practitioners, as recently the debt service-to-equity ratio is 60%, which could worsen as the oil price continues to fall [13].

Finding durable solutions to the consequences of the COVID-19 has become a topic of discussion among scholars and practitioners globally [16, 18]. Considering the role played by the global Islamic finance industry in the provision of solutions to the last global financial crisis, another challenge is thrown to the industry to offer alternative and sustainable finance [8]. It is widely believed that Islamic social finance instruments, such as zakat, waqf and *Sadaqat*, among others, have the potential to generate funds to provide solutions to the contemporary problems of Muslims [15, 16]. Historically, zakat and waqf have played a significant role in poverty alleviation in Islamic societies.

Contemporarily, Islamic social finance instruments have been digitalized in order to efficiently and effectively contribute to the religious and socio-economic development of Islamic society. In other words, these instruments are integrated with financial technology (fintech) applications in many Islamic countries, such as Malaysia, Indonesia, the U.AE, Qatar, etc. This implies that various Islamic countries are now moving towards becoming digital Islamic economies. Digital technology becomes an instrument used to collect, distribute and manage zakat as well as disseminate its education [12].

The rest of the paper is divided into five sections. Section 2 discusses the challenges facing Islamic social finance institutions in Nigeria. The technological instruments to apply in the digitalization of Islamic social finance institutions in Nigeria are presented in Sect. 3. Section 4 explains the sources and beneficiaries of Islamic social funds through the utilization of Islamic fintech. Section 5 explains the benefits of the digitalization of Islamic social finance instruments in the country. Finally, the conclusion and recommendations are presented in Sect. 6.

2   The Challenges of Islamic Social Finance Institutions in Nigeria

Many Nigerian states, such as Kano, Gombe and Zamfara have commissions that are primarily saddled with the responsibility of collecting and distributing zakat and waqf funds. Unfortunately, these commissions have not yet contributed effectively to alleviate poverty in Nigeria, as they face several challenges. Administratively, zakat and waqf institutions are politically appointed by Governors in Nigeria [2]. Most Nigerians do not trust or have confidence in political appointees as many of them were found guilty of engaging in financial and non-financial scandals. They also have inadequate managerial and administrative knowledge of such institutions. [7] also revealed two key challenges of zakat institutions in Nigeria, which include the ineffectiveness of government administrative machinery and taking unilateral decisions at individual levels. Besides, a review of the extant relevant literature established ineffective governance, administration and management as some of the key factors hindering the successful implementation of zakat in Nigeria [14]. Hence, in order to enhance the

function of zakat and waqf institutions their commissions or agencies should be converted into a Ministry of Zakat and Waqf Affairs, which should be managed by an experienced scholar of integrity that has both Islamic and conventional experiences preferably in Islamic social and management sciences [10]. This will ensure their autonomy in discharging their duties efficiently and effectively.

In the case of collections of zakat and *waqf*, a study by [19] found that the lack of keeping proper and complete records of zakatable liabilities and deductible liabilities has made zakat collections very low and ineffective to alleviate poverty in Kano state, Nigeria. Generally, zakat collections are very low, as most zakat payers don't like to pay to zakat commissions or agencies but prefer to distribute directly to beneficiaries. Consequently, the amount they collect is very low. This happens not only because zakat payers do not trust the administrators but due to a lack of awareness and knowledge of zakat and the importance of Islamic social finance in general. [1] called upon Islamic scholars, academics, waqf agencies, practitioners, developers and financial institutions to collaborate in order to provide creative ideas, methods and initiatives towards enhancing waqf practices.

Besides, Nigeria should adopt the best four practices of waqf from four major Sunni schools of thought as well as the models used from other countries, such as Malaysia, Indonesia, Bangladesh and Pakistan, among others [1]. Adopting practices approved by these Sunni schools and models used in these countries would surely maximize the collection for these instruments. For example, the most common form of waqf widely practiced in Nigeria is the construction of mosques directly by donors [17]. Other forms of integrated waqf models (e.g. with zakat and Islamic microfinance) that are capable of alleviating poverty in the country, as obtainable in Indonesia, Malaysia and Bangladesh, among others, are not practiced in Nigeria. The use of fintech, particularly in the COVID-19 pandemic period would surely contribute to maximizing collections from various Islamic social finance instruments. For instance, the utilization of various fintech applications by BAZNAS has greatly assisted it in the collection of huge amounts of zakat funds during the lockdown and the restriction of movement. Unfortunately, zakat collection in Nigeria is often done from house to house by commission officials. It is very rare to find zakat payers pay it directly to the commission.

The distribution of Islamic social financial funds among beneficiaries is not properly done in a way and manner to alleviate poverty in Nigeria. Many more deserving beneficiaries do not benefit from such funds. In the case of zakat, many zakat payers continuously distribute their zakat to the same family and friends every year. Others give a small amount of money to beneficiaries that could be spent in a few days. In most cases, these funds are given to them without encouraging them to become self-reliant. The fact is that their judicious use of the funds could one day make them become successful entrepreneurs to the extent that they can help others to escape out of the poverty cage [20]. [19] established that business zakat revenue in Kano State, Nigeria, can provide adequate financial support to various poverty alleviation programs if sensibly implemented, poverty could be minimized to the barest minimum in the state. Hence, the activities of zakat institutions should be integrated with various empowerment programs and other related matters [10]. This could help in empowering beneficiaries to become successful entrepreneurs.

Another challenging issue relating to distribution is that zakat, waqf and other social finance funds are manually distributed in Nigeria. There is also no proper way of screening the eligibility and identity of the recipients. Consequently, the funds are exposed to various forms of misappropriations and other irregularities. The use of fintech technological applications could greatly assist in speeding up the distribution of such funds to the most deserving beneficiaries.

3   Applicable Technological Instruments

Generally, there exist many technological innovations that support the provision of financial services efficiently and effectively. In fact, new instruments are continuously emerging to ease the provision of financial services. These inventions could be applied in the provision of Islamic financial services. Any innovation is allowed to be applied in Islam if it does not contradict the Shariáh. The technological applications to use in the provision or supporting Islamic financial services could be broadly divided into three classes:

1. Disintermediation leading to open access to services
   a. *Peer-to-peer lending (P2P)*: P2P lending is an online platform that allows giving money as loans from one peer to another or peers [3]. This is an online platform that connects businesses directly with fund providers for a fee, which can enable SMEs to have access to finance and allows investors to verify or check credit easily [6].
   b. *Crowdfunding*: Crowdfunding is an online platform that enables the accumulation of a small amount of money from a large number of people to finance a certain project [4, 5].
   c. *Mobility*: This service enables access to information or application in an untethered way, normally via portable and networked devices like smartphones, which allows the user to have access to certain information or applications without necessarily being in a certain place [6].
   d. *Open banking*: This uses application interfaces that enable third-party service providers to have access to customer banking data [6].
2. Greater automation from insights to activity
   a. *Artificial intelligence*: This entails a set of technologies that allows computers to execute "smart" tasks via technological applications, such as expert systems, natural language processing and machine learning, a process that uses algorithms for the analysis of data with a view to generating insights and make predictions [6]. It is a technological application where human users teach robots to assist them with daily tasks, such as the detection of various activities that signify money laundering or scam accounts [19].
   b. *Big data/ analytics*: This applies analytical instruments for processing large data sets generated from multifarious sources that drive business decisions [6]. This application enables written and stored data in the server (internet) comprising every click for all online transactions to be read and analyzed [20].

    c. *Quantum computing*: This entails the application of the quantum theory to create computers that are capable of processing complex problems much more effectively than their conventional counterparts [6, 20].

3. Greater decentralization and security

    a. *Blockchain*: Blockchain is also called distributed ledger, which consists of all unremovable data about every activity under one platform and is distributed to an enormous server globally for cross-verification and decentralization [20].

    b. *Cybersecurity*: This entails a set of technologies, processes and practices applied to protect networks, computers and data from attack or access without authority [4–6]. Therefore, it provides protection to collected and processed data as well as the privacy and of all users and stakeholders [20].

    c. *Cloud adoption*: This is an application that keeps resources on the internet (in a "cloud") that are retrievable by using web-based tools and applications rather than directly from a server connection. Cloud adoption could enable firms to have their capital expenditure on expensive internal servers substantially reduced [6].

From the above, it is understandable that the applications in the first category include P2P finance, crowdfunding, mobility and open banking that allow individuals or businesses to get funds. The second category consists of artificial intelligence, big data/analytics and quantum computing process enormous transactions and access to the required information within a short period of time. It also facilitates making rational decisions like human beings. The third and final category, which comprises blockchain, cybersecurity and cloud adoption, provides strong protection to financial data and information to maintain the privacy of users and prevent unauthorized access and alterations. It also ensures safekeeping data and information in a decentralized form, so that they could be accessed by eligible persons from different locations across the globe. However, the crowdfunding platform has more potential to generate more funds than the P2P platform in order to meet up the financial needs of a greater proportion of the Nigerian population. According to [15], there are four types of crowdfunding:

- Donation-based crowdfunding: This is managed for social or philanthropic projects often managed by NGOs;
- Reward-based crowdfunding: This entails collecting funds where contributors get some tangible reward like a membership rewards scheme as a token to appreciate their contributions;
- Debt-based crowdfunding: This is also called lending-based crowdfunding, which is used to provide loans to finance startups or small businesses and;
- Equity-based crowdfunding: This is where equity funds are provided to finance the operations of businesses.

To sum up, P2P and crowdfunding platforms are very much relevant in the current situation that Nigeria finds itself. These could be implemented successfully if technologies like big data/ analytics, artificial intelligence, quantum computing, cybersecurity, blockchain and cloud adoption are concurrently used with these platforms in order to facilitate, make easier and strongly protect all transactions carried on the platforms against fraud and alterations.

4   The Sources and Beneficiaries of Funds Through Islamic Fintech

Islamic social finance instruments, such as zakat, *waqf, and saqadat*, among others, are capable of mitigating the consequences of the COVID-19 pandemic [5]. Considering the growing population of Muslims and the need to mitigate the consequences of the COVID-19 pandemic, the importance of integrating it with fintech is very profound. Fintech can provide an integrated solution to the whole value chain of zakat consisting of the collection, distribution and intervention of funds to the improved identification of eligible beneficiaries [20]. For example, the National Board of Zakat of Indonesia, BAZNAS, has greatly adopted fintech in discharging its mandates since before the emergence of the COVID-19 pandemic. BAZNAS has been digitally developed to the extent that great lessons could be learned by many Islamic countries, including Nigeria. Specifically, [21] provided the following digital development of BAZNAS:

- It collaborated with the MatahariMall.com portal in 2017 to provide zakat calculator and zakat payment services;
- It partnered with e-commerce and Elevenia are centers for buying and selling;
- In 2018, it launched a zakat service by using a digital payment machine called M-Cash, which is placed in 700 shopping centers in the country;
- It entered into a partnership for an application that provides financial services known as "OY" with a view to make it easier for zakat payers to assist the poor and the needy in Indonesia;
- In 2019, it collaborated with GoPay for the creation of an online payment service called "GoZakat" that allows digital payment of zakat and;
- Now partnering with Monster AR for launching an android-based application known as "Augmented Reality".

Second, waqf is another strong instrument that needs to be revitalized in order to enhance the socio-economic development of the ummah during the COVID-19 pandemic. In this case, the most important form of waqf to utilize is cash waqf, more especially for reviving the going concerns of micro, small and medium enterprises (MSMEs). Many Islamic nations like Malaysia, Indonesia, Bangladesh and Pakistan have been using cash waqf to help SMEs for eradicating poverty and economic growth and development [18]. [15] provides what should be used with cash waqf fund as follows:

- To apply *mudarabah* in supporting the existing MSMEs that are negatively affected by the COVID-19 pandemic but need additional capital;
- To finance the procurement of raw materials or equipment production for the sustainable operations of MSMEs through *murabahah*;
- To pay profit margin for Islamic contracts entered by MSMEs with Islamic microfinance.
  In other words, the return on cash waqf would be used to pay the share of profit due to Islamic microfinance, so that the MSMEs would only pay the principal amounts like *qard hasan*.

- To finance the development of MSMEs online businesses in order to maintain physical distancing and a new normal era.

Third, according to [14], zakat and other charitable funds (including *waqf*, *sadaqat*, etc.) could be used for the following purposes:

- To afford entrepreneurship training for MSMEs to improve their capability *hibah* or *qard al-hasan*, particularly to micro-entrepreneurs;
- To offer capital for MSMEs when the training is completed based on *hibah* or *qard al- hasan*;
- To offer and satisfy basic needs "sembako" for the sustainability of MSMEs, particularly for the revival of micro-enterprises that have been negatively affected by the COVID-19 pandemic;
- To stimulate the repayment of debts by MSMEs, especially micro-businesses indebted to Islamic financial institutions, cooperatives or IFIs and;
- Using other charitable donations, such as *sadaqat* and *infaq*, as reserve funds in order to pay staff salaries, utilities, rents, etc. The funds could also be used to meet contingency needs, like losses from *mudarabah and musharakah*.

Moreover, *sadaqat* (voluntary donations) and *qard-alhasan* (benevolent loan) can be used to discharge similar functions with zakat *and* waqf by assisting the victims of the consequences of the COVID-19 pandemic. There are numerous beneficiaries of Islamic social finance. Basically, those that are eligible to receive zakat, as mentioned in the Noble Qurán, include the poor and the needy, zakat administrators, slaves or captives, people in debts, in the cause of Allah and wayfarers. These people are often the beneficiaries of waqf and *sadaqat*.

Considering the damage caused by the pandemic to the Nigerian populace, these Islamic social finance instruments should be used to reduce its impact, particularly through the provision of basic needs that include foods, health, education and other basic social amenities. Currently, there are many people in different locations of Nigeria that urgently need to be provided with these basic needs not only because of the COVID-19 pandemic but also due to insecurity. However, provision of these needs cannot sustainably mitigate the effects of the COVID-19 pandemic. However, revival of micro, small and medium enterprises (MSMEs) is expected to play a significant role in achieving sustainable socio-economic development as well as economic growth and development. Therefore, financing the operations of MSMEs with Islamic social finance funds is expected to provide solutions to the consequences of the COVID-19 pandemic.

It is vital to note that part of the generated funds should be used to support the provision of security in the country, particularly in the places affected by banditry and Boko haram activities. This is because overcoming security challenges in Nigeria is a requirement for the successful utilization of Islamic social finance instruments for socio-economic and religious development. In other words, solving Nigerian security challenges is expected to restore agricultural and commercial activities in Nigeria which is certainly going to contribute significantly to mitigating the consequences of the COVID-91 pandemic and solving other problems of Nigeria.

5   The Benefits of the Digitalization of Islamic Social Finance Institutions in Nigeria

Fintech can be infused into Islamic finance products and services to achieve optimal customer experience, cost reduction, operational efficiency, transparency, consistency, fairness and equitable treatment among different customer groups [9]. More specifically, the use of fintech platforms could facilitate the efficient and effective collections and disbursements of Islamic social finance funds. The collection and distribution of funds generated through Islamic finance instruments are susceptible to fraudulent activities, which make them ineffective. [20] recommended the application of blockchain technology to ensure that actual charitable donations and government aids are paid directly into the dedicated accounts as well as approved amounts paid to qualified beneficiaries. Hence, the BAZNAS created a blockchain technological application called i-zakat as well as digitization to develop zakat beneficiary identification numbers to facilitate distributed zakat funds [12]. Blockchain is a decentralized distributed ledger used to maintain financial transaction records and can be used in the provision of financial services like zakat, *qardh-al-hasan,* P2P lending and *mudarabah* [7, 21]. This technology can be applied by zakat institutions for storing a complete set of data for zakat payers and beneficiaries with a view to compiling their various distributions [12]. Similarly, the use of the direct payment of charitable donations or government aids through bank account and mobile payment with the aid of blockchain can minimize the incidence of fraudulent activities in collecting and distributing such funds in cash and enhance financial inclusion [20]. The application of the Islamic-based crowdfunding platform model is anticipated to provide solutions to the current problems faced by MSMEs because of the negative impact of the pandemic [14].

Going by the above general benefits, the beneficiaries of Islamic social finance funds in Nigeria could be broadly divided into three, Islamic social finance institutions, businesses and vulnerable people. First, it will be of great help to Islamic social finance institutions in discharging their duties, particularly in revitalizing zakat and waqf in such a way as that ensure the collection are maximized and disbursed to eligible beneficiaries. As obtainable in Indonesia, various technological applications would be utilized for collections as well as selection and payment to qualified beneficiaries. The use of blockchain technology allows all forms of fraudulent activities to be detected and prevented. Second, Islamic fintech provides platforms that allow Nigerian businesses, particularly MSMEs, to get access to cheaper finance without any delay. For long (before the emergence of the COVID-19), financial constraint was the major challenge faced by MSMEs across the globe as established by the literature.

The emergence of Islamic fintech has provided solutions to the financial challenges to many MSMEs in the world.

In fact, as earlier mentioned, many developed Muslim minority countries, such as the US, the UK and France, among others, have Islamic fintech companies that provide financial support to their MSMEs. Another key benefit of Islamic tech is risk-sharing. The Shariáh allows risk-sharing but prohibits risk transfer [9]. However, in the conventional practice risk is normally transferred to the borrower. Therefore, Nigerian

MSMEs will be more willing to access funds through Islamic fintech firms than their conven tional counterparts.

Third, Islamic fintech can serve as an efficient and effective instrument of helping the people that become vulnerable to the COVID-19 pandemic, who are mostly the poor and the needy. During the lockdown period, many cases of fraud and irregularities were witnessed during the distribution of palliatives and financial assistance provided by the Federal Government of Nigeria to state Governors for distribution among the poor and the needy in their respective states. The Governors were also accused of giving financial assistance to their political allies and supporters and left many of the most deserving beneficiaries to continue surviving in misery.

6 Conclusion and Recommendations

Considering the notable contributions of Islamic social finance instruments to poverty alleviation in some Muslim-dominated countries, this study seeks to provide ways of revitalizing such instruments in Nigeria, particularly by integrating zakat and waqf institutions with fintech in order to provide long-lasting solutions to the socio-economic crises caused by the COVID-19 pandemic. The study shows various technological applications that will assist in the administration, collection and distributions of Islamic social finance funds efficiently and effectively.

However, in order to successfully revitalize Islamic social finance through the adoption of fintech, certain measures need to be taken by adapting the best practices from Indonesia, Malaysia, U.A.E, etc. Specifically, at least five measures have to be considered and carefully implemented. First, the appointment into the boards and committees of zakat and waqf institutions should be strictly based on integrity and competency. Political interference in the appointment and performance of administrative responsibilities should be minimized to the barest minimum. This is achievable through enacting laws make these institutions truly independent. Second, there is the need to create massive awareness and knowledge of Islamic social finance instruments in order to motivate zakat payers and waqf and *sadaqat* donors to contribute maximally as well as educate and motivate the beneficiaries on better ways of utilizing funds given to them. Third, policies and regulations should be provided to provide an enabling environment for efficient and efficient operations of Islamic fintech companies. Fourth, awareness and knowledge of the relevant technological applications should be promoted. Fifth, zakat and waqf institutions should be fully integrated with Islamic microfinance in order to assist MSMEs. These recommendations are implementable in the country, as it now has an independent Ministry called "Ministry of Communications and Digital Economy", which has various agencies that are committed to transforming the country into a fully digital economy.

References

1. Abubakar, A.M.: Towards an effective investment in waqf properties in Nigeria. In: Proceeding of the International Conference on Masjid, Zakat & Waqf (IMAF 2014) (2014)

2. Ahmad, M.: An empirical study of the challenges facing zakat and waqf institutions in northern Nigeria. ISRA Int. J. Islamic Finan. **11**(2), 338–356 (2019). https://doi.org/10.1108/IJIF-04-2018-0044

3. Ali, H., Abdullah, R., Zaini, M.Z.: Fintech and its potential impact on Islamic banking and finance industry: a case study of Brunei Darussalam and Malaysia. Int. J. Islamic Econ. Finan. **1**(2), 73–108 (2019). https://doi.org/10.18196/ijief.2116

4. Alansari, Y., Al-Sartawi, A.: IT governance and e-banking in GCC listed banks. Procedia Comput. Sci. **183**, 844–848 (2021)

5. Azman, N.H.N., Masron, T.A., Ibrahim, H.: The significance of Islamic social finance in stabilizing income for micro-entrepreneurs during the COVID-19 outbreak. J. Islamic Monetary Econ. Finan. **7**(1), 115–136 (2021). https://doi.org/10.21098/jimf.v7i0.1307

6. Dubai Islamic Economy Development Centre (DIEDC), Islamic fintech report 2018 (2018). https://www.dinarstandard.com/wp-content/uploads/2018/12/Islamic-Fintech-Report-2018.pdf. Accessed 20 May 2021

7. Farouk, A.U., Idris, K., Saad, R.A.J.: The challenges of zakat management: a case of Kano state, Nigeria. Asian J. Multi. Stud. **5**(7), 142–147 (2017)

8. Hassan, M.K., Rabbani, M.R., Ali, M.A.M.: Challenges for the Islamic finance and banking in post COVID era and the role of fintech. J. Econ. Cooperation Dev. **41**(3), 93–116 (2020)

9. Lajis, S.M.: Fintech and risk-sharing: a catalyst for Islamic finance. In: Zulkhibri, M., Abdul Manap, T.A. (eds.) Islamic Finance, Risk-Sharing and Macroeconomic Stability, pp. 237–254. Springer, Cham (2019). https://doi.org/10.1007/978-3-030-05225-6_12

10. Mustafa, D., Baita, A.J., Adhama, H.D.: Quantitative economic evaluation of zakah- poverty nexus in Kano state, Nigeria. Int. J. Islamic Econ. Finan. **3**(1), 21–50 (2020). https://doi.org/10.18196/ijief.2120

11. National Bureau of Statistics, Foreigntrade statistics, Q1 2021 (2021). https://nigerianstat.gov.ng/elibrary?page=2&offset=10. Accessed 22 Jun 2021

12. Ninglasari, S.Y., Muhammad, M.: Zakat digitalization: effectiveness of zakat management in the COVID-19 pandemic era. J. Islamic Econ. Laws **4**(1), 26–44 (2021)

13. Onyekwena, C., Ekeruche, M.A.: Understanding the impact of the COVID-19 outbreak on the Nigerian economy, Africa in Focus (2020). https://www.brookings.edu/blog/africa-in-focus/2020/04/08/understanding-the-impact-of-the-covid-19-outbreak-on-the-nigerian-economy/. Accessed 15 May 2021

14. Saad, R.A.J., Farouk, A.U.: A comprehensive review of barriers to a functional zakat system in Nigeria: what needs to be done ? Int. J. Ethics Syst. **35**(1), 24–42 (2019). https://doi.org/10.1108/IJOES-06-2018-0090

15. Sulaeman, S.: A conceptual and empirical study on the development of the Islamic donation-based crowdfunding platform model for micro small and medium-sized enterprises (MSMEs) in times of COVID-19 pandemic in Indonesia. Asian J. Islamic Manage. **2**(2), 107–122 (2020). https://doi.org/10.1108/AJIM.vol2.iss2.art4

16. Umar, U.H., Abubakar, M.: Maximizing zakat revenues in the COVID-19 period: the need for creating zakat accounting standards in OIC member countries. Int. J. Zakat **6**(2), 63–74 (2021)

17. Umar, U.H.: Integrating family waqf into an inheritable going concern business: an instrument for the sustainable welfare of exempted heirs. In: Ali, K.M., Hassan, M.K., Ali, A.E.E.S. (eds.) Revitalization of Waqf for Socio-Economic Development, Volume 2, pp. 67–87. Springer, Cham (2019). https://doi.org/10.1007/978-3-030-18449-0_4

18. Umar, U.H.: Adapting the Al Rajhi Waqf model to mitigate the impact of covid-19 on the Ummah: a lesson to Muslim philanthropists. In: Hassan, M.K., Muneeza, A., Sarea, A.M. (eds.), COVID-19 and Islamic Social Finance, Routledge (2021)

19. Umar, U.H., Abubakar, M., Sharifai, I.I.: Why does business zakat contribute insignificantly to achieving 'SDG-1: ending poverty' in Nigeria? Evidence from recordkeeping practices. In: Billah, M.M. (ed.), Islamic Wealth and the SDGs, Palgrave Macmillan (2021). https://doi.org/10.1007/978-3-030-65313-2_11
20. World Bank, Leveraging Islamic fintech to improve financial inclusion (2020). https://openknowledge.worldbank.org/handle/10986/34520. Accessed 18 May 2021
21. Zubaidah, S., Afifah, A.: Development of zakat management digitalization in Indonesia. In: 4th International Conference of Zakat (ICONZ), 7–8 October 2020, Surabaya, Indonesia (2020). https://doi.org/10.37706/iconz.2020.227

Behavioral and Non-behavioral Factors and the Level of Adapting and Implementing Fintech and E-Banking in Bahrain: Suggested Model

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Abstract. The Adaptation of Fintech and E-banking is feasible; however, the older generations will need more time to adjust to the rapid changes as the future of finance is Fintech and E-banking. To fully optimize their potential benefits, they must be accepted by the population. With current speculations and the rise of cybercrimes, it has become harder to accept any new technology. Consumers are encouraged to accept this technology due to the government's efforts in providing protection against such attacks. Depending on the previous literature, the current study suggested a model that can be used to analyze the most behavioral and non-behavioral factors that can affect the level of adapting and implementing fintech and e-banking in Bahrain. The study recommends that more studies must be conducted about Fintech, to increase the awareness of the society about the advantage and disadvantages of such technology, to develop academic programs in financial technology to graduate experts who can work in the field of Fintech in the future and develop guidelines for using the Fintech platforms.

Keywords: Fintech · E-banking · Cybercrimes · Bahrain

1 Introduction

In the age of modern technology, the world has been on the lookout for the best technological gadgets. This has made a significant contribution to strengthening the economy while providing excellent services to consumers and corporations [1]. "FinTech" is the present depiction of an elevated facility that strives to facilitate the quality of financial ease through an automatic and simple method with established capabilities. These capabilities reduce the expense, exhaustion, and time spent previously [16]. The use of financial innovations assists organizations, organizations, entrepreneurs, banks, and customers in monitoring financial objectives through calculations that are performed automatically and monitored by softwares and virtual tunnels. Technology allows customers to obtain data from the financial sectors at any

time, from anywhere. Furthermore, FinTech has gained in popularity over the recent years, and was originally applied to technology employed in financial institution back-end frameworks. The emergence of mobile phones ushered in a new era of FinTech development and growth. Due to the significant hesitation of customers, conventional brokers started to build online databases to adapt to the unprecedented progress in financial technology [12, 13, 15, 22]. This is true for financial firms that, due to time and effort constraints, do not offer modern financial technology. Aside from that, FinTech is now one of the most lucrative businesses on the planet [6, 7].

Recently, most of our monetary transactions are automated. One of the famous lines followed in the Kingdom of Bahrain is "BenefitPay". BenefitPay resembles the integration of e-banking and fintech amongst our population.

E-banking and Fintech are the future of the Banking and Finance world [5]. Soon enough, all transactions will be electronic, and the use of actual money will disappear. Hence, the population should be ready to accept and use electronic banking. During this era of pandemic, many people had to adapt to the use of electronic banking through mobile phone applications or computer websites. Some age groups might have a difficult time adjusting to the new way of banking. [16]. Moreover, a significant difference in the adoption of this new technology is noticed between the millennials, generation X, and generation Z. Misconceptions and speculations about cybersecurity play a major role in the acceptance and adoption of E-banking and Fintech amongst the older generations [9, 30]. Fear of the lack of security amongst boomers has significantly slowed down the growth of Fintech and E-banking. This has caused an issue with the level of integration amongst the population [3].

Furthermore, the adoption of Fintech and E-banking is feasible, however, the older generations will need more time to adjust to the rapid changes as the future of finance is Fintech and E-banking. To fully optimize their potential benefits, they must be accepted by the population. With current speculations and rise of cybercrimes, it has become harder to accept any new technology. Consumers are encouraged to accept this technology due to the government's efforts in providing protection against such attacks [19]. According to the information gathered and the researchers conducted on the same topic, the main domain affecting the implementation and adaptation of those services are the changing variables Examples of those variables are, legal risk, economic growth, day-to-day transactions, the type of education (e-learning) convenience and much more. [18, 23].

This research adds to the growing body of knowledge in several ways. There is no evidence of studies on the adaptation of E-banking and Fintech within the population in the Kingdom of Bahrain. Nevertheless, there is evidence of studies done from the financial institutions' point of view [17]. Moreover, it is crucial to revisit the factors that influence the adaptation of Fintech and E-banking. This research casts an additional line to future research. It is beneficial to any future research. Banks in the Kingdom of Bahrain have currently started the implementation process of FinTech applications, and such study can help them to identify the main factors that could affect the acceptance of the financial technology.

2   Literature Review

Various international studies on FinTech adaptation in the banking industry have been conducted throughout the past years, with several of the studies taking place in the United States, the United Kingdom, and other nations [27]. Fintech is an acronym for (financial) And (technology). It's a relatively a new phrase used to refer almost to whatever digital software that provides consumers or financial institutions to give increasingly new solutions to financial companies using the newest technology developments in sophisticated ways that are faster than before and it is considered as part of the companies' social responsibility toward the society especially with the uncertain circumstances in the crisis's times [2, 10]. The idea of Fintech outcomes is approaching a bank and requesting a demo balance statement, and then being capable of pulling the data into the client's mobile in instantaneously [27]. Fintech is also a term that describes and defines financial technology, which is a sector that applies a business-to-consumer system in any form of financial innovation. Fintech refers to a business that offers financial products through software and technology [4, 24].

[20] added that fintech allows people to take control of their financial lives, leading in far more financial options than previously available. Fintech utilises tools to assist people better their financial situation and accomplishments, building on standard finance college experience. In addition, the Fintech ideology combines financial institutions with cutting-edge digital and technological — operations, as well as conceptual data — to improve financial and banking services and bring them in line with modern technologies. According to [21], Fintech was being used as a strategic tool by many banks around the world, ranging from mobile payment applications to consumer banks online platforms. Furthermore, by combining cutting-edge innovation with financial services, Fintech has aided industries and provided various benefits that mainly challenge the industry while also providing better financial products to businesses and consumers [12, 13, 15, 16] states that e-banking allows consumers to conduct transactions in a much more convenient way as to going towards traditional ways of banking. A huge transaction or deposit can be made online nowadays. This means that trade is easier and reachable in a click of a button.

Fintech increases a bank's efficiency and productivity by allowing current customers to benefit from improved convenience with a single button purchase. Nonetheless, in comparison to conventional banking systems, online banking technologies expose banks to a wide range of risks and expectations. There are many dangers associated with using online financial services. Its ability to extend an organism's overall threat profile and the levels of risk linked to specific financial, strategic, operational, reputational, and legal liability sets it apart [5, 8].

Banks use E-channels to conduct business with both local and international customers. Electronic platforms are commonly used by financial firms to receive guidance and to provide goods and services to the consumers. While there is a broad range of products in the range of services provided by financial institutions via their internet-based platforms, the essence of financial risk can differ. New computer manipulation technologies by cybercriminals affiliated with organized crime have developed. Deposits, lending, customer support, monetary equipment arrangement, electronic

payment, and requirement for other services and goods, such as electronic currency, are examples of such commodities, services, and other facilities [28].

Numerous Fintech companies interact with their clients using sophisticated and virtual platforms that are available via web browsers and mobile applications such as Android devices. For construction and management, these systems depend on comprehensive information technology and data analysis tools. Although these innovations are still commonly used by a broad segment of society, computer learning, cloud services, and data gathering are the most current technologies that endorse the philosophy and idea of Fintech services [25, 29].

The following information and findings are based on how this chapter is structured: The first section examines the process of formulating the hypothesis. The sample size is discussed in the second part. Finally, in the third section the model's evolution is explained. Altogether, the research of study approach is based on a comprehensive literature analysis, after which the researcher used a list based of past studies to develop the conceptual framework and survey questions.

3   Suggested Model

As per the literature revied for e.g. [5, 13–16, 19–21, 27, 29] the authors suggested to conduct future studies to analyze the relation between behavioral factors and non-behavioral factors and the level of adoption the FinTech and e-banking in Bahrain. Figure number one shows the independent and dependent variables can be included in such model (Fig. 1).
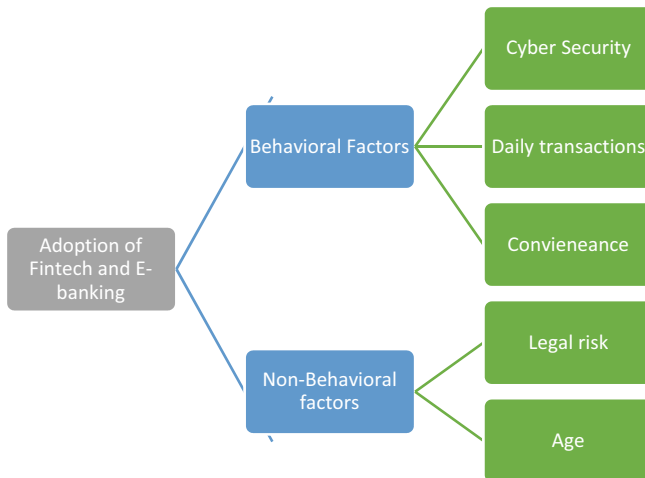
Fig. 1. Developed by the authors

4   Conclusion and Recommendations

The development of a media resources to assemble on is being aided by the sophisticated internet generation and MENA's extensive ICT infrastructure. Nevertheless, FinTech applications in areas such as e-commerce, online services, secure transactions, and payment methods have helped to boost the finance sector's coherence [17]. Fintech and E-banking are the future and more studies should be conducted in Bahrain. This but one study of only a few that might be helpful for future references. The economic cost of the GCC region's delayed implementation and acceptance of Fintech and E-banking is higher. According to [26], this has reflected in a smaller number of reliable studies to support future and present investigations. The work has the potential to add to future research and provide fresh information to previous investigations. E-banking, according to [11], should be any sort of technology innovation within the financial sector, which includes ATMs and mobile banking apps. E-banking covers a wide range of topics, including electronic payroll deposits. This means that depositing payrolls does not require a trip to the bank; instead, it can be done through the online bank's mediators.

Accordingly, the researchers recommend conducting more studies about the need of financial technology, to increase the awareness of the society about the advantage and disadvantages of such technology, to develop academic programs in financial technology to graduate experts who can work in the field of Fintech in future and to develop guidelines for using the Fintech platforms.

References

1. CBB, F.: FinTech & Innovation, CBB (2021). Cbb.gov.bh. https://www.cbb.gov.bh/fintech/. Accessed 9 Mar 2021
2. Sofia, 26 FinTech Copanies Powering Institutional Investments and Trading, Let's Talk Payments (2016). 26 Feb 2016. Accessed 24 Mar 2021
3. Mohannad, A.D., Samer, A., Sharif, K.: Fintech in the eyes of millennials and generation Z (the financial behavior and Fintech perception). Banks Bank Syst. **15**, 20–28 (2020). https://doi.org/10.21511/bbs.15(3).2020.03
4. Yuen, Y.Y., Yeow, H.P., Lim, N.: Internet banking acceptance in the United State and Malaysia: cross cultural examination. Mark. Intell. Plan. **28**(3), 443–448 (2015)
5. Alansari, Y., Al-Sartawi, A.: IT governance and E-banking in GCC listed banks. Procedia Comput. Sci. **183**, 844–848 (2021)
6. Afshan, S., Sharif, A., Frooghi, R., Nazneen, D.-S.: Internet banking in Pakistan: an extended technology acceptance perspective. Int. J. Bus. Inf. Syst. **2**, 223–254 (2018). https://doi.org/10.1504/IJBIS.2018.089863
7. Musleh Al-Sartawi, A.M.A. (ed.): The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. SCI, vol. 974. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-73057-4
8. Azouzi, D.: The adoption of electronic banking in Tunisia: an exploratory study. J. Internet Bank. Commer. **14**(3), 1–11 (2009)

9. Bridging the Cybersecurity Skills Gap Safeguards Critical Assets: Cybersecurity expert explores the cybersecurity skills gap and ways to broaden cybersecurity knowledge and benefit from automation–in a new article from Messaging Architects, New York (2021)
10. Al-Sartawi, A.: Does it pay to be socially responsible? empirical evidence from the GCC countries. Int. J. Law Manage. **62**(5), 381–394 (2020)
11. Britannica, T.: Editors of Encyclopaedia, Electronic banking. Encyclopedia Britannica (11 Nov 2016). https://www.britannica.com/topic/electronic-banking
12. Chauhan, N., Tekta, P.: Fraud detection and verification system for online transactions: a brief overview. Int. J. Electron. Bank. **2**(4), 267–274 (2020)
13. Shihadeh, F.: Online payment services and individuals' behaviour: new evidence from the MENAP. Int. J. Electron. Bank. **2**(4), 275–282 (2020)
14. Chayjan, M.R., Bagheri, T., Kianian, A., Someh, N.G.: Using data mining for prediction of retail banking customer's churn behaviour. Int. J. Electron. Bank. **2**(4), 303–320 (2020)
15. Memdani, L.: Demonetisation: a move towards cashless economy in India. Int. J. Electron. Bank. **2**(3), 205–211 (2020)
16. Business Jargons. What is E-banking? definition, services and benefits - Business Jargons (2021). https://businessjargons.com/e-banking.html. Accessed 9 Jun 2021
17. CBB, C.: Central Bank of Bahrain (2018). Cbb.gov.bh. https://www.cbb.gov.bh/. Accessed 16 Jun 2021
18. Musleh Al-Sartawi A.M.A.: E-Learning improves accounting education: case of the higher education sector of Bahrain. In: Themistocleous M., Papadaki M., Kamal M.M. (eds.) Information Systems. EMCIS 2020. Lecture Notes in Business Information Processing, vol. 402, pp. 301–315. Springer, Cham https://doi.org/10.1007/978-3-030-63396-7_20
19. Coetzee, J.: Risk aversion and the adoption of fintech by South African Banks. African J. Bus. Econ. Res. **14**(4), 133–153 (2019). https://doi.org/10.31920/1750-4562/2019/14n4a6
20. Hochstein, M.: Fintech (the Word, That Is) Evolve s (2015). Accessed 20 Mar 2021
21. Juwaheer, T.D., Pudaruth, S., Ramdin, P.: Factors influencing the adoption of internet banking-a case study of commercial bank in Mauritius. World J. Sci. Technol. Sustain. Dev. **9**(3), 204–234 (2012)
22. Sanad, Z., Al-Sartawi, A.: Financial statements fraud and data mining: a review. In: Musleh Al-Sartawi, A.M.A., Razzaque, A., Kamal, M.M. (eds.) EAMMIS 2021. LNNS, vol. 239, pp. 407–414. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-77246-8_38
23. Mohammad, A., Raid, A.A.: The factors affecting the use of e-banking services from the customers point of view: a field study in the Jordanian Southern Region. Jordan J. Bus. Adm. **12** (2016)
24. Musleh Al-Sartawi, A.M.A., Razzaque, A., Kamal, M.M. (eds.): EAMMIS 2021. LNNS, vol. 239. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-77246-8
25. Mackenzie, A.: The fintech revolution. London Bus. School Rev **26**(3), 50–53 (2015)
26. Vives, X.: The impact of fintech on banking. Eur. Econ. **2**, 97–105 (2017)
27. Hannoon, A., Al-Sartawi, A.M.A.M., Khalid, A.A.: Relationship between financial technology and financial performance. In: Musleh Al-Sartawi, A.M.A. (ed.) The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. SCI, vol. 974, pp. 337–344. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-73057-4_26
28. Xie, P., Zou, C.: The theory of internet finance. China Econ **8**(2), 1–15 (2013)
29. Karolak, M., Razzaque, A., Al-Sartawi, A.: E-services and M-services Using IoT: an assessment of the Kingdom of Bahrain. In: Musleh Al-Sartawi, A.M.A., Razzaque, A., Kamal, M.M. (eds.) EAMMIS 2021. LNNS, vol. 239, pp. 523–533. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-77246-8_48
30. Al-Sartawi, A.: Information technology governance and cybersecurity at the board level. Int. J. Crit. Infrastruct. **16**(2), 150–161 (2020)

Financial Technology: Literature Review Paper

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Abstract. The demand for financial technologies has increased in the last few years. The most impacted sectors are the financial institutions, which are leading the trend. However, due to not using financial data in most of the previous literature still, we are not sure enough about how financial technology will reshape and improve the performance of financial institutions. The aim of this paper is to critically review the previous studies that discussed financial technology. Besides, the study highlights the gaps in the literature and suggests future studies.

Keywords: Financial technologies · Financial institution · Financial performance · Banks

1 Introduction

Financial technology considered as the incorporation of technology in the financial sector [3]. According to the author, humans are often unaware of Fintech, yet they apply it in their daily lives through online banking, through online games, through online purchases, and much more. The author further states that Fintech is also widely used by companies to make payments, for artificial intelligence, and in processing big data. The Fintech concept has been widely used yet unknown to many users [1, 2]. For instance, the Bitcoin concept is not a new phenomenon. Less than a few years ago, the cryptocurrency became a buzzword in world, where the idea of virtual cash and virtual cash. Financial institutions have also adopted blockchain, where corporations use a network of computers to secure their data [4, 5].

The Fintech concept has a significant effect on financial institutions. For instance, banks have continued to embrace Fintech as digital transformation continues to swipe across the world. The banking experience has now shifted from traditional banking to modern banking characterized by the incorporation of the Fintech concept. As technological innovation continues to gain popularity, financial institutions have incorporated the use of the internet to facilitate digital transactions [6–9]. Consumers have also positively embraced Fintech because of the level of convenience associated with it. Another emerging trend in the global business sphere is the storage of business data.

Modern organizations continue to have large amounts of information captured to enhance marketing, research, and to facilitate payment processes. These corporations can securely facilitate storage of information by incorporating Fintech to help in data storage. Financial institutions have now embraced cloud-based technology to secure files [2, 10]. A lot of institutions have positively incorporated Fintech and have had a significant financial performance [2].

2 Literature

The term Fintech has been a buzzword in the 21st century, but it has a long history. According to the *International Journal of Innovation, Management, and Technology* the first use of Fintech was in the 1950s [2, 10, 11]. The authors suggest that early scholars had predicted Fintech to control the future of money, especially in the financial sector. With increasing innovation around the world, the financial industry has not been left behind [12, 13]. In the modern-day banks, Fintech is a central concept, used to facilitate the transaction to increase the efficiency of banks. For instance, banks in the modern world use Fintech to facilitate online transactions with the help of applications. There has also been a reduction in the banking halls because customers can access their information via the website or through the bank's portal [14, 15]. The administration costs have also been significantly reduced as banks nowadays process staff payments using digital means as opposed to the manual procedures, which was time-consuming. The authors conclude that with Fintech, customers can transact remotely without the need to visit the financial institutions. That trend has significantly improved the financial performance of the institutions, bringing a significant revolution in the banking sector [16, 17].

In the book Future of Fintech [1] the authors document that the Fintech concept began in the 1950s through the introduction of credit cards, though it was unknown to many. Credit cards became popular in the 1960s when ATMs became so popular that nearly all banks struggled to ensure their availability. According to the authors, Fintech was even more apparent in the 1980s when the concept of stock exchange gained momentum. With the introduction of the internet in the 1990s, Fintech established a permanent base because, through websites, customers could easily engage in online transactions. The book suggests that Fintech allowed banks in use in the early 2000s to engage in internet banking. Banks across the globe immediately replicated the trend, making Fintech effective in shaping the future of financial institutions.

A report from the *Technical Bureau of Economic Research* [5] attempted to examine the effect of excessive regulation on Fintech application by the banks. The study had an empirical analysis of the banks and found that Fintech has the potential to shape the banking sector if used appropriately. However, excess regulations from the government make Fintech ineffective. According to the report, Fintech accounted for 30% of bank growth because of the economic transformations seen in the banking sector. The main conclusions from the report were: 1) Fintech can make the financial industry grow and improve their financial positions, 2) Government regulations tend to affect Fintech prevalence in financial institutions 3) Fintech is the critical driver of

success in most startups. From the report, it is apparent that Fintech plays a significant role in shaping the financial industry.

Many researchers how Fintech has shaped the crowdfunding sphere [16, 19–21], the authors wrote that Fintech utilizes new aspects of the technology, hence has shaped the crowdfunding sphere. But one startling finding from the study is that excessive regulation from state agencies tends to hinder Fintech's value in crowdfunding. However, a positive outcome from the study was that Fintech is evolving daily, and in the future, the system will be smarter and faster, hence transform the financial sector.

[14] attempted to investigate the impact of using Fintech by financial institutions to access the creditworthiness of the customers. One empirical finding from the study was that Fintech has a positive effect on screening customers who desire loans from banks. The study predicted that in the future of banking, the lender would use borrower's soft information to determine their creditworthiness. Fintech can only facilitate this delicate information and produce effective results if used appropriately.

Staff discussion paper analyzed the impact of Fintech on the central bank of Canada. From the discussion, the authors [12] found that even the central bank applies the Fintech concept unknowingly. The study used the Central Bank of Canada as an example and found that it was changing its payment mechanisms from traditional currencies to the digital society. According to the discussion, the move was welcomed because it was likely to make the society to become cashless. One advantage of digital currency, according to the discussion, is that it reduces fraud and other financial crimes since it eliminates the usage of real money. As a result, the study suggests that the central bank should begin utilizing digital currency early enough to improve the efficiency of the government's intervention in controlling the flow of money. Further, advantages of digital currencies, according to the study, are that it reduces the costs and complexity entailed in transactions. The authors suggest that digital currency cannot be counterfeited, and operations tend to have a high level of anonymity. Another reason for the popularity of the digital currency in central banks is that it helps to facilitate transactions at any place and not bound to exchange rates or interest rates.

[8] argued against the integration of Fintech by the central banks, arguing that the risks would surpass the benefits. In the book, the future of finance and the outlook for regulation, the author argues that the creation of digital currency by a central bank would be disruptive once it is open to all citizens. The author believes that Fintech is likely to be beneficial but disruptive on the same measure. The author suggests that digital currency is expected to lead to reductions in interest rates and taxes.

Authors of [23–26] discussed how Fintech application and other technological applications can impact the performance. The authors categorized the Fintech innovations to costumers toward applications and back-office operations.

Fintech enhanced the way of dealing with customers and enhanced the performance. Accordingly, such features can enhance business, improving scalability, improving standards of development, and facilitating data management. Moreover, Fintech technology could be used for information management, incorporating financial designs, and reduction of challenges of business management such as legal compliance and financial risks [27–32].

[2] attempted to evaluate the economic impact of Fintech companies on the traditional banking sector and possible future scenarios. One finding from the study is that

Fintech has some significant financial implications, especially in the finance field. According to the author, humans can use Fintech in sophisticated information processing in the field of finance. The author suggests that humans can continuously use Fintech to allocate resources to productive areas. The author believes that this trend would, in turn, serve as a driving force for humans, leading to significant economic transformation.

[22] another author attempted to evaluate the impact of Fintech on Islamic Finance and Financial stability. The author documents in the book that Fintech has enhanced the efficiency of finance in Islamic banks, leading to improved financial stability. The author believes that if Fintech is continuously used, it will contribute to economic development in the long run. The author suggests a positive relationship between Fintech and the financial performance of medium and large institutions. According to the author, if financial institutions gain access to Fintech at the initial stage, they are likely to expand the business through the incorporation of e-commerce. In this manner, the author believes that Fintech can positively contribute to economic development. However, the author suggests that Fintech can only be effective if appropriate resources are in place. Fintech is more prominent in developed countries where there is widespread infrastructural development.

Many authors try to evaluate the implications of Fintech in the 21st century for e.g. [19, 31–37]. They conclude that Fintech can positively stimulate economic transactions through the incorporation of the internet and smartphone use in businesses. The book predicts that in the late stages of the 21st century, companies might increasingly use Fintech to facilitate transactions. One example given by the authors is the popularity of block chain technology, which has already influenced the future of money. There is also the popularity of virtual currencies by central banks to change monetary policy.

[21] Investigated the effect of Fintech and how technology is transforming small businesses. According to the author, rapid financial expansion is a result of the application of Fintech, which can raise the growth potential. The author wrote that major companies such as those in the automobile, services, and banking sector could significantly benefit from Fintech. This author's notion suggests that Fintech has the potential to change the financial landscape of small and large businesses rapidly. For instance, the authors use the example of the banking sector, which traditionally relied on ledgers for financial transactions. But since the introduction of the underlying technology, the banking industry has transformed due to the emphasis put on Fintech. Nonetheless, the world expects more rapid innovation likely to shape Fintech and impact financial services. The author categorized Fintech development into three types. The first type is the block chain concept invented in 2008, which made Bitcoin become a buzzword. The second category is artificial intelligence using computing power to analyze big data. The third phase and most advanced is technological innovation, characterized by the invention of the smartphone, which made it easier for customers to access financial services.

According to the *Journal of Information Technology Services,* Fintech has also led to globalization in the financial sector. Fintech has led to the widespread use of cellphones and smartphones, which has led to the spread of trends from one country to another [26]. According to the authors, smartphones have penetrated both developed and developing countries, leading to general ideas. Further, the authors suggest that

Fintech may make financial services personal with a high degree of privacy because smartphones have a feature that can allow users to personalize their preferences. Using the smartphone concept, the authors unanimously agree that Fintech makes it possible for financial institutions to analyze the customer's needs and provide more customized services.

In the GCC region and the Arab region, Fintech is not a new phenomenon and has been explored and applied by financial institutions. For instance, most banks in GCC and other Arab countries utilize Fintech in their daily activities. Insurance firms also use Fintech through the incorporation of block chain technology to buy and sell insurance policies. Game companies also apply the Fintech concept, where gamers are allowed to play their favorite games after they subscribe to specific packages. X-BOX and PlayStation are the popular games that utilize Fintech to enable people to download the game in their smartphones and pay for their preferred packages. Although the research in Fintech still not enough and most of the studies are depending on exploring opinions rater than analyzing the impact of such technology on the economy or financial performance of financial institutions [21, 23, 25].

3   Conclusion

The demand for financial technologies has increased in the last few years. The most impacted sectors are the financial institutions, which are leading the trend. The study's focus was on reviewing the literature about financial technology especially the literature related to the banking sector. Most of the previous studies agreed that financial technology becomes a vital component in any future success for the financial institution and they must use it to enhance their performance. Moreover, regulators must develop guidelines and more clear regulations to control the way of using financial technology by the institutions and individuals.

Accordingly, the researchers recommended conducting further studies about financial technology using financial data to measure its impact on financial performance and the financial institutions to utilize more of the financial technology in their services to enhance their performance.

References

1. Bernardo, N., Weis, L.A.: Future of Fintech. Palgrave Macmillan, Basingstoke, UK (2017)
2. Hannoon, A., Al-Sartawi, A., Khalid, A.: Relationship between financial technology and financial performance. In: Musleh Al-Sartawi, A.M.A. (ed.) The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. SCI, vol. 974, pp. 337–344. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-73057-4_26
3. Browne, R.: Everything you've always wanted to know about Fintech (2017). https://www.cnbc.com/2017/10/02/fintech-everything-youve-always-wanted-to-know-about-financial-technology.html. Accessed 5 Dec 2019
4. Sanad, Z., Al-Sartawi, A.: Financial statements fraud and data mining: a review. In: Musleh Al-Sartawi, A.M.A., Razzaque, A., Kamal, M.M. (eds.) EAMMIS 2021. LNNS, vol. 239, pp. 407–414. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-77246-8_38

5. Buchak, M.G., Piskorski, T., Seru, A.: Fintech, regulatory arbitrage, and the rise of shadow banks. Technical Report, National Bureau of Economic Research (2017)
6. Musleh Al-Sartawi, A.M.A., Razzaque, A., Kamal, M.M. (eds.): EAMMIS 2021. LNNS, vol. 239. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-77246-8
7. Constˆancio, V.: The future of finance and the outlook for regulation. In: Remarks at the Financial Regulatory Outlook Conference, Rome, p. 64 (2017)
8. Al-Sartawi, A., Sanad, Z.: Institutional ownership and corporate governance: evidence from Bahrain. Afro-Asian J. Finan. Account. **9**(1), 101–115 (2019)
9. Dakdaki, M.: The Economic Impact of Fintech Companies on the Traditional Banking Sector and Possible Future Scenarios, 1 ed. (2017)
10. Fung, B., Halaburda, H.: Bank of Canada (2016). https://www.bankofcanada.ca/2016/11/staff-discussion-paper-2016-22/. Accessed 4 Dec 2019
11. Alansari, Y., Al-Sartawi, A.: IT governance and E-banking in GCC listed banks. Procedia Comput. Sci. **183**, 844–848 (2021)
12. Iyer, R., Ijaz Khwaja, A., Luttmer, E.F.P., Kelly, S.: 2009. https://papers.ssrn.com/sol3/. Accessed 4 Dec 2019
13. Al-Sartawi, A.: Information technology governance and cybersecurity at the board level. Int. J. Crit. Infrastruct. **16**(2), 150–161 (2020)
14. Lacasse, R.M., Lambert, B., Roy, N., Sylvain, J., Nadeau, F.: A digital Tsunami: fintech and crowdfunding. In: International Scientific Conference, pp. 4–6 (2016)
15. Hannoon, A., Abdalla, Y., Al-Sartawi, A., Khalid, A.: Board of directors composition and social media financial disclosure: the case of the United Arab Emirates. In: Musleh Al-Sartawi, A.M.A. (ed.) The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. SCI, vol. 974, pp. 229–241. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-73057-4_18
16. Leong, K., Sung, A.: FinTech (financial technology): what is it and how to use technologies to create business value in FinTech way? Int. J. Innov. Manage. Technol. **9**(2), 74–78 (2018)
17. Lynn, T., Mooney, J., Rosati, P., Cummins, M.: Disrupting Finance: FinTech and Strategy in the 21st Century, 1st edn. Springer, Cham (2018)
18. Al-Okaily, M., Lutfi, A., Alsaad, A., Taamneh, A., Alsyouf, A.: The determinants of digital payment systems' acceptance under cultural orientation differences: the case of uncertainty avoidance. Technol. Soc. **63**, 101367 (2020)
19. Mills, K.G.: Fintech, Small Business & the American Dream: How Technology is Transforming Lending and Shaping a New Era of Small Business Opportunity, 1st edn. Springer, Chem (2018)
20. Naifar, N.: Impact of Financial Technology (FinTech) on Islamic Finance and Financial Stability. IGI GLOBAL, Hershey (2019)
21. Musleh Al-Sartawi, A.M.A. (ed.): The big data-driven digital economy: artificial and computational intelligence. SCI, vol. 974. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-73057-4
22. Parlour, C.A., Uday, R., John, W.: Making Money: Commercial Banks, Liquidity Transformation, and the Payment System (2017). https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2892150. Accessed 4 Dec 2019
23. Musleh Al-Sartawi, A.M.A.: E-learning improves accounting education: case of the higher education sector of Bahrain. In: Themistocleous, M., Papadaki, M., Kamal, M.M. (eds.) EMCIS 2020. LNBIP, vol. 402, pp. 301–315. Springer, Cham (2020). https://doi.org/10.1007/978-3-030-63396-7_20
24. Youngkeun, J., Park, H.-Y., Chuhwan, P.: An analysis of economic effects of the fintech industry. J. Inf. Technol. Serv. **17**(1), 47–58 (2018)

25. Karolak, M., Razzaque, A., Al-Sartawi, A.: E-services and M-services Using IoT: an assessment of the Kingdom of Bahrain. In: Musleh Al-Sartawi, A.M.A., Razzaque, A., Kamal, M.M. (eds.) EAMMIS 2021. LNNS, vol. 239, pp. 523–533. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-77246-8_48

26. Qasim, H., Abu-Shanab, E.: Drivers of mobile payment acceptance: the impact of network externalities. Inf. Syst. Frontiers **18**(5), 1021–1034 (2016). https://doi.org/10.1007/s10796-015-9598-6

27. Al Shawwa, M.: The 2nd Electronic and Mobile Payments in the Arab World Conference - Presentation on the Jordan Retail Banking Survey and findings of the E & M Banking services [Video file] (2016). https://www.youtube.com/watch?v=WLeikg3AFA4

28. Al-Okaily, A., Abd Rahman, M.S., Al-Okaily, M., Ismail, W.N.S.W., Ali, A.: Measuring success of accounting information system: applying the DeLone and McLean model at the organizational level. J. Theor. Appl. Inf. **98**, 2697–2706 (2020)

29. Chauhan, N., Tekta, P.: Fraud detection and verification system for online transactions: a brief overview. Int. J. Electron. Banking **2**(4), 267–274 (2020)

30. Al-Okaily, A., Al-Okaily, M., Shiyyab, F., Masadah, W.: Accounting information system effectiveness from an organizational perspective. Manage. Sci. Lett. **10**(16), 3991–4000 (2020)

31. Chayjan, M.R., Bagheri, T., Kianian, A., Someh, N.G.: Using data mining for prediction of retail banking customer's churn behaviour. Int. J. Electron. Banking **2**(4), 303–320 (2020)

32. Al-Okaily, A., Al-Okaily, M., Ai Ping, T., Al-Mawali, H., Zaidan, H.: An empirical investigation of enterprise system user satisfaction antecedents in Jordanian commercial banks. Cogent Bus. Manage. **8**(1), 1918847 (2021)

33. Gupta, M., Sikarwar, T.S.: Modelling credit risk management and bank's profitability. In. J. Electron. Banking **2**(2), 170–183 (2020)

34. Al-Okaily, M., Alqudah, H., Matar, A., Lutfi, A., Taamneh, A.: Dataset on the acceptance of e-learning system among Universities students' under the COVID-19 Pandemic Conditions. Data Brief **32**, 106176 (2020)

35. Shihadeh, F.: Online payment services and individuals' behaviour: new evidence from the MENAP. Int. J. Electron. Banking **2**(4), 275–282 (2020)

36. Al-Qudah, A.A., Al-Okaily, M., Alqudah, H.: The relationship between social entrepreneurship and sustainable development from economic growth perspective: 15 'RCEP'countries. J. Sustainable Finan. Investment 1–18 (2021)

37. Memdani, L.: Demonetisation: a move towards cashless economy in India. Int. J. Electron. Banking **2**(3), 205–211 (2020)

Artificial Intelligence and Sustainable Technology

The Use of Artificial Intelligence in the Field of Electronic Commerce

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Abstract. The study aimed to identify the use of artificial intelligence applications, and their use to classify and analyze data, add a personal character to the way goods and services are presented in proportion to the users' desires, in addition to extracting and analyzing user reactions about goods and services, carrying out the inventory and planning process, and others.

The study also shed light on the advantages of using artificial intelligence applications, including the possibility of dispensing with routine work, obtaining information and results for analysis in record time, and helping to make marketing and strategic decisions.

Keyword: Artificial intelligence · Electronic commerce · Application

1 Introduction

Artificial intelligence systems have evolved and become one of the most important means and methods that help increasing the profit of electronic stores because of the features and benefits far from the human element also and during 2020 chatbots have become one of the most important sources of profit for e-commerce and thus have been relied upon in many works and design of electronic stores and shopping companies [9].

The size of the e-commerce market is $ 2 trillion, due to the large spread of online store design companies, and the artificial intelligence will push this number to a higher level [14].

Although the goal of creating and developing artificial intelligence is to surpass the human being in the implementation of his life and work and facilitate them to do them, it has become a powerful profit tool for today's electronic store owners who flock to apply smart tools and technologies to their stores, and to take advantage of the advantages of these various technologies in terms of studying user behavior [17], studying and analyzing the market and competitors, in addition to communicating with customers at any time, resulting in a large number of users coming to the store, increasing the percentage of purchases and increasing profits [3], as artificial intelligence ensures that customers enjoy an easier, faster and better shopping experience so that they enjoy shopping for the maximum limit, and the online store owner benefits from the profits as well [25].

Due to the tremendous development in information technology, including the e-commerce channel, and the tremendous growth in computing power, artificial

intelligence has now made its way towards strengthening the online retail sector, changing the way electronic retailers sell their products and services, and also the way customers buy [35]. Electronic retailers are becoming aware of the central and distinct role that artificial intelligence will play in the future, especially in achieving the best possible performance [16], and an active system has begun to develop innovative solutions for electronic retailers, integrating artificial intelligence in the entire value chain, marketing, logistics. Customer Relationships, and Innovative services [22].

This makes artificial intelligence a top investment priority for most companies in the e-commerce industry as it enables online retail giants to leverage the wonders of machine learning to meet the growing volume of customers. It gives businesses access to a wide range of structured data, which is then processed and analyzed to give online shoppers an enhanced and more personalized shopping experience [19].

2   The Benefits and Advantages that Accrue to Electronic Commerce as a Result of Applying Various Artificial Intelligence Tools and Techniques

1- **Predicting consumer buying behavior**
   Artificial intelligence allows you to set predictions about the goods that the customer may need in his next purchasing process, and all this is done based on analyzes and studies of this customer's behavior through his previous purchases or on the history of his product search. All these data and analyzes are very important and are She is expressly responsible for the success of achieving your business goals [15].

2- **Logistics management**
   Through the application of artificial intelligence techniques in online store, the customer can manage all logistical matters in terms of accepting shipments from users and sending orders to storage and packing places and then shipping companies, and also the artificial intelligence sets the dates for the delivery of shipments to the customer and tracks the shipments until they arrive, and when any change in appointments is responsible for informing the customer first [23].

3- **Data collection and analysis**
   Artificial intelligence tools and techniques help the customer to collect data for the audience and users of your online store and then study and analyze it for later use in creating advertising campaigns, in marketing campaigns, during the evaluation of the store's performance indicators, and many other things [27].

4- **Excellent customer service**
   The user is often exposed to the chatbot before and when visiting any of the websites or online stores, which is a design that simulates the natural conversation that takes place between the user and the owner of the online store [17].
   It is one of the most important uses of artificial intelligence that allows the owner of the online store to communicate with customers directly and respond to all their inquiries and comments quickly, which increases the bonding relationship between customers and the store and facilitates the completion of the purchase process [12].

One of the most important roles played by artificial intelligence is to serve customers with high professionalism, through the conversations that are created [14].

5- **Ability to change prices**

Having the ability to change prices, or as it is called dynamic pricing in the world of e-commerce, is one of the strategies of this type of modern technological intelligence and is more suitable for sellers and retailers who determine the price as a result of market demand for the product, in addition to the possibility of changing the price of products as a result of the high demand for them or as a result of the opposite [7].

6- **Facilitate the shopping process for customers**

Like what we need people to guide us in stores and traditional commercial markets and help us reach what we want to buy, artificial intelligence came to play this role through electronic stores where we can now use the search box at the top of the store and write any words related to what we are looking for to help you and show all products or the services that are close to what we mentioned [4], so that the search and shopping process is easier for customers and makes them prefer shopping through online store more than any other stores [13].

This search box has evolved to find in many stores that it turns into voice search and this is one of the latest techniques of amazing artificial technology, where the customer can use this voice search and find the products or services he wants, and all these facilities provided by these smart technologies work to motivate customers purchase then increase store's sales and earn profits [18].

7- **Increase the percentage of sales**

This is one of the most important results and features that online store will get as a result of applying smart technology techniques and tools today. When making the shopping process easier for the consumer, he will complete the purchase easily, and when predicting the products, he wants to buy also this stimulates the customer's completion of the purchase process [25]. Achieving one goal, which is to motivate customers to buy, and then the online store owner enjoys achieving an increase in the percentage of store sales and then reaping profits and money [16].

The trend of consumers to e-commerce is increasing very rapidly, which leads to a clear growth in the size of the e-commerce market, as 1.9 billion people are expected to make electronic purchases by the end of 2019, and more than 2 billion people by 2021. And the abundance of demand has pushed companies to Think of new ways to reach more audiences [6].

3   The Impact of Artificial Intelligence on e-Commerce

The trend of consumers to e-commerce is increasing very rapidly, which leads to a clear growth in the size of the e-commerce market, as 1.9 billion people are expected to make electronic purchases by the end of 2019, and more than 2 billion people by 2021 [18]. And the abundance of demand has pushed companies to Think of new ways to reach more audiences [3].

These methods include personalized email marketing, configured voice search and image search; A lot of these methods rely primarily on automation and artificial intelligence, which has a very large impact on e-commerce now, and in the future in particular. In this article, there are four reasons that explain the impact of artificial intelligence on the e-commerce market [10].

1. **Minimize cart abandonment**
   Emails sent to a consumer who does not complete the purchase after putting some products in the cart has an open rate of 45%, which is the result of email marketing automation that relies on artificial intelligence. Abandoning purchase after putting products in the shopping cart often indicates a pre-purchase error or problem; The use of automation and email marketing helps in reducing this problem [20].
   There are many reasons that might prevent a user from not completing the purchase, such as high shipping costs and the need to create an account before purchasing can be done; Understanding these reasons is necessary in order to overcome the problem and make the user easier to purchase [5]; Automation is thus an excellent way to return customers, while information that can help to prevent more customers from abandoning their cart is also collected through an email containing a survey [26].

2. **Facilitate voice search**
   A comScore study predicts that by 2020, 50% of all internet searches will be conducted by voice. And with the advent of devices like Alexa, Echo, and Apple devices that use Siri and Google Home, customers can search for products using their voices. As a result, companies have to ensure that their products are found through voice search [29].
   Companies should start optimizing their websites for voice search. For example, many companies can now use machine learning by letting customers shop with Alexa on their websites [7]. Customers are looking for more convenience in the process of online shopping, and voice search provides customers with this convenience by being able to search for items without the need for a laptop or phone, which makes the shopping experience more efficient [21].

3. **Promote more specific audience targeting**
   AI eliminates the need for guesswork and assumptions when it comes to proper consumer targeting; Instead of adopting the concept of "one size fits all" and creating advertisings with broad and ineffective targeting, companies can now target customers according to their purchasing behavior and the nature of their interaction digitally because of artificial intelligence [15].
   Digital marketing automation and artificial intelligence tools make it easy to collect target audience data and create dynamic ads that take this data into account, and accordingly these advertisings are published on platforms and channels appropriate to the nature of the content, making the target person more likely to see the advertisings [8]. Also, retargeting, which allows companies to target customers who have already interacted with the brand in one way or another [24].

4. **Improve Search Results**
   A marketer can create very attractive and good content, but he cannot achieve marketing goals and increase sales if customers cannot find it. Lots of customers

search for products using search engines and in-store searches. It is worth noting that more than 40% of e-commerce site visits come through natural search results of the search engine Google; This makes preparing a site to appear in search engines vital or crucial to the success of the store [29].

Tools that rely on artificial intelligence can help marketers to attract more traffic to their sites in a way that encourages buyers to flow smoothly through the e-commerce store by analyzing the site and ensuring that the correct keywords are chosen, and the content is organized perfectly and without errors such as site performance analysis tools, filter related products etc. [11].

For many years, the mention of artificial intelligence has been associated with robotic devices and the shape of machines that are expected to exist in the future; But today, it is impossible to have a conversation about the future of digital marketing without mentioning AI as a major part of that future [9]. Consequently, marketers must constantly think about how to exploit the capabilities of artificial intelligence in making more effective marketing decisions to achieve better successes and enhance reach of the target audience [17].

4   The Main Stages of Artificial Intelligence Marketing

There are important and few stages and elements that are a major reason for making the term artificial intelligence marketing as strong as it is today, we will know them as follows:

1- **Big Data**
    Big data is a clear concept, and its meaning is easily communicated, and it indicates the ability of the marketer to collect the largest possible amount of information and data and place it in sections titled with the least amount of work that requires employees, and then this data can be used to deliver the service to right consumer at the right time via the appropriate method [1].

2- **Machine learning**
    After marketers collect big data, they must understand, analyze and learn from it. The term machine learning helps in identifying potential trends and events that may happen, and predicting the next step, insights and responses, and reactions from data owners, so that the marketer can then understand how these actions happen [16].

3- **Powerful solutions**
    The term artificial intelligence marketing provides important solutions that know how the world is going in the same way that a person knows and understands, and that means that from big data [9], these systems can produce appropriate systems to understand and provide correct concepts and useful data for you through the data you have collected, and provide a broad understanding of human emotion and communicate like a person This makes platforms that use artificial intelligence marketing able to better understand the content that the customer wants, provide suitable solutions to him, the nature of the language in which he is addressed, and also respond to the e-mail better [27].

5   Artificial Intelligence is the Future of Marketing

It is the future of marketing that gave people great comfort and allowed the project manager to save labor and many costs.

AI Marketing is getting more attention among marketers because of the insights it provides. According to a recent PwC study, 72% see AI as a "commercial advantage" [25].

Artificial intelligence will revolutionize the world of e-marketing, through data analysis and the ability to adapt to inputs, artificial intelligence has become the human being in determining marketing trends [29]. Brands and marketers are leveraging there are many advantages that AI significantly affect marketing outcomes in the coming years:

Smarter Searches
As advanced tech solutions grow smarter, it is important to remember that audiences are getting smarter too [20]. Because of social media and fast search engines like (Google!), customers are finding what they're looking for faster than ever. Artificial intelligence and big data solutions can analyze these research patterns and help marketers identify key areas in which to focus their efforts [8].

Smarter Ads
Marketers are already put their interest in smarter ads, with marketing solutions in place. With a new abundance of data available, online ads can become smarter and more effective [16]. Artificial intelligence solutions can delve into keyword searches, social profiles, and other data online to get human-level results [1].

Delivery of Duplicate Content
With AI, marketers can take data and targeting to a whole new level. Audience analyzes can go beyond the typical demographic level to understand people on an individual basis [14]. Now, marketers can use AI to identify potential customers or buyers and deliver ideal content that is most relevant to them. With big data, machine learning, and artificial intelligence combined [29].

Relying on Robots
Customer service and retention is another area in which AI will play a large role in the future. Soon, chat functions and other direct consumer engagement methods will be powered by AI bots [23]. Many companies can save employees time and expenses by using these tactics. Artificial intelligence robots can also access the value of the Internet, information, data, and search records on the entire Internet, making them more efficient than their human counterparts [21].

Continuous Learning
Not only can AI be used to uncover insights that were once hidden, but it can also actually be taught and learn how to incorporate previously undisclosed insights into new campaigns, improving communication to target only the most relevant users. Over time, these AI solutions will get smarter, dramatically increase conversions, and boost real-time decision-making [8].

6 Mechanisms for Using Artificial Intelligence in the Field of Electronic Commerce

1. **Chatbots**

   Chatbots are one of the biggest game-changing tools powered by artificial intelligence. With Natural Language Processing (NLP), Chatbots are able to understand and respond to both voice and live chat interactions with clients [20]. NLP chat programs act as customer service representatives without the need for an actual human being as chat bots can be used in the main messaging applications by embedding them on a page. Chatbots provide customers with a fast and easier time to reach online businesses using the same messaging platforms that customers use daily [21].

   Software developers are taking advantage of the demand for bot chat software, with platforms like Drupal 8 offering modules that make it easy for users to browse websites through pre-defined chats using bots with the advantage of Facebook Messenger, Alexa, and other chatbots [4].

2. **Recommendation engines**

   Often used by companies selling directly to consumers prove to be an effective customization technique that can be easily implemented [21].

   Recommendation gives customers a unique shopping experience by analyzing their online behavior [14]. This allows clients to have a more relevant page engagement as it shows them that they are serving as individuals rather than with a one-size-fits-all interface [30].

   The recommendation engine tactic works by gathering information about what the customer has browsed and bought and what has been viewed and purchased by similar customers. The most important part of the recommendation's engine is the ability to show customers relevant offers to everyone [28].

   A clear example of this principle in action is Acquia Commerce: a product that provides a simple way to create custom buyer experiences, integrate commercial content across various platforms and simplify customer profile data from a wide range of sources [5].

3. **Photo and voice search**

   Enabling ecommerce search engines to think the way humans think, Artificial Intelligence is not just the use of NLP for chatbots [17]. Some companies aiming to improve e-commerce have focused on the visual elements of search. They described this program as "artificial intelligence with vision [17]." This enables developers to create smarter apps that see the world as real people do. Through advanced image and video recognition, companies are empowered to develop customer-focused experiences for customers [13].

   Since AI software can manage and sort a much larger volume of data compared to actual humans, this machine learning allows the software to visually tag, organize, and search for content by tagging images and video features [19].

   Alexa Skills for example - businesses can take advantage of the product's voice search functionality and put their content front and center [16]. The skill function integrates well with Drupal, and it has led to some clever marketing solutions [16].

4. **Intelligent customers**

   The purpose of the AI program is to collect as much data as possible about the users of the platform. Ideally, the large volume of data provides AI with the necessary information needed to achieve "smart output". In order to obtain real-time, transparent and actionable insights [18], e-commerce businesses must: collect, store and analyze an ever-increasing volume of data; Be able to transform data into practical intelligence; Use aggregate information to communicate with customers depending on where they are in the customer lifecycle [1].

   Collecting customer intelligence is one of the most important purposes of AI programs. Typically implemented in the early stages of the cycle, customer intelligence acquisition equips e-commerce businesses with essential information about nearly every aspect of their customers' behavior [16]. This enables companies to make educated guesses about where each individual is in the customer life cycle, the customer's preference for certain types of products, and the customer's potential revenue [11].

   The customer can find a good illustration of this in the integrating Drupal with Business Intelligence (BI) tools. As more and more developers collaborate to build with technology, collecting data about customer preferences will become easier [3].

5. **Re-targeting**

   Core business dynamics will tell the customer that the cost of hiring new users for a product is more expensive than maintaining and retaining existing users. Artificial intelligence gives companies the opportunity to get the most out of retention through redirection [15]. Redirecting, which is performed in a number of ways, takes care of re-attracting shoppers and finding a way to invite them back to website for another opportunity to make purchases from it [16].

The continuous advancement in artificial intelligence has made it an endless possibility in the e-commerce industry. Gartner's study has a significant impact on the way e-commerce companies attract and retain customers, and predicts that by 2022, 85% of a customer's relationship with the business will be managed without the need for human interaction [23]. While retail giants have the advantage of early experience with the AI revolution, smaller e-commerce teams can do the same now. As AI becomes more and more sophisticated over time, e-commerce companies are now able to improve consumers' shopping experience by leveraging the power of AI [4].

For example, Drupal integrates with several remarketing tools like Facebook Pixel and the suite of remarketing solutions offered by Google. Companies are already taking advantage of AI when it comes to remarketing - and their options will only expand from this point forward [7].

7   Applications of Artificial Intelligence in the Field of Electronic Commerce

Global AI applications are shaping the future of software development. The business world is increasingly interested in these technologies, and many companies are turning to them [2].

Many companies have strategized in this area, while aspiring that AI applications will generate more than billions of dollars in business value in the coming years [28].

Artificial intelligence algorithms and advanced analytics have huge potential in software development [16]; This provides smooth, real-time decisions at a large scale.

Artificial intelligence platforms can perform complex and intelligent functions related to human thinking, and we present in the following lines [13], the most important of them at the global level, which came as follows:

1) **Google Cloud AI Platform**

   This platform provides machine learning and deep learning capabilities, with NLP capabilities, speech and vision capabilities for developing software on the cloud, including:

   Speech

   This platform provides interfaces for converting speech to text and converting text to speech; And that is using neural network models. The audio is also converted to text that supports 120 different languages, regarding to the audio files can be converted from (MP3) or (LINEAR16) formats [6].

   Vision

   It delivers its capabilities through REST and RPC APIs that use machine learning models, and is trained to detect objects, faces, as well as read handwritten and printed texts using APIs [15].

2) **Microsoft Azure AI Platform**

   It is a popular choice for developing artificial intelligence among software developers who offer some capabilities such as: speech capabilities, machine learning, vision capabilities, along with language abilities [27].

3) **IBM Watson**

   This platform provides solutions for financial services, internet of things, media, healthcare, oil and gas, in addition to advertising; It allows any cloud environment, integration and training on a flexible information architecture for developers [15]; With the aim of expediting the development and deployment of models for these platforms, in addition to providing some tools for developers [29].

4) **BigML**

   It offers powerful algorithms for machine learning and allows software developers to use popular languages such as: Ruby, Java, Python, Node.js and Swift [15].

5) **Infosys Nia**

   AI platform allows software developers to create AI-powered applications; The following capabilities include machine learning, contract analysis, creating chatbots, and solving various analytics [21].

AI capabilities to save time and resources by automating digital marketing services [11].

There Are Some of the Benefits that Can Be Reaped from AI Programs

– **Help to understand customers**: AI can analyze data to predict purchasing behaviors and decisions of target customers.
– **Improve user experience:** the companies can use AI data to provide their audience with what they need and provide technical support via chatbots [1].

– **More Effective Marketing:** AI helps you cut with improvisation and guesswork. And build marketing strategies based on data analysis and thoughtful steps [18].
– **Increase Productivity:** With AI algorithms, the companies can automate a lot of boring and stressful tasks. This will help the customer to increase productivity, save time and money [17].
– Consumer behaviors and technology are evolving in unpredictable ways. Therefore, the field of digital marketing will not stop changing in line with these developments. Therefore, it is important that the companies keep abreast of all changes and trends in the industry [25].

8   Employing Artificial Intelligence in E-commerce

E-commerce is based on the principle of employing computing and communication technologies to consolidate economic activity among some or all commercial organizations and their customers of all levels. Artificial intelligence technologies have begun to invade many e-commerce sectors, such as the trade and business [29].

Artificial intelligence is used to facilitate the task of selecting products; And make recommendations on them [15]; In addition to steering the trade talks and deliberations; And at auctions; Solve product scheduling problems; Deepening the capabilities of service agencies. With the provision of a (automated) mechanism for making decisions regarding the prices of commodities placed on the global market [2].

Artificial intelligence is employed in the supply chain management and organization department to expand its activities and increase the profitability resources achieved [5].

9   Employing Artificial Intelligence in Product Pricing and Distribution

Firms are diagnosed with more than one obstacle related to determining the selling price of products in light of the prevailing prices; And the nature of the offered prices in the event that more than one product is placed in one sale [7].

Providing smart tools with a good ability to automate response helps eliminate the need for an employee with advanced experience that enables to answer customer questions [16]. In order for the producer to ensure customer satisfaction, the customer must have a clear picture of the nature of the goods that he can offer; Style of presentation; The nature of the positioning of the product assortment; And the price limits for each of its cases [24].

10 Increase the Intelligence of Programmed Ads

The world of e-commerce has expanded greatly over the past years, and the main reasons for that are data, and only data. Some companies are now offering advertisers a limited variety of consumer behavior, interests, and data to make everything you pay for advertising worth the cost [11].

All this data comes with its own challenges, and companies today are working hard to identify the appropriate marketing strategy for them. And here comes the importance of artificial intelligence. Today there are many platforms that can facilitate paid marketing campaigns and guide to the one that is most relevant to the customer [7]. One of the most prominent platforms, which is an artificial intelligence program that seeks to facilitate the automation and management of marketing campaigns without any human intervention [8].

11 The Relationship Between Artificial Intelligence and E-commerce

Artificial intelligence is among the best systems, on which most financial sectors are concentrated, in recent years, and that is why e-commerce companies have adopted methods through which they can introduce artificial intelligence, so that shopping becomes more useful and effective [11], and this article is devoted to clarifying the relationship between artificial intelligence and e-commerce [11].

The world of e-commerce over the Internet has increased significantly in recent years, relying only on the data provided, due to the company's interest in displaying, presenting a selection and a variety of consumer behavior, and also interest in presenting their data and interests [15].

12 The Impact of the Emergence of Artificial Intelligence on Electronic Commerce

– After the emergence of artificial intelligence, all e-commerce companies are working to know the appropriate strategy in order to market their products [7].
– Artificial intelligence has made social networking sites, such as Facebook, Twitter and Instagram, as means facilitate the marketing campaigns provided by the company [21].
– The artificial intelligence program aimsto facilitate these campaigns and the methods and means of managing them, and all of this is done without the presence of any human intervention [15].
– Chatbots will get smarter, by activating an artificial intelligence program.
– At the present time all commercial markets and e-commerce companies are using artificial intelligence in chatting [13].
– Chat bots experience has been applied, which gives all users the opportunity to communicate with all brands easily and conveniently [4].

- This is done by using natural language, provided that it is suitable for chatting with users [2].
- Chatbots have become better than traditional customer services, especially in matters related to marketing and sales [24].
- This makes it easier for the company to achieve more profits, because of the artificial intelligence program [10].

13   Conclusion

In the end, it is important to have a clear vision of how to apply artificial intelligence techniques in electronic commerce, and to define the goals that you want to achieve from the application of these smart technologies to you, as it helps to achieve the goals in choosing the appropriate tools and strategies for their application, in addition to having the ability to measure Success or not.

After this article, it became clear to us that the success of e-commerce in general and the continued success of e-store in particular depends on many factors and elements that we discover day after day, to show the most prominent updates of the world of electronic stores to benefit from it when working on online store, and perhaps it has also become clear that besides electronic marketing strategies and advertising campaigns, there are other elements that may contribute significantly to achieving goals in creating an online store, such as documenting your brand, increasing the percentage of sales or increasing the percentage of profits.

More and more companies are now investing in artificial intelligence to meet barriers to product growth such as reducing operational costs, making room for more accurate product matching, and obtaining legitimate product reviews. Although AI technology is still very far from perfect, e-commerce companies are constantly working towards improving their tools to keep pace with market demand. The collaboration between companies also paves the way for sharing their AI competencies, which then create more sophisticated AI tools.

The role AI plays in our daily life, but it is very important. From platforms like Facebook and Snapchat to online shopping apps, we can make sure that AI technology will dominate the digital age, as an engine of exponntial growth.

Finally, the growth of technological intelligence does not stop, as it surprises us every day with a new update and creation that contributes to facilitate business and facilitate our steps towards success and the summit.

References

1. Arrieta, A.B., et al.: Explainable artificial intelligence (XAI): concepts, taxonomies, opportunities and challenges toward responsible AI. Inf. Fusion **58**, 82–115 (2020)
2. Musleh Al-Sartawi, A.M.A. (ed.): The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. SCI, vol. 974. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-73057-4

3. Alansari, Y., Al-Sartawi, A.: IT governance and E-banking in GCC listed banks. Procedia Comput. Sci. **183**, 844–848 (2021)

4. Chia-Chen, Y., Shang-Ling, O., Li-Chang, H.: A hybrid multi-criteria decision-making model for evaluating companies' green credit rating. Sustainability **11**, 1506 (2019)

5. Cockburn, I.M., Henderson, R., Stern, S.: The impact of artificial intelligence on innovation. In: The Economics of Artificial Intelligence: An Agenda, pp. 115–152 (2019)

6. Davenport, T.H., Ronanki, R.: Artificial intelligence for the real world. Harv. Bus. Rev. **96** (1), 108–116 (2018)

7. Kolodin, D., Telychko, O., Rekun, V., Tkalych, M., Vladyslav, Y.: Artificial intelligence in E-commerce: legal aspects, advances in economics, business and management research. In: III International Scientific Congress Society of Ambient Intelligence, vol. 129, pp. 96–102 (2020)

8. Di Vaio, A., Boccia, F., Landriani, L., Palladino, R.: Artificial intelligence in the agri-food system: rethinking sustainable business models in the COVID-19 scenario. Sustainability **12**, 4851 (2020)

9. Di Vaio, A., Palladino, R., Hassan, R., Escobar, O.: Artificial intelligence and business models in the sustainable development goals perspective: a systematic literature review. J. Bus. Res. **121**, 283–314 (2020)

10. Fu, H., Manogaran, G., Wu, K., Cao, M., Jiang, S., Yang, A.: Intelligent decision-making of online shopping behavior based on internet of things. Int. J. Inf. Manage. **50**, 515–525 (2019)

11. Hannoon, A., Musleh, A., Al-Sartawi, A., Khalid, A.: Relationship between financial technology and financial performance. In: Musleh Al-Sartawi, A.M.A. (ed.) The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. SCI, vol. 974, pp. 337–344. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-73057-4_26

12. Huang, M.H., Rust, R.: Artificial intelligence in service. J. Serv. Res. **21**(2), 155–172 (2018)

13. Karolak, M., Razzaque, A., Al-Sartawi, A.: E-services and M-services using IoT: an assessment of the Kingdom of Bahrain. In: Abdalmuttaleb, M.A., Al-Sartawi, M., Razzaque, A., Kamal, M.M. (eds.) Artificial Intelligence Systems and the Internet of Things in the Digital Era: Proceedings of EAMMIS 2021, pp. 523–533. Springer International Publishing, Cham (2021). https://doi.org/10.1007/978-3-030-77246-8_48

14. Kumar, T., Trakru, M.: The colossal impact of artificial intelligence. E-commerce: statistics and facts. Int. Res. J. Eng. Technol. **6**, 570–572 (2020)

15. Khrais, L.T.: Role of artificial intelligence in shaping consumer demand in E-commerce. Future Internet **12**, 1–12 (2020)

16. Luo, X., Tong, S., Fang, Z., Zhe, Q.: Machines vs. humans: the impact of chatbot disclosure on consumer purchases. Unpublished working paper (2019)

17. Nadikattu, R.R.: Implementation of new ways of artificial intelligence in sports (May 14, 2020). J. Xidian Univ. **14**(5), 5983–5997 (2020)

18. Sanad, Z., Al-Sartawi, A.: Financial statements fraud and data mining: a review. In: Abdalmuttaleb, M.A., Al-Sartawi, M., Razzaque, A., Kamal, M.M. (eds.) Artificial Intelligence Systems and the Internet of Things in the Digital Era: Proceedings of EAMMIS 2021, pp. 407–414. Springer International Publishing, Cham (2021). https://doi.org/10.1007/978-3-030-77246-8_38

19. Kakkar, S., Monga, V.: A study on artificial intelligence in E-commerce. Int. J. Adv. Eng. Sci. Res. **4**(4), 62–68 (2017)

20. Soni, N., Sharma, E.K., Singh, N., Kapoor, A.: Artificial intelligence in business: from research and innovation to market deployment. Procedia Comput. Sci. **167**, 2200–2210 (2020)

21. Soni, N., Sharma, E.K., Narotam, S., Amita, K. Impact of Artificial Intelligence on Businesses: from Research, Innovation, Market Deployment to Future Shifts in Business Models. arXiv preprint, pp. 1905−2209 (2019)

22. Steels, L., Brooks, R.: The Artificial Life Route to Artificial Intelligence: Building Embodied, Situated Agents. Routledge (2018)

23. Thiraviyam, T.: Artificial intelligence marketing. Int. J. Recent Res. Aspects Spec. Issue Conscientious Comput. Technol. **12**, 449–452 (2018)

24. Kumar, T., Trakru, M.: The colossal impact of artificial intelligence in E-commerce: statistics and facts. Int. Res. J. Eng. Technol. **06**(05), 570–572 (2019)

25. Tussyadiah, I.P., Miller, G.: Perceived impacts of artificial intelligence and responses to positive behaviour change intervention. In: Information and Communication Technologies in Tourism 2019, Springer Science and Business Media LLC, Berlin, Germany, pp. 359–370 (2018)

26. Vishal Dineshkumar, S.: Emerging roles of artificial intelligence in ecommerce. Int. J. Trend Sci. Res. Dev. **4**(5), 223−225 (2020). ISSN: 2456-6470

27. Song, X., Yang, S., Huang, Z., Huang, T.: The Application of artificial intelligence in electronic commerce. J. Phys. Conf. Ser. **1302**, 1–7 (2019)

28. Jiao, Y.: Applications of artificial intelligence in e-commerce and finance. Artificial Intelligence [cs.AI]. Institut National des Télécommunications (2018)

29. Yao-Zhi, X., Zhang, J.L., Hua, Y., Wang, L.Y.: Dynamic credit risk evaluation method for E-commerce sellers based on a hybrid artificial intelligence model. Sustainability **11**, 1–17 (2019)

30. Zhou, Z., Chen, X., Li, E., Zeng, L., Luo, K., Zhang, J.: Edge intelligence: paving the last mile of artificial intelligence with edge computing. Proc. IEEE **107**, 1738–1762 (2019)

Crowdsoured Technology as a Collabarative Tool for Environmental Enforcement: A Critical Review of Current Applications

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Abstract. The systems in which law enforcement systems operate undergoing constant changes, such as the increase in demands for effectiveness which has led to the appreciation of IT as innovative, effective, and crucial addition to the law enforcement system. The study aims to review the existing crowdsourced technology in environmental compliance and enforcement and other relevant fields. The study recommended that the Future research is required to further understand and explore the potential and efficiency of crowdsourced application in environmental enforcement.

Keywords: Environmental · Enforcement · Technology · Crowdsourcing

1 Introduction

Collaborative measures in environmental policy implementation were found to be an effective tool in the dealing with the ineffective nature of the current policy system in environmental protection [15, 17, 19, 25]. [31], on his part, purports that the enforcement regime has to emphasize on cooperation among governments, the private sector, and the individual citizens. [23] acknowledged that inadequate collaboration and coordination, insufficient circulation and sharing of information, and weakened understanding of environmental laws and regulations has contributed significantly towards ineffective environmental protection law enforcement. All the previous researchers find inadequate participatory measures to be a factor effecting the overall implementation of the environmental policies [1, 2, 15, 17–28].

Various researchers have indicated that participatory approaches have positive impact on environmental policy implementation. [16] state that "There is no denial that public participation *can* contribute to deliver effective, legitimate and efficient environmental policies in a multi-level context." They also acknowledged that current international and European Union environmental policies increasingly promote collaborative and participatory decision-making on appropriate and multiple governance levels as a means to attain more sustainable policies and a more effective and lasting policy implementation [12, 13, 21]. [16] indicate that inclusion of multiple stakeholders

and sources of information which are participatory approaches are expected to be solutions to addressing challenging environmental problems.

Technology such as crowdsourced applications are being increasingly utilized to help enhance and facilitate law enforcement all around the world. In an attempt to increase community participation crowdsourced technologies are being implemented as collaborative tools to incorporate the public in the environmental protection process, including environmental law enforcement [24]. Environmental policy makers and implementers are acquiring information and opinions from the public and incorporating them in their policy formulation and action taking strategies and processes. Social media algorithms when integrated with crowdsourcing data mining paradigms have made law enforcement approaches more collaborative and technology-based rather than centralized and labor intensive [8–10, 24].

2   Existing Literature

In this section the current crowdsourced applications in the field of environmental protection and enforcement will be reviewed. As well as crowdsourced applications in the field of criminal law enforcement.

2.1   Crowdsourcing

The term crowdsourcing was popularized by Howe in an article published in WIRED in 2006. In his later publication in 2008 he defines crowdsourcing as: "*Crowdsourcing is the act of taking a job traditionally performed by a designated agent and outsourcing it to an undefined, generally large group of people in the form an open call.*" [27] identify three general ways in which crowdsourcing can be implemented and their characterization which they have summarized in the following Table1:

Table 1. Summary crowdsourced implementations and their characterization [27]

Type		Expected contribution	Cognitive content	Benefits	Remunerations	Examples
Simple tasks	Integrative	Data or info	Low	Cost	Very low or no	ReCaptcha, OpenStreetMap
Complex tasks	Selective	Problem solving	Expertise & problem-solving skills	Distributed competences	High (>$1000)	Atizo, InnoCentive
Creative tasks	Integrative or selective	Creation of content	Individual creativity	Diversity and novelty	Variable	Crowdspring, Wilogo, Calling All Innovators

[22] divided the benefits of crowdsourcing in general into results-based and process-based benefits. The process-based benefits were low-cost research compared to traditional research. Some of the process-based benefits large scale of participants, large scale of coverage potential intervention, increase public awareness, transcends

borders and boundaries, can be democratic, mobility, high social robustness, can reach untapped expertise, can cover unpredictable events, feasible due to availability of software. As for the result-based benefits they were high speed of research progression, increased accuracy, new discoveries, can attain previously unattainable data, rewards are more direct, completion of tasks that were not possible, early detection and response, results accuracy, improvement of users lives [22].

2.2   Crowdsourcing in Environmental Protection

Innovative measures are becoming increasingly applied in various fields in environmental protection because of their potential to lower costs and increase efficiency. [13] find that innovation in environmental policy is increasingly appealing since it is expected to lower costs of environmental measures and overcome existing trade-offs between ecological and economic costs. One of these innovative participatory approaches which is increasingly being studied and applied is through crowdsourcing. Current ways in which crowdsourcing is being applied in environmental protection are mainly in the environmental monitoring, awareness, and research processes. Very few studies have been done on the potential of crowdsourcing innovation in the enforcement of environmental law.

2.2.1   Environmental Monitoring and Awareness

[28] assert that solutions using participatory sensing and crowdsourcing are applicable to both monitoring the physical world and raising people's awareness. NoiseTube which is a low-cost approach to monitoring noise pollution which uses the public and mobile devises as noise sensors. [28] suggest that this initiative is an effective tool in gather data on noise pollution to support policy and decision making. It can also be used by citizens for a range of matters, from increasing awareness to gathering evidence.

Air quality monitoring technologies have had significant advances in innovation. [7] give several examples of innovation in crowdsourced innovation of air quality monitoring. One such example is in the Imperial Valley of California, where a community-based air quality low cost monitoring system which measures particles, temp, humidity, and has a microcontroller to allow real-time wireless data transfer is used. Members of the public were trained in maintenance and troubleshooting of the monitor and involved in identifying the monitoring locations [7]. A website (www. ivanair.org) shows the data created in real time and gives health warnings and answers question. Data from the system are being evaluated for public health actions [7]. Another example of the use of crowdsourcing innovations in environmental monitoring and awareness is Citi-Sense-MOB project, which are monitors that allow users to monitor air quality [7]. [7] suggest that the project (Citi-Sense-MOB) will develop the infrastructure to monitor environmental data continually using micro-sensors fixed on moving platforms, such as vehicles. The project's final output will provide real-time data on air quality and CO_2 emissions at road level for both authorities and citizens. The project is also expected to increase awareness on climate change and air pollution as well as awareness of the health impacts of air pollution. The project will focus on promoting behavioral changes to reduce air pollution [6, 7].

[1] proposed a project that creates a tool for environmental monitoring and awareness through a mobile applications (PAN) available to the participants. The users can take images of point of interests using smartphones and the PAN App [1]. The user is directed to a certain location and is then guided to photograph in a certain direction. The images are processed to time-lapse videos to show changes. This data can used for long term monitoring. They also expected awareness through certain features in the PAN app, such as digitally guided tours [1].

2.2.2   Environmental Research

[7] purport that the availability and lower cost of mobile or personal environmental monitoring innovations have been main factors of the increased interest in participatory research in environmental health.

One of the crowdsourcing tool which have been studied and used in environmental protection is social media. Social media can Enhance understanding of human nature interactions are essential to conservation science and practice, but retrieving relevant information is still challenging. Although social media has become an important source of data on human-nature interactions, analysis of social media is still limited and are not applied to their full potential. In the study they gave several examples of current social media data sources and methods of mining and analysis of the data [14, 20, 29]. They mainly focused on social media platforms that they found were most popular and helpful in studying human nature interactions. The main platforms were Facebook, Twitter, Instagram, Flickr, and Weibo [3–5].

[11] Also find the importance of social media analysis can be influential in enhancing human-environment interaction understanding and shaping future environmental conservation and management. Through their analysis of 169 studies in uses of social media data in environmental disciplines, they support the idea that this data source offers unique opportunities to extend the scope, scale, and depth of environmental research [11]. They also find that most studies focus on the analysis of people's behavior and perceptions of the environment, followed by environmental monitoring and applications in environmental planning and governance [11].

2.3   Crowdsourced Criminal Law Enforcement

Although few studied have been conducted on participatory approaches through crowdsourcing in environmental law enforcement, there have been numerous studies conduct on crowdsourcing in criminal law enforcement. [30] have explored opportunities that arise from crowdsourcing and policing. They suggest that the areas of idea generation and public participation to be the primary areas in which crowdsourcing is applicable in policing. They also find that crime prevention programs to be applicable. The program's success relies on collaboration between the law enforcement, public, and broader civil society. Public participation and idea generation combined together have also the potential to engage a wide range of the public in security-related legislative processes [30]. An example is 'Policing Act Wiki' in New Zealand where the public were empowered by engaging in dialogue with the parliamentarians responsible for the drafting the new police law [30]. The researches find that the most promising application of crowdsourced law enforcement is that it can include the ability to involve

many citizens more directly in crime investigation other activities, such as manhunts or missing persons. Micro tasking is also a potential crowdsourcing approach, for example, public monitoring of CCTV online, which has been found effective in the UK [30].

The Boston Marathon bombing was one of the first direct crowdsourced collaborations of the public and law enforcement. In their study [22] on how the public through Reddit (an online social platform) attempted to assist the law enforcement through conducting their own investigation. They researchers find that the users shared and searched for information to help identify the perpetrator, and some even gave expert knowledge to find clues to help with the investigation [22]. Even though the public did not themselves solve the crime, the potential is clear. They investigated how the users (Reddit) participated in the online discussion and found several categories, which will be listed according to number of users. First, most used the platform for self-expression. Second, share and distribute information and data. Third, assistance for victims. Forth, discussed directly related information to the investigation [22].

Other crowdsourced application for law enforcement have been used in crime reporting and crime prevention. [10] conducted their study on the WikiCrimes system, which is meant to provide a common area of interaction among people so that they can report and monitor locations where crime are occurring. They find that there are three main goals of the system: 1) Increase transparency and publicity of information on crimes, 2) citizen prevention, and 3) increase crime reporting in areas with unreported crime. The researchers suggest that this platform can be considered as an axillary source of information collection that may add more quality to the data gathering process [10]. Other studies also give several examples of crowdsourced crime prevention and reporting applications. Ariffin, Solemon, and Abu Bakar [2] evaluate mobile crowdsourcing for crime watch. They use 6 mobile applications related to crime; Enforce Crime Map, CrimeWatch Mobile, Community Against Crime, Malaysia Crime, Community Alert and MyDistress. Through their evaluation they suggest that crime related information is essential, since it increases local authorities such as law enforcement agencies, ability analyze the information to help prevent similar crime occurring [2].

Although the most current applications of crowdsourcing have not been used directly to enforce environmental law, [12] finds that environmental information generated by the community already contributes to federal and state government efforts across the U.S. to implement and enforce the environmental laws. Officials have used and encouraged the use of information gathering by citizen initiatives, including the initiatives that are designed to promote compliance [12]. They gave examples to initiatives that have resulted in direct enforcement through citizen science. One of these examples was in Tonawanda, New York in which air quality sampling done by community activist prompted the state Department of Environmental Conservation to conduct follow-up studies which detected unsafe concentrations of benzene linked to a coke plant that was later indicted, convicted, and ordered to pay fines and conduct community impact studies [12]. They find that current initiatives *"merely scratch the surface of the potential to use data generated by community groups and individuals with access to new and cheaper information technologies to bolster compliance and enforcement"* [12].

3   Conclusion and Discussion

The systems in which law enforcement systems operate undergoing constant changes, such as the increase in demands for effectiveness which has led to the appreciation of IT as innovative, effective, and crucial addition to the law enforcement system [14]. Technology has altered or modified the strategies applicable in environmental compliance and enforcement and impacted the processes concerning accuracy and reduction of human-human interaction. Crowdsourced technologies have eased the collection, processing, and management of data during law enforcement. Creating a solution to various environmental problems using the crowdsourcing as a participatory concept instead of force avoids suspicion activities related to human investigation. Use of crowdsourced technologies can also remove lawyers and other legal experts from many tasks or minimize their need within the environment.

Through our literature review we have found that the potential of participatory approaches, specifically through crowdsourced innovation, to enhance environmental law enforcement is available. Although crowdsourcing has been used in several initiatives in the past for research, awareness, and monitoring of the environment. Few initiatives or direct crowdsourced platforms have been applied directly to the enforcement of environmental law process. The study provides a review of the current crowdsourced application and impacts on law enforcement including environmental enforcement. The adoption of crowdsourced innovation by environmental enforcement systems can have a possible enhancement on their processes and outcomes. This has been found to be a potential tool for data collection, such as gathering evidence and reporting, crime prevention, and awareness. Also, for increasing public participation in the process of enforcement which was found to be a strengthening factor in enhancing law enforcement effectiveness. Although the benefits of these innovations are evident decision-makers and implementers have to keep in mind some of the limitations of these technologies such as data quality and volume, privacy issues, and data authenticity.

Future research is required to further understand and explore the potential and efficiency of crowdsourced application in environmental enforcement. As well as the limitations and disadvantages of these application in the field on environmental enforcement which might outweigh the benefits and affect the end outcome.

References

1. Albers, B., De Lange, N., Xu, S.: Augmented citizen science for environmental monitoring and education. Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci. **42**(2/W7), 1–4 (2017)
2. Ariffin, I., Solemon, B., Bakar, W.M.L.W.A.: An evaluative study on mobile crowdsourcing applications for crime watch. In: Proceedings of the 6th International Conference on Information Technology and Multimedia, pp. 335–340. IEEE (2014)
3. Al-Sartawi, A.: Does it pay to be socially responsible? Empirical evidence from the GCC countries. Int. J. Law Manage. **62**(5), 381–394 (2020)
4. Al-Sartawi, A.: Assessing the relationship between information transparency through social media disclosure and firm value. Manage. Acc. Rev. **18**(2), 1–20 (2019)

5. Al-Sartawi, A.: Institutional ownership, social responsibility, corporate governance and online financial disclosure. Int. J. Criti. Acc. **10**(3/4), 241–255 (2018)
6. Musleh Al-Sartawi, A.M.A. (ed.): The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. SCI, vol. 974. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-73057-4
7. English, P.B., Richardson, M.J., Garzón-Galvis, C.: From crowdsourcing to extreme Citizen science: participatory research for environmental health. Annu. Rev. Public Health **39**, 335–350 (2018)
8. Fang, S., et al.: An integrated system for land resources supervision based on IoT and cloud computing. Enterp. Inf. Syst. **11**(1), 105–121 (2017)
9. Fiorino, D.J.: Rethinking environmental regulation: perspectives on law and governance. Harv. Envtl. L. Rev. **23**, 441 (2018)
10. Furtado, V., et al.: Collective intelligence in law enforcement–The WikiCrimes system. Inf. Sci. **180**(1), 4–17 (2010)
11. Ghermandi, A., Sinclair, M.: Passive crowdsourcing of social media in environmental research: a systematic map. Glob. Environ. Chang. **55**, 36–47 (2019)
12. Glicksman, R.L., Paddock, L.C.: Introductory chapter to elgar encyclopedia of environmental law. Decision making in Environmental Law (2016)
13. Hemmelskamp, J., Renning, K., Leone, F.: Innovation-Oriented Environmental Regulation: Theoretical Approaches and empirical Analysis, vol. 10. Physica-Verlag, Heidelberg (2000)
14. Hoey, A.: Techno-cops: information technology and law enforcement. Int. J. Law Inf. Technol. **6**(1), 69–90 (2018)
15. Jones, M.: Enforcement of US fisheries laws in the EEZ: an illustration of the value of the coast guard's deepwater missions to the nation and the need to provide it with adequate deepwater resources. Ocean Coast. Law J. **13**(2), 4 (2016)
16. Koontz, T., Newig, J.: From planning to implementation: top-down and bottom-up approaches for collaborative watershed management. Policy Stud. J. **42**(3), 416–442 (2014)
17. Macrory, R.B.: Regulation, Enforcement, and Governance in Environmental Law, p. 464. Bloomsbury publishing, London (2014)
18. Muller, C., et al.: Crowdsourcing for climate and atmospheric sciences: current status and future potential. Int. J. Climatol. **35**(11), 3185–3203 (2015)
19. Munang, R., Mgendi, R.: How smart policies can lessen effects of climate change. Afr. Renewal **30**(2), 33 (2016)
20. Musleh Al-Sartawi, A.M., Razzaque, A., Kamal, M.M. (eds.): Artificial intelligence systems and the internet of things in the digital era. In: EAMMIS 2021, Lecture Notes in Networks and Systems, vol. 239. Springer, Cham (2021)
21. Newig, J., Fritsch, O.: Environmental governance: participatory, multilevel – and effective? UFZ Discussion Papers, GoverNat 8, Helmholtz – Centre for Environmental Research UFZ (2008)
22. Nhan, J., Huey, L., Broll, R.: Digilantism: an analysis of crowdsourcing and the Boston marathon bombings. Br. J. Criminol. **57**(2), 341–361 (2017)
23. Nickoloff, S.: Capsule commentary on Ranard et al., crowdsourcing—harnessing the masses to advance health and medicine, a systematic review. J. Gen. Intern. Med. **29**(1), 186–186 (2014)
24. Omand, D., Bartlett, J., Miller, C.: Introducing social media intelligence (SOCMINT). Intell. Natl. Secur. **27**(6), 801–882 (2018)
25. Paddock, L., Qun, D., Kotze, L.J., Markell, D.L., Markowitz, K.J., Zaelke, D.: Compliance and Enforcement in Environmental Law: Towards More Effective Implementation, p. 712. Edgar Elgar Publishing, UK (2011)

26. Preston, B.J.: Enforcement of environmental and planning laws in New South Wales, land and environment Court of NSW. In: The Law and Sustainability Symposium, University of Southern Queensland Law School and the Australian Center for Sustainable Business and Development. Brisbane (2011)
27. Schenk, E., Guittard, C.: Towards a Characterization of Crowdsourcing Practices. Halshs-00439256, version 2 (2010)
28. Stevens, M., D'Hondt, E.: Crowdsourcing of pollution data using smartphones. In: Proceedings of UbiComp 10 (2010)
29. Toivonen, T., et al.: Social media data for conservation science: a methodological overview. Biol. Cons. **233**, 298–315 (2019)
30. Vera, A., Salge, T.O.: Crowdsourcing and policing: opportunities for research and practice. Eur. Police Sci. Res. Bull. **16**, 141–154 (2017)
31. Zinn, M.D.: Policing environmental regulatory enforcement: cooperation, capture, and citizen suits. Stan. Envtl. L.J. **21**, 81−83 (2012)

Artificial Intelligence in Practice: Implications for Information Systems Research, Case Study UAE Companies

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Abstract. In this paper, the researcher tried to provide a systematic review and synthesis of practice-based literature on AI, highlighting what leading industry entities and experts understand by AI in United Arab Emirates (UAE). I use these findings to propose an (AI) adoption, use and impact classification framework for information systems (IS) research and propose a corresponding research agenda. Artificial intelligence (AI) has the potential to enhance every component of information system (IS) at the individual, organizational and societal level. However, (AI) technologies are being developed and commercialized at an unprecedented speed making it hard for (IS) researchers and practitioners to keep up with these technologies and how they can enhance IS. The technologies have evolved so fast in the last 15 years that many companies have tried and failed to implement AI without truly understanding what it is. Therefore, understanding (AI) from the perspective of the leading developers of related technologies is crucial for its adoption, use and impact on IS.

Keywords: Artificial intelligence (AI) · Information systems (IS) · Adoption-use-impact framework · Systematic review · United Arab Emirates (UAE)

1 Introduction

Artificial intelligence (AI) is one of the most important industrial technologies. It is transforming every aspect of society at the individual, organizational and societal levels [2]. Although there is no accepted definition, all researchers and practitioners continue to focus on advanced designs, development, and applications of (AI). That is why eminent scientists and technology entrepreneurs like Stephen Hawking and Elon Musk fear that (AI) could end mankind as it may grow beyond our control [5].

The 2018 AI index report [18] shows that there are eight times more academic publications on AI since 1996, a rapidly growing number of AI start-ups, and a rising demand for AI skills. World regions and industries also continue to grow their AI adoption capabilities and sign cooperation partnerships that focus on advancing AI technologies and ensuring their use in the economy. Yet, these entities do not have a common understanding of AI as each of them develops, implements, and markets AI according to their understanding and perception of it.

This disarray is a fundamental barrier to the adoption, use and impact of (AI) as it obscures AI's potential for sustainable value creation and limits human control over its evolution [12]. This significantly affects the IS discipline because this foundational disarray makes it hard for IS researchers to conduct research on the applications of AI in IS that would be applicable, generalizable, and acceptable by many IS practitioners. Depending on the (AI) technology developer, provider, or company, the (IS) practitioners may tend to understand (AI) differently and this may impact on adoption it.

The findings in this article contribute to both research and practice by reducing the foundational barriers to AI adoption use and impact in IS. This idea by presenting the definitions, main objectives, characteristics, capabilities, dimensions, technologies, and principles that guide the development of AI in practice today.

This provides a common understanding of AI on which researchers can develop models and theories on (AI) in (IS) and that can help (IS) managers and professional implement innovative (IS) in their organizations.

As per the findings in this article, researcher proposes a classification framework for AI adoption, use and impact in (IS) and use this framework to propose a research agenda on how (IS) research can support AI practice. In Sect. 2 that follows, researcher presented the methodology used to carry out the systematic review and the research framework. Also, present and discuss the results in Sect. 3, and then Sect. 4 concludes the paper.

2   Research Methodology

In this study, researcher wants to consistently identify the most important and recurrent underlying concepts of AI in practice today so that he can use this information to identify research gaps in IS literature. Therefore, he conducted a structured qualitative systematic review of literature from practitioners based on the guidelines provided by Webster and Watson [20]. This methodology includes identifying the relevant literature and structuring the review. Researcher used this methodology because it is very effective at identifying the direction, size, consistency, and strength of evidence, and has been extensively used in synthesizing knowledge in IS research [1]. After ten conducted meetings to discuss the institutions that have a quality practice-based information on (AI), I arrived at four groups of leading entities in technology research and development.

Researcher wanted coverage to make sure he objectively captures all the main aspects of (AI) by major groups of practitioners [14]. The tech companies were selected having the most revenue, best working conditions and most attractivity. Researcher selected companies that featured in at least two of the rankings as being the most competent to share relevant expertise on (AI). Also, he reviewed articles from consulting firms that featured in at least two of the following 2018 rankings [15]: best management consulting firms, information technology (IT) implementation firms, IT technology and communication firms, IT strategy firms, growth innovation and new business model firms.

Researcher has reviewed expert-driven reviews and magazines that featured in the top 10 2018 Amazon best sellers in technology e-magazines best 10 journals and

magazines [18]. Research institutions were selected based on google scholar citations and web of science rankings on the top publishing research institutions. Finally, IT industry analyst companies were selected based on their perceived impact on the (IT) industry and on the (IS) community [3, 6]. Table 1 presents the entities belonging to the four expert groups from which the source materials for the review were finally obtained.

Table 1. Sources of material for the literature review

IT Companies (15)	
We Do: IT Network Services, LLC	Sunrise Computer and Network L.L.C
FmeExtensions	Abu Dhabi International Medical Services (ADI)
Grafdom Abu Dhab	Truth Economic Consultancy
Hannover Consulting Engineers LLC	Engineering consultant
Technology park	HCL Technologies Limited
Al Ghaith Oilfield Supplies	Contracting & Trading Co. C.A.T Group
United International Group L.L.C	Blue Horizon Services
Consolidated Contractors Company	
Consulting Firms (10)	
FTI Consulting	Al Taayeen Management Consultants
Business Boutique DMCC	Insights Management Consultancy LLC
Bain & Company Middle East	AURION Business Consultants
Nine Dots Management Consultancy	Bainona Engineering Consultancy - LLC
Scope Management Consultancy	NADIA Recruitment and Executive Firm
Expert Reviews and Magazines (12)	
Arabian Business	Bloomberg Businessweek Middle East
Business Traveller	Forbes Middle East
Gulf Business	Saneou Al Hadath
Your Business	Arabian Reseller News
Network World Middle East	PC Magazine Arabia
Research Institutions (3)	
Technology Innovation Institute	Research Center, Khalifa University
Center of Developing science and technology through education	
Consulting Firms (7)	
Cyber Infrastructure – We make IT	Red Spider – Web and Art Design
Branex	Infor Talent Science
Sunflower Lab	Future Technologies - Digital Product Agency
FreeBites – Graphics Resources for Dubai Ad Agencies	

After selecting the entities that provided the source materials, Researcher proceeded to select the relevant publications to be reviewed. Figure 1 diagrammatically presents the selection process. "X" is the name of the target entity (Gartner, Microsoft, etc.). In the company websites, however; It did not need to include "X" or "pdf" in the search phrases.
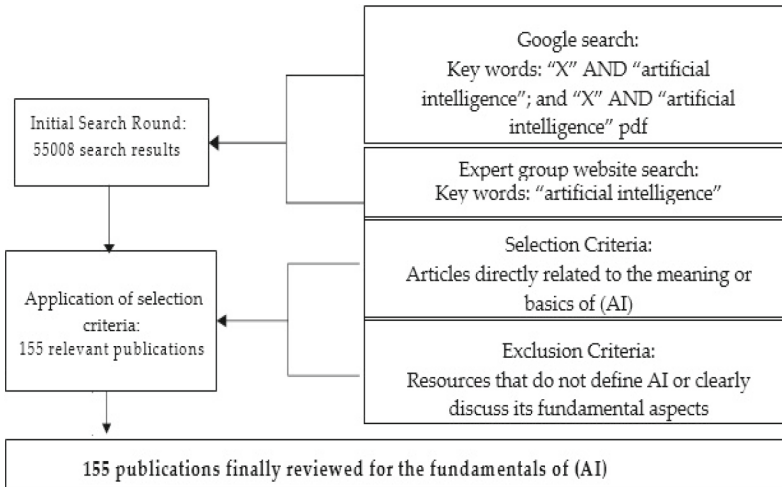
Fig. 1. The selection process for reviewed publications

To analyze the data collected, the researcher used the content analysis method as guided by Davenport [7] and Elo [8]. This method consists of three phases [17]: preparation, organization, and reporting. he chose to use this method because of the possibility it provides to enhance the understanding of data in documents by categorizing them based on words or phrases with similar meanings. It has proven to be very effective in attaining a condensed broad description of a phenomenon as well as in developing conceptual frameworks which are both objectives to be attained in this study. Also, he used an inductive content analysis approach whereby we read through all the 155 relevant articles while writing down the headings of all main aspects related to (AI) that identified. After this first review, the articles categorized under their corresponding headings and merged the data that were found in similar headings under a single heading which then became categories [10, 13].

After verification by each author, researcher named the categories using content-characteristic words and made a description for them. Then each did a second review to validate each category and its content and arrived at the categories presented in Table 2. He used AQUAD version 7.5.5.1, a Computer Assisted/Aided Qualitative Data Analysis Software (CAQDAS) to facilitate word counting and content categorization [9, 11].

Table 2. (AI) Concept categories and their meanings

Category of AI concepts	Meaning
AI definitions	A statement expressing the exact meaning of AI in context
AI characteristics (functions)	A prominent set of attributes that distinguish AI
AI capabilities (services)	The potential of AI to perform or develop certain aptitudes
AI principles (ethics, values)	Beliefs, rules or standards of conduct that could be accepted as the basis for good AI reasoning, conduct or behavior
AI technologies (subfields, computing system, application areas, methods, technique, branches, computing models)	The practical applications domains of AI
AI principles AI dimensions (types, categories)	The classification used to distinguish AI based on common attributes

These categories helped the researcher to develop a concept-centric framework which he augmented [20] with (IS) levels of analysis for the organization of our findings and to better capture research gaps in (AI) adoption use and impact. This framework will enable to unlock the value of (AI) that revolves around people (individuals), processes (task), organizations, inter-organizational relationships, and society. From the meanings of the categories, researcher realizes that (AI) characteristics, capabilities, principles, and technologies are categories that can practically affect the management and implementation of (AI) in (IS). AI definitions and dimensions essentially just explain the understanding practitioners have of (AI) and not the functional aspects and thus, the current classification framework will not include them [16]. This proposed framework is presented in Table 3.

Table 3. (AI) Adoption, use and impact framework in information systems (Legend: A = Adoption, U = Use, I = Impact)

	Artificial intelligence concepts								
	Characteristics & capabilities			Principles			Technologies		
Level of analysis [19]	A	U	I	A	U	I	A	U	I
People									
Processes									
Organization									
Interorganizational									
Society									

3   Results and Discussion

In this part, researcher summarizes and discuss each category to bring out the main perception practitioners have of (AI):

3.1   (AI) Definition

The keywords in the definition of (AI) by practitioners are machines (15%), learning (12%), perform tasks (14%), human intelligence (11%) and computer systems (9%). This is because, generally, practitioners perceive (AI) to be machines or computer systems capable of learning to perform tasks that normally require human intelligence. However, there are some particularities, depending on the expert group. Most IT companies perceive AI as a term in the computer science field used to describe machines that perform tasks by mimicking human intelligence using abilities acquired through machine learning and deep learning. Consulting firms define AI more like the theory and development of computer systems (mostly machines) or technologies capable of performing tasks that normally require human intelligence.

3.2   (AI) Dimensions

Practitioners tend to classify AI into two main dimensions which some also called types, categories, forms, or domains: artificial general Intelligence (AGI – 33%), and artificial narrow Intelligence (ANI – 26%). AGI, which some referred to as general/generalized (AI), Pure (AI) or Strong (AI), is AI that can perform any/multiple intellectual tasks in a way that matches or surpasses human intelligence. ANI, which some practitioners referred to as narrow/applied AI, Pragmatic AI, or Weak AI refers to the application of AI techniques to narrower or specific problems.

Practitioners claim they started to focus on ANI because of the lack of progress they were making in AGI. PwC suggests hardwired/specific systems and Adaptive systems as the two main dimensions of AI. Hardwired systems have automated and assisted intelligence capabilities, while adaptive systems have augmented and autonomous intelligence capabilities.

3.3   (AI) Characteristics

Researcher has identified two main characteristics of (AI): learning (20%) and perception (22%). In fact, there is no (AI) if the system cannot learn and perceive data or objects in its environment. (AI) must be able to learn from experience and use the learning to comprehend (16%) by recognizing patterns, solve complex problems, understand language and its nuances, create perspectives, and make decisions. Also, it must demonstrate some degree of environmental perception such as visual perception and speech recognition.

3.4   (AI) Capabilities

As an emerging technology, (AI) is expected to have promising capabilities that will enable or facilitate the transformation or creation of businesses processes and industrial systems. However, these capabilities have not been widely discussed [4]. The four main AI capabilities (or cognitive services) discussed by practitioners are: learn (22%), sense (11%), act (15%), and comprehend (19%). These capabilities came mostly from consulting firms. Sense as (AI's) ability to process information like images, sound, speech, and text; comprehend as (AI's) pattern recognition capabilities; act as (AI's) ability to interpret data, make rational decisions and execute them automatically; and learn as (AI's) ability to leverage algorithms for the interpretation of input data. Microsoft and IBM perceive vision (4%), speech (4%), language (5%), knowledge (6%) and search to be the main (AI) capabilities.

They call them the main building blocks of every (AI)-based solution. Vision refers to AI's ability to recognize image or video content; speech refers to its ability to understand sounds and transcribe them into text; language refers to their ability to understand the meaning of words despite the nuances and complexities of language; and knowledge refers to its ability to understand relationships between objects in its environment.

3.5   AI Principles

Researcher observed that there is no generally accepted basis for good AI reasoning, conduct or behavior. Many practitioners did not focus on this aspect and those who did suggest principles in line with their perspective and applications of (AI). However, bias/fairness (13%), transparency (17%), privacy (13%), accountability (11%), safety/reliability (9%), and security (4%) were the most recurrent principles expected to guide the design and development of (AI).

The principles suggested and applied by IT companies mostly have an orientation towards AI design and development. In addition to the principles, some companies for example, suggest other principles like value alignment, explainable, and user data rights. They also talk about intent, algorithmic and data responsibility, system assurance, embedded values, robustness.

3.6   AI Technologies

To refer to AI technologies, practitioners interchangeably used terms like subfields, application areas, methods, techniques, and branches. The most widely known AI technologies among practitioners include machine learning (ML – 25%), deep learning (DL – 15%), NLP (13%), computer vision (7%), robotics (4%), speech recognition (6%), and neural networks (4%). IT companies were mostly interested in ML and DL, with a few discussing neural networks, NLP and computer vision. All other AI technologies like text analysis, speech recognition, and smart robotics were not very much discussed. The main technologies discussed by consulting firms were NLP, ML, computer vision, and DL. Experts' reviews and magazines focused on DL and ML, while research institutions focused on DL and NLP.

The researcher has summarized In Table 4, what practitioners today fundamentally perceive as (AI). These are some of the key aspects that guide their design and development practices.

Table 4. Summary of the main perception of AI by practitioners

Categories of AI concepts	Findings
AI (What is)	Intelligent machines, set of technologies, computer systems
Main dimensions	Artificial General Intelligence (AGI), Artificial Narrow Intelligence (ANI), Assisted Intelligence, Augmented Intelligence, Automated Intelligence, Autonomous Intelligence, Pragmatic AI, Pure AI, Strong AI, Weak AI
Core characteristics	Learning, Perception
Key capabilities	Communicate, Comprehend, Know, Learn, Listen, Process Data, Reason, Recognize Patterns, Search, Sense, Speak, Think, Visualize
Main objectives	Perform Tasks, Solve Complex Problems
Main guiding principles	Accountability, Agility, Beyond Bias, Controllability, Customizability, Empathy, Fairness, Reliability, Resilience, Privacy, Robustness, Security, Transparency, Trustworthiness, Vigilance, Integrity
Key technologies	Biometrics, Cognitive Engagement, Cognitive Insight, Collaborative Systems, Computer Vision, Deep Learning, Expert Systems, Generative Adversarial Networks (GANS), Image Analysis, Image Recognition, Knowledge Engineering, Knowledge Representation, Logic Networks, Machine Learning, Natural Language Generation, Natural Language Processing (NLP), Natural Language Understanding, Neural Networks, Ontology Creation, Pattern Recognition, Robotic Process Automation (RPA), Robotics, Smart Robotics
Endpoint	Emulate human intelligence and/or performance

4   Conclusion

The aim of this paper was to explore what leading expert entities in the AI research and development industry today perceive AI to be, and how this can help foster IS research on AI. To this end, we decided to conduct a systematic literature review of 155 articles published by 15 IT Companies, 10 Consulting Firms, 12 Expert Reviews and Magazines, 3 Research Institutions and 7 IT Industry Analysts. The intention was to contribute to both IS research and practice by reducing the foundational barriers to AI adoption, use and impact in IS and to start a serious discussion on the role of AI in contemporary IS.

In this article, researcher provide the definitions, dimensions, characteristics, capabilities, and principles, that form the basis of what leading industry experts call (AI). He developed a logical approach to grouping and presenting these underlying concepts we uncovered, and we use this to present the major findings and insights of

this research. It also provides a scheme that helps to classify existing IS literature or research gaps on AI adoption, use and impact in IS according to IS levels of analysis. researcher hopes this provides the IS community with the necessary understanding of AI and begins discussions on the classification of available knowledge on the topic.

Researcher believes that the current contribution is crucial to the future of (AI) in (IS) because it is expected to open a whole new perspective for the IS community. Researchers would be able to use this classification framework as a starting point for the classification of (AI) research in IS because none has been done before, especially one that relies on information from current (AI) practices. Also, this framework captures all the main AI concepts now and can easily be extended to accommodate new concepts. This provides a common understanding of AI on which researchers can develop models and theories on AI in IS and that can help IS practitioners implement innovative IS in their organizations.

The researcher believes that this paper is very timely because of the increasing number of AI-based information systems and the growing research on AI. Thus, understanding the fundamental aspects of AI and key areas of interest can help boost the evolution of AI in a more constructive and sustainable direction.

References

1. Andrew, S., Paul, H. Trust in Artificial Intelligence. Transform Your Business with Confidence (2018)
2. AWS: What Is Artificial Intelligence? Machine Learning and Deep Learning (2018). https://aws.amazon.com/machine-learning/what-is-ai/. Accessed 17 June 2021
3. Bernard, J.-G., Gallupe, R.B.: IT industry analysts: a review and two research agendas. CAIS **33**, 16 (2013)
4. Brynjolfsson, E., Rock, D., Syverson, C.: Artificial intelligence and the modern productivity paradox: a clash of expectations and statistics. In: The Economics of Artificial Intelligence: An Agenda. University of Chicago Press, Chicago (2018)
5. Cellan-Jones, R.: Stephen Hawking warns artificial intelligence could end mankind. BBC News **2**, 2014 (2014)
6. Davenport, T.H., Ronanki, R.: Artificial intelligence for the real world. Harv. Bus. Rev. **96**(1), 108–116 (2018)
7. Douglas, B.K., Oliver, S.G.: Here is the evidence, now what is the hypothesis? The complementary roles of inductive and hypothesis-driven science in the post-genomic era. BioEssays **26**(1), 99–105 (2004)
8. Elo, S., Kyngäs, H.: The qualitative content analysis process. J. Adv. Nurs. **62**(1), 107–115 (2008)
9. Gobet, F., Sozou, P.: The Role of Imagination in Social Scientific Discovery: Why Machine Discoverers Will Need Imagination Algorithms. Michael Stuart Scientific Discovery in the Social Sciences. Springer Verlag, Chem (2019). https://home.kpmg/content/dam/kpmg/uk/pdf/2018/06/trust_in_artificial_intelligence.pdf. Accessed 17 June 2021
10. Jantzen, B.C.: Discovery without a 'logic' would be a miracle. Synthese **193**(10), 3209–3238 (2015). https://doi.org/10.1007/s11229-015-0926-7
11. Miles, M.B., Huberman, A.M., Huberman, M.A., Huberman, M.: Qualitative Data Analysis: An Expanded Sourcebook. Sage, Thousand Oaks (1994)

12. Oh, C., Lee, T., Kim, Y., Park, S., Suh, B.: Us vs. Them: understanding artificial intelligence technophobia over the google deepmind challenge match. In: Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems, ACM, pp. 2523–2534 (2017)
13. Paré, G., Trudel, M.-C., Jaana, M., Kitsiou, S.: Synthesizing information systems knowledge: a typology of literature reviews. Inf. Manage. **52**(2), 183–199 (2015)
14. Poornima, R., James, J.: Making AI Responsible and Effective (2018). https://www.cognizant.com/whitepapers/making-ai-responsible-and-effective-codex3974.pdf
15. Ramya, A., Kannathal, A.: Artificial Intelligence and Robotics Process Information (2018). https://www.infosys.com/industries/financial-services/insights/Documents/robotics-processautomation-cards.pdf
16. Ransbotham, S., Kiron, D., Gerbert, P., Reeves, M.: Reshaping business with artificial intelligence: closing the gap between ambition and action. In: MIT Sloan Management Review, vol. 59, no. 1. Massachusetts Institute of Technology, Cambridge, MA (2017)
17. Samiee, S.: Transnational data flow constraints: a new challenge for multinational corporations. J. Int. Bus. Stud. **15**(1), 141–150 (1984)
18. Shoham, Y., et al.: The AI Index 2018 Annual Report. Stanford university, Stanford (2018)
19. Pietsch, W.: The causal nature of modeling with big data. Philos. Technol. **29**(2), 137–171 (2015). https://doi.org/10.1007/s13347-015-0202-2
20. Webster, J., Watson, R.T.: Analyzing the past to prepare for the future: writing a literature review. MIS Q. **26**, xiii–xxiii (2002)

Management Information Systems Enhance Corporate Sustainability

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Abstract. After the fourth industrial revolution, information technology has become indispensable and the most influential in businesses, countries, and individuals. These modern technologies contributed to the speed and ease of data transfer, which enhanced the global economy, societies, and public institutions. Vast developments require businesses to adopt information systems to improve spending efficiency, improve decision-making processes, and build flexible capabilities to maintain business sustainability among various age challenges. Intelligent systems, e.g., Artificial intelligence (AI), the Internet of Things (IoT), and cloud computing, drive global economies. Where strategic agility and proactive business planning have contributed to the adoption of information systems to re-engineer enterprise resource management, in Industry 4.0, intelligent machines have increased the productivity of companies towards optimal use of resources, achieving minimum capital while satisfying operational excellence.

Keywords: Management information systems · Artificial intelligence · Internet of Things · Natural language processing · Cloud computing · Big data · Business · Corporate sustainability · Agility

1 Introduction

In a world of rapid change and uncertainty, information technology has become a necessary and decisive factor in our daily lives. It is challenging to live without Technology in all areas of life [28–32]. Technology has dominated all areas of our life in recent years, such as the economy, education, health, and other sectors. Even contributing to shaping the new world and increasing the competitive advantage for sustainability [5, 58, 59]. The management information system is the most prominent area that countries are racing to invest in to enhance the efficiency of governments in raising national output and keeping pace with the development taking place, especially after the Fourth Industrial Revolution [16–18]. Management information systems improve the performance of technical approaches to raise performance efficiency by adopting modern technologies, where machines can predict the future and contribute to the

decision-making process through big data analytics and the ability to think and act using algorithms [39, 43].

Moreover, it contributes significantly to improving the quality of services and raising customer service efficiency through the database and information analyzed more broadly and deeply [9–12]. On the other hand, it also contributes to increasing business efficiency, enhancing productivity, and rationalizing costs; therefore, everyone from countries and organizations is racing to invest in management information systems applications and technologies [41, 50–53]. The business sector faces significant challenges and pressures to maintain business sustainability and survival challenges and changes at political, social, and economic levels. However, information technologies are the first weapon in facing these challenges and decisive factors for the Sustainability of services and business operations, so most businesses are accelerating in adopting these techniques to keep pace with development [19, 21, 30–33]. This research will be focusing on the management information systems intelligent systems solutions and their positive effect on corporate sustainability, Improvement in operational excellence, Decision making, and the importance of strategic agility to adopt MIS in business sustainability [39].

2   Related Theoretical Review

2.1   Management Information Systems (MIS)

– **Artificial intelligence (AI)**
  AI theoretically is an autonomous system that is interacted and self-managed without end-user inputs; it can learn and locate the pinpoint of the decision-making platform, aims to tackle various evidence and objects. Thus, systems have got managed by automated circumstances [39, 40]. Moreover, Jensen posits that AI machines can prevent human opinions in decision-making to ensure fair and better decisions [9, 39].
– **Machine learning (ML)**
  Machine Learning (ML) is an intelligent technique that permits devices to learn by themselves and stored data. Thus, the programmer does not have to explicitly program issues and failures over time. [31] reveal that the outcome of ML is utilizable to predict and classify objectives. Such a scenario enables classification procedure based on archived data on high reliability, making the ML the drive to take the appropriate decisions [31, 40].
– **Big data**
  Big data is the dataset, including a large volume of information and velocity, and it significantly required scaling methods in horizontal ways for efficient processes. In addition, [13, 34]. Big data is a trended generation of information technology, as architectures have investigated the Technology to analyze a massive volume of data and get main characteristics [13].
– **Text mining/Natural language processing (NLP)**
  NLP is a communication tool that enables computers to understand human languages; the method obtains by analyzing a massive volume of data extracted from

human language. [45] point out that NLP can solve simple issues, such as responding to a query via internet platforms, as it combines complex required terabytes of data to automate it [45]. Also, they Finds that NLP is helpful to use in various applications to analyze the data contains text and audio; such applications are Search engines, Chatbots, Spell check software, and social network development [26, 40].

– **Internet of Things (IOT)**

IoT is a network that enables users to integrate millions of Intelligent Machines to export information in objects of control services and operations such as home automation systems, healthcare applications, power grid, and essential infrastructure control. Furthermore, monitoring and controlling the IoT is the following trending approach. Hence, restrictions get built by the gap of artificial and actual environments, which are reduced by dynamic Digitalization of physical systems, as it has gotten developed to deliver well-performed services with added values for IoT devices. Such devices are transferred to production data, integrated by cloud platforms to use applications in industry 4.0 effectively. These devices contribute to producing data at all production levels, for example, the number of produced products, temperature, energy, and waste, as such data are valuable criteria for trace quality of production [3, 7, 24].

– **Could Computing**

Cloud computing gets determined as a new standard method of comprehensive spread computing. Such a technology shifts the application of computers and relevant machines from laptops, personal computers to large capacity data centres. Cloud computing positively affects consumers and information technology-enabled organizations through significant capital investments [24, 58]. This Technology includes access to scalable remote resources, such as servers, networks, and applications on-demand and on pay per usage basis. Cloud services are getting developed in many activities related to the IoT, including Genomics Data Processing, Education, and Learning Services for Small and Medium enterprises, E-Learning Methods, Manufacturing operations, Smart Cities, Emergency Recovery in hospitals, E-Government, Internet of Cars and Human Resource management [8, 39–43].

2.2 Sustainability

Sustainability is embracing innovation practices that achieve economic, social, and environmental practical performance. Moreover, developing sustainability involves economic growth by preventing a decrease in natural resources such as carbon footprint. Environmental sustainability integrates with the social responsibility of business operations and their environmental effects [21–23].

2.3 Operational Excellence

For Example, Working to achieve customer satisfaction by providing the required products or goods promptly with the desired specifications at the lowest possible cost while ensuring the highest levels of quality promised to the customer, raising customer loyalty and making them marketed indirectly with their satisfaction [44]. And,

Google AI robot gets credited for this, although [25, 56] shed a few reservations. Moreover, organizational capability aid in enhancing proactivity, reacting effectively to situations, and demand effective resource utilization. It also improves spending efficiency, raises organizational capability to deal with the rapidly changing world, and contributes significantly to the corporate survival from continuous threats by transforming them into future opportunities [40, 51, 53].

3   Literature Review

3.1   Management Information Systems Solutions

Management information system enables the gathering and data processing to allow decision-makers to strategically plan, implement applications, control operations, and quantitively decide on processes [36]. [51] finds that the decision has vital aspects such as rational decision-making process and accuracy of data to gain a sustainable competitive business environment, as it depends on a high level of information. However, the importance of information systems has been added increasingly as a significant role in the decision-making process [45]. They also find that the decision objective is to find solutions from various solutions to solve obstacles and problems. For achieving the desired goals, the decision is comprehending how to move in a specific direction, which is selectively beyond various methods. In the firms, the information will create the basis for Identifying ways. While data is collected, the vital goal of the Information System implemented, information is proceeded to managers to assist in making decisions. A significant relationship between information systems managed by public organizations, people, and effective decision-making positively influences government entities and integrated organizations [52].

According to [18], Digitalization is an observed fact that affects every process and operation on demand in the global economy. Such Digital Technologies focused increasingly on the industry. For example, Digital technology in the manufactured products and Industry 4.0 premises and online services outsourcing manage production ways, Business, and recruitments within worldwide value chains [18]. [36] finds that e-commerce is becoming a modern challenge to accelerate the development of the global economy. It is the introduction of qualitatively new directions to the strategic management of business processes using information technology. Its context is the digitalization of business processes, along with the concept of Industry 4.0 [33]. The digital business process attempts to effective capabilities, increase productivity and connectivity to various functions of organizations businesses operations, along with its created value by intelligent systems solutions [20], as major modern technologies in industry 4.0 are the following:

Artificial Intelligence (AI), Machine Learning (ML), And Big Data
[2, 3] computational intelligence has quick and excellent quality results contributing to AI developments and advances. AI has an increasingly important drive that influences societies as its economies get classified by rapid innovation and outstanding education. Today, AI and ML consider as economic abilities among oil; those who collect and transform data are empowered persons. Moreover, intelligence acts by analysis process

and knowledge by data through artificial intelligence [2]. [31] explain that AI and ML increasingly help businesses achieve a high level of Sustainability through intelligent machines in their operations and consumer-facing activities. Such Systems as chatbots, for example, use dedicated human resources to manage customer inquiries, as it helps reduce customer feedback without loss of customer satisfaction [27, 50].

[17] reveal that business managers gain substantial savings through such innovative machines. However, managers face a challenge too within small and medium-sized enterprises (SMEs) from the lack of comprehension of AI and ML. Managers do not understand how such innovative technologies add value to their organizations and corporate sustainability [15, 32] report contributed to the AI revolution, as it discovers that AI can help SMEs construct business models and enable them to attain practical scale and productivity results. Such a case inevitably extends to the highly efficient use of resources and reduces the environmental impact [32].

[2] find that big data is a new trend of information technology; it emerged rapidly over the past decades; Internet drive enables businesses to access large amounts of data that traditional tools cannot process [37]. [28] contribute that Business can empower their position in the market by adopting extensive data systems. The study explains that large Businesses and SMEs can attain Sustainability by implementing big data in many aspects. For example, big data enhance the openness and transparency of information, assisting business managers in making effective decisions as they archive data in automated forms, operational and time-consuming during the business process [23, 39, 58].

[45] argue that while large firms operate big data, SMEs play an essential role within the global economy. SMEs should adopt big data for tackling complex situations about service quality and stakeholder management. Such lead to influencing local economic policies. That contributes SMEs to address the issues affecting their productivity, using data-based policies and strategies [40, 58, 59] as previous studies concluded that big data analytics provides opportunities for business sustainability. Businesses will remain powered in a data-driven economy and evidence by organizational practices over time among traditional strategic management practices; big data are reshaping information value chains and reassess competitive forces [58].

Text Mining/Natural Language Processing (NLP)
Natural language processing (NLP) is a critical component in data systems. Such a form of Technology includes Common use activates of question answering, summarizing, natural language, and language modelling. The study finds that NLP was a vital tool for global healthcare organizations; NLP library technology has been widely used in enterprises worldwide [19]. In addition, [19] reveals that spark NLP empowers various business areas, while Spark NLP can work offline and gets developed in air-gapped networks. NLP has the benefit of the transfer learning method and deploying the latest algorithms in NLP research; more, it delivers the critical mission to business-grade solutions on-demand as it considers as an open-source NLP library [19]. According to [49], they advise using NLP to reduce business costs and gain competitive advantage by adopting NLP intelligent systems in Business that will create value to organizations, be cost-effective, and generate revenues to attain sustainability factors [43].

Internet of Things (IOT)

[54] has contributed to the effective adoption of IoT to businesses. The scholar address improvement in several areas of business operations. Such a technology elaborates by various models, for example, recommend that processing speed are efficient while supply chains are automated. As a result, innovation gets enhanced, and Businesses produced valuable products than previously [48]. emphasize the potential of IoT to boost economic Sustainability for various businesses and a significant indirect impact on businesses sustainability; hence, it creates efficient deals with customers and suppliers, which has resulted in gaining supply chain management advantage and reducing waste [39]. [35] conclude that IoT assists various businesses in attaining Sustainability by determining the preferred areas and using their object competencies to transfer and grow effectively. Companies have to enrol in their decision-making and supply chain systems to reach systematic growth [31].

Cloud Computing

[12] find that cloud computing enables various benefits to Business. It allows data increasingly to be accessible to a large volume of individuals; different projects activate deployed on-demand. Such a scenario significantly sustains business productivity, as business operations get flexibly operated from various locations. Such flexibility is critical, for example, when a business monitors the competition, acquires consumers, and establishes a new product. The study, profound that business managers and partners, if they got open access to data, their capacity for learning increases over time, leading to better decisions and accomplishing Sustainability in the business sector [10]. [4] find that one of the significant advantages of cloud computing for various businesses, the benefits of considering Information Technology failures, are becoming more flexible and on-demand services anywhere and anytime on global premises [4]. Previous studies have contributed cloud computing as demanded tool in business models; it enhances the robustness of business performance—such as Technology elaborating in enterprises management resources and practical energy usage.

3.2   The Role of Business

The business sector is one of the most critical sectors that affect the level of life of the state and the world, as it gets linked to all other sectors. Therefore, any change or damage to other industries such as the environmental, political, social, and military leads to direct damage. In the past, the business sector was traditional simple and did not depend on Technology primarily. However, after the industrial revolutions, especially the 4.0 industry, the whole world began to focus on information technology and the need to strengthen the infrastructure supporting the adoption of these technologies [40, 47].

According to International Institute for Management Development (IMD) world competitive centre, in 2020, Singapore becomes the second country in the general ranking of the governments of digital competitiveness that adopting modern technologies. The countries in the Gulf aim to strengthen IT infrastructure. These countries are adopting e-government to enhance all business environments. These countries provide support for the private sector and seek foreign investment within this area [47].

The new of the Gulf nations get underpinned to sustainable corporate development through firm resources, services and the diversification of different sources of income. Such countries wish to discontinue relying on only their oil resources for national income [1, 12, 37, 55, 57].

3.3   MIS Role in Improving Business Sustainability

Management information systems play a pivotal role in the Sustainability of modern businesses, as they contribute to enhancing the decision-making process and raising the efficiency of performance [35, 46]. Revealing that MIS transformation tools such as AI machines, IoT, and cloud computing are considered knowledge management systems that contribute to demand over time to value creation and digital innovation approach, which attain inclusive and global growth [46]. Modern technologies based on advanced information systems can improve the efficiency of operating systems and support innovation, which enhances the competitive advantage and grows the Business locally. In addition to strengthening the global economy in general [14, 38], The following studies show various business benefits from MIS aspects, including business sustainability strategic approaches [55, 56].

Operational Excellence
Operational excellence is the excellence in the processes that enhances competitive advantage and achieves customer satisfaction directly related to Supply chain management [26]. Moreover, Big data analysis is an example of the most prominent operational excellence. It enables companies to analyze that data to reach customer requests with the highest possible quality and speed while rationalizing expenses [6]. On the other hand, the simulation of reverse logistics systems enhances the business benefit and supports green environment policy. Reverse logistics systems are one of the modern ways to dispose of waste created and reversed in a way that can benefit from returning it to the re-manufacturing points, which is a value-added that enables optimal use of resources [12]. Information Thus, information supported by innovation [40].

Improved Decision Making
Analyzing big data assesses past data and link past patterns with current data. Hence, big data can predict the future contributes, enhancing the efficiency of decision-making in the business sector [13]. Furthermore, modern information technology facilitated analyzing and eliciting results based on the data more accurately while reducing the possibility of human errors. From another perspective, scholars reveal that decision-makers gained an edge when applying management of information systems on their market when searching for the customer desired products, estimated quantity, and new ways to innovatively produce such products, with reduced expenses [49, 50].

Strategic Agility Advantage To Business Survival
The market and work environments have changed drastically, as technological developments after the fourth industrial revolution represented by big data, AI, and the Internet have become decisive for business survival. In addition, [34] pointed out that technological developments have contributed to shaping modern business parameters. However, the ability of a business to have strategic agility in keeping pace with these

technologies according to world data is one of the critical factors to maintain business sustainability [30]. Furthermore, Lengnick-Hall and Beck (2009) have proven that Strategic agility is an essential element to increase business competitiveness through the flexibility to deal with the accelerating needs in environmental changes, proactive steps for strategic moves, and rapid response to urgent matters [22]. From the point of view of MIS, decision makers in organizations must be aware of strategic agility and can be strategically agile in built a qualified teams and enable them to benefit from information technology as well as invest in the adoption of these technologies that support innovations and enhance the efficiency of spending, which sustain business and create new opportunities [39].

4   Conclusion

This research paper concluded that developing information technologies such as AI shapes business opportunities and competitiveness. Moreover, managing information systems by implementing intelligent machines in businesses operations has positive potential in productivity, market demand, optimal use of resources, improving the decision-making process, and gaining strategic agility advantage. That will reflect on digital innovation applications to enhance business survival. Furthermore, management information systems play a significant role in modern corporate sustainability by contributing to organizational performance and market productivity. Therefore, the study suggested adopting intelligent technologies in industries, such as IoT and cloud computing, to gain sustainability and reduce environmental changes upon adopting these technologies. Therefore, thus technologies adoption is significantly beneficial for the global economy. Moreover, after the Fourth Industrial Revolution, it became the most prominent weapon for enhancing spending efficiency and exploiting available resources, raising business productivity, as also recommended by scholary authors [39].

5   Research Limitations

There are two significant limitations addressable for future research. First, future research can focus on the role of MIS in improving business sustainability. Such a relationship requires a deeper empirical comprehension for improving service and product quality by utilizing Management Information Systems, which will reflect its corporate sustainability and have depth assessment by considering the Global revolutions and industry experiences over time. Second, the lack of sampling data focusing on regulating business strategies and business sustainability factors through awareness programs to business partners regarding using MIS in the short term. Therefore, Future research can be extending to a broader pool of journals to honestly examine how MIS is changing the trends of Driven-knowledge and E-learning of the future direction of Business aspiring Sustainability.

References

1. Alabbasi, Y., Sandhu, K.: Blockchain technologically driven innovation at the gulf cooperation council countries: an overview. In: Research Anthology on Blockchain Technology in Business, Healthcare, Education, and Government, pp. 1202−1217 (2021)
2. Al-Sartawi, A. (ed.): The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. SCI, vol. 974. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-73057-4
3. Al-Sartawi, A.: Information technology governance and cybersecurity at the board level. Int. J. Crit. Infrastruct. **16**(2), 150–161 (2020)
4. Andra-Ileana Neicu, A.C.R.: Cloud computing usage in SMEs. An empirical study based on SMEs employees perceptions. Sustainability **12**, 4960 (2020)
5. Awamleh, F., Ertugan, A.: The relationship between information technology capabilities, organizational intelligence, and competitive advantage. Sage J. **11**(2), 215824402110152 (2021)
6. Albastaki, Y.: Clustering algorithms as a tool for odour classifications in enose developments. In: Al-Sartawi, A., Razzaque, A., Kamal, M.M. (eds.) EAMMIS 2021. LNNS, vol. 239, pp. 46–56. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-77246-8_5
7. Al-Sartawi, A.: Social media disclosure of intellectual capital and firm value. Int. J. Learn. Intellect. Cap. **17**(4), 312–323 (2020)
8. Al-Sartawi, A.: Does it pay to be socially responsible? Empirical evidence from the GCC countries. Int. J. Law Manage. **62**(5), 381–394 (2020)
9. Benjamin, M., Jensen, C.W.: Algorithms at war: the promise, peril, and limits of artificial intelligence. Int. Stud. Rev. **22**(3), 526–550 (2019)
10. Chang, V.: An overview, examples, and impacts offered by emerging services and analytics in cloud computing virtual reality. Neural Comput. Appl. **29**(5), 1243–1256 (2017). https://doi.org/10.1007/s00521-017-3000-1
11. Christa, U.R., Kristinae, V.: The effect of product innovation on business performance during COVID 19 pandemic. Uncertain Supply Chain Manage. **9**, 151–158 (2021)
12. Dario Assante, M.C.: The use of cloud computing in SMEs. Procedia Comput. Sci. **83**, 1207–1212 (2016)
13. Deepa, N., Pham, Q.-V.: A Survey on Blockchain for Big Data: Approaches, Opportunities, and Future Directions (2020). arXiv preprint
14. Dev, N., Shankar, R., Qaiser, F.H.: Industry 4.0 and circular economy: operational excellence for sustainable reverse supply chain performance. Resour. Conserv. Recycl. **153**, 15 (2020)
15. Ghasemaghaei, M., Ebrahimi, S., Hassanein, K.: Data analytics competency for improving firm decision making performance. J. Strateg. Inf. Syst. **27**(1), 101–113 (2018)
16. Hannoon, A., Al-Sartawi, A., Khalid, A.: Relationship Between Financial Technology and Financial Performance. In: Al-Sartawi, A.M.A. (ed.) The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. SCI, vol. 974, pp. 337–344. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-73057-4_26
17. Hansen, E.B., Bogh, S.: Artificial intelligence and Internet of things in small and medium-sized enterprises: a survey. J. Manufact. Syst. **58**, 362–372 (2021)
18. Osipov, V., Rončević, A.: Institutionalization of the fourth industrial revolution in national economics and on global market: different paths to success. In: Konina, N. (ed.) Digital Strategies in a Global Market, pp. 39–52. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-58267-8_4

19. International Institute for Management Development (2020). https://www.imd.org/centers/world-competitiveness-center/rankings/world-digital-competitiveness/

20. Jamwal, A., Agrawal, R., Sharma, M., Kumar, V., Kumar, S.: Developing a sustainability framework for industry 4.0. Procedia CIRP **98**, 430–435 (2021)

21. Kocaman, V.D.: Spark NLP: natural language understanding at scale. Softw. Impacts **8**, 100058 (2021)

22. Langley, D.J., Doorn, J., Ng, L., StefanStieglitz, I.C., Lazovik, A., Boonstra, A.: The internet of everything: smart things and their impact on business models. J. Bus. Res. **122**(2021), 853–863 (2021)

23. Lăzăroiu, G., Luminit, I., Andronie, M., Dijmărescu, I.: Sustainability management and performance in the urban corporate economy: a systematic literature review. Sustainability **12**(18), 7705 (2020)

24. Lengnick-Hall, C., Beck, T.: Resilience capacity and strategic agility: prerequisites for thriving in a dynamic environment. Res. Papers Econ. **2**, 39–69 (2009)

25. Karolak, M.: E-services and M-services using IoT: an assessment. In: Al-Sartawi, A., Razzaque, A., Kamal, M.M. (eds.) Artificial Intelligence Systems and the Internet of Things in the Digital Era - Proceedings of EAMMIS 2021, pp. 523–533. Springer, Istanbul, Turkey (2021) https://doi.org/10.1007/978-3-030-77246-8_48

26. Karolak, M., Razzaque, A., Al-Sartawi, A.: E-services and M-services using IoT: an assessment of the Kingdom of Bahrain. In: Abdalmuttaleb, M.A., Al-Sartawi, M., Razzaque, A., Kamal, M.M. (eds.) Artificial Intelligence Systems and the Internet of Things in the Digital Era: Proceedings of EAMMIS 2021, pp. 523–533. Springer International Publishing, Cham (2021). https://doi.org/10.1007/978-3-030-77246-8_48

27. Lorne, F.T., Gogireddy, M.R.: Digital social contracts with AI robots: some implications for Amazon.Com. In: Musleh, A.M.A., Al-Sartawi, A.R., Kamal, M.M. (eds.) EAMMIS 2021. LNNS, vol. 239, pp. 78–89. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-77246-8_8

28. M. Iqbal, S.H.: A study of big data for business growth in SMEs: opportunities & challenges. In: 2018 International Conference on Computing, Mathematics and Engineering Technologies (iCoMET), pp. 1–7 (2018)

29. Sadeeq, M.M., Abdulkareem, N.M., Zeebaree, S.R., Ahmed, D., Sami, A.S., Zebari, R.R.: IoT and cloud computing issues, challenges and opportunities: a review. Qubahan Acad. J. **1**(2), 1–7 (2021)

30. Mangla, S.K., Kusi-Sarpong, S., Luthra, S., Bai, C., Jakhar, S.K., Khan, S.A.: Operational excellence for improving sustainable supply chain performance. Resour. Conserv. Recycl. **162**, 105025 (2020)

31. Abdalmuttaleb, M.A., Al-Sartawi, M., Razzaque, A., Kamal, M.M. (eds.): Artificial Intelligence Systems and the Internet of Things in the Digital Era: Proceedings of EAMMIS 2021. Springer International Publishing, Cham (2021)

32. Massimi, M., Dimond, J., Le Dantec, C.: Finding a new normal: the role of technology in life disruptions. In: Proceedings of the ACM 2012 Conference on Computer Supported Cooperative, pp. 719–728 (2012)

33. Menga, T., Jing, X., Yan, Z., Pedrycz, W.: A survey on machine learning for data fusion. Inf. Fusion **57**, 115–129 (2020)

34. Nejatian, M., Zarie, M., Rajabz, A.: Paving the path toward strategic agility: a methodological perspective and an empirical investegation. J. Enterp. Inf. Manage. **32**(4), 538–562 (2019)

35. Nylander, W.H.: Challenges for SMEs entering the IoT world: success is about so much more than technology. In: Proceedings of the 7th International Conference on the Internet of Things (2017)

36. Olesia, B.: Use of modern information technologies and digitalization of business processes. In: Concepts, Strategies and Mechanisms of Economic Systems Management in the Context of Modern World Challenges (2021)

37. Palani, K.: Role of management information system in jindal power industry in Odisha: a paradigm shift for corporate sustainability. In: Research Review International Journal of Multidisciplinary, pp. 28–31 (2018)

38. Prifti, V., Markja, I., Dhoska, K., Pramono, A.: Management of information systems, implementation and their importance in Albanian enterprises. In: IOP Conference Series: Materials Science and Engineering (2020)

39. Razzaque, A.: Artificial intelligence and IT governance: a literature review. In: Al-Sartawi, A.M.A. (ed.) The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. SCI, vol. 974, pp. 85–97. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-73057-4_7

40. Razzaque, A., Eldabi, T., Chen, W.: Quality decisions from physicians' shared knowledge in virtual communities. Knowl. Manag. Res. Pract. 1–13 (2020) https://doi.org/10.1080/14778238.2020.1788428

41. Razzaque, A., Eldabi, T., Jalal-Karim, A.: Physician virtual community and medical decision-making: mediating role of knowledge sharing. J. Enterp. Inf. Manag. 26(5), 500–515 (2013)

42. Razzaque, A.: M-learning improves knowledge sharing over e-learning platforms to build higher education students' social capital. SAGE Open 10(2), 1–9 (2020). https://doi.org/10.1177/2158244020926575

43. Razzaque, A., Karolak, M.: Blending of physicians' leadership and decisionmaking style within virtual platforms for improving service quality. In: Musleh Al-Sartawi, A. (ed.) The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. Springer Nature, Cham, Switzerland (2021) https://doi.org/10.1007/978-3-030-73057-4_8

44. Shams, R., Vrontis, D., Belyaeva, Z., Ferraris, A., Czinkota, M.: Strategic agility in international Business: A conceptual framework for "agile" multinationals. J. Int. Manage. 27(1), 94–113 (2021)

45. Shirley Coleman, R.G.M.: How can smes benefit from big data? Challenges and a path forward. Qual. Reliab. Eng. Int. 32(6), 2151–2164 (2016)

46. Sion, G.: Participating in a highly automated society: How artificial intelligence disrupts the job market. J. Self Governance Manage. Econ. 13(4), 57–62 (2018)

47. Sanad, Z., Al-Sartawi, A.: Financial statements fraud and data mining: a review. In: Abdalmuttaleb, M.A., Al-Sartawi, M., Razzaque, A., Kamal, M.M. (eds.) Artificial Intelligence Systems and the Internet of Things in the Digital Era: Proceedings of EAMMIS 2021, pp. 407–414. Springer International Publishing, Cham (2021). https://doi.org/10.1007/978-3-030-77246-8_38

48. Sjödin, D., Parida, V., Palmié, M., Wincent, J.: How AI capabilities enable business model innovation: scaling AI through co-evolutionary processes and feedback loops. J. Bus. Res. 134, 574–587 (2021)

49. Tarnowska, K.A., Ras, Z.: NLP-based customer loyalty improvement recommender system (CLIRS2). Big Data Cognitive Comput. 5(1), 4 (2021)

50. Tornjanski, V., Marinković, S., Jančić, Ž: Towards sustainability: effective operations strategies, quality management and operational excellence in banking. Amfiteatru Econ. J. 19(44), 79–94 (2017)

51. Vahedi, M.: The role of information systems in decision-making and public policy making. J. Manage. Acc. Stud. 7(2), 11–14 (2020)

52. Vaioa, A., Palladino, R., Pezzib, A., Kaliszc, D.E.: The role of digital innovation in knowledge management systems: a systematic literature review. J. Bus. Res. **123**, 220–231 (2021)
53. Venkatesh, R., Singhal, T.K., Mathew, L.: Emergence of digital services innovation as a path to business transformation: case of communication services providers in GCC region. Int. J. Eng. Technol. (2017)
54. Vitkauskaitė, E., Varaniūtė, V., Bouwman, H.: Evaluating SMEs readiness to transform to iot based business models. In: 30th European Conference of the International Telecommunications Society (ITS) (2019)
55. Zhang, M., Zhao, X., Lyles, M.: Effects of absorptive capacity, trust and information systems on product innovation. Int. J. Oper. Prod. Manage. **38**(2), 493–512 (2018)
56. Zhang, Z., Sharifi, H.: A methodology for achieving agility in manufacturing organizations. Int. J. Oper. Prod. Manage. **20**(4), 496–512 (2000)
57. Bhatti, A.: Exploring the Adoption of Artificial Intelligence in the Finance Industry the Case of Chatbot in Kenya (2019)
58. Suhel, S., Shukla, V., Vyas, S., Mishra, V.: Conversation to automation in banking through chatbot using artificial machine intelligence language. In: Infocom technologies and optimization, pp. 611–618 (2020)
59. Yu, B.T., Ulukok, E.: Google's use of artificial intelligence in a two-sided advertising market causing trust loss, and data monopolization. In: Al-Sartawi, A.M.A., Razzaque, A., Kamal, M.M. (eds.) EAMMIS 2021. LNNS, vol. 239, pp. 383–397. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-77246-8_36

Residual Networks for Image Clustering

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Abstract. Clustering is an unsupervised learning process which groups objects into clusters using a similarity measure, like Euclidean distance. It basically classifies data into structures that are more easily understood and manipulated. Clustering has many utilities in real time applications as it helps to discover hidden trends and relationships inside data. In this work, we propose an approach for Image Clustering which uses Residual Networks (ResNets). Firstly, a Residual network performs image classification. Then, a softmax function is applied to obtain the decimal probabilities of all the classes, which are then used for clustering. The proposed method is extremely fast and more accurate than the K-means clustering algorithm. Experimental results show that this approach achieves 98.53% clustering accuracy on MNIST, 94.81% on Intel Image dataset and 96.94% on a self-created custom dataset.

Keywords: Supervised clustering · K-means · Image clustering · ResNet · Deep learning

1 Introduction

Image clustering plays a key role in data analysis in machine learning and computer vision. At a very basic level, a clustering algorithm takes a set of items as input and finds clusters in feature space. Technically, image clustering groups images such that any two given items in the same cluster should be more similar than those not in the same cluster. Supervised classification has been widely used in pattern recognition and computer vision, which includes several applications such as face recognition, AR tracking, object detection, medical diagnosis, etc. It relies on labelled data to train a classifier and uses the data as a "supervisor" or teacher, hence the name.

In the literature, much research has been dedicated to clustering algorithms. One of the most effective and widely used clustering algorithms is K-means. Such traditional clustering methods depend on some distance metrics which are predefined. In case of image clustering, for image datasets these metrics are difficult to identify. Specifically for K-means, sometimes it becomes difficult to predict the K-value i.e., the number of clusters required. Quality of clustering in K-means is also dependent on initial values of clusters. Over the years exploration and study on neural networks (or deep learning) has progressed rapidly. The advent of deep learning was set by AlexNet [10], which in 2012 ILSVRC achieved by far the best results ever reported at that time. These results sparked the interest and research in deep learning in computer vision. A Convolutional Neural Network (CNN/ConvNet) is a deep learning algorithm which takes image input

and processes pixel data in order to either classify or recognize the image. It assigns learnable weights to image features as an importance measure. These assigned weights also help CNN to differentiate images from one another. In computer vision, CNNs yield better results and accuracy as compared to almost every other algorithm or method for any given problem statement (Fig. 1).
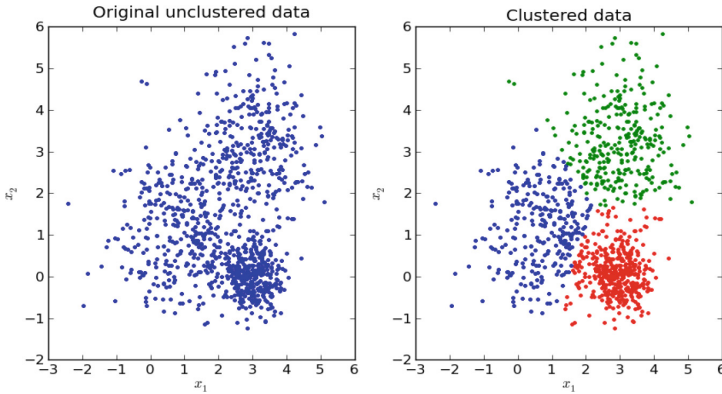
Fig. 1. A basic idea of clustering. Different colors represent different clusters. Data points present on the left side are unclustered whereas those on the right are clustered i.e., associated to their respective closest centroids.

In this paper, we introduce image clustering using residual networks, a ConvNet based method which combines classification and clustering. Our objective here is to learn a similarity measure for the given dataset, so that clusters are formed accordingly. The framework of the proposed method consists of two components, ResNet and softmax function. For clustering on any given dataset first we train the ConvNet on the train set of that particular dataset. We use ResNet (or Residual Network) [9] for training and classification. It performs the feature extraction and then assigns learnable parameters (like weights and biases) to them. Activation functions are used with CNNs to increase the nonlinearity which in turn increases the learning capability. Nonlinearity is introduced to ensure that output at any point should not be a linear combination of inputs. This narrows the ability of a neural network to fit non-linear boundaries which will not be powerful enough to fit on big datasets. At the end of the ResNet architecture, a softmax function is applied in order to extract the probabilities of all the classes in a given image which are then used for clustering. The approach used could be called as supervised clustering as only labelled data is used for training.

2   Literature Review

To specify the thesis as a well-structured idea, we have touched upon many research papers [1–8] that are similar to our proposed work. Conclusion details of some of those papers are as follows,

1. In this paper the authors have introduced Deep Adaptive Clustering which is a single stage CNN based method used for image clustering. It formulates a clustering problem into a binary pairwise-classification framework. Pairwise classification is basically a task to predict whether any two datapoints that form a pair belong to the same class or to different classes. Firstly, labelled features are extracted from the given input and similarities are calculated from these features. From these calculated similarities, labelled samples are selected for training of the ConvNet which again generates labelled features. Argmax activation function is used at the end to select the largest response from learned label features, which is then used for clustering [1].

2. The research work done in this paper proves that Fuzzy K-means is better than K-means for clustering. It mentions various limitations of the K-means algorithm and how Fuzzy K-means overcomes these limitations. For the experimentation, a prototype application was created to exemplify the efficiency of both the algorithms on Diabetes dataset. Various factors like number of clusters, fuzziness, maximum iterations, precision, CPU time, etc. were taken into consideration for comparison of both the algorithms. The results show that the Fuzzy K-means is better [2].

3. This paper proposes a method for clustering which uses K-means algorithm with Support Vector Machine (SVM). It mentions the issue with distance measure in K-means, which directly affects the clustering quality. The authors use a dataset containing training examples of data points with their correct cluster mappings. An SVM is trained on this dataset to learn the distance measure which helps K-means to cluster the data points in a similar fashion. The dataset used to train SVM contains labelled data which accounts for supervised clustering [3].

4. This paper provides a survey of clustering with deep learning on the basis of network architecture. The paper mentions recent works carried out to implement clustering using deep learning, which is termed as deep clustering. Various deep clustering algorithms are discussed in this paper based on different deep learning architectures like Autoencoder (AE), Deep Belief Network (DBN), Fully Convolutional Network (FCN), Variational Autoencoder (VAE) and Generative Adversarial Networks (GAN). Evidently deep clustering gives a big performance gain as compared to conventional clustering algorithms. This is a result of their powerful ability of feature extraction [4].

5. The research in this paper aims to overcome the most known disadvantages in the K-means algorithm. These include positioning of initial cluster centroids and requirement of K-value, which needs to be provided beforehand. The paper mentions three clustering methods, following almost the same approach for initialization of prototypes. A new definition of the density of data points is given and is used with K-means for determination of K-value. After this, the density of each data point is calculated and data points are arranged in a descending order. Top K data points are taken as initial prototypes. The proposed methods solve the aforementioned issues with K-means [5].

3   Methodology

As discussed in brief in the introduction, we follow a supervised approach to clustering. The images from the dataset are first fed to the ConvNet which is ResNet in our case. It does the feature extraction and classification of the input images. For this image processing, ConvNets use a convolution operation, in which a filter is used to convolve over the image. A filter is nothing but a small matrix which is slid across an image based on a moving measure and multiplied with input. This moving measure which governs the filter movement is known as stride and is generally denoted by n. Convolution operation combines two signals to form a third signal. Here the two signals are, filter and a particular region of input image. Convolution operation relates the input signal, output signal and the impulse response. The output signal is a convolution operation between input signal and impulse response. After the convolution operation the output is enhanced in a certain manner like blurring, embossing, sharpening, edge detection, etc. For instance, in edge detection a variety of mathematical methods are used that aim at identifying points where the image brightness varies or changes sharply, or if there is discontinuity in a pattern or a color. Such enhanced outputs generated from different convolutions serve as features for a model, which are then used in the learning process. If these features are visualized, in initial stages they are just color blobs but as the model converges, they become more like the actual images. This concludes the training and classification part of ResNet.

At the end of this structure, we use a softmax function which extracts the probabilities of all the classes that could be present in a given image. Softmax is generally used for classification problems where the prediction has to be done on more than two classes. From these extracted probabilities for a given image, the highest one is selected and the image is assigned to the class with highest probability. All the images are clustered in a similar way using probabilities which makes the clustering process less complex and faster.

4   Algorithm Used

To implement this research work, we've used ResNet as our ConvNet which provides the image classification results, which are then converted into the probabilities by using the softmax function.

4.1   ResNet

ResNet (Residual Network) was introduced by Kaiming He et al. (2015) in their paper "Deep Residual Learning for Image Recognition". The ResNet models were a breakthrough in deep learning because of their ability to go deeper without increasing the training error percentage. A plain network with increasing depth also increases the training error percentage. ResNets help in tackling the vanishing gradient problem which restricts other convnets to go deep.

Residual Networks are so called because they have additional residual blocks as compared to plain networks. These residual blocks add skip connections around several layers of convolutions, adding the input to the block output. This solves the problem of vanishing gradient which is prevalent in plain networks. ResNets can go deeper than plain networks without introducing much training error.

4.2   Softmax

Softmax function also known as normalized exponential function, as it normalizes the output generated to a probability distribution. It is often used in the last part of a neural network for the same reason. It is similar to logistic regression but can be used for more than two classes. The output values for softmax lie in the range [0, 1]. This helps to avoid binary classification. Below is a mathematical representation for the softmax function,

$$\sigma(\vec{z})_i = \frac{e^{z_i}}{\sum_{j=1}^{K} e^{z_j}}$$

5   Results

In this section we apply the proposed method for image clustering and evaluate the performance on standard datasets. A comparison is done with K-means algorithm on the basis of two measures, accuracy and time taken to finish the clustering process. For ConvNet we have used ResNet-34 for experimentation. For any given dataset, first ResNet was trained on the training set. After this the trained model was used for clustering process. Experiments were performed using a Tesla T4 GPU (available on Google Colaboratory, http://colab.research.google.com) with a stable Internet Connection. Datasets used for the experimentation are as listed in the table below (Table 1),

Table 1.   Description of different attributes of datasets used

Dataset	Images	Clusters	Image size
Intel Image Dataset	24500	6	28 × 28
MNIST	70000	10	150 × 150
Custom	400	4	900 × 900

Custom dataset containing 4 classes was prepared by us with uneven density. This dataset was prepared to test the robustness of algorithms. Results achieved after the clustering process on each dataset for both K-means and proposed method are mentioned in the tables below (Tables 2, 3 and 4). These results are also represented in graphical form for a better comparison (Figs. 2, 3 and 4).

Table 2. Results on Intel Image Dataset (K-means vs Proposed method)

Intel Image Dataset	GPU Time(s)	Accuracy
K-Means	178.56	0.8452
Proposed Method	33.54	0.9481

Table 3. Results on MNIST Dataset (K-means vs Proposed method)

MNIST	GPU Time(s)	Accuracy
K-Means	683.27	0.9023
Proposed Method	135.86	0.9853

Table 4. Results on Custom Dataset (K-means vs Proposed method)

Custom	GPU Time(s)	Accuracy
K-Means	9.83	0.9105
Proposed Method	1.95	0.9694
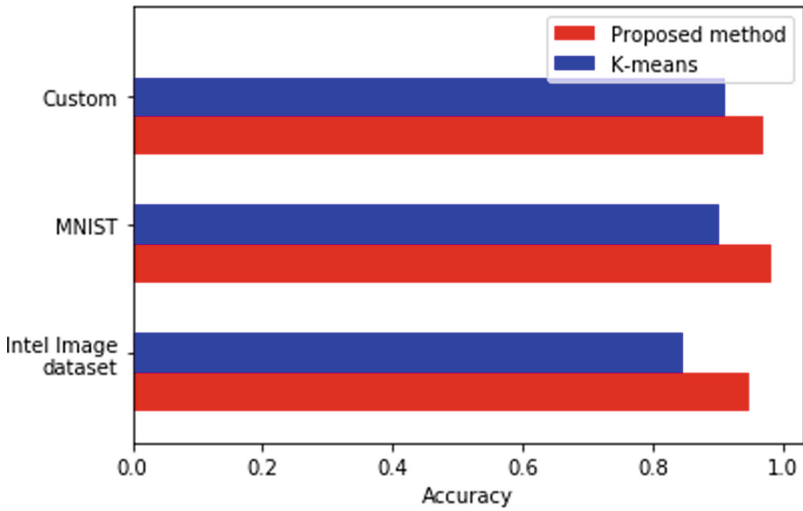
Fig. 2. Comparison of accuracy: K-means vs Proposed method
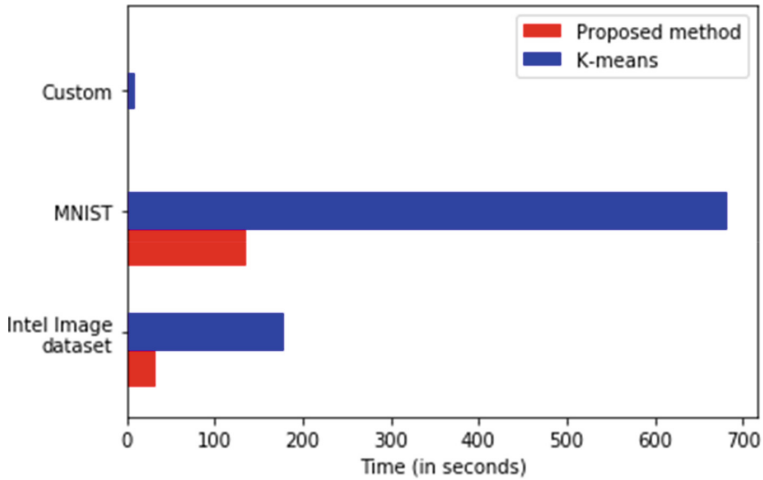
Fig. 3. Comparison of time taken for clustering: K-Means vs Proposed method. Note: For Custom dataset, the proposed method took very less time comparatively, as a result of which it is not clearly visible.
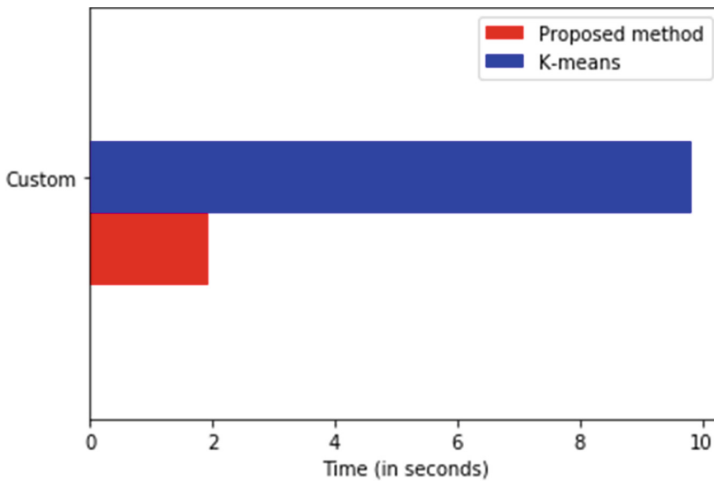
Fig. 4. Comparison of time taken for clustering on Custom dataset: K-means vs Proposed method.

In the graphical representations of results, the performance difference is clearly noticeable. The proposed method is faster and more accurate. Inference is fast on ConvNets as it is just a forward pass of the input provided. It is much faster on GPU ($\sim$4–5 times than a CPU). A normal K-means algorithm cannot make much use of GPU, and thus cannot be accelerated like a ConvNet. Another advantage is a relatively simpler implementation of clustering. For any given image, probabilities of all the

classes are extracted at the end of inference using softmax. The image is then mapped to the class with highest probability. The proposed method is more accurate as the ResNet is already fitted on the datasets and converged before the clustering. Whereas K-means algorithm starts from scratch with unlabeled data.

6   Conclusion

We proposed an alternative image clustering method using ResNet and softmax which is based on supervised clustering. ConvNet is trained on labeled data to extract probabilities, which are used to perform clustering. Performance analysis shows that it is extremely fast as compared to state-of-the-art K-means, because of the use of ConvNet and a relatively simpler implementation, which translates to faster computations. The proposed method is a combination of classification and clustering. It achieves superior performance both in terms of time and accuracy on three different datasets which were used for experimentation. This shows that our method can deal with large-scale images as well, and can be a better prospect in field of image clustering.

References

1. Chang, J., Wang, L., Meng, G., Xiang, S., Pan, C.: Deep adaptive image clustering. In: Proceedings of the IEEE Conference on Computer Vision Pattern Recognition, pp. 5879–5887 (2017)
2. Sivarathril, S., Govardhan, A.: Experiments on hypothesis fuzzy K-means is better than K-means for clustering. Int. J. Data Min. Knowl. Manag. Process (IJDKP) **IV**(5), 21–34 (2014)
3. Finley, T., Joachims, T.: Supervised k-means clustering (2008). http://www.cs.cornell.edu/~tomf/publications/supervised_kmeans-08.pdf
4. Min, E., Guo, X., Liu, Q., Zhang, G., Cui, J., Long, J.: A survey of clustering with deep learning: from the perspective of network architecture. IEEE Access **VI**, 39501–39514 (2018)
5. Abubaker, M., Ashour, W.: Efficient data clustering algorithms: improvements over K-means. Int. J. Intell. Syst. Appl. **V**(3), 37–49 (2013)
6. Finley, T., Joachims, T.: Supervised clustering with support vector machines. In: Proceedings of the International Conference on Machine Learning, pp. 217–224 (2005)
7. Gan, H., Sang, N., Huang, R., Tong, X., Dan, Z.: Using clustering analysis to improve semi-supervised classification. Neurocomputing **101**, 290–298 (2013)
8. Guérin, J., Boots, B.: Improving image clustering with multiple pretrained CNN feature extractors. In: 29th British Machine Vision Conference 2018 (BMVC) (2018)
9. He, K., Zhang, X., Ren, S., Sun, J.: Deep residual learning for image recognition. In: CVPR 2016 (2016)
10. Krizhevsky, A., Sutskever, I., Hinton, G.E.: ImageNet classification with deep convolutional neural networks. In: Proceedings of the Advance Neural Information Processing System, pp. 1097–1105 (2012)

Students Perceptions About Teaching in Smart Bahraini Universities

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Abstract. The study aims to investigate the student's perceptions about teaching in smart Bahraini universities, the researcher conducted his study by using interview of 34 students from universities in the Kingdom of Bahrain. The results revealed that students were satisfied with studying in smart universities, which allow easy communication between the lectures and students, and the results indicated that there are some requirements for smart universities at Bahraini universities must be done, such as smart management, and smart learning environments.

Keyword: Smart teaching · Smart university · Smart learning

1 Introduction

The term of smart has become associated with many aspects and facilities of our life, and smart systems have become a feature of this era and its greatest productions, as they are present in most of the facilities and systems we use, such as smart buildings, smart cities, smart devices, and the smart web… etc., and due to what these systems have brought about great changes in every area of society and in the way of thinking of its members. We can call the era in which we live a smart age.

The concept of smart has been expanded from small devices and companies to large, smart environments and spaces that represent society, entire cities and all their institutions, and from these spaces, smart universities. The Smart University is an efficient and highly effective educational institution that uses smart technology in the infrastructure of its systems in order to make the educational process more dynamic and effective, as it provides rich, interactive and constantly changing educational environments that work to empower individuals' abilities and behaviors and encourage them to interact and cooperate, and to increase participation and communication between students and lectures in the framework that makes them participants and

responsible in developing and raising the level of the educational process, and aims to transform from a consumer of knowledge to a producer of it and the transformation of the entire society into a knowledge society, contributing to the promotion of learning goals in the twenty-first century [22].

The most important benefits of a smart university are the organization of communication and cooperation in the field of education between all elements of the educational process from anywhere and at any time, enriching the education process and the research environment, and solving the problems and obstacles of traditional learning systems through technical empowerment. On the other hand, working on building a new person is the most important goal of the smart university, a different and unconventional person in his learning style and behavior, who is characterized by intellectual and behavioral flexibility, master's various skills, is able to self-learning, and search for information on his own and is a producer of knowledge. Entrepreneurial spirit, innovation, and creativity [14].

2   Problem Statement

Mankind is currently witnessing the era of information technology in various forms and its effects on all aspects of daily life. Where technology clearly affects human thought in general and the areas, which has been greatly influenced by the many variables surrounding, such as environmental, cultural, social, religious, and technological variables. In keeping with this development, the idea and concept of smart universities emerged and became one of the challenges facing most countries, especially developing countries, in how to develop their universities to keep pace with the development of technology and enter the era of smart universities as a basic requirement for survival and competition in light of the globalization and development of education in the world [18].

With the tremendous technological developments in the field of education, universities have begun to expand the use of technology within them, whether in administrative operations, teaching or scientific research. Bahraini universities have sought to transform into smart universities that are characterized by a number of characteristics that distinguish them from traditional universities, such as social orientation, mobility, accessibility, technological effectiveness, and openness. In addition, students and graduates of smart universities are distinguished by some skills and knowledge from other students and graduates of traditional universities. It requires a shift from traditional universities to smart universities that has a number of requirements and components such as the availability of distinguished human capital, smart buildings, smart management, smart educational environment, information network and knowledge… etc. Within the framework of Bahraini universities endeavor to be an international leader and a model for knowledge production and its applications; The problem of the study is summarized in answering the following question: To what extent do the Bahraini universities possess the components and requirements of smart universities?

3   Literature Review

Previous studies have been interested in many of the possibilities offered by smart universities, and among these studies:

The importance of smart universities emerged during the Corona crisis, and studies focused on highlighting the advantages of these universities in education, including a study of [6], which dealt with the use of mobile phones in education in Bangladesh during the Corona pandemic, and the results revealed that students' perceptions of education through the mobile phone were positive. Social media enhances the teaching and learning process.

In the same context, a study of [7], focused on the way in which Romanian universities were able to provide knowledge during the Coronavirus pandemic, the research revealed that higher education institutions in Romania were not geared to a large degree for education through the Internet, and it revealed that teaching suffer from lack of technical skills and the teaching style is inappropriate.

A study of [13], focused on identifying the reality of electronic learning in Philippine universities during the Pandemic, and the results revealed that faculty members differed significantly among themselves in favor of online education on the basis of age, gender, college and education.

A study of [22], focused on dealing with distance education and students' perceptions towards teaching in it, and the results revealed that students were interested in studying some programs such as time management and developing English language skills.

Some studies have also been interested, including a study of [22], to identify the vision of stakeholders towards smart education at the University of Sharjah, and the results revealed that the University of Sharjah came in the forefront in becoming a smart university, by converting the traditional campus into a smart campus.

Some studies, including a study of [21], have been concerned with the use of modern technology - especially laptops, tablets and smartphones - in teaching and learning process. The results revealed that there is an urgent need for lectures to learn how to increase the effectiveness of using emerging technology in preparing classrooms and making lectures more effective.

One of the studies dealt with teachers' perceptions towards smart education, a study of [17], which revealed the smart board that was well received by lectures because of the positive perception towards smart education.

A study [15], that dealt with the effectiveness of the smart board in developing English language teaching, and the results revealed that the use of the smart board increased participation in the lectures.

A study [1] focused on identifying the reality of electronic education in Indonesian universities, and the results revealed that smart education tools increase students 'educational achievement.

Study aims

- Identifying the students' perceptions of smart education.
- investigating the requirements for applying the smart learning strategy.
- investigating the advantages of education in smart universities.
- Specifying to what degree, the students are satisfying with teaching in smart university.
- revealing the facilities of smart university.
- Identifying the difficulties facing the smart university.

Study Questions

- What are students' perceptions of smart education?

- What are the requirements for applying the smart learning strategy?
- What are Advantages of education in smart universities?
- To what degree the students are satisfying with teaching in smart university?
- What are the facilities of Smart University?
- What are the difficulties facing the smart university?

The Definition of Traditional Universities

Traditional universities are universities that have an academic nature focusing their attention on the theoretical aspects of the sciences and do not take care of the same degree in the applied and scientific aspects of these sciences [8]. Most of these universities are old universities that were established on the traditional foundations for the advancement of science for the sake of science and were not established for the sake of directly serving the community. An example of this is Oxford University. Cambridge, England, and New Delhi, India [25].

The Definition of Smart University

A smart university is known as a university that possesses a physical and technical infrastructure and integrates technological innovations and the Internet to provide a new type of educational and scientific processes and to support the requirements of smart education [16]. It is based on the activity of e-learning centers and multimedia centers, and it relies on scientific laboratories, an open virtual environment, libraries, scientific research centers, smart classrooms and computer labs, as it relies on training, practical application and innovation in many educational and social activities, providing a smart campus network and accessing the Internet in every place based on wireless technologies, cloud infrastructure, mobile technologies, and access to e-learning resources [24].

The Components of the Smart University

The smart university is based on several basic principles, which are the following:

1. Smart physical infrastructure that includes smart and modern buildings and facilities [5].
2. Smart IT hardware infrastructure that includes (advanced wired and wireless network infrastructure, laptops and tablets, cameras and sensors, storage devices, smart boards, displays, surveillance systems, communication systems [19].
3. A smart software infrastructure and smart IT software infrastructure, which include (learning systems management systems, enterprise management systems, control systems, security and protection systems, social networks systems, a smart electronic library, an interactive website, pages on communication sites [9].
4. More about this source text Source required for additional translation information.
5. Smart Individuals trained [10].
6. Smart educational environment that includes a set of smart software and interactive educational systems, smart electronic books, and educational materials [11].
7. Clear smart strategy plans, and educational goals.
8. Smart Management System: uses integrated management programs for education systems and the institution [19].

Characteristics of the Smart University

A smart university is characterized by five basic characteristics:

1. **Mobility Education:** is the ability of the educational process elements to access scientific content, from anywhere, anytime, through mobile devices (Hamdan Bin Mohammed Smart University) [12].
2. **Individual education:** is to give personal education to each individual, build individual education cards (smart card) and organize communication and cooperation in the field of education between all concerned parties.
3. **Accessibility:** is the ease of access to educational and administrative information and services, such as learning systems, scientific databases, information sources, online resources, and others [3]
4. **Technological Effectiveness:** Technical effectiveness provides the validity of the information technology infrastructure at the university, through cloud technologies, and virtual technologies, based on the principles of flexibility, simplicity, modularity, scalability, and others [4].
5. **Openness:** Openness in the smart university system means that it works to provide open repositories of educational materials and resources to form e-learning courses, provide training for students in all disciplines, and free access to sources and scientific research [26].

The Importance and Role of Smart Universities

Smart universities perform many roles and tasks, namely:

1. **Experiential learning:** where students can learn by performing and implementing the explanatory and training steps on their own by directly interacting with devices, the network, programs, etc., so that many of them become creative and not merely recipients of knowledge [2].
2. **Attractiveness of presentation:** it means presenting information in attractive and effective ways, which greatly helps in developing higher thinking skills, and helps a lot of innovation, discovery, aspiration, reading, and achieving various and useful competencies [7].
3. **Motivation:** It is known that smart devices such as mobile phones in particular are more popular among students, and such devices cause increased motivation for students and increase their motivation because they are often associated with fun, games and freedom [17].
4. **Achieving independence and a sense of self:** This occurs especially when a wonderful variety of activities are presented, making students feel more independence, higher motivation, and a desire to discover their own capabilities [20].
5. **Improving achievement and production:** by enhancing language skills by positively influencing students' attitudes towards learning and helping them build self-education strategies and enhancing their self-confidence, and there is no doubt that the lecture has a major role in this.
6. **Providing original materials for study:** One of the advantages of distance education, through advanced smart devices, is to facilitate the use of various resources from the original reading materials, whether in university or from their homes, and

these materials can be accessed around the day at a relatively low cost if compared to their prices in reality [25]

7. **Greater interaction:** By means of remote learning via smart devices, students can communicate with people they have never met, and they can also interact with their classmates. Moreover, some internet activities give students positive and negative feedback by automatically correcting their online exercises [13].

8. **Individualization and Acceleration:** Students who are shy or overly inhibited can benefit from one-on-one cooperative learning that focuses on the student; Where distance education can achieve remarkable progress for people like them without preventing their peers from working at the speed that suits them [24], the same is the case for those who are excelling who can pass educational programs in short times armed with the dedication of time and effort and the greatest passion; Such people can accelerate their learning process to a greater degree and quality [25].

9. **The distance from one source of information:** Although students can still use their books, they have opportunities to escape from canned knowledge and discover thousands of information sources, via smart and network devices, and as a result, their education meets the need for interdisciplinary learning in a multicultural world [23].

10. **Global Literacy:** Educators must now facilitate students' access to the Internet and make them feel like citizens of a global classroom and communicate globally to their fullest potential [22].

The model of a smarter university (Fig. 1):
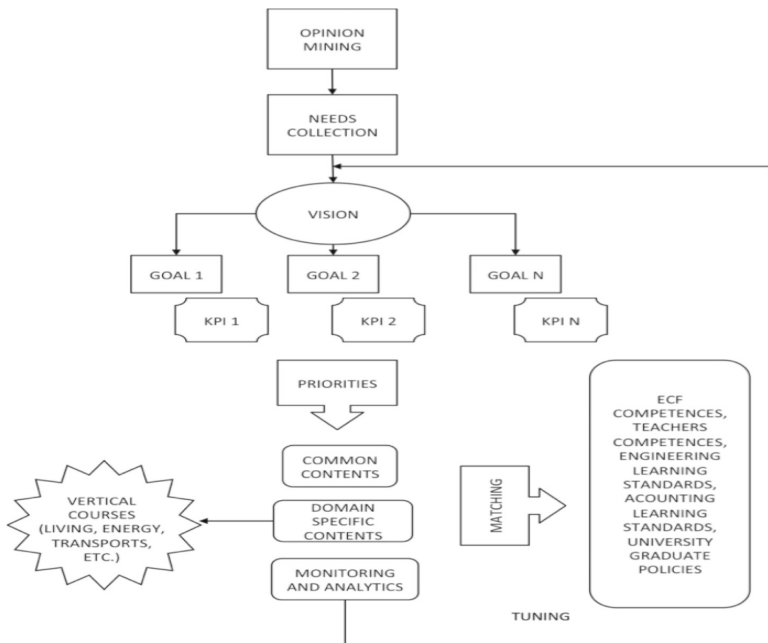
Fig. 1. The model of smart university

This model explains the components of smart university which includes:

Opinion Mining: This step means gathering opinions, analyzing and organizing them to create a smarter university in the long term to form a clear and specific roadmap for the university [13].

Needs Collection: It means analyzing the needs of society and stakeholders and translating these needs into specifications that the smart university adheres to and aims to achieve.

Vision: It means working on creating a strategic vision for the university. It can be translating into clear, ambitious and realistic goals in the medium and long term.

Priorities: Which the priorities are determined, where the objectives of the highest priority are determined first and then the lowest priority, and the goals that have priority not urgent are excluded [26].

Common Contents: In this stage, common knowledge and skills are extracted that all students should use in specific scientific fields that correspond to their interests.

Domain Specific Contents: It is represented in the skills and knowledge that students must possess in a specific field, and these areas include information and communication technology and business [13].

Competences, Standards and Policies: It includes the standards that must be met by the lecturers, the standards that must be met in the learning process, and the policies followed by the university administration [13].

Matching: One of the most difficult parts of this model is the feasibility of specific procedures for training lecturers and their knowledge of various cognitive aspects. The lecturers must have information technology skills and their ability to use it [3].

Monitoring and Analytics: At this stage, tools for forecasting, simulation, data gathering, and analysis are used to make any adjustments to the processes used [1].

Method
The technique of collecting data was through interviews and observations. The methodology in this study used a type of informal conversation interview. The researcher conducted his study by interview of 34 students from universities in the Kingdom of Bahrain.

The interviews were held with the students at the time and date specified by them, and the interviews lasted between forty-five and sixty minutes. The interviews were recorded, and the students 'answers were analyzed about the basic topics related to education in smart universities, namely: Requirements for applying the smart learning strategy, advantages of education in smart universities, the Satisfaction about teaching, and difficulties facing the smart university [20].

4   Results and Discussion

Requirements for Applying the Smart Learning Strategy
The results show that the requirements for applying the smart learning strategy are concentrated in:

– Modernizing the infrastructure by providing universities with advanced technologies to display advanced electronic content and to teach innovative educational curricula and to provide energy sources and alternative energy.
– Providing high-level communication networks that are flexible in their content, and in their tools, accuracy and speed, relying on modern technology means that provide opportunities for constructive dialogue and fruitful cooperation between all the main parties of the process (administrators, lectures, students) on the one hand, and on the one hand. Second, it strengthens the university's partnership with the surrounding community (institutions and individuals).
– Computerizing the curriculum to become electronic curricula, with special consideration being given to curricula with scientific and technical content, which provide students with continuous learning opportunities that provide students with the opportunity to absorb new technologies such as smart manufacturing systems, communication networks, energy use systems, and others.
– Providing more advanced tools for evaluating the progress of the educational process, reviewing plans and programs, checking development paths, and achievement rates according to specific time schedules, based on agreed standards.
– Train and support lectures with appropriate tools to help them define lesson plans, set exams, review best practices, exchange information and communicate with colleagues, educational staff, students and parents using high-speed electronic networks.

Advantages of Education in Smart Universities
The results showed that there are many factors that characterize smart universities, and make students accept to study in these universities, and among these factors:

– Change the traditional methods of communicating information, so that the learner can better assimilate the content, and reach the maximum possible retention of the acquired knowledge, by re-employing it in the search for new knowledge or devising solutions to actual problems and devising ways and means to solve this problem, including support for self-learning.
– Exit curricula and educational materials from traditional frameworks and familiar stereotypes of textbooks to electronic curricula, and digital scientific content that provides students with opportunities for continuous learning, group learning and distance learning, communicating with lectures, accessing student information and data, and taking tests using an integrated package of smart applications.
– Preparing students to deal with technical changes and innovations in the field of technology and encouraging them to participate in conferences, exhibitions and workshops prepared for this purpose in various sectors.

– Encouraging students to use innovative technological tools in classroom activities as well as teamwork among students.
– Involving students in developing smart learning strategies due to the availability of all the aids that allow them to immediately benefit from what they have learned and link it to practical reality as well as to draw the future of their professional life.

The Satisfaction About Teaching

The results indicated that students were satisfied with studying in smart universities, which allows easy communication between the lectures and students, as well as easy follow-up of educational activities and follow-up of their rates in various evaluation methods, in terms of educational content, lessons were presented in the form of videos and text files (PDF) in addition to pictures and explanations. As for communication between the lecture and students, all means of communication were available, whether by e-mail or the course page on the model through discussion forums or even through the course group on the WhatsApp application. As for the assignments and duties were made available to the students in a sufficient period of time, and they contain all the directions and instructions they need to implement and deliver the assignment, and upon completion of its correction, notes were attached to the deficiencies in the students' work.

The Facilities of Smart University

The results showed that there are some requirements for smart universities at Bahraini universities, such as smart people, smart management, and smart learning environments, but there are no smart buildings. Despite the availability of some requirements and components of smart universities at Bahraini Universities, they need to be developed and improved so that they are more available.

Difficulties Facing the Smart University

The results showed that there are many difficulties facing smart education in Bahraini universities, including the following:

– The university did not purchase a license for Camtasia Studio, the modern version, as this program is very effective in recording lessons, especially lessons of a practical nature that require explaining some points or using different sites to support the lessons and topics presented.
– The problem of stopping the service of the e-learning system, and the lecture was unable to open the sysyem.
– Although this problem did not occur only once during the semester, it may affect the educational system, especially if it happened at the time of a final exam.
– Some students suffer from lack of familiarity with the e-learning system, and others do not constantly follow up their e-mail.
– Female students not participating in joint conversations with male students due to social and cultural considerations.

Recommendations

– Emphasis on effective teaching methods that raise problems, such as stimulating innovation among students.

- Simplify abstract concepts such as facts, such as the mathematical theories of a demand.
- Preparing educational programs aimed at developing the creative thinking skills of students in general.
- The complexity of developing methods of thinking for a student, to extend to the areas of developing creative thinking skills.
- Support courses such as educational curricula with programs that develop creative thinking for students.
- Universities have written comprehensive strategies that include practical and practical methods for developing the creative thinking of students.

References

1. Saragih, A.H., Setyowati, M.S., Hendrawan, A., Lutfi, A.: Student perception of student-centered e-learning environment (SCeLE) as media to support teaching and learning activities at the University of Indonesia. In: International Conference on Smart City Innovation, pp. 1–10 (2018)
2. Ahmed, M., Kim, Y.: Energy trading with electric vehicles in smart campus parking lots. Appl. Sci. **8**(10), 1749 (2018)
3. Al-Sartawi, A.: Social media disclosure of intellectual capital and firm value. Int. J. Learn. Intellect. Cap. **17**(4), 312–323 (2020)
4. Al-Sartawi, A.: Assessing the relationship between information transparency through social media disclosure and firm value. Manag. Account. Rev. **18**(2), 1–20 (2019)
5. Anttila, J., Jussila, K.: Universities and smart cities: the challenges to high quality. Total Qual. Manag. Bus. Excellence **29**(9/10), 1058–1073 (2018)
6. Biswas, B., Roy, S.K., Roy, F.: Students perception of mobile learning during COVID-19 in Bangladesh: university student perspective. AQUADEMIA **4**(2), 2–9 (2020)
7. Coman, C., Țîru, L.G., Meseșan-Schmitz, L., Stanciu, C., Bularca, M.C.: Online teaching and learning in higher education during the coronavirus pandemic: students' perspective. Sustainability **2**, 1–24 (2020)
8. Rico-Bautista, D., Medina-Cárdenas, Y., Guerrero, C.D.: Smart university: a review from the educational and technological view of Internet of Things. In: Rocha, Á., Ferrás, C., Paredes, M. (eds.) ICITS 2019. AISC, vol. 918, pp. 427–440. Springer, Cham (2019). https://doi.org/10.1007/978-3-030-11890-7_42
9. Florina, F.C.: Smart University, Smart City. The role of universities in advancing intelligent urbanization. Ann. Univ. Oradea Econ. Sci. Ser. **29**, 18–28 (2020)
10. Gürler, S., Sağsan, M.: Universities as smart organization and green innovation strategy: a theoretical framework for North Cyprus. In: Proceedings of the International Conference on Intellectual Capital, Knowledge Management & Organizational Learning, pp. 169–176 (2019)
11. Andaluz, V.H.: Smart university immersive virtual learning. In: 15th Iberian Conference on Information Systems and Technologies (CISTI) 24–27 June, pp. 1–5 (2020)
12. Hamdan Bin Mohammed Smart University. https://www.hbmsu.ac.ae/. Accessed 22 Jan 2021
13. Heinemann, C., Uskov, V.L.: Smart university: literature review and creative analysis. In: Uskov, V.L., Bakken, J.P., Howlett, R.J., Jain, L.C. (eds.) SEEL 2017. SIST, vol. 70, pp. 11–46. Springer, Cham (2018). https://doi.org/10.1007/978-3-319-59454-5_2

14. Adekitan, A.I., Abolade, J., Shobayo, O.: Data mining approach for predicting the daily Internet data traffic of a smart university. J. Big Data **6**(1), 1–23 (2019). https://doi.org/10.1186/s40537-019-0176-5

15. İstifçi, İ., Keser, A.D., Serpil, R., Önal, M.A., Alan, B., Türkyılmaz, S.: An analysis of teachers' and students' perceptions on the use of smart boards in foreign language classrooms. Turk. Online J. Engl. Lang. Teach. (TOJELT) **3**(2) 83–110 (2018)

16. Bakken, J.P., Varidireddy, N., Uskov, V.L.: Smart university: software/hardware systems for college students with severe motion/mobility issues. In: Uskov, V.L., Howlett, R.J., Jain, L.C. (eds.) Smart Education and e-Learning 2019. SIST, vol. 144, pp. 471–487. Springer, Singapore (2019). https://doi.org/10.1007/978-981-13-8260-4_42

17. Chau, K.T., Zainuddin, D.A.B., Ling, S.K., Ng, L.M., Yang, J.: The perception of lectures towards smart board technology in a Malaysian primary school. Int. J. Inf. Educ. Technol. **10**(6), 405–409 (2020)

18. Glukhova, L.V., Syrotyuk, S.D., Sherstobitova, A.A., Pavlova, S.V.: Smart university development evaluation models. In: Uskov, V.L., Howlett, R.J., Jain, L.C. (eds.) Smart Education and e-Learning 2019. SIST, vol. 144, pp. 539–549. Springer, Singapore (2019). https://doi.org/10.1007/978-981-13-8260-4_47

19. Musleh Al-Sartawi, A.M.A., Razzaque, A., Kamal, M.M. (eds.): EAMMIS 2021. LNNS, vol. 239. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-77246-8

20. Musleh Al-Sartawi, A.M.A.: E-learning improves accounting education: case of the higher education sector of Bahrain. In: Themistocleous, M., Papadaki, M., Kamal, M.M. (eds.) Information Systems, EMCIS 2020, pp. 301–315. Springer, Cham (2020). https://doi.org/10.1007/978-3-030-63396-7_20

21. Fidalgo, P., Thormann, J., Kulyk, O., Lencastre, J.A.: Students' perceptions on distance education: a multinational study. Int. J. Educ. Technol. High. Educ. **17**(1), 1–18 (2020). https://doi.org/10.1186/s41239-020-00194-2

22. Uskov, V.L., Bakken, J.P., Pandey, A., Singh, U., Yalamanchili, M., Penumatsa, A.: Smart university taxonomy: features, components, systems. In: Uskov, V.L., Howlett, R.J., Jain, L.C. (eds.) Smart Education and e-Learning 2016. SIST, vol. 59, pp. 3–14. Springer, Cham (2016). https://doi.org/10.1007/978-3-319-39690-3_1

23. Moralista, R.B., Oducado, R.M.F.: Faculty perception toward online education in a state college in the Philippines during the coronavirus disease 19 (COVID-19) pandemic. Univ. J. Educ. Res. **8**(10), 4736–4742 (2020). https://doi.org/10.13189/ujer.2020.081044

24. Mitrofanova, Y.S., Sherstobitova, A.A., Filippova, O.A.: Modeling the assessment of definition of a smart university infrastructure development level. In: Uskov, V.L., Howlett, R.J., Jain, L.C. (eds.) Smart Education and e-Learning 2019. SIST, vol. 144, pp. 573–582. Springer, Singapore (2019). https://doi.org/10.1007/978-981-13-8260-4_50

25. Yu, Y., Qi, A.: Teaching system of smart learning environment for aerobics course. Int. J. Emerg. Technol. Learn. **13**(5), 165–176 (2018)

26. Zhu, Z.-T., Yu, M.-H., Riezebos, P.: A research framework of smart education. Smart Learn. Environ. **3**(1), 1–17 (2016). https://doi.org/10.1186/s40561-016-0026-2

A Review Analysis Investigating the Efficacy of Machine Learning in Intrusion Detection

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Abstract. The comprehensive development in communication technology rapidly increases the probability of hacker attacks. Therefore, intrusion detection has recently become one of the significant areas in network security. Machine learning is an effective analysis tool to detect network intrusion. This review examines some machine learning techniques, including single classifiers, hybrid classifiers, and ensemble classifiers. It focuses on several hybrid classifier techniques developed for intrusion detection systems. This review also helps to give a better insight into different approaches in which research is conducted in intrusion detection. Eight machine learning methods are used to compare attacks to a standard. Decision tree detection-based machine learning performs well in assessing these hazards. Several indications have been discovered to give an average rating on the efficacy of various approaches.

Keywords: Intrusion detection · IDS · ABD · Machine learning · SBD · Hybrid classifiers · Random Forest · Decision Tree · Support Vector Machine · Naïve Bayes · K-NN · KDD · Adaboost classifier · Quadratic Discriminant Analysis

1 Introduction

Computer networks are utilized in almost every area of human existence, including industry, business, banking, and so on. Due to this, it is essential to create dependable networks. An illegal action via the network, such as unauthorized attackers entering the system or authorized users violating the resources they have been granted [1], is called a network intrusion.

Intrusion detection (ID) is the practice of monitoring system operations for a potential attack and blocking illegal access [2]. Intrusions are sometimes known as attacks or anomalies. Intrusion detection systems (IDS) are considered to be tools for improving network security [3].

One way of categorizing IDS is based on the method of detection intrusion. IDS are categorized into two types, Signature-Based Detection (SBD) and Anomaly-Based Detection (ABD). The first type identifies intrusion with a pre-defined description of intrusive behaviors using signature matching algorithms [4]. It is mainly based on

known attack actions and cannot detect novel or unknown attacks. However, it can accurately generate fewer false alarms. ABD relies on constructing a standard model of user behavior as it analyzes the characteristics of network behavior [2]. It can detect anomaly behavior by examining the high-volume traffic, a surge in traffic from a specific host or to a particular host, and load imbalance in the network [1]. Anomaly detection detect unknown attacks based on the audit. Yet, it suffers from the disadvantage of having a high false alarm. The problem in ABD refers to the issue of classification of how to distinguish between normal and abnormal activities efficiently. Machine learning techniques are consistently applied to serve this purpose.

The IDS model may be implemented using primary machine learning methods classified as supervised and unsupervised algorithms [5, 6]. Among the several supervised algorithms are Artificial Neural Network (ANN), Bayesian Statistics, Support Vector Machine (SVM), Bayesian Networks (BN), Decision Tree (DT), and K-nearest neighbor [7]. Some of the typical unsupervised learners are K-means clustering, Fuzzy clustering, and Outlier detection (Local outlier factor) [8, 9].

Many standard datasets are used to evaluate intrusion detection, including DARPA 1998, DARPA 2000, KDD'99, and NSL-KDD [10], to name a few examples.

2   Related Work

Hansen and Salomon [4] proposed that multiple classifiers produce more accurate results than the best single classifier. R. Schapire [1] shows that the weaker single classifiers can be boosted to produce robust classifiers.

The hierarchical hybrid intelligent system combines support vector machine and decision tree (DTSVM) as Peddabachigaria et al. proposed. In particular, the DTSVM can reliably identify viruses.

Zhang et al. [2] proposed a framework for ABD utilizing a Random Forest (RF) algorithm to detect uninhabitable intrusion. The implementation has been tested over KDD Cup '99 datasets. Precisely, this approach increases the detection rate and lowers down false positive rate.

FC-ANN is a new ANN method based on IDS combining ANN and Fuzzy Clustering presented by Gang, et al. [5]. This approach has achieved a higher detection rate for R2L and U2R attacks; nonetheless, a potential drawback of this approach is its weakness in detecting probe-based attacks.

Hamed et al. [12] conducted research analyzing the effectiveness of many trials on cyber-security datasets, including vast categories of cyber-attacks and evaluating the performance's efficiency in precision, f1-score, recall, metrics, and accuracy.

A Nave Byes method and a hybrid Decision Tree classifier are suggested to achieve excellent accuracy with minimal time complexities [13].

D. Abbott [14] suggested that combining models plays a vital role in increasing accuracy and decreasing model variation and that the more models that are connected, the higher the accuracy.

T. Saranya et al. [15] have done a study examining the comparative work's nature related to various ML algorithms adopted in IDS for several applications: Internet of Things, big data, fog computing, smart city, and 5G network. Further, another definite

purpose of this work is classifying the intrusions using ML algorithms such as Classification and Regression Trees (CART), Random Forest, and Linear Discriminant Analysis (LDA). The KDD-CUP datasets were used to conduct the testing for this research. Besides, efficiency was measured and compared to other latest shreds of research.

Chowdhury et al. [16] have suggested a novel algorithm using a combination of simulated Annealing & SVM to detect the network's strange behaviors and classify between normal and abnormal behavior. The algorithm has achieved a detection accuracy of 98.76% and a lower false-positive rate of 0.09% compared to normal SVM.

3   Machine Learning Techniques

Machine learning techniques are categorized into three classes; a single classifier (standalone classifier), a hybrid classifier (a combination of more than one machine learning algorithm), and an ensemble classifier (multiple weak learners are combined) [8].

1. Single Classifiers

A single machine learning method is used to tackle the intrusion detection issue. The following is a synopsis of several well-known single classifiers.

SVM is a method to solve a wide range of classification and pattern recognition problems. The analyzer assesses an arrangement of pre-specified criteria to build up vectors. All vectors are classified as either attack or normal vectors. The classifier determines if a vector corresponds to several anomalies and issues an alarm event if needed [17].

K-Nearest Neighbour (KNN) Algorithm is a memory-based method requiring no training. It functions on the intuitive idea where close objects are more likely to be in the same category [18].

A Decision Tree (DT) Classifier is a set of significant rules helping to predict the new incoming inputs. The main idea is to build a lookup table to assist in identifying the expected class of output. Several search algorithms, e.g., breadth-first search, genetic algorithm, and cross-validation, are implemented to generate the efficiency of the decision table. Criteria are included in the lookup table, and the anticipated actions are based on those conditions [19].

ANN is made up of processing units known as highly interconnected neurons linked together in a particular topology. It can learn by example and generalize from limited and imperfect data [20].

BN is a technique generally used for intrusion detection in combination with statistical schemes; it encodes probabilistic relationships among the variables of interest. In general, BN is an acyclic graph between the expected class (output) and several attributes [21].

Fuzzy logic (FL) is a computing technique constructed on the degrees of truth instead of the regular true or false boolean logic on a regular Boolean expression. Each fuzzy rule consists of this general form,

$$IF\ condition\ THEN\ conclusion\ [weight] \tag{1}$$

The condition is a fuzzy expression defined using logic operators, the conclusion is an atomic expression, and weight is a real number in [0, 1]. FL has always been an excellent choice for intrusion detection because the security itself includes fuzziness, and the boundary between the normal and anomaly is not well-defined. By using FL, the false alarm rate in determining intrusive activities can be reduced [22].

2. **Hybrid Classifiers**

In IDS development, the primary aim is to attain the required and best possible accuracy for intrusion detection. This objective naturally helps in designing hybrid approaches to solve emergent problems. A hybrid classifier aims to integrate various machine learning algorithms to increase the system's performance significantly. The amalgamation of these two different machine learning techniques is intensely used to detect the performance of the hybrid intrusion detection system.

Precisely, an anomaly-based detection model and a signature-based detection model are individually trained by most hybrid detection systems to gain the detection model's results quickly. Thus, this case shows the improvement of the detection rate [13].

3. **Ensemble Classifiers**

An ensemble classifier is a technique that uses many weak single classifiers to tackle the same issue at the same time and then combines their output to improve accuracy [9].

The main benefit of the classifier combination is to increase robustness and accuracy and improve the overall generalization for most IDS applications.

Ensemble classifier tries to find the best combination algorithm and gain the best set of classifiers for the combination. Different methods for generating classifiers of the combination exist, such as bagging, boosting, and stacking [23].

Several factors play a crucial role in achieving the success of an ensemble technique, such as the choice of the combination method, the choice of a base classifier, and the training sample size. Specifically, an ensemble is called a homogeneous ensemble if it refers to learners of the same type. It is a heterogeneous ensemble if it relates to learners of different types [23].

In Table 1, the number of publications on hybrid classifiers and ensemble classifiers is clearly shown.

Table 1. Hybrid and Ensemble classifiers

Classifier types	The numbers of articles
Hybrid classifiers	[3, 6, 7, 9–11, 12–15, 19, 20]
Ensemble classifiers	[8, 12, 19]

4 Experiments

1. **The Dataset**

An Intrusion Detection System (IDS) is designed to detect many forms of network assaults. Some types of IDS can be classified based on network data collected from various sorts of hostile actors. KDD-99 challenges allow evaluators to build a classification algorithm that can distinguish between friendly and aggressive or malicious inbound traffic. This database contains simulated military intrusion attacks that corporations may use to assess risk.

This raises concerns regarding the sharing of sensitive data and the protection of personal information. If a physical device is equipped with an IP address, you may determine who is using the device.

The difficulty in this area is choosing the data collecting method with the highest accuracy rate while keeping network users secure. Log analysis and network control are the two types of intrusion detection.

Generally, data at the level of the program are unique to the category of the dataset. This knowledge will provide new insight into how devices can operate so that they were correctly accounted. This second class of data contains information about the devices' data flow. Other information might include the content or data type of the information transmitted between the devices.

A link is a series of TCP packets between a source and destination IP addresses with times between them. Each relation is defined as either natural or an attack. Every link record has a length of about 100 bytes. Attacks may be classified into four types: Denial-of-service (DOS), Remote 2 Local (R2L), User to root attack (U2R), and Probing [24].

2. **The Implementation**

Eight machine learning models from the Python software Sklearn were used to compare the models. For this experiment, the same set of characteristics is applied to all models. The dataset has been divided into training and testing segments, with 90% of the total dataset used for training and the remaining 10% used to test the essential dataset. As a result, the random state parameter employed in the trials for all methods was 42. This is guaranteed to distribute resources equitably across many runs. Accordingly, the models of Logistic Regression (LR), Naive Bayes (NB), Random Forest (RF) and Linear Support Vector Machine (LSVM), Decision Tree (DT), K-Nearest Neighbors (KNN), Adaboost classifier (Ada), and Quadratic Discriminant Analysis (QD) have been selected. Figure 1 illustrates the pipeline of the proposed model, which we have tested and taught for both training and testing phases.

The dataset is highly unbalanced, which necessitates developing a model capable of correctly classifying the intrusion types. Since the number of adequately categorized points cannot be assessed if the dataset is unbalanced, we will provide the accuracy score, estimated to be the total number of correctly classified points.

The confusion matrix will be used to determine how well the data points from each of the classes are classified. To come up with the optimal model, we will compute precision, recall, and weighted f1-score.

All categorical properties are converted to binary properties using One-Hot-Encoding. This conversion requires an integer matrix representing the categorical (discrete) data received. The matrix will be sparse, with each column representing a possible value. For attributes where an input value is required, the range is presumed to be [0, n values]. As a result, before changing the categories, all characteristics must be converted to numbers.

A Pearson's Coefficient Correlation indicates how much each characteristic in the dataset is associated with every other feature (117 features). Using filters, characteristics that are correlated to the output are separated from those that are not. All features were carefully chosen to a particular threshold, and data was split 90–10 for training and testing.
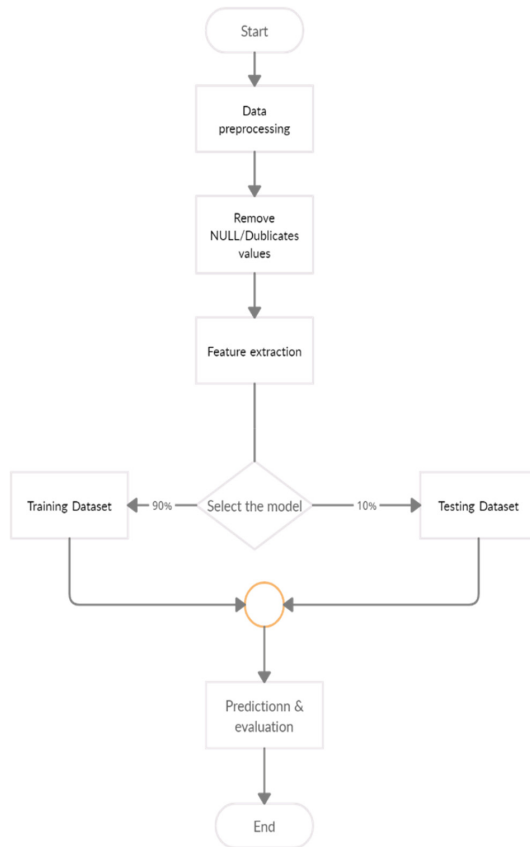
Fig. 1. The pipeline model of the proposed implementation

Figure 2 depicts the optimum training (TR), testing (TST), and accuracy values, respectively. The best findings are shown in bold for the best values and times discovered compared to the other methods (Table 2).

Table 2. Hybrid and Ensemble classifiers

	RF	NB	DT	Ada	KNN	LR	lSVM	QD
Tr time	19	0.8	1.8	38	434	3.5	88	1.8
Tst time	0.9	0.9	0.01	0.3	198	0.01	0.4	0.4
Acc	93%	87%	93%	92%	93%	81%	90%	81%

The models are tested and trained using testbed data, and their success is measured in terms of accuracy, recall, and f1-score. Figure 2 shows the trained and tested eight different techniques for IDS in both attack and average data.
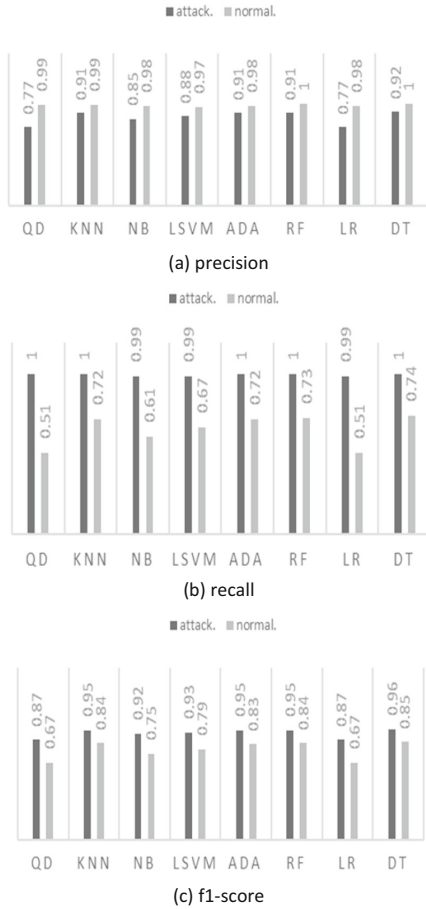
Fig. 2. A comparison between the attack and normal data by an (a) precision (b) recall and (c) f1-score using the eight algorithms for the KDD99 dataset

5   Discussion and Conclusion

A review article describing a set of machine learning-based IDS experiments for both single classifiers and hybrid classifiers has just been presented. Observed concerns are listed below:

- The KDD intrusion detection dataset to acceptable false alarm rate and detection accuracy finds zero single classification techniques able to detect the entire classes of attacks
- The hybrid and/or ensemble approach can enhance detection accuracy by using proper combination methods and base classification techniques.
- If the training dataset does not contain enough samples of the different intrusions, the machine learning algorithm will introduce many false positives and f negatives.
- Two (LR, QD) or three (LR, QD, NB) single classifiers need to be improved by combining them to reduce the false alarm alerts
- More comparative analysis of various hybrid classifier techniques for IDS shall be performed considering some performance matrices derived from the confusion matrix.
- The NB algorithm is the best technique for time consumption where DT and LR overcome NB in the testing time. DT and LR are considered the fastest in the small dataset, where NB is the fastest in the vast dataset.
- DT techniques are the best in terms of f1-score, where LR and QD suffer from approaching the 90% score.
- DT techniques are the best in precision, where LR, LSVM, QD suffer from approaching the 90% precisions.

In general, to measure the effectiveness of IDS, some standard parameters shall be taken into consideration, such as detection rate, false positive, false negative, true positive, and false alarm. Selecting a hybrid classifier is uneasy work. The hybrid approach chosen should focus on maximizing the rate of the true positive and true negative. It has also been discovered that hybrid approaches that use clustering as a pre-processing tool for datasets are significant.

The nature of attacks is continuously changing nowadays. This challenge is still an open challenge and a new platform for the researcher's community. This review article can be used as a reference to enhance existing approaches for future research.

References

1. Schapire, R.E.: The strength of weak learnability. Mach. Learn. **5**(2), 197–227 (1990)
2. Zhang, J., Zulkernine, M., Haque, A.: Random-Forests-based network intrusion. IEEE Trans. Syst. Man Cybern.—Part C: Appl. Rev. **38**, 649–659 (2008)
3. Scarfone, K., Mell, P.: Guide to Intrusion Detection and Prevention Systems (IDPS). Department of Commerce, National Institute of Standards and Technology, Gaithersburg (2007)
4. Hansen, L., Salomon, P.: Neural network ensembles. IEEE Trans. Pattern Anal. Mach. Intell. **12**, 993–1001 (1990)

5. Gang, W., Jinxing, H., Jian, M.: A new approach to intrusion detection using artificial neural networks and fuzzy clustering. Expert Syst. Appl. **37**(2011), 6225–6232 (2014)

6. Troesch, M., Walsh, I.: Machine Learning for Network Intrusion Detection. Final Report for CS 229

7. Hamid, Y., Sugumaran, M., Journaux, L.: Machine learning techniques for intrusion detection: a comparative analysis. In: International Conference on Informatics and Analytics, pp. 53–58 (2016)

8. Jyothsna, V., Ramaprasad, V.V., Prasad, K.: A review of anomaly-based intrusion. Int. J. Comput. Appl. **28**(7), 26–35 (2011)

9. Haq, N., Rafi, M., Onik, A., Shah, F., Hridoy, A., Farid, D.: Application of machine learning approaches in intrusion detection system: a survey. (IJARAI) Int. J. Adv. Res. Artif. Intell. **4**(3), 9–18 (2015)

10. Lee, S., Kim, G., Kim, S.: A novel hybrid intrusion detection method integrating anomaly detection with misuse detection. Expert Syst. Appl. **41**(4), 1690–1700 (2014)

11. Peddabachigaria, S., Abraham, A., Grosacand, C., Thomas, J.: Modeling intrusion detection system using hybrid intelligent systems. Comput. Appl. **30**, 114–132 (2007)

12. Alqahtani, H., Sarker, I.H., Kalim, A., Minhaz Hossaina, S.Md., Ikhlaq, S., Hossain, S.: Cyber intrusion detection using machine learning classification techniques. In: Chaubey, N., Parikh, S., Amin, K. (eds.) COMS2 2020. CCIS, vol. 1235, pp. 121–131. Springer, Singapore (2020). https://doi.org/10.1007/978-981-15-6648-6_10

13. Parvat, T.J., Arjunwadkar, N.M.: An intrusion detection system, (IDS) with machine learning (ML) model combining hybrid classifiers. JMEST **2**, 647–651 (2015)

14. Abbott, D.: Combining models to improve classifier accuracy and robustness. In: Second of International Conference on Information Fusion, Fusion 1999, vol. 1, pp. 289–295 (1999)

15. Saranya, T., Sridevi, S., Deisy, C., Chung, T.D., Ahamed Khan, M.K.A.: Performance analysis of machine learning algorithms in intrusion detection system: a review. Procedia Comput. Sci. **171**, 1251–1260 (2020). https://doi.org/10.1016/j.procs.2020.04.133

16. Chowdhury, M.N., Ferens, K., Ferens, M.: Network intrusion detection using machine learning. In: International Conference on Security and Management, vol. 30, pp. 30–35 (2016)

17. Juma, S., Muda, Z., Mohamed, M., Yassin, W.: Machine learning techniques for intrusion detection system: a review. J.

18. Das, V., Pathak, V., Sharma, S., Sreevathsan, Srikanth, M., Kumar, G.: Network intrusion detection system based on machine learning algorithms. Int. J. Comput. Sci. Inf. Technol. (IJCSIT) **2**(6), 139–151 (2010). Theor. Appl. Inf. Technol. **72**, 423–429 (2015)

19. Kohavi, R., Sommerfield, D.: Targeting business users with decision table classifiers. In: KDD, pp. 249–253 (1998)

20. Mukkamala, S., Janoski, G., Sung, A.: Intrusion detection using neural networks and support vector machines. In: International Joint Conference on Neural Network (IJCNN), vol. 2, pp. 1702–1707 (2002)

21. Teodora, G., Verdejo, J., Farnande, G., Vazquez, E.: Anomaly-based network intrusion detection: techniques, systems and challenges. J. Comput. Secur. **28**, 18–28 (2009)

22. Zamani, M., Movahedi, M.: Machine Learning Techniques for Intrusion Detection. arXiv: 1312.2177v2 (2015)

23. Aburomman, A., Reaz, M.: A survey of intrusion detection systems based on ensemble and hybrid classifiers. Comput. Secur. **65**, 135–152 (2017)

24. Stolfo, J., Fan, W., Lee, W., Prodromidis, A., Chan, P.K.: Cost-based modeling and evaluation for data mining with application to fraud and intrusion detection. Results JAM Proj. Salvatore 1–15 (2000)

The Role of Interactivity in Social Commerce Websites: A Content Analysis Study

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Abstract. This paper contributes to bridging an important gap in the interactivity literature. The gap is manifested in the incongruities in reporting the relationship between the interactivity levels on web platforms and relevant outcome variables. Indeed, researchers are contested on whether more interactivity leads to positive or negative customer experiences online. To bridge this gap, the researchers investigate the interactivity of social commerce websites, as they are deemed an appropriate context for this study. Indeed, social commerce platforms are noted for being built on novel and highly engaging interactive features, and hence are more likely to result on positive customer experiences. To achieve the study's aim, the researchers conduct a content analysis of 73 social commerce websites, noting the existence or lack of interactivity features in each of them. They, then, link the results from the content analysis to web analytics acquired through desk research. The findings show that both dimensions of interactivity (i.e., human-to-website and human-to-human interactivity) result on more social commerce effectiveness. Still, the effect of the less widespread human-to-human interactivity features is stronger and more significant than that of the more ubiquitous human-to-website interactivity features. The study's results highlight the importance of continuing to investigate interactivity in more novel and engaging contexts to provide up-to-date recommendations for marketers and practitioners.

Keywords: Content analysis · Digital marketing · E-commerce · Interactivity · Social commerce · Social media

1 Introduction

Interactivity is "the degree to which two or more communication parties can act on each other, [and] on the communication medium" [1, p. 54]. The concept has long been discussed in the literature and investigated from different perspectives and in a variety of contexts [2–7]. Still, there exists a major gap in interactivity research, which is manifested in the incongruities in reporting the relationship between interactivity and its outcome variables. Indeed, while many researchers find that that the higher the interactivity of a platform is, the more effective it will be in positively influencing the customers' online experiences [8, 9], other researchers highlight possible negative outcomes of increased interactivity, such as hampering communication and persuasion [10, 11].

In this paper, however, it is suggested that higher interactivity will lead to positive outcomes in more novel and engaging platforms. To test this, the researchers facilitate social commerce (SC) websites as the context of the investigation. SC is defined as the result of merging social media and e-commerce technologies [12]. It is widely observed that the interactive features on SC are particularly novel and highly engaging to the consumers, and are, hence, expected to result on increased website effectiveness [13]. To support this notion, the researchers utilize interactivity scores calculated based on content analysis and link them through regression analysis to usage metrics conveying website effectiveness, acquired from Alexa.com. Results from this study highlight how the evolution of interactivity influences consumers in new ways, which will both inform marketing strategy and further academic research on the role of interactivity in new communication technologies.

This study is inspired by Ghose and Dou's leading research paper in the Journal of Advertising [14] and parallels it in a number of ways. First, Ghose and Dou's 1998 paper focused on exploring official business websites, which they described as a growing area of interest at the time. Similarly, this study explores social commerce, which is now considered an evolving phenomenon [15]. This study also follows in Ghose and Dou's footsteps by conducting an exploratory content analysis that contributes to updating their Interactivity Index to fit the current online social climate. Finally, the researchers concur with Ghose and Dou's findings that more interactivity will result on positive effects, as both studies aim to link the interactivity scores attained through content analysis to outcome variables acquired through desk research. The aim of this paper is, thusly, to explore the relationship between the interactivity of social commerce websites and their effectiveness.

2 Interactivity

Interactivity is alternatively defined as "the degree to which a communication technology can create a mediated environment in which participants can communicate… and participate in reciprocal message exchanges" [16, p. 372]. Interactivity is a distinguishing characteristic of many of the latest communication technologies, from social media platforms and virtual communities [4, 6] to mobile applications and smart devices [5, 7]. Two dimensions of interactivity have been frequently explored in prior research; human-to-website (H-W) and human-to-human (H-H) interactivity. The first describes different website attributes that facilitate a person's interactions with said website [17]. These include features that facilitate browsing, downloading content, viewing media, and creating lists, among others. H-H interactivity refers to the communication occurring between human participants through the communication technology [17]. This includes features that facilitate sharing content with others, posting content, liking, commenting, and building social profiles, etc.

As discussed earlier, the interactivity of new media has been connected in prior literature to many positive outcomes from the customer's perspective. This includes platform quality [9, 14] and brand credibility [13] perceptions, in addition to feelings of affect [8] and belonging [18]. However, another line of research ties interactivity to negative effects, including hindering communication [3], interrupting persuasion [11],

and diverting attention from marketing messages [10]. Therefore, the researchers in this study aim to investigate the concept further, but in a newer context (i.e., SC). This pursuit is expected to offer fresh insights into the outcomes of interactivity. This is due to the uniquely interactive nature of SC platforms that incorporate high levels of both H-W and H-H Interactivity. This investigation is especially relevant, as interactivity is characterized by "its continued prominence in scholarly thought despite technological changes" [19, p. 71]. This stems from its effective role in informing practice, as marketers are willing to learn more about the concept in order to capitalize on its potential to satisfy their customers and gain competitive advantage [9].

Further, it was determined that interactivity is an important concept to investigate in the context of SC in particular [20]. This is due to marketers' keenness to understand and capitalize on the capabilities of SC to offer their consumers engaging, sociable, and satisfying experiences on these up-and-coming platforms [21, 22]. Consequently, it is recommended that researchers should explore the interactivity of SC, specifically in regard to how it can be manipulated to influence the consumers' online experiences [23]. Indeed, although past research emphasizes interactivity as a distinguishing characteristic of SC, the expected role of interactivity within the SC environment is seldom empirically examined, despite being a fitting perspective to capture the interrelation between the technological, social, and commercial themes of the concept [12, 22].

3   Social Commerce

Social commerce is defined, by Almahdi, as "the result of the convergence between social media and e-commerce technologies" [12, p. 399]. It is a growing phenomenon that is expected to continue creating new opportunities for businesses and brands [15]. SC sales in the United States have grown to 36.09 billion USD in 2021, a 34.8% increase from 2020 [24].

SC can be observed in different types of online platforms that afford opportunities for both sociability and shopping and buying activities [12]. This means that a lot of online platforms that are around today fit the bill of social commerce. Examples of SC platforms can vary from e-commerce websites that allow writing and responding to reviews, to brand-centered virtual communities and social networking sites in which customers can interact with marketers and other customers [25].

4   Methods

To answer the study's research question, an exploratory content analysis of 73 social commerce websites is conducted. The findings from the content analysis are then regressed against usage metrics belonging to each of the websites analyzed, to uncover if higher SC interactivity is connected to website effectiveness. Content analysis is considered an intuitive tool for gauging the interactivity of websites [26], because "the measurement of interactivity of a web site begins with the presence of interactive devices for each dimension of interactivity" [27, p. 465]. As discussed by Mcmillian [26], when carrying out a content analysis that is rooted in interactivity, the researcher

typically chooses a number of websites from a pre-defined list, analyzes them for the existence (or the lack thereof) of interactive features determined by reliable a scale, and finally calculates an interactivity score for each of the websites analyzed. These scores are then linked to relevant outcome variables [14]. These steps are expanded on next.

4.1 Choice of Websites to Analyze

Prior interactivity studies that carried out content analyses mostly used website top lists to justify their choice of analysis subjects [9, 27, 28]. However, finding a comprehensive list of SC platforms proves to be a difficult task, since SC is a relatively new concept which remains insufficiently understood [12]. As a solution to this problem, the researchers created a list of 73 SC platforms that they extracted from academic and online articles. The sample size of this study is comparable to that of Voorveld et al.'s top paper, which carried out a content analysis based on 65 brand websites [28]. The researchers do not claim that this is an exhaustive list of websites but deem it representative of the SC nature. Still, it is important to bear in mind that what is used in this study remains "a judgemental sample" [14, p. 36].

4.2 Choice of Interactivity Scale

Ghose and Dou pioneered creating the Interactivity Index; one of the earliest examples of a scale quantifying the interactivity of a website [14]. The Interactivity Index and its updated versions [9, 28] are the basis for the interactivity scale used in this study to rate the different sites for the existence or lack of H-W and H-H interactive features. Examples of the H-W features in the index include showing popular content and automatic recommendations, personalization, access to activity history and lists, and viewing multimedia content. Examples of H-H features include options for sharing, liking, commenting, posting content, building social profiles, and finding friends. The typology development process proposed by Nickerson et al. [29] is facilitated to start this study. The process suggests going through several iterations of deductive and inductive analyses until satisfactory results are accomplished. In this study, several iterations are followed of first 1) qualitatively analyzing the 73 websites to get a general overview of their interactivity, then 2) updating the interactivity index to fit the SC theme based on both the initial analysis and established interactivity and SC research [30], 3) having two external coders analyze the websites based on the updated Interactivity Index, and finally 4) using the results from both coders to calculate a reliable interactivity score for each website analyzed.

4.3 Web Analytics

One of the main benefits of using the Internet as a research tool is that it can provide a wealth of information about online consumer behaviors by utilizing web analytics [31]. Web analytics are "the measurement, collection, analysis and reporting of Internet data for the purposes of understanding and optimizing web usage" [32, p. 550]. These usage metrics are often facilitated as a proxy for the effectiveness of websites when other types of data (e.g. sales revenues) are not readily available [31].

Consequently, two usage metrics are selected to represent the effectiveness of SC websites in this study, namely: average time spent on the website and page views per user. Average time spent on the website reflects the average length or duration of website visit [33], while average page views per user reflects a user's frequency of visits to the website pages [32]. The two metrics are expected to "provide a parsimonious representation of the browsing decisions users face in a site visit" [34, p. 250]. These metrics are especially useful in capturing the success of SC websites, because of the experiential nature of shopping on SC. Indeed, better interactive features on SC websites are expected to "keep users interested and drive page views" [35, p. 590]. The metrics utilized in this study are acquired from Alexa.com, a well-established web traffic data and analytics tool.

5 Findings

In the following section we discuss the study's findings, highlighting the frequency, regression, and Whitney-Mann analyses conducted.

5.1 Frequency of Usage of Interactive Features

As a starting point of the analysis, the frequency of each interactive function across the websites researched was uncovered through content analysis. These descriptive data will play a key role in understanding some of the later findings of this study. Indeed, the Popular Content feature is (rather fittingly) the most popular feature amongst the 73 websites analyzed, followed by Sharing options at 88% of the websites. Interestingly, all (but one) of the features that occur in more 70% of the websites reviewed are H-W interactive features. Specifically, History Profiles occur in 84% of the websites, while Mobile Applications, Recommendations, and Lists are available in 81%, 79%, and 77% of the websites, respectively. Mid-range popular interactive features occurring in more than half of the websites analyzed include a couple of H-W interactive options (i.e. Notifications at 66% of the websites and Customization of Viewing at 58%), and several H-H features such as the ability to Like Posts and build Social Profiles (both at 67%), in addition to Social Content Provision (64%), Content Creation (64%), Commenting (62%), and Adding Friends on the websites (53%). Finally, interactive options that occur in less than half of the websites are mostly H-H interactive features (i.e., Private Messaging, User Groups, Real-Time Communication, and Finding Friends), while two of them reflect H-W relationships (i.e., Multimedia Content, and Picture with Comments). The latter two are found in 48% and 22% of the websites reviewed.

5.2 Interactive Features and Effectiveness of Social Commerce Websites

Before running the necessary statistical tests, a number of websites had to be removed as a result of outliers (excess duration of use, e.g., Reddit). A few other websites were removed because Alexa.com did not provide analytics for them. The remaining 64 websites were used as a part of the regression analysis and Whitney-Mann tests.

Three main findings are highlighted as a result of this study. First, interactivity has a statistically significant effect on website effectiveness (i.e., time spent and pages viewed). Second, interactivity affects time spent more significantly than it does page views. Third, H-H interactivity is more influential on outcome variables than H-W interactivity.

Table 1. Regression analysis results

	General interactivity			Human-Website interactivity			Human-Human interactivity		
	Adjusted R2	Beta	Bootstrap Sig. (2-tailed)	Adjusted R2	Beta	Bootstrap Sig. (2-tailed)	Adjusted R2	Beta	Bootstrap Sig. (2-tailed)
Time on site	0.330	0.584	0.00	0.210	0.472	0.001	0.330	0.571	0.001
Page views	0.160	0.416	0.002	0.125	0.373	0.006	0.142	0.377	0.005

Indeed, as depicted in Table 1, general interactivity (which is the combined scores of H-W and H-H interactivity) has a significant effect on both time spent on site and pages viewed. However, its effect on time on site (R2 .330, p < .001) is stronger and more significant than its effect on page views (R2 .160, p < .005). A similar pattern is observed in the way H-W interactivity and H-H interactivity influence the same outcome variables, in that all the influences are significant, but they vary in the extent of their effect and significance. The influence of H-W interactivity is stronger on time spent (R2 .210, p < .001) than on pages viewed (R2 .125, p < .01). Similarly, the influence of H-H interactivity is stronger on time spent (R2 .330, p < .001) than on pages viewed (R2 .142, p < .005). Comparing their influences on the same outcome variables, it is uncovered that H-H interactivity has a stronger influence on time spent (R2 .330, p < .001) than H-W interactivity has on the same variable (R2 .210, p < .001). Similarly, H-H interactivity has a stronger influence on pages viewed (R2 .142, p < .005) than H-W interactivity has on the same variable (R2 .125, p < .01).

Additionally, a Mann-Whitney test is conducted to uncover the extent to which each interactive feature individually affects the designated outcome variables. The results show an interesting pattern. Indeed, when it comes to the H-W interactive options, the more common they are (e.g., history, recommendations) the least affective they are in influencing the outcome variables. However, the H-W interactive options that are less common in SC websites (e.g., multimedia content, pictures with comments) are more likely to influence outcome variables. Conversely, H-H interactive options (which are generally less wide-spread that their H-W counterparts, and hence more novel) are more likely to influence the outcome variables.

6   Discussion and Conclusion

Interesting results are uncovered through the statistical analyses. First of all, achieving the study's aim, a positive relationship is found between interactivity and SC website effectiveness. Moreover, different interactivity dimensions are found to affect website effectiveness in different ways. Specifically, the more unique H-H interactivity influences outcome variable more significantly than the more widespread H-W interactivity. In other words, SC users seem to take H-W interactivity as a given, which is still not the case for H-H interactivity.

These findings are consistent with the literature suggesting that marketers "should continue developing applications… with novel, pleasurable experiences to reinforce pleasurable effects in using the site and further to strengthen its stickiness" [36, p. 1159]. Similarly, as a result of their content analysis, Voorveld et al. find that "unique interactive features contribute most to consumers' perceptions of interactivity" [28, p. 91]. Voorveld et al. also recommend that marketers should pay attention to the constant evolution of interactivity and tailor their platforms to the interactivity needs of their consumers [28].

Along the same lines, findings from this study can be useful to digital marketers as it will help them in understanding their customer journeys and thus designing online platforms that will incorporate both H-H and H-W features, which will lead to customers' enjoyment and engagement.

Future research could look into the role of interactivity in new communication technologies using experimental research methods. Moreover, a longitudinal study could be a good idea to uncover the growth of SC over the years and the effect of different interactive features within social commerce platforms over time.

References

1. Liu, Y., Shrum, L.J.: What is interactivity and is it always such a good thing? Implications of definition, person, and situation for the influence of interactivity on advertising effectiveness. J. Advert. **31**(4), 53–64 (2002)
2. Almahdi, M.: The Evolution of Interactivity in the Context of Social Commerce: A Multifaceted Investigation. University of Bath (2018)
3. Rafaeli, S.: Interactivity: From new media to communication. In: Sage Annual Review of Communication Research: Advancing Communication Science, pp. 110–134. Sage, Beverly Hills, CA (1988)
4. Bozkurt, S., Gligor, D.M., Babin, B.J.: The role of perceived firm social media interactivity in facilitating customer engagement behaviors. Eur. J. Market. (2020)
5. Kang, H., Oh, J.: Beyond user control and two-way communication: the four-factor model of interactivity of wrist-worn smart devices. Media Psychol. 1–28 (2021)
6. Li, M., Hua, Y., Zhu, J.: From interactivity to brand preference: the role of social comparison and perceived value in a virtual brand community. Sustainability **13**(2), 625 (2021)
7. Alalwan, A.A., et al.: Examining the impact of mobile interactivity on customer engagement in the context of mobile shopping. J. Enterp. Inf. Manag. (2020)

8. Vendemia, M.A.: When do consumers buy the company? Perceptions of interactivity in company-consumer interactions on social networking sites. Comput. Hum. Behav. **71**, 99–109 (2017)

9. Chen, K., Yen, D.C.: Improving the quality of online presence through interactivity. Inf. Manag. **42**(1), 217–226 (2004)

10. Lee, E.-J., Shin, S.Y.: Are they talking to me? Cognitive and affective effects of interactivity in politicians' Twitter communication. Cyberpsychol. Behav. Soc. Netw. **15**(10), 515–520 (2012)

11. Oh, J., Sundar, S.S.: How does interactivity persuade? An experimental test of interactivity on cognitive absorption, elaboration, and attitudes. J. Commun. **65**(2), 213–236 (2015)

12. Almahdi, M.H.: Social commerce: a concept explication. In: Musleh Al-Sartawi, A.M., Razzaque, A., Kamal, M.M. (eds.) Artificial Intelligence Systems and the Internet of Things in the Digital Era. EAMMIS 2021. Lecture Notes in Networks and Systems, vol. 239, pp. 398–404. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-77246-8_37

13. Johnson, T.J., Kaye, B.K.: Some like it lots: the influence of interactivity and reliance on credibility. Comput. Hum. Behav. **61**, 136–145 (2016)

14. Ghose, S., Dou, W.: Interactive functions and their impacts on the appeal of internet presence sites. J. Advert. Res. **38**(2), 29–43 (1998)

15. Geyser, W.: What is Social Commerce and How it's Shaping Online Shopping, 20 July 2021. https://influencermarketinghub.com/what-is-social-commerce/

16. Kiousis, S.: Interactivity: a concept explication. New Media Soc. **4**(3), 355–383 (2002)

17. Chen, Q., Griffith, D.A., Shen, F.: The effects of interactivity on cross-channel communication effectiveness. J. Interact. Advert. **5**(2), 19–28 (2005)

18. Shih, H.-P., Huang, E.: Influences of web interactivity and social identity and bonds on the quality of online discussion in a virtual community. Inf. Syst. Front. **16**(4), 627–641 (2012). https://doi.org/10.1007/s10796-012-9376-7

19. Rafaeli, S., Yaron, A.: Assessing interactivity in computer-mediated research. In: Joinson, A., et al. (eds.) Oxford Handbook of Internet Psychology, pp. 71–88. Oxford University Press, Oxford (2007)

20. Wang, C., Zhang, P.: The evolution of social commerce: the people, management, technology, and information dimensions. Commun. Assoc. Inf. Syst. **31** (2012)

21. Huang, Z., Benyoucef, M.: User preferences of social features on social commerce websites: an empirical study. Technol. Forecast. Soc. Chang. **95**, 57–72 (2015)

22. Turban, E., Strauss, J., Lai, L.: Social Commerce. Springer, Heidelberg (2016)

23. Lu, B., Fan, W., Zhou, M.: Social presence, trust, and social commerce purchase intention: an empirical research. Comput. Hum. Behav. **56**, 225–237 (2016)

24. Lipsman, A.: Social Commerce 2021: Media and Commerce Convergence Creates Growth Opportunity for Brands, 3 September 2021. https://www.emarketer.com/content/social-commerce-2021

25. Almahdi, M., Archer-Brown, C., Panteli, N.: Developing a typology of social commerce websites: an exploratory study. In: Academy of Marketing Conference: The Magic in Marketing. Limerick, Ireland (2015)

26. McMillan, S.J.: A four-part model of cyber-interactivity some cyber-places are more interactive than others. New Media Soc. **4**(2), 271–291 (2002)

27. Ha, L., James, E.L.: Interactivity reexamined: a baseline analysis of early business web sites. J. Broadcast. Electron. Media **42**(4), 457–474 (1998)

28. Voorveld, H.A.M., Neijens, P.C., Smit, E.G.: The relation between actual and perceived interactivity. J. Advert. **40**(2), 77–92 (2011)

29. Nickerson, R.C., Varshney, U., Muntermann, J.: A method for taxonomy development and its application in information systems. Eur. J. Inf. Syst. **22**(3), 336–359 (2013)

30. Huang, Z., Benyoucef, M.: From e-commerce to social commerce: a close look at design features. Electron. Commer. Res. Appl. **12**(4), 246–259 (2013)
31. Turban, E., King, D., Lee, J.K., Liang, T.P., Turban, D.C.: Overview of electronic commerce. In: Electronic Commerce. Springer Texts in Business and Economics, pp. 3–49. Springer, Cham (2015). https://doi.org/10.1007/978-3-319-10091-3_1
32. Chaffey, D., Ellis-Chadwick, F.: Digital Marketing: Strategy, Implementation and Practice, 6th edn. Pearson, Boston (2016)
33. Laudon, K.C., Traver, C.G.: E-commerce. Pearson, Boston, MA (2013)
34. Bucklin, R.E., Sismeiro, C.: A model of web site browsing behavior estimated on clickstream data. J. Mark. Res. **40**(3), 249–267 (2003)
35. Stutzman, F., et al.: Privacy in interaction: exploring disclosure and social capital in Facebook. In: ICWSM (2012)
36. Lin, K.-Y., Lu, H.-P.: Why people use social networking sites: an empirical study integrating network externalities and motivation theory. Comput. Hum. Behav. **27**(3), 1152–1161 (2011)

Social Media as an Effective Tool for Health Communication: Insights from the COVID-19 Pandemic

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Abstract. Health communication efforts are crucial in improving the public's well-being and quality of life. Consequently, health organizations are constantly seeking out more effective and interactive channels to deliver health communication messages to their intended audiences. One of such channels is social media, which has been noted to facilitate the interaction between health organizations and their consumers. Based on a study of the literature, this paper discusses the use of social media as an effective tool for spreading health communication messages. It further highlights the opportunities and challenges facing health organizations when using social media as a tool for health communication. The researchers present the COVID-19 pandemic as a case to illustrate the major role of social media in health communication, while shedding light on how fake news can impede such important efforts.

Keywords: COVID-19 · Fake news · Health communication · Social media

1 Introduction

Social media technologies are creating a major shift in the relationship between organizations and their consumers. Indeed, before social media, organizations relied on traditional one-way-communication methods, such as the television, radio, and newspapers, to deliver marketing messages to their audiences [1]. The mammoth growth of social media, however, dramatically changed the marketing scene as we know it. Instead of being on the receiving end of marketing messages, such platforms empowered consumers with the necessary tools to find information about products and services and to share product and brand reviews and experiences with others [2]. Therefore, in order to thrive in today's market, marketers must adapt to this shift in power [3].

Due to the aforementioned reasons, social media technologies have revolutionized the way health organizations communicate with their audiences, especially regarding the speed of communication and convenience of sharing information between them [4, 5]. Moreover, such interactive technologies allow targeting specific segments of the population with personalized health communication, and facilitate social support [6, 7].

However, despite to the many benefits of using social media for health communication, such platforms should still be handled with caution. Indeed, healthcare

organizations should address the privacy and security concerns of their consumers [8] and understand the risks of misinformation associated with using social media for health communication [9]. This literature review paper elaborates on these issues in light of the ongoing COVID-19 pandemic. It starts with defining health communication and highlighting the opportunities and threats provided by social media as a tool for health communication. The case of using social media for COVID-19 health communication is then presented, with emphasis on the role of fake news in derailing COVID-19 health communication efforts on social media. A few suggestions on ways to deal with such challenges are presented at the end of the paper.

2   Health Communication: Definition and Role

Health communication is an evolving field of research that has been receiving increasing attention over recent years [10], because it has been noted to affect the public's health, well-being, and quality of life [11]. Clift defines the concept as "a health education approach which attempts to change a set of behaviors in a large-scale target audience regarding a specific problem in a predefined period of time" [12, p. 99]. Bonyan *et al.* [13] similarly follow a change-of-behavior perspective when approaching the concept. They highlight the role of health communication in helping control health crises through changing people's behaviors and responses [13]. This change in behavior is achieved, according to Muturi, through empowering the audiences by "providing them with knowledge and understanding about specific health problems and interventions" [14, p. 79].

Rimal and Lapinski [11] employ communication theory to explain the concept as an "exchange of shared meaning" (p. 247). They, further, highlight the importance of carefully selecting the most contemporary communication channels for distributing health communication and intervention messages to their intended audiences [11]. Freimuth and Quinn [15], similarly, discuss the opportunities presented by novel and interactive communication technologies for delivering health information, especially in terms of offering audiences relevant and personalized messages. One of such novel interactive communication technologies that can be utilized to deliver health communication messages is social media platforms [16].

3   Social Media in Health Communication

Social media is defined, according to Almahdi, as "a range of online platforms and applications that implement a variety of interactive mechanisms to facilitate their users' social activities" [17, p. 61]. According to Healthcare Compliance Pros (HCP), 80% of social media users have used these platforms to search for health-related information, including searching for medical news and updates [18]. This makes social media an extremely useful and ubiquitous tool to share health information with the public; a tool that still needs to be approached with caution due to the sensitive nature of the information that it can be used to propagate [18]. We discuss the benefits and challenges associated with facilitating social media in health communication, next.

3.1   Benefits of Using Social Media in Health Communication

Social media have created a paradigm shift in the dynamics of interaction between healthcare organizations and their consumers, in addition to the speed and convenience at which they can communicate [4, 5]. Doctors, hospitals, and other healthcare providers are now using social media to market their services, connect with their patients [19] and share information in a way that is convenient for all parties involved [4, 5]. Indeed, social media affords audiences, of different population segments, higher levels of interactivity and social support [6]. Additionally, such platforms afford health professionals advanced targeting tools to reach specific segments of audiences as needed [6].

In addition to being at the receiving end of health information, the highly interactive nature of social media allows the public to actively use such platforms to seek health-related information [8, 20]. Indeed, social media provides easy access to health information for vulnerable individuals or those who face difficulty in finding such information via traditional ways, such as youngsters, people belonging to lower socioeconomic groups, and ethnic minorities [5]. In addition to using social media to search for health information, the public uses these platforms to share updates about their own health issues [21] and receive peer, social, and emotional support related to their health concerns [5]. Moreover, some people feel more comfortable using social media to discuss sensitive health issues rather than doing so in face-to-face meetings with health professionals [22].

Social media is also beneficial in public health surveillance where it can provide low-cost information round the clock. Such information may be collected by monitoring public response to a particular health issue or tracking and monitoring a disease outbreak [9]. Another benefit lies in the platforms' ability to identify misinformation regarding any health issue and identify areas for target information and intervention. Finally, the information generated by health professionals is regularly shared by mainstream media, contributing to health care policymaking [5].

3.2   Challenges of Using Social Media in Health Communication

Several challenges pertaining to the use of social media to spread health communication messages have been noted in prior research. The lack of reliability and general low quality of a lot of the health information shared comes at the top of the list [8]. Ukoha and Stranieri elaborated on this point by highlighting that authors of health-focused web and social media pages are frequently unknown [8]. This contributes to blurring the line between the audience and page authors, making it difficult for information seekers to verify the information they receive from those sources [8].

Further limitations in this regard include the confidentiality and privacy concerns relating to sharing one's personal health experiences online [8]. Along the same lines are security issues attached to health-related social media interactions. Risks may arise when personal data is stolen or when incorrect information is delivered in the case of a health organization's social page getting hacked [5].

Another risk may arise when the general public lacks the sufficient knowledge or skill needed to understand and apply the information they find on social media to their

personal health routines or conditions [8]. Moreover, having access to a lot of information on social media might lead to information overload and confusion [9]. Even riskier, such unprecedented access to health information might deter the patients from visiting their health providers, as they might incorrectly assume it sufficient to rely on information found on the internet to deal with their health concerns [5].

4   Social Media in COVID-19 Health Communication

As the COVID-19 pandemic started spreading unpredictably around the world, an increased need has occurred to facilitate social media in reaching out to the public to both spread awareness and control their panic and anxiety [23, 24]. Using social media to spread COVID-19 awareness messages has proved especially useful because the public gets to interact with and share the messages with their social networks, and even ask questions [25]. In such situations, "social media can function as trusted stewards of civic responsibility" [25, p. 1].

Indeed, social media has been used (and is still being used) by many governments and not-for-profit organizations for health communication and community intervention campaigns. Such campaigns are utilized to encourage the public to follow scientifically-informed precautions to decrease the spread of the pandemic [25]. These include practicing social distancing and good personal hygiene, wearing a mask, and following self-isolation rules [26]. More recent campaigns have been utilized to encourage people to take the COVID-19 vaccination [27, 28].

Marketing activities within these campaigns can be observed in different shapes and forms; from creating official social media pages with updated pandemic-related information and sharing emotional content about the real dangers of COVID-19, to utilizing celebrities and social media influencers to promote adherence to COVID-19 precautions and encourage their followers to get the vaccine [25, 27, 28]. Other than official organizations using social media to combat the COVID-19, citizens have also been taking an active role responding to the disruption and shortage of resources caused by the pandemic. People have been harnessing the power of social media to raise funds for pandemic humanitarian aid [29] and providing social support to one another [7]. But perhaps most importantly of all, citizens have been increasingly relying on social media to access and share information and updates about the COVID-19 pandemic [7].

5   COVID-19 Health Communication and Fake News

According to Gelfert, fake news can be defined as the "presentation of… false or misleading claims as news" [30, p. 84]. Despite of the important role of social media in distributing scientifically accurate facts about COVID-19, it has been equally utilized in posting fake news about the virus, thus creating worldwide panic and fear about the pandemic [31]. Some of such unsubstantiated fake news include claims that China has deliberately created the corona virus as an act of biological warfare [32], or that the

virus has spread as a result of 5G technologies [33], or even that governments can insert microchips in the receiver's body through vaccinations [34].

The World Health Organization has stated that in addition to fighting a global pandemic, the world is currently fighting an 'infodemic' caused by social media misinformation [35]. This infodemic "continues to undermine the global response and jeopardizes measures to control the pandemic" [35, p. 1]. Commenting on this phenomenon, Mr. Joe Biden, the president of the United States, has called out social media corporations, including Facebook, for their role in propagating misinformation about COVID-19 vaccinations, which is contributing to increasing the death toll from the pandemic in the USA [34].

While it has been reported that some social media corporations are trying to systematically eliminate such false information from their sites [36], fake news is an ongoing challenge. This is especially alarming, because fake news often look very convincing and might even be presented by trusted individuals on social media. This makes it difficult for most of the public to tell fake news apart from accurate information. What makes matters even more complicated is that, due the unpredictable nature of the virus, the public kept receiving changing, and sometimes conflicting, directions from governments and global health organizations on how to navigate life during the pandemic [37].

On a more positive note, however, the World Health Organization highlights that of 23,500 global respondents it surveyed, nearly 60% are conscious about the existence of COVID-19 fake news and try to distinguish it from other types of news [35].

Going forward, training health information seekers on how to find accurate information through various social media platforms might be a necessary step [9]. Another measure to minimize the effects of COVID-19 fake news would be for governments and relevant health organizations to continue supplying the public with scientific and accurate information related to the pandemic, in order to drown out the noise of fake news [37].

References

1. Hoffman, D.L., Novak, T.P.: A new marketing paradigm for electronic commerce. Inf. Soc. **13**(1), 43–54 (1997)
2. Turban, E., Strauss, J., Lai, L.: Social Commerce. Springer, Heidelberg (2016)
3. Gwadabe, M.L.: Adoption of web 2.0 marketing: an exploratory study about the Nigerian SME's. Int. J. Inf. Syst. Serv. Sect. (IJISSS) **9**(4), 44–59 (2017)
4. Belfiore, P., Liccardo, A.: Social marketing and sport management for health promotion. Sport Sci. **12**(1), 36–39 (2019)
5. Bhatia, P.S.: Benefits and limitations of social media in health communication (2019)
6. Moorhead, S.A., et al.: A new dimension of health care: systematic review of the uses, benefits, and limitations of social media for health communication. J. Med. Internet Res. **15**(4), e85 (2013)
7. Abbas, J., et al.: The role of social media in the advent of COVID-19 pandemic: crisis management, mental health challenges and implications. Risk Manag. Healthcare Policy **14**, 1917 (2021)

8. Ukoha, C., Stranieri, A.: Criteria to measure social media value in health care settings: narrative literature review. J. Med. Internet Res. **21**(12), e14684 (2019)

9. Carroll, J.K., et al.: Who uses mobile phone health apps and does use matter? A secondary data analytics approach. J. Med. Internet Res. **19**(4), e125 (2017)

10. Schiavo, R.: Health Communication: From Theory to Practice, vol. 217. John Wiley & Sons, Hoboken (2013)

11. Rimal, R.N., Lapinski, M.K.: Why health communication is important in public health. Bull. World Health Organ. **87**, 247–247a (2009)

12. Clift, E.: HEALTHCOM: a communication methodology for health in the Third World. Health Educ. Res. **5**(1), 99–106 (1990)

13. Bonyan, R., et al.: Identification of the awareness level by the public of Arab countries toward COVID-19: cross-sectional study following an outbreak. J. Pharm. Policy Pract. **13**(1), 1–10 (2020)

14. Muturi, N.W.: Communication for HIV/AIDS prevention in Kenya: Social–cultural considerations. J. Health Commun. **10**(1), 77–98 (2005)

15. Freimuth, V.S., Quinn, S.C.: The contributions of health communication to eliminating health disparities. American Public Health Association (2004)

16. Chou, W.-Y.S., et al.: Social media use in the United States: implications for health communication. J. Med. Internet Res. **11**(4), e48 (2009)

17. Almahdi, M.: The Evolution of Interactivity in the Context of Social Commerce: A Multi-faceted Investigation. University of Bath (2018)

18. HCP: Posting with Caution: Social Media and HIPAA Compliance, 2021. Accessed 23 July 2021. https://www.healthcarecompliancepros.com/blog/posting-with-caution-the-dos-and-donts-of-social-media-and-hipaa-compliance

19. Lim, W.M.: Social media in medical and health care: opportunities and challenges. Mark. Intell. Plan. (2016)

20. Zhang, X., et al.: How the public uses social media wechat to obtain health information in china: a survey study. BMC Med. Inform. Decis. Mak. **17**(2), 71–79 (2017)

21. Woo, H., et al.: Estimating influenza outbreaks using both search engine query data and social media data in South Korea. J. Med. Internet Res. **18**(7), e177 (2016)

22. Colineau, N., Paris, C.: Talking about your health to strangers: understanding the use of online social networks by patients. New Rev. Hypermedia Multimed. **16**(1–2), 141–160 (2010)

23. Machado, R.A., et al.: Social media and telemedicine for oral diagnosis and counselling in the COVID-19 era. Oral Oncol. (2020)

24. Ding, H.: Transnational quarantine rhetorics: public mobilization in SARS and in H1N1 flu. J. Med. Humanit. **35**(2), 191–210 (2014)

25. Pollock, J.C.: New Book COVID-19 in International Media Finds Many Countries Trust Social Media to Confront COVID-19, 2021. Accessed 24 July 2021. https://www.globenewswire.com/news-release/2021/07/21/2266784/0/en/New-Book-COVID-19-in-International-Media-Finds-Many-Countries-Trust-Social-Media-to-Confront-COVID-19.html

26. Cvetković, V.M., et al.: Preparedness and preventive behaviors for a pandemic disaster caused by COVID-19 in Serbia. Int. J. Environ. Res. Public Health **17**(11), 4124 (2020)

27. NRC-RIM. Vaccination Is Campaign, 2021. Accessed 24 July 2021. https://nrcrim.org/vaccines/vaccination-campaign

28. Health, A.G.D.o. COVID-19 vaccines campaign social media, 2021. Accessed 24 July 2021. https://www.health.gov.au/initiatives-and-programs/covid-19-vaccines/covid-19-vaccination-campaign-materials/covid-19-vaccination-campaign-other-resources/covid-19-vaccines-campaign-social-media

29. Movono, A., et al.: Fijians harness the fundraising power of social media as their government struggles with the COVID-19 crisis, 2021. Accessed 24 July 2021. https://theconversation.com/fijians-harness-the-fundraising-power-of-social-media-as-their-government-struggles-with-the-covid-19-crisis-164390
30. Gelfert, A.: Fake news: a definition. Informal Log. **38**(1), 84–117 (2018)
31. Depoux, A., et al.: The pandemic of social media panic travels faster than the COVID-19 outbreak. Oxford University Press (2020)
32. Nie, J.-B: In the shadow of biological warfare: conspiracy theories on the origins of COVID-19 and enhancing global governance of biosafety as a matter of urgency. J. Bioethical Inq. **17**(4), 567–574 (2020)
33. Reuters. False claim: Coronavirus is a hoax and part of a wider 5G and human microchipping conspiracy, 2021. Accessed 25 July 2021. https://www.reuters.com/article/uk-factcheck-coronavirus-5g-idUSKBN22P22I
34. Bose, N.: White House blames YouTube, Facebook for spread of COVID-19 vaccine misinformation 2021. Accessed 24 July 2021. https://globalnews.ca/news/8054977/white-house-youtube-facebook-covid-vaccine-misinformation/
35. Organization, W.H. Social media & COVID-19: A global study of digital crisis interaction among Gen Z and Millennials, 2021. Accessed 23 July 2021. https://www.who.int/news-room/feature-stories/detail/social-media-covid-19-a-global-study-of-digital-crisis-interaction-among-gen-z-and-millennials
36. Frenkel, S., Alba, D., Zhong, R.: Surge of Virus Misinformation Stumps Facebook and Twitter. The New York Times, New York (2020). 8
37. Nyilasy, G.: Fake news in the age of COVID-19. Pursuit [Internet]. University of Melbourne, 2020. Accessed 12 June 2020

Sustainability and Governance

Corporate Governance and Real Earnings Management: The Role of the Audit Committee Characteristics

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Abstract. This work studies the impact of corporate governance (audit committee) on real earning management among companies recorded on the Amman stock exchange in Jordan. Wherein, the sample consisted of 92 firms from the industrial and service companies from the period 2009 to 2018. Corporate governance examined through the audit committee size, meetings and gender, whereas real earning management has been quantified using cash flow from operations. In the present study formed by agency theory and employing the panel data method. The findings illustrate that the audit committee size and gender have a negative and significant relationship with real earning management. While the relationship between the meetings of the audit committee and real earning management is significantly positive. This paper provides empirical evidence to help executives, stakeholders make decisions. Consequently, these results offer evidence for the Jordanian executives, investors, and regulators.

Keywords: Audit committee size · Meeting and gender · Real earning management

1 Introduction

Numerous incidents involving financial fraud by the management company have brought financial reporting to the public. The WorldCom accounting scandals negatively impacted the trust of regulators in financial statements. The accounting scandals that occurred in the US companies like (Sunbeam, Cendant, Waste Management, WorldCom, and Enron) and Comrade in Germany. Earnings management is the major reason behind these scandals (e.g. Cullinan, 2004). This practice leads to hindering the economic development of the country's and lower investment from domestic and foreign investors [9].

Moreover, companies have goals to earnings in an effort to sustain the continuity of businesses. Real earning management is a strategy that diverges from the regular operations used by the managers to deceive shareholders. Such agency problem is expected to be solved through Corporate Governance. Taking earnings management is one option that the company's management performs. As a result, the information

contained earnings become obsolete through the opportunistic actions of managers in maximizing desires [29]. Furthermore, real earnings management practices are accomplished through three methods: operating cash flow manipulation, costs of manufacturing, and discretionary costs. The real activities manipulation is extremely difficult to recognize by the auditors, also by the qualified auditors [34].

Subsequently, to protect proprietors' riches and pull in progressively foreign investments, the practices of corporate governance are starting to incorporate the utilization of instruments to screen top management such as the audit committee [7].

The audit committee is one of the board's sub-committees. It is mainly considered an efficient technique to guarantee corporate governance in organizations. [19] described audit committees as sub-committees in the Governing Body making audit arrangements and as a Board sub-committee as well.

Further, several definitions have been provided. [38] argued that an audit committee works on reviewing the annual financial reports prior to submitting them to the directors' board. They added that committees work in general as a link between auditors and the boards of directors. Their responsibilities might involve reviewing auditor's nomination, the audit's total scope and results, internal financial controls, and the publication's financial information. Firms form an audit committee within the Directors Board for participating in supervising the accounting and financial reporting rules and procedures in a company.

The audit committee attempts to improve the Board's capability to achieve its legal duties and assure the financial reports credibility and objectivity. Therefore, the main role of audit committees is to create suggestions for the modification and appointment of external auditors; it includes broader fields, including manager surveillance and the internal control system of the company [6]. Then, audit committees take a significant part in supervising the company management to safeguard owners' interests [21].

Consequently, the audit committee helped the investors to be more confident in the stock market and served the investors and stakeholders especially after the reaction of the Jordanian market to enact a set of laws of corporate governance in (2002) and the updated in (2004). Also, the legislation was updated in (2009) with the first corporate governance guideline to encourage reform of the country's stock market and restore the trust of the investor. Moreover, in the year of (2017) to enhance corporate governance procedures, the Jordanian government updates the Jordanian Corporate Governance Code (JCGC 2017) in Amman Stock Exchange's [25].

This Jordanian corporate governance code introduced more information about audit committees, including the frequency and the size of the audit committees' meetings and financial and accounting expertise and review of the external auditor's job on financial reporting and fields of financial reporting supervision and inner controls [2].

In the last decades, the company climate in Jordan is not useful to investors. scams, Frauds, malpractices have significantly been leading to a decline in the performance of Jordanian companies and breaching the trust of Jordanian investors. Especially in 2017, the non-compliance with governance standards led to the conversion of 5 public shareholding companies to mandatory liquidation after it proved unable to handle their financial matters and administrative [14].

Hence, this work examines the relationship between the audit committees' characteristics and real earning management. It would be a contribution to the existing

literature in highlighting the audit committee characteristics role in real earning management, namely: audit committee size, meetings and gender. Furthermore, this study aims to investigate the effect of the Audit Committee characteristics on real earning management for the Jordanian stock exchange sectors (service and industrial sectors). Where the tested of the period from 2009 to 2018. Also, it is expected, good characteristics of the audit committees would affect the real earning management.

2 Theoretical Background, Literature Review and Development of Hypothesis

2.1 Theoretical Background

Agency Theory
In agency theory, the manager can be driven by self-interest rather than the desire to promote owner's interest [21]. This is the cause of the issue related to agency, demonstrating the two parties' competing interests. When a conflict of interests takes place between managers and shareholders, the former usually make the decisions. [32] added that these decisions are usually made in the managers' best interests rather than the shareholders' interests. Thus, there is a good chance that managers will participate in real earning management.

The agency theory suggests procedures to reduce real earning management by forming a proper committee and a suitable directors board as key corporate governance mechanism. The audit committee is a measure developed to diminish the agency problems and decrease information asymmetry [35]. Moreover, in order to decrease the agent's self-serving nature, governance mechanisms like board subcommittees (audit committee) consisting of managers with suitable characteristics like meetings frequency and diversity of gender and the size of the committee are necessary to avoid or decrease the agent's selfish interest. Their judgment might have an influence on whether the financial data is transparent and not deceptive [39].

2.2 Literature Review and Development of Hypothesis

For accountants, researchers, and organizations, the Audit Committee and its effect on financial reporting quality have become significant [14]. To identify the functions, characteristics, and responsibilities of the Audit Committees, efforts have been made by providing guidelines to assist them in restoring the financial reports credibility [16]. Regarding this, the Audit Committee assures that it takes part in minimizing manipulation such as real earning management and data misstatement [4].

In the literature, earning management has two types, real and accrual-based [27]. Great deal of literature gave confirmation in the engagement of controlling earning through real earning management along with accrual method [30]. [30] clarified real earning as the take-off from typical operational practices, for example, lessening of discretionary expenditures, price discounts, and an overproduction to meet certain procuring edges. As indicated by [37], firms endeavoured to accomplish benchmark by

leaving from ordinary working exercises and proposed that corporate governance (audit committee) factors assume a noteworthy part in moderating real earning management.

A great deal of research that has investigated how the presence of the Audit Committee and its characteristics impact the financial reporting quality has found that having an audit committee helps in decreasing manipulation such as real earning management and increasing the quality of financial reports [1, 5, 11, 13, 22, 27].

2.2.1 Audit Committee Size

With regard to the serving members number, the audit committee size is seen as an indicator of the resources available for the audit committee's effectiveness. As prior studies discuss that the audit committee's effectiveness somehow depends on its characteristics, like the audit committee size [18, 19]. The audit committee needs sufficient members to fulfil its duties [36], and suitable resources to be successful in managing and tracking the actions of managers [23]. [28] for example, concluded that the audit committee size influenced the risk of businesses obtaining audit reports with mistakes or non-compliant qualifications. According to [12], the larger the audit committee, the higher the chances of finding and addressing any issues in the financial reporting process [26]. This can be attributed to the fact that the size tends to offer the required synergy and variety of skills and views to guarantee efficient monitoring. The Jordanian Corporate Governance Code (JCGC, 2017) recommends that an audit committee should have three directors as a minimum.

Inconsistent findings were reached in a study conducted on real earning management and audit committee size. For instance, a positive relationship exists, according to [24], between the size of the audit committee and real earning management. Comparably, [8] detected a noteworthy impact of audit committees' size on earnings manipulation and earnings quality.

Nevertheless, [16] discovered a negative relationship between the audit committee and the earning management. To ensure effective monitoring, however, a diverse set of skills, expertise, experiences, and views by a bigger audit committee is needed. As a result, possible procedure of corporate reporting problems is highlighted and resolved. Thus, the size of any audit committee forms the core aspect of audit committee features. Thus, the following proposition is postulated:

H1: There is a negative relationship between Audit committee size and Real Earnings Management in the listed industrial and services firms in ASE.

2.2.2 Audit Committee Meeting

The regularity with which the meetings of the audit committees are held is crucial in assisting the management in resolving any problems and enhancing businesses' internal control system [33]. A good deal of research has shown that there is an association between earning management and meeting of the audit committee, but the findings are inconclusive and inconsistent. According to [34], a minor association between the activity of audit committees and earning management exists, while [31] demonstrated a positive relationship between the meeting of the audit committee and earning management. However, the results of a great deal of research in various contexts [10, 12,

15, 21] has indicated a negative link between the meeting of audit committees and earning management.

Systematic meetings of audit committees can help in guaranteeing that the reporting system is of good quality. Thus, a proactive audit committee that meets on a regular basis can decrease Real earning management [17]. According to this argument, regular audit committee meetings are a requirement for efficient monitoring. That can be ascribed that if the audit committee are regularly held, the committee will oversee the company management and discover Real earning management in an effective way. Hence, the following is hypothesized:

H2: A negative relationship exists between Audit committee meeting and Real Earnings Management in the listed industrial and services firms in ASE.

2.2.3   Audit Committee Gender

The previous research showed that the gender of the members in Audit Committees and the participation of females in the Committees impacts on many sorts of decisions that companies make [3]. Females have characteristics that make them cautious in financial matters, and they are risk averse [38]. Moreover, females tend to be neutral in their judgments and behaviours [25]. Such a distinction in cognitive function, decision making, and conservation may significantly impact the financial reporting quality [19]. In some studies, the effect of the gender of the Audit Committee on the quality of financial reporting has been studied. According to these studies, a positive relationship exists between female participation and financial reporting quality [28]. More studies have determined that a positive relationship between the diversity of gender and the auditor's report quality exists [6]. Hence, the following is hypothesized:

H3: A negative relationship between Audit committee gender and Real Earnings Management exists in the listed industrial and services firms in ASE.

3   Research Methodology

3.1   Selection of Sample and Data Sources

This work aimed to study the relationship between the features of audit committees and real earning management measured by the Roychowdhury model (2006) in the Jordanian market. This study focuses on Amman Stock Exchange (ASE) listed companies because it is deemed one of the Middle East's most vital stock exchanges.

Furthermore, Jordan is an essential centre in the Middle East because of its strategic and essential place among the region's nations and as a financial channel for many markets. In this research, multiple sources were used to obtain the data set used in the analyses.

The study data were collected for the years 2009–2018 from Jordanian public shareholders companies listed on the Amman Stock Exchange (ASE) using the annual reports accessible on the ASE website and addition to using DataStream. The data set

included the present study of all ASE-listed companies over a 10-years period except for the financial sector. The main sample of the study includes 92 companies from the industrial and service companies for 920 firm-years observations, Table 1 below shows summarized for the selected sample.

Table 1. Sample selection

Service sector	47
Industrial sector	45
Total firm-year in the final sample	**92**

3.2   Measurement of Variables

According to the results of previous literature and the availability of data and the environment of the Jordanian market, Table 2 summarizes the measurement of the variables utilized in the current study.

Table 2. Description the measurements of variables.

Variables	Acronym	Measurement
Dependent Variable: Real earning management	REM	Roychowdhury Model (2006)
Independent variable: Audit committee size	ACZ	The number of members constituting the audit committee
Audit committee meeting	ACM	The number of annual meetings the committee holds
Audit committee gender	ACG	The ratio of female members in the audit committee

A regression analysis was estimated linking the relationship between independent variables and dependent variable through the model of this study is established by the following equation. The hypotheses are tested of significance at the 0.05 level (95 confidence level).

$$REM = \alpha + \beta1 ACZ + \beta2 ACM + \beta3 ACG + \varepsilon \qquad (1)$$

4   Discussions and Empirical Results

For the variables of the study, Table 3 illustrates the means and standard deviations of the independent variables involved in the regression model which are: Audit committee size, meeting and gender, and Real earning management as a dependent variable.

Table 3. Descriptive statistics

	REM	ACZ	ACM	ACG
Mean	0.014917	3.041304	3.719565	0.023043
Median	0.010753	3.0000000	4.000000	0.000000
Maximum	0.060730	6.000000	11.000000	0.333330
Minimum	−0.019963	0.000000	0.000000	0.000000
Std. Dev	0.021536	0.653467	1.334096	0.084432
Skewness	0.443336	−1.282446	0.464192	3.39538
Kurtosis	2.074404	15.05609	6.57436	12.54376
Probability	0.000000	0.000000	0.000000	0.000000

Table 3 reveals that the mean real earning management of companies in the Amman stock exchange is 0.014917, ranging from −0.019963 to 0.060730, with a standard deviation rate equivalent to 0.021536. Then, concerning the independent variables (IV), this table illustrates that the mean of the audit committee size is 3.041304 with a standard deviation of 0.653467, the minimum value in audit committee size is 0.000, and a maximum size of the audit committee is 6.000000. This shows that the audit committees abide by the Jordanian Corporate Governance code, which provides that three non-executive directors at least must be comprised in the audit committee.

For the audit committee meeting, Table 3 shows that the average is 0.769815 with a standard deviation of 3.719565, the minimum is 0.000000, and a maximum meeting rate equivalent to 11.000000. That shows abide by the meeting of the audit committee in the Jordanian companies' around the stage specified in the corporate governance code, which is four meetings at least for the audit committee members in the year. Finally, Table 3 illustrates that the gender of audit committee mean is 0.023043 with a standard deviation of 0.084432, the minimum is 0.000000 and with a maximum of 0.333330.

Table 4. Correlation analyses

	REM	ACZ	ACM	ACG
REM	1.000000			
ACZ	−0.101053*	1.000000		
ACM	0.053117*	0.426445	1.000000	
ACG	−0.069761*	−0.009381	0.102513	1.000000

Correlation is significant at * $\alpha = 0.01$, ** $\alpha = 0.05$.

Table 4 reveals the correlation between the dependent variable and independent variables. As a result, the size of audit committee (ACZ) and audit committee gender (ACG) has a negative relationship with Real earning management (REM), with ACZ = −0.101053, and ACG = −0.069761 values at $\alpha = 0.01$. Moreover, the findings explain that the meetings of audit committees have a positive connection with Real

earning management (REM), with ACM = 0.053117. Thus, to examine the amount of multicollinearity between the autonomous factors, which, as indicated must be less than 80% [39]. Therefore, there were no multicollinearity issues with the data, which generally requires 80% or above to conclude that the correlations between independent variables have multicollinearity issues (Table 5).

Table 5. Regression analysis using REM

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ACZ	−0.005164	0.001189	−4.344166	0.0000
ACM	0.002076	0.000585	3.546603	0.0004
ACG	−0.021531	0.008365	−2.573906	0.0102
C	0.023397	0.003399	6.882536	0.0000
R-squared	0.428552	Mean dependent var		0.014917
Adjusted R-squared	0.425370	S.D. dependent var		0.021536
F-statistic	8.973981	Durbin-Watson stat		1.710311
Prob (F-statistic)	0.000007			

The table above shows the impact of the characteristics of audit committees on real earning management. In this paper, three hypotheses were evaluated. The model generates R-squared of 0.428552 for the evaluation carried in on above, F-value is 8.973981 and P-value is 0.000007, Durbin-Watson is 1.710311 and adjusted R-squared suggests that 0.425370 is significant at 5%.

Moreover, the findings for the connection between the audit committee characteristics and the real earning management were presented on the Table above: the regression outcome in model on above shows that the audit committee size is related to the real earning management, $\beta = -0.005164$, $t = -4.344166$, $p = 0.0000$. The result corresponds to the hypothesis that the audit committee size has a negative relationship with real earning management, therefore, H1 is accepted. This outcome agrees with the studies done by [16, 18, 20, 21]. On the other hand, the result of this study inconsistent with existing literature like [8, 26].

Meanwhile, the finding reveals that the meetings of audit committees have a positive and significant relationship at 5% level with real earning management, $\beta = 0.002076$, $t = 3.546603$, $p = 0.0004$. Subsequently, the results are inconsistent with the hypothesis that supports a negative association of the meeting of audit committees with real earning management. Hence, H2 was rejected. This finding agrees with the previous study such as [34] and consistent with study by [31]. And this finding disagrees with the study by [10, 12, 15, 21]. Furthermore, these findings disagree with the agency theory.

Finally, H3 reveals that the audit committee gender negatively impacts the real earning management. The finding provides that the gender of the audit committee has a negative and significant associated at 5% level with the real earning management, $\beta = -0.021531$, $t = -2.573906$, $p = 0.0102$. Therefore, the result is supporting the hypothesis of a negative relationship with real earning management. Hence, H3 is

accepted. The negative result implies that it leads to limit the manipulation and aggressive real earning management by having more diversity of gender on the audit committee. This finding agrees with the previous studies such as [6]. And this finding disagrees with the study by [28]. Conforming to the viewpoint of the agency theory, the diversity of gender offers the opportunity to detect and disclose mistakes. Therefore, this result agrees with the theory of the agency.

5   Conclusion

Employing a sample of 92 Jordanian companies registered on the Amman Stock Exchange from 2009 to 2018, the current study purposed to investigate the impact of the audit committee on the real earning management as one of the major corporate governance methods. By utilizing the Thompson Data Stream and Amman Stock Exchange site to obtain the data from the chose companies, the present study utilized the panel data technique through the Fixed Effect regression strategy so as to research the relationship between chosen components, the final sample was 920 firms-years.

The current study discovered the following after analysis: A negative and significant relationship between the size and gender of the audit committees with real earning management exists. This result supports the concept of the agency that the audit committee's size, gender have a negative effect on real earning management. The result also conforms with the agency theory, assuming that the audit committee's efficiency rises as the committee's size rises to limit the manipulation. There is a positive and significant connection with real earning management between audit committee meetings. This conclusion does not conform with the agency theory, assuming the manipulation will be limited by the commitment to annual meetings by the committee of the audit.

This work's contribution to the literature lies in its analysis of the connection between the audit committee size, meeting and gender and the real earning management. Through this link, this work contributes to the literature by utilizing uniform and helpful measurements. Thus, this paper adds to the area of corporate governance and manipulation by researching the connection between the characteristic of the audit committee and real earning management in any evolving economy, by providing proof that the audit committee influencing real earning management in the Jordanian capital market. Finally, for future studies in developing and advanced countries, the connection between these variables (audit committee and real earning management) needs to be investigated in order to identify the result. Moreover, future studies should explore other variables that might affect real earning management.

References

1. Abbott, L.J., Parker, S., Peters, G.F.: Audit committee characteristics and restatements. Audit.: J. Pract. Theory **23**(1), 69–87 (2004)
2. Abdullatif, M., Ghanayem, H., Ahmad-Amin, R., Al-shelleh, S., Sharaiha, L.: The performance of audit committees in Jordanian public listed companies. Corp. Ownersh. Control. **13**(1), 762–773 (2015)

3. Abu Zraiq, M., Fadzil, F.: The impact of audit committee characteristics on firm performance: evidence from Jordan. Sch. J. Appl. Sci. Res. **1**(5), 39–42 (2018)

4. Al Daoud, K.A., Ismail, K.N.I., Lode, N.A.: The impact of internal corporate governance on the timeliness of financial reports of Jordanian firms: evidence using audit and management report lags. Mediterr. J. Soc. Sci. **6**(1), 430–442 (2015)

5. Al- Shaer, H., Salama, A., Toms, S.: Audit committees and financial reporting quality evidence from UK environmental accounting disclosures. J. Appl. Acc. Res. **18**(1), 2–21 (2015)

6. Aldamen, H., Duncan, K., Kelly, S., Mcnamara, R., Nagel, S.: Audit committee characteristics and firm performance during the global financial crisis. Acc. Financ. **52**(4), 971–1000 (2012)

7. Al-Sartawi, A.: The effect of corporate governance on the performance of the listed companies in the gulf cooperation council countries. Jordan J. Bus. Adm. **11**(3), 705–725 (2015)

8. Azzoz, A.R.A.M., Khamees, B.A.: The impact of corporate governance characteristics on earnings quality and earnings management: evidence from Jordan. Jordan J. Bus. Adm. **12**(1), 187–207 (2016)

9. Al-Khadash, H., Al-Sartawi, A.: The capability of sarbanes-oxley act in enhancing the independence of the Jordanian public accountant & its impact on reducing the audit expectation gap. Jordan J. Bus. Adm. **6**(3), 294–316 (2010)

10. Baxter, P., Cotter, J.: Audit committees and earnings quality. Acc. Financ. **49**(2), 267–290 (2009)

11. Beasley, M.S., Carcello, J.V., Hermanson, D.R., Neal, T.L.: The audit committee oversight process. Contemp. Account. Res. **26**(1), 65–122 (2009)

12. Bédard, J., Chtourou, S.M., Courteau, L.: The effect of audit committee expertise, independence, and activity on aggressive earnings management. Audit.: J. Pract. Theory **23**(2), 13–35 (2004)

13. Chi, O., Friday, I.: Corporate governance and financial reporting quality in selected Nigerian company. Int. J. Manag. Sci. Bus. Adm. **2**(3), 7–16 (2016)

14. Dakhlallh, M.M., Rashid, N., Wan Abdullah, W.A., Al Shehab, H.J.: Audit committee and Tobin's Q as a measure of firm performance among Jordanian companies. J. Adv. Res. Dyn. Control Syst. **12**(1), 28–41 (2020). https://doi.org/10.5373/JARDCS/V12I1/20201005

15. Davidson, R., Goodwin-Stewart, J., Kent, P.: Internal governance structures and earnings management. Acc. Financ. **45**(2), 241–267 (2005)

16. Hamdan, A.M., Mushtaha, S., Musleh Al-Sartawi, A.: The audit committee characteristics and earnings quality: evidence from Jordan. Aust. Acc. Bus. Financ. J. **7**(4), 51–80 (2013)

17. Hamid, N.A., et al.: Determinants of tax compliance among individual tax payers in Malaysia. J. Adv. Res. Dyn. Control Syst. **12**(3), 316–321 (2020). https://doi.org/10.5373/JARDCS/V12I3/20201196

18. Herdjiono, I., Sari, I.M.: The effect of corporate governance on the performance of a company. Some empirical findings from Indonesia. J. Manag. Bus. Adm. **25**(1), 33–52 (2017)

19. Hossain, D.M., Khan, A.R.: Audit committee: a summary of the findings of some existing literature. Cost Manag. **34**(5), 40–57 (2006)

20. Ika, S.R., Mohd Ghazali, N.A.: Audit committee effectiveness and timeliness of reporting: Indonesian evidence. Manag. Audit. J. **27**(4), 403–424 (2012)

21. Inaam, Z., Khamoussi, H.: Audit committee effectiveness, audit quality and earnings management: a meta-analysis. Int. J. Law Manag. **58**(2), 179–196 (2016)

22. Johl, S.K., Johl, S.K., Subramaniam, N., Cooper, B.: Internal audit function, board quality and financial reporting quality: evidence from Malaysia. Manag. Audit. J. **28**(9), 780–814 (2013)

23. Kalbers, L.P., Fogarty, T.J.: Audit committee effectiveness: an empirical investigation of the contribution of power. Auditing **12**(1), 24 (1993)

24. Madi, H.K., Ishak, Z., Manaf, N.A.A.: The impact of audit committee characteristics on corporate voluntary disclosure. Proc. Soc. Behav. Sci. **164**, 486–492 (2014)

25. Mohammed, A.M.: The impact of audit committee characteristics on firm performance: evidence from Jordan. Acad. Acc. Financ. Stud. J. **22**(5), 1–7 (2018)

26. Noor, R.M., Nik Mohd Rashid, N.M.N., Mastuki, N.: Zakat and tax reporting: Disclosures practices of Shariah compliance companies, pp. 877–882 (2011). https://doi.org/10.1109/CHUSER.2011.6163862

27. Pomeroy, B., Thorton, D.B.: Meta-analysis and the accounting literature: the case of audit committee independence and financial reporting quality. Eur. Acc. Rev. **17**(2), 305–330 (2008)

28. Pucheta-Martínez, M.C., De Fuentes, C.: The impact of audit committee characteristics on the enhancement of the quality of financial reporting: an empirical study in the Spanish context. Corp. Govern.: Int. Rev. **15**(6), 1394–1412 (2007)

29. Ratmono, D.: Manajemen Laba Riil dan Berbasis Akrual: Dapatkah auditor yang Berkualitas Mendeteksinya. In: Proceeding Simposium Nasional Akuntansi XIII, Purwokerto, vol. 16, no. 1, pp. 188–194 (2010)

30. Roychowdhury, S.: Earnings management through real activities manipulation. J. Acc. Econ. **42**(3), 335–370 (2006)

31. Saleh, N., Mohd Iskandar, T., Mohid Rahmat, M.: Audit committee characteristics and earnings management: evidence from Malaysia. Asian Rev. Acc. **15**(2), 147–163 (2007)

32. Solomon, J., & Solomon, A.: The role of transparency in corporate governance. Corp. Govern. Acc. 119–143 (2004)

33. Stewart, J., Munro, L.: The impact of audit committee existence and audit committee meeting frequency on the external audit: perceptions of Australian auditors. Int. J. Audit. **11**(1), 51–69 (2007)

34. Sanad, Z., Al-Sartawi, A.: Financial statements fraud and data mining: a review. In: Musleh Al-Sartawi, A.M.A., Razzaque, A., Kamal, M.M. (eds.) EAMMIS 2021. LNNS, vol. 239, pp. 407–414. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-77246-8_38

35. Thoopsamut, W., Jaikengkit, A.O.: Audit committee characteristics; audit firm size and quarterly earnings management in Thailand. In: Emerging Issues and Challenges in Business & Economics: Selected Contributions from the 8th Global Conference, vol. 24, no. October, pp. 47–70. Firenze University Press (2009)

36. Visvanathan, G.: Corporate governance and real earnings management. Acad. Acc. Financ. Stud. J. **12**(1), 9 (2008)

37. Whittington, O.R., Pany, K.: Principles on Auditing and Other Assurance Services. Irwin McGraw-Hill, Boston (2001)

38. Yoshikawa, T., Phan, P.H.: The performance implications of ownership-driven governance reform. Eur. Manag. J. **21**(6), 698–706 (2003)

39. Zhu, X., Lu, S.: Earnings management through real activities manipulation before mergers and acquisitions. J. Financ. Acc. **13**, 1 (2013)

Corporate Social Responsibility:
Deconstructing a Conceptual Muddle

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Abstract. This study aims at deconstructing a conceptual muddle surrounding the concept of corporate social responsibility (CSR) that results when the concept is used. To achieve this aim, the study adopted the analytical approach commonly used in analytical philosophy, and "deconstruction of conceptual muddle". The study concludes that there is a conceptual muddle related to the many concepts used, synonymously or differently with (CSR). There is also a conceptual muddle due to (CSR) emergence, its advantages and disadvantages. In addition, conceptual muddle noted due several index selected for measurement (CSR). The main conceptual muddle resulted from the failure to define "corporate responsibility", whether corporate responsibility towards maximizing the profits of their shareholders, or towards society and environment.

Keywords: Corporate social responsibility (CSR) · Corporate Citizenship (CC) · Global Corporate Social Responsibility · Deconstruction

1 Introduction

The debate about the concept "corporate social responsibility" (CSR) has been arisen since the concept has been emerged. [1] discuss has emerged for decades. It is one of the concepts used in different sciences. [2, 3] described (CSR) as "ambiguous" concept. Authors do not agree about the concept emergence, its uses, how to measure it, its benefits and harms. In addition, there are many concepts used as a synonymous or differently to (CSR). As a result, the expanded debate about (CSR) created conceptual muddle. (CSR) conceptual muddle is the problematic of this study.The study aims at deconstructing conceptual muddle of (CSR). In order to do so, it depended on a conceptual and analytical approach, which mainly used in analytical philosophy. This approach helps to clarify the controversy about (CSR) by studying different literatures about the concept. It helps also to clarify the ambiguity of (CSR) by following the logic and theoretical analysis. Therefore, this study is important because there is a need to deconstruct the conceptual muddle of (CSR), since this concept has been widely spread, and many attempts to measure it has emerged. Still there are rare literatures trying to understand the ambiguity of (CSR) or deconstruct conceptual muddle of this concept. Debate about (CSR) resemble a snowball that grows larger as it rolls.

2   Literature Review

Different authors examine whether a corporate should have a social responsibility or not. If so, how corporate should do its social responsibility? This create a debate about (CSR). [4] discusses that debate over (CSR) is expanding, without clarifying what is the aspects of this debate, and why the debate is expanding?

Although some literatures reveal some of the ambiguity aspect of (CSR), but it does not reveal all the aspects. For example, [5] address the different uses of (CSR) [5], while [6] address the main four uses of (CSR) related to profits, political performance, social demands and moral values. In addition, there is a debate concerning the effects resulting from using (CSR) whether it is harmful effects or beneficial effects. [7] concentrates on the harmful effects of (CSR), [8] examine the benefits of using (CSR). [9] discusses that there are many benefits when using (CSR) such as its advantages for marketing and improving the quality of life for people and the planet. In addition, [10] examine different ways of measuring the concept [10].

3   The Debate About the Emergence of (CSR)

Conceptual muddle of the (CSR) cannot understood without understanding the debate about the emergence of (SCR). [11] argue that the debate about emergence of (CSR) back to the past decade. [12] think it goes back more than two decades [12]. [13] have noted that (CSR) has emerged since the 1930s. Farndale et al. (2019) think that the emergence of (CSR) back to during ancient times, when people believed that businessmen and wealthy people should do work that would serve [14]. While Eichar (2017) discusses that the emergence of (CSR) back to the nineteenth century when large corporations stormed the economic scene [15]. Eichar (2017) argues that although many Americans marveled at what they saw, many small traders who worried because they crushed by the predatory practices of companies like Standard Oil, but employers voluntarily adopted humane practices in the workplace and gave generously to their communities [15].

Other literatures believe that (CSR) has emerged in America, at the end of the eighteenth century, but authors who believe that (CSR) emerged in eighteenth century disagreed about the reason for the (CRS) emergence. Some authors discuss that (CRS) emerge in the eighteenth century due to the United States had the right to revoke the business license for companies if its business was not acting responsibly. This changed at the beginning of the 19th century when the Supreme Court ruled that corporations must treated as citizens and under the Constitution. This changed the idea that companies had to act responsibly by making it a voluntary responsibility, which is only necessary if the company wants to be a "good citizen". However, Goudam et al., (2017) debate for a different reason for its emergence in the eighteenth century [16]. Zorn & Collins (2007) believe that (CRS) became popular because of one of the basic writings on corporate social responsibility by businessman [1]. Howard Bowen (1953) introduced the main idea behind corporate social responsibility: Companies have an obligation that goes beyond economic performance and when he said gain profit does not conflict with moral behavior and the assumption of social responsibilities [1].

4   The Problem of Not Defining Corporate "responsibility"

The first thing that catches the eye when perusing the various literatures that discuss the (CRS), is the failure to define what is meant by "responsibility," this creates conceptual muddle. Bagnoli & Watts (2003) indicated that the first responsibility of the corporate that it should pay attention to maximize profits (Bagnoli & Watts, 2003). Bagnoli & Watts (2003) debated that "responsibility" of the company must be towards the rights of its shareholders in the first place. In other words, Bagnoli & Watts (2003) limited "responsibility" of the corporate only to the company's responsibility towards its shareholders and its employees. [17]. Garriga & Melé (2004) also argued that corporate is a tool for creating wealth and this is its only social responsibility. Only the economic aspect of interactions between business and society is considered. Therefore, any social activity is accepted when it reaping wealth. This set of theories can be useful because they understand CSR as simply a way to maximize profits [6].

Luo & Bhattachary (2006) argued, corporate "responsibility" is its obligations towards the environment and society, so it concerns not only the financial interest of its stakeholders, but also it concern the societal obligations [18]. Siegel & Vitaliano (2007) discuss that the "responsibility" of the corporate is its involvement in an activity that appears to lead to the development of a social agenda beyond what is required by law [5]. However, this point of view does not lose sight of the company's responsibility to achieve profits. That is, to benefit from the company's social obligations towards society, and in order for the company to benefit itself and achieve profits, thus preserving the part related to the rights, whether for shareholders or employees. Wood (1991) argued "responsibility" that corprates are not responsible for solving all social problems. However, they are responsible for solving the problems they have caused, and they are responsible for helping to solve social problems and issues related to their business [19].

(CSR) used locally (inside the society that the corporate work), but after the emergence of "Global Corporate Social Responsibility" [20]. The debate about CSR expanded, because corporate responsibility has transcended its responsibility towards its societies. Global Corporate Social Responsibility" has emergence after 34 of the largest multinational corporations in the world signed Joint Statement "Global Corporate Citizenship - A Leadership Challenge for CEOs and Boards" during the Economic Forum Global Corporate Citizenship in January 2002 in New York. [21] The new corporate social responsibility became evident following the fierce protests against globalization, since the end of the 1990s. There is another debate in the Arab world concerning (CSR) that differs from the debate around corporate responsibility in the world. This debate about corporate social responsibility in the Arab world based on Islamic duty, which is Zakat [22]. Some literatures in the Arab world confuse between (CSR) and charity or donation.

5   The Problem of Many Concepts Used Synonymously or Differently with (CSR)

Conceptual Muddle of (CSR) can explored through the various concepts that used synonymously with (CSR). Panayiotou & Aravosis (2011) used "corporate citizenship" (CC) synonymously with (CSR) [23]. While the majority of literatures considered (CSR) and (CC) to be synonymous, other studies found that, they are not [24]. Wood (1991) discuss that (CSR) can be replaced by the (CC) because it is broader than (CSR) [19].

Whitehouse (2003) distinguished between (CSR) and (CC) by identifying two models for (CSR) in order to reform corporates activities. The first, represented by the citizenship model, it seeks to encourage corporates to behave as good citizens. The second model, the compliance model, seeks to compel companies, through legal means, or to prevent social harm. Whitehouse (2003) suggested pursuing effective corporate citizenship plans, but this should accompanied by revitalizing the compliance model; only then can CSR be achieved [25]. The debate about corporate shall do its responsibility voluntarily or by law, raised a new problem about (CSR). Another conceptual muddle of (CSR) can explored when concept "creating shared value (CSV)" used synonymously with (CSR), while others distinguish between them [26]. Michael Porter and Mark Kramer proposed (CSV). This concept calls for a deeper appreciation of actual social needs in a broader understanding of the company's productivity. According to Porter and Kramer, (CSV) is defined as "the policies and operating practices that enhance the competitiveness of a company while at the same time advancing the economic and social conditions in the communities in which it operates" [27]. However, Williams (2014) distinguishes between (CSR) and (CSV), Williams (2014) argued that (CSR) concentrate on responsibility, while (CSV) concentrate on creating values [28].

In addition, another conceptual muddle of (CSR) can explored when concept "social responsibility or social response (SR)" used synonymously with (CSR), while others distinguish between them. The literatures which distinguish between the two concepts discuss that the main difference between is (CSR) relates to the duty of business firms to ensure its benefit to the society as well as the environment, while (SR) is the general way that person(s) should be responsible for society and environmental benefits. Thus, social responsibility, when applied to business, becomes a corporate social responsibility [29]. Another conceptual muddle of (CSR) can explored when concept "smart business" (SB)" used synonymously with (CSR). Weeden, (2011) used (CSR) as (SB) because when a company fulfills its obligations to society benefits both the company and society, so this is considered as a "smart business" [30].

6   The Problematic When Using (CSR)

Another conceptual muddle of (CSR) emerged when using (SCR) in different meaning. Garriga & Melé, (2004) limit the uses of (CSR) to four theoretical groups: the first group is instrumental theories, which conceder the company as a tool for reaping

wealth, and the second group of theories Political theories concerned with the power of corporations in society, and the responsible use of this power in the political arena. The third group is integrative theories, in which the institution focuses on social demands; the fourth group of theories is the ethical theories, which grounded in the moral responsibilities of companies in society. Thus, all (CSR) theories offer four main uses related to profits, political performance, social demands, and moral values [6]. The problematic when using (CSR) increasing when various concepts used synonymously or differently with (CSR) such as (CC), (CSV), (SR), SB) as we cleared above.

7   The Benefits or Harmful Effects of (CSR)

There is debate about (CSR) whether it has benefits for the company's shareholders, employees, and society or it has harmful effects. Keiner (2008) discuss it has positive benefits for company's shareholders and employees, as well as positive benefits for society [31]. While Ahmad & Mujtaba (2017) considered (CSR) has harmful effects to the company and its employees, even if it achieves some benefits to society. These harmful effects for (CSR) called the dark side of social responsibility [8].

It is difficult to list all the benefits and harms of (CSR) according to the various literature. For example, Alhouti & D'Souza (2018) argues that there is benefits of (CSR) for each of the community, for the image of the company itself, its shareholders, employees, and for the sustainability of the company [32]. Carroll & Buchholtz (2015) argue among the benefits of (CSR) on corporate employees, is the development of their motivation to work, and the development of their performance. In addition to the benefits accruing to the company itself, including enhancing the company's marketing efforts, and improving the company's reputation [33]. Rubenstein (2004) debates that (CSR) enables the company to charge a higher price for its product, and to attract investment [8]. Harris et al. (2008) argues (CSR) holds companies accountable for the effects of their decisions and activities on all aspects of society and the environment [34]. In addition to the benefits of corporate social responsibility, other studies have found harms resulting from corporate social responsibility. Waddock (2007) discuss that In order for the company to carry out its social responsibility it has to carry out various social and environmental activities, these activities are costly to the company. It will be at the expense of shareholder profits, or it will be at the expense of the company expansion. This why these harms results is called the negative aspects of CSR or the dark side [35]. Waddock (2008) added another negative side of (CSR) when the company performs its social responsibility only to obtain a good reputation and gain the trust of employees, shareholders and consumers, but many of the initiatives it announces are false. Thus, there is a gap between theory and practice [36].

8   The Problem of Measuring (CSR)

Some studies have shown a need for measuring (CSR) in order to develop it (Tencati, 2010: 413). However, conceptual Muddle of (CSR) can explored through discovering there is different ways to measure of corporate social responsibility [37]. Measuring

(CSR) means how to convert (CSR) from a theoretical concept into measurable concept [38]. The Index selected for measurement not specified. (Hopkins, 2005) believes that it is possible to use some of the available data provided by companies to measure whether (CSR) is getting better or worse Hopkins (2005) argued that there are major systems of measurement (CSR) Index applied to companies around the world such as [39]:

1. Business Corporate in the Community's (BITC).
2. Financial Times Stock Exchange (FTSE).
3. Dow Jones Sustainability Index (DJSI).
4. Business Ethics 100.
5. Accountability Rating Rating.
6. Global Reporting Initiative (GRI)

There are different measurement Index used to measure (CSR), alant & Cadez, (2017) argued the measurement Index of (CSR) ranging from reputation Index, content analytics, questionnaire-based surveys, and one-dimensional metrics [10]. These different measurement Index do not take into account different types of corporates. Garriga & Melé (2004), (CSR) of multinational companies, differ from (CSR) of the small or local companies. Thus, it is difficult to compare (CSR) of the small companies with (CSR) of multinational companies towards communities and the environment. We can't use the same Index of measurement. [6] In addition, there is a debate on how to measure (CSR). This debate is limited between who thinks (CSR) can measured through the attitudes and responses of the employees or shareholders to a company's social commitments. Others think (CSR), can be measured though the behaviors and commitments of the company to society or the environment [40].

9   Conclusion

The study concluded that there is a conceptual muddle of (CSR) noted by:

1. The debate about when the concept (CSR) was emerged, the debate about the emergence of (CSR) summarized by whether it goes back to:
   a) The past decade.
   b) More than two decades.
   c) 1930s.
   d) The ancient times, when people believed that businessmen and wealthy people should do work that would serve society.
   e) The nineteenth century when large corporations stormed the economic scene.
   f) The end of the eighteenth century in when United States had the right to revoke the business license for companies if its business was not acting responsibly.
2. Not defining what is meant by "responsibility" of the company, whether it is towards its shareholders and maximizing their profits regardless of its other responsibilities such as society, the environment, or its responsibility towards society or the environment to repair the damage caused by the company, regardless of its rights to reap wealth.

3. Many concepts that are sometimes used synonymously with the concept (CSR) or differently, such as Corporate Citizenship (CC), Creating Shared Value (CSV), Social Response (SR), Smart Business (SB)
4. The problematic when using (CSR), in different meaning related to profits, political performance, social demands, or moral values.
5. The debate about (CSR) whether it has benefits for the company's shareholders, employees, and society or it has harmful effects (Dark Side).
6. The debate several index selected for measurement (CSR). These different index didn't take into consideration whether (CSR) of multinational companies or local companies. Thus, it is difficult to compare (CSR) of the small companies with (CSR) for of multinational companies.

References

1. Zorn, T., Collins, E.: Is sustainability sustainable? Corporate social responsibility, sustainable business, and management fashion. In: May, S., et al. (eds.) The Debate over Corporate Social Responsibility, pp. 405–416. Oxford University Press, Oxford (2007)
2. Woodman, H., et al.: An evaluation of the state of the CSR field in Australia: perspectives from the banking and a mining sectors. In: Information Resources Management Association Corporate Social Responsibility: Concepts, Methodologies and Applications, pp. 833–860. IGI Global, USA (2018)
3. Suman, S., Das, S.: Corporate environmentalism, epistemological review & ontological position. In: Mitra, N., Schmidpeter, R. (eds.) Mandated Corporate Social Responsibility. CSR, Sustainability, Ethics & Governance, pp. 199–214. Springer, Cham (2020). https://doi.org/10.1007/978-3-030-24444-6_11
4. May, S., et al. (eds.): The Debate over Corporate Social Responsibility. Oxford University Press, Oxford (2007)
5. Siegel, D., Vitaliano, D.: An empirical analysis of the strategic use of corporate social responsibility. J. Econ. Manag. Strategy 16(3), 773–792 (2007)
6. Garriga, E., Melé, D.: Corporate social responsibility theories: mapping the territory. J. Bus. Ethics 53(1–2), 51–71 (2004)
7. Ifzal, A., Mujtaba, A.: The dark side of corporate social responsibility: evidence from a public sector oil company. NUML Int. J. Bus. Manag. 12(1), 15–27 (2017)
8. Rubenstein, D.: The Good Corporate Citizen: A Practical Guide. Wiley, New Jersey (2004)
9. Newell, A. (ed.): Corporate Social Responsibility: Challenges, Benefits and Impact on Business Performance (Business Economics in a Rapidly-changing World), Nova Science Publishers, UK (2014)
10. Galant, A., Cadez, S.: Corporate social responsibility and financial performance relationship: a review of measurement approaches. Econ. Res.-Ekonomska Istraživanja 30(1), 676–693 (2017)
11. Hopkins, M.: Corporate Social Responsibility and International Development: Is Business The solution? Earthsacn, London (2007)
12. Žukauskas, P., et al.: Management Culture and Corporate Social Responsibility. Intech Open, London (2018)
13. Idowu, S., Filho, W.: Foreward. In: Idowu, S., Filho, W. (eds.) Professionals' perspectives of corporate social responsibility. Springer, Berlin (2009)

14. Farndale, E., et al.: Corporate social responsibility and talent management in turkey. In: Association, M., Resources, I. (eds.) Corporate Social Responsibility: Concepts, Methodologies, Tools, and Applications, pp. 1228–1242. IGI Global, USA (2019)
15. Eichar, D.: The Rise and Fall of Corporate Social Responsibility. Routledge, New York (2017)
16. Goudam, S., et al.: Corporate Social Responsibility in India. Trends, Issues and Strategies. Anchor Academic Publishing, Hamburg (2017)
17. Bagnoli, M., Watts, S.: Selling to socially responsible consumers: competition and the private provision of public goods. J. Econ. Manag. Strategy **12**(3), 419–445 (2003)
18. Luo, X., Bhattacharya, C.B.: Corporate social responsibility, customer satisfaction, and market value. J. Mark. **70**(4), 1–18 (2006)
19. Wood, D.: Corporate social performance revisited. Acad. Manag. Rev. **16**(4), 691–718 (1991)
20. Dashwood, H.: The Rise of Global Corporate Social Responsibility: Mining and the Spread of Global Norms. Cambridge University Press, Cambridge (2012)
21. Grane, A. et al.: The emergence of corporate citizenship: historical development and alternative perspectives. In: Scherer, A.G., Palazzo, G. (eds.) Handbook of research on Global Corporate Citizenship, pp. 25–50. Edward Elgar, Cheltenham (2008)
22. Selvik, K.: Business and social responsibility in the Arab world: the Zakat vs CSR models. Syria Dubai Comp. Soc. **12**(1), 95–123 (2013)
23. Panayiotou, N., Aravosis, K.: Supply chain management. In: Idowu, S., Louche, C. (eds.) Theory and Practice of Corporate Social Responsibility, pp. 55–72. Springer, Berlin, Heidelberg (2011). https://doi.org/10.1007/978-3-642-16461-3_4
24. Banerjee, S.: Corporate Social Responsibility: The Good, the Bad and the Ugly. Edward Elgar, Cheltenham (2007)
25. Whitehouse, L.: Corporate social responsibility as citizenship and compliance: initiatives on the domestic. Eur. Glob. Level J. Corp. Citizensh. **11**, 85–98 (2003)
26. Liel, B.: Creating Shared Value as Future Factor of Competition: Analysis and Empirical Evedence. Springer VS, Wesbaden (2016)
27. Jamali, D.: CSR in deeloping countries through an institutional lens. In: Eweje, G. (ed.) Corporate Social Responsibility and Sustainability: Emerging Trends in Developing Economies, pp. 21–44. Emerald, UK (2014)
28. Williams, O.: Corporate Social Responsibility: The Role of Business in Sustainable Development. Routledge, Ney York (2014)
29. Zu, L.: Corporate Social Responsibility, Corporate Restructuring and Firm's Performance. Springer, Berlin (2009)
30. Weeden, C.: Smart Giving Is Good Business: How Corporate Philanthropy Can Benefit Your Company and Society? Wily: Jossey Bass, Hoboken (2011)
31. Keinert, C.: Corporate Social Responsibility as an International Strategy. Physica-Verlag Springer, Heidelberg (2008)
32. Alhouti, S., D'Souza, G.: Benefits of corporate social responsibility. J. Consum. Mark. **35**(3), 277–286 (2018)
33. Carroll, A., Buchholtz, A.: Business & Society: Ethics, Sustainability, and stakeholder Management, 9. Cengage Learning, USA (2015)
34. Harris, D., et al.: Marketing for Stakeholders 2008–2009. Elsevier, Oxford (2008)
35. Waddock, S.: The dark- side paradoxes of success. In: May, S., et al. (eds.) The Debate over Corporate Social Responsibility, pp. 74–87, Oxford University Press, New York (2007)
36. Waddock, S.: Corporate citizenship: the dark-side paradoxes of success. In: Flynn, G. (eds.) Leadership and Business Ethics. Issues in Business Ethics, vol. 25, pp. 258–268. Springer, Dordrecht (2008). https://doi.org/10.1007/978-1-4020-8429-4_16

37. Tencati, A.: Corporate reporting frameworks. In: Aras, G., Crowther, D. (eds.) A Handbook of Corporate Governance and Social Responsibility, pp. 413–436. Gower, Fanham (2010)
38. Benn, S., Bolton, D.: Key Concepts in Corporate Social Responsibility. Sage, London (2011)
39. Hopkins, M.: Measurement of corporate social responsibility. Int. J. Manag. Decis. Mak. **6** (3/4), 213–231 (2005)
40. Camilleri, M.A.: Corporate social responsibility policy in the United States of America. In: Idowu, S., Vertigans, S., Schiopoiu Burlea, A. (eds.) Corporate Social Responsibility in Times of Crisis. CSR, Sustainability, Ethics & Governance. Springer, Cham (2017). https://doi.org/10.1007/978-3-319-52839-7_7

Analysing Buying Behaviour of Consumers Towards Personal Care Products for Sustainable Growth of an Organization: A Case of Himalaya Personal Care Product

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Abstract. Consumer is considered as the 'KING' in the market especially in ever-changing economic scenario. Further, with an increase in competition in market and initiation of digital transformation in various segments of economy especially from information perspectives with the implementation of ITS and ICT based technology, survival and sustainability of business become bigger challenge for many firms. Thus, to hold large consumer base and adding more and more consumer to their business, firms are using various tools and techniques, methods along with analytical mechanism to understand the needs of consumers i.e. Buying Behavior, so the firms can meet the consumer expectations by developing or modifying the product(s) accordingly.

Thus, in this paper an attempt is being made to identify and analyse the consumer's preference and satisfaction i.e. buying behavior towards Personal Care Products with an intension to investigate the influence of product dimension on customer satisfaction and customer loyalty. Moreover, given that Personal Care Industry is one of the fastest growing consumer product sector in India with increase in per capita spent (in USD), the companies have huge scope to grow further but due to increase in competition in the segment, sustainability is a bigger challenge. However, with the strong hold of base through meeting their expectations, one can provide a path for sustainable development of business. Hence, for the conduct of the study Himalaya Personal Care Products are taken as case to analyse buying behavior of consumers.

Keywords: Sustainability · Consumer satisfaction · Firm · Market · Buying behavior

1 Introduction

Consumer behavior is the study of how individual customers, groups or organizations select, buy, use, and dispose ideas, goods, and services to satisfy their needs and wants. It refers to the actions of the consumers in the marketplace and the underlying motives

for those actions. The perspective of role theory assumes that consumers play various roles in the marketplace. Starting from the information provider, from the user to the payer and to the disposer, consumers play these roles in the decision process [11].

This article presents a research study in the field of consumer's buying behavior. This study is to identify the consumer's preference and satisfaction towards Himalaya Personal Care products and to investigate the influence of product dimension on customer satisfaction and customer loyalty as well as to understand the Himalaya effect of the product. The main purpose of this article is to identify the different streams of thought that could help the future researchers and guide them. The researcher has gone through materials that had been investigated on consumer buying behavior. This research study is rapidly evolving as researchers recognize and implement new techniques and transdisciplinary perspectives to understand the nature of purchase and consumption behavior. This in-depth outlook attempts to study consumer buying behavior in the illumination of rapidly developing lifestyles, standards, priorities, and communal contexts. The overall goal of such research endeavor is to achieve better understanding of consumer buying behavior.

Himalaya's item developments took new structures through quick extension in new ranges. As they arrive at spread in different portions and went through a rebranding to bring our whole scope of contributions under the single umbrella since 1930. They have combined their portfolios in pharmaceuticals, personal care, and baby-care, Himalaya for Moms, wellness, and animal health to advance as a head-to-heel health supplier [4]. Today, Himalaya is a main worldwide natural wellbeing and individual consideration an association with near 500 items suggested by more than 4,50,000 specialists in India. They have arisen as the unmatched pioneers in investigating the cooperative energy among Ayurveda and current science to foster items that spread the guarantee of Wellness in each Home and Happiness in each Heart [3]

Today, there is developing acknowledgment of integrative medication, where customary frameworks of medication like Ayurveda are dovetailing into ordinary medication to give comprehensive treatment regimens, integrative medication gives patients admittance to medical services dependent on great science, all - encompassing treatments, and healing and safeguard therapies. Himalaya has put resources into a cutting edge Research and Development (R&D) focus in Bengaluru, India, which envelops more than 130,000 square feet of room. Which is ISO-9001: 2008 affirmed. They have a group of in excess of 200 doctors and researchers working in their R&D office. This immense and as sorted foundation of the R&D group gives them interesting experiences into the universe of spices, helping us comprehend, find and foster advancement items [4].

Himalaya have different range of products like animal health, baby care, Himalaya for moms, nutrition, personal use, pharmaceuticals and wellness. Further personal care includes body care, eye care, face care and hair care. Also, Himalaya location setup and customer positive perception are their core strengths in this competitive market. Whereas big working capital, high dependence on raw materials and high sensitivity of crops are pain area of the company. But apart from certain weaknesses Himalaya's global market, marketing and promotion, demographics and segmentation variables provides them with great opportunities to expand and take a lead in order to diversify the business and expand the customer base [1].

2 Literature Review

One of the recent studies by Lavuri R. & Sreeramulu (2019) on personal care product with reference to women's buying behaviour to understand the woman's purchasing conduct with respect to individual consideration items. The study asserted that depending on demographical components of respondents are having a critical mean contrast with the purchasing of individual consideration items and item factors and choice influencers were altogether affecting purchasing conduct of ladies' respondents [7]. Another recent study by Rajee & Kasinathan (2019) studied consumer preferences, us age pattern and satisfaction towards Himalaya cosmetic in baby-care product segment and examined that 56% of the purchasers of Himalaya makeup are females and 52.20% have a family size of 4–6 individuals. The majority of the clients have a place with the month to month pay gathering of Rs. 10000–20000, so Himalaya Cosmetics could furnish their items in little amounts with most extreme utility cost. They reasoned that the present market is more client arranged in the sense all the business activities rotate around understanding their conduct and purchasing behavior [15].

Another study by Sujatha K. & Amala S. (2018) on consumer satisfaction towards skin care product in Tiruchirappalli Town and revealed that utilizing beauty care products in the present life has become a need, and individuals are not thinking about makeup as an extravagance. There is a shift from synthetic-based beautifiers to Himalaya items, for its Ayurveda base and quality. This study was carried out with primary investigation which includes 67% of the complete respondents are female, 67% are between 15–30 years old, and the greater part 35% are school level [18]. A study by Charwak B. (2016) regarding customer satisfaction towards Himalaya skin care product with direction to discover client prerequisites of Himalaya skincare items. The study revealed that individuals presently are not thinking about beauty care products as an extravagance, the majority of the customers feel that there are more synthetic compounds in beautifying agents, which cause many results, and began exchanging once again to home-grown-based beautifiers. To prevail over contenders and to advance its present position, Himalaya ought to advance its items in each conceivable channel to support up deals and especially needs to build the recurrence of its Ad's on paper and electronic media [2].

Kavitha & Fathima (2017) studied about consumer satisfaction towards herbal products and found that home grown meds are believed to be protected as it is normal, yet indeed it can cause genuine antagonistic impacts and collaboration with different medications and enhancements. Home grown items accept to help individuals assemble their great wellbeing with the assistance of normal sources. For millennia, people have utilized spices. The exploration infers that consumer loyalty assumes an indispensable part in deciding the use of natural items [6]. Moreover, a study on consumer's satisfaction towards Himalaya product carried out by Praveena & Anitha (2018) in Thiruthuraipondi Town asserted that Himalaya as the name proposes ought to fulfill the quick individuals on the planet without bargaining quality and standard. The current investigation uncovers that the clients have a decent inclination towards Himalaya items. It tends to be presumed that it's anything but an extremely intriguing and client experience while going through this investigation of client inclination and fulfillment [13].

Another study by Rajee & Kasinathan (2019) to examine impact of culture towards buyer behaviour of hair care product revealed that to comprehend the characteristics of the Indian purchaser and to develop purchasing profile, the investigation must be done corresponding to their current circumstance, culture and custom, instructive and monetary status, level of openness, and level of refinement [14]. In addition to this, a study on female customer satisfaction on hair oil and beauty cream by Saravan K. & Santosh K. (2018) found that to comprehend the idiosyncrasies of the Indian purchaser and to build purchasing profile, the investigation must be done comparable to their current circumstance, culture and custom, instructive and monetary s tatus, level of openness, and level of complexity [17].

Further, study by Ujwala B. (2012) and Manimekalai K. (2019) regarding consumer buying behaviour revealed that given change in attitude of consumer and increase in competition too, the companies should launch more product with appropriate marketing strategies [19]. However, Poranki K R (2015) study about consumer attitude and perception on personal care product revealed that consumer like best quality product on any price [12]. Whereas, the study by Hossain M D and Shila N S (2020) on factors influencing consumer decision making for personal care product asserted that specialization and characteristics of product are more important and consumer are ready to pay even more price for the product [5].

Moreover, one of the recent study by Mamta (2019) regarding buying behaviour of rural consumer towards personal care product and revealed that social factors along with demographic factors plays an important role in rural areas with reference to buying decisions and therefore companies need to rethink about their marketing strategies given demographic importance of rural area because rural market is almost 3 times of urban market which is still untapped to some good extent [8]. Another study by Mohanpriya A. et al. (2019) with reference to impact of skin care product on self-esteem of users and non-users and revealed that the self-esteem of users is always higher than non-users [10].

However, in current Covid-19 scenario, Ayurveda products become increasingly popular. Further, the pandemic has resulted in a change in consumer lifestyles, with an increased focus on preventive healthcare remedies leading to a surge in demand for immunity-positioned supplements, including Ayurvedic medicines and products, as consumers pursue different ways to combat the virus. Companies such as Dabur and Himalaya Wellness said they have seen an increase in demand for Ayurvedic products across portfolio. For Himalaya, the surge in demand has been seen particularly in its Pure Herbs range such as Guduchi, Tulasi, Amalaki, Ashvagandha, and others [16].

Again, with the change in economic scenario especially in post-Covid phase II where almost every firm is struggling with revenue generation to previous level, customer is the key and thus, it is important to have large consumer base for long run. Therefore, on the basis of relevant literature review following objectives have been setup for the conduct of the study.

3   Objectives of Research Study

– To check the awareness of consumer towards personal care products.
– To measure attitude and perception of consumer while considering the purchase of personal care product.
– To understand the shopping habits of consumer towards personal care products.
– To measure the level of understanding consumer, have towards Ayurvedic products and chemical based products.
– To analyze and examine the consumer choice towards Himalaya personal care product.
– To suggest effective recommends on basis of study

4   Significance of the Study

The study will highlight the buying behavior of consumer towards Himalaya's personal care products. The significance of the proposed study is to know the different strategies for the satisfying consumers of Himalaya products. This will help in to understanding various features and promotional strategy of Himalaya. This study will also provide specific suggestions and proposals on what needs to be changed, what does not need to be changed and how to implement these changes.

5   Methodology and Data Source

5.1   Rational of the Study

The market is witnessing a trend where consumers are shifting from the habits of purchasing and using chemical based or synthetic based cosmetics to herbal cosmetics. The present research paper was exploratory in nature and investigated the buying behavior of consumer consumers on Himalaya Personal Care products in Vadodara district of Gujarat. The proposed research study focuses on consumers 'expectations, buying behavior, attitude and perception of consumer towards Himalaya products.

5.2   Scope and Coverage of the Research Study

The Indian herbal cosmetics market is growing every year and hence, the competition between existing players is also in the upward direction. At the same time, various local brands are entering the Indian herbal cosmetics market. And one such that has been known for a very long time is Himalaya. To sustain and perform in the competitive market, understanding the basic relationships between various demographic and socioeconomic factors of the consumers is important. The research study is mainly undertaken to examine the impact of consumer buying behavior of consumer towards Himalaya personal care products. The researcher will collect the primary and secondary to measure and evaluate the current scenario of buying behavior of consumer towards the Himalaya

personal care product. The analysis is based on primary data captured through a structured questionnaire and was administered to a total of 100 respondents. The geographical coverage of this study is restricted to Baroda city only. We will be taking data from consumer who will be between the age group of 18–50. This will help us knowing the buying behavior, like and dislike of Consumer towards Himalaya personal care products.

5.3 Research Plan

– Population of the Study: Consumer that are residing In Vadodara.
– Type of Study: Sample Study
– Sample Size: 100
– Sample Design: Non-Probability Sampling Technique
– Sampling Method: The samples will be drawn using convenience sampling technique for survey.

5.4 Sources of Data

– The study would make the use of both primary data and secondary data sources of information.
– Primary Source: The primary source of data would be an online standard questionnaire circulated amongst the Consumer in Vadodara.
– Secondary Source: The secondary source of data collection include relevant literature review such as articles, news letters, online blogs, journals, research papers, reports, etc.

5.5 Data Collection

– Data Collection Tools: Structural questionnaire will be used as a main source to collect data other than the research work done online and the library.
– Data Collection Method: Google forums (questionnaire) will be adopted to circulate the questionnaire.

5.6 Data Analysis and Interpretation

The collected Primary data shall be edited, pre-coded, classified and tabulated. Thereafter the data will be presented in the form of tables, charts, graphs and diagrams as the case may be. The collected data will be analysed with the help of appropriate statistical tools and techniques. Analysed data will be interpreted to establish meaningful relationship pertaining to study.

5.7   Data Analysis-Result and Findings

1. Age (Table 1)

Table 1. Age of respondents

Age	No. of respondents	% of respondents
Below 25	61	61
25–35 years	4	4
36–46 years	30	30
Above 47	5	5
Total	100	100

Source: Our Study

2. Have you heard about Himalaya's Personal Care Product? (Table 2)

Table 2. No of respondent heard about Himalaya's personal care product.

Yes/no	No. of respondent	% of respondents
Yes	100	100
No	0	0
Total	100	100

Source: Our Study

3. How did you get to know about Himalaya's personal care product? (Table 3)

Table 3. How did you get to know about Himalaya's Personal Care Product.

Platform	No. of respondents	% of respondents
Television	70	70
Social media	14	14
Magazines	2	2
Newspaper	2	2
Through a person	12	12
Total	100	100

Source: Our Study

4. In general, do you like Himalaya's personal care products? (Table 4)

Table 4. Brands consumer prefer

Brand	No. of respondents
L'oreal paris	51
Garnier	20
Olay	16
The body shop	27
Biotique	31
Forest essentials	6
Clinique	6
Other	23
Total	180

Source: Our Study

5. What are the other brands that you usually prefer?

Table 5 represents that 51 respondents prefer L'Oreal Paris, 20 prefer Garnier, 16 like Olay, 27 like The Body Shop, 31 prefer Biotique, 6 prefer Forest Essentials, 6 people like Clinique, 23 respondents liked other products like Patanjali, Dove, Neutrogena, Lakme, Ponds, Joy, Bath and Body works, Nevia, Nivia, Nyle, Mamaearth, Herbal Essence, Lacto Calamine, Tresemme, Clean & Clear, Innis free, Oriflame and Maybelline New York.

Table 5. Preference

Preference	No. of respondents	% of respondents
Yes	73	73
No	1	1
Maybe	26	26
Total	100	100

Source: Our Study

6. What are the main reasons you like Himalaya's personal care products? (Table 6)

Table 6. Factors of Himalaya

Factors	No. of respondents
Quality	49
Natural ingredients	69
Brand heritage	11
Price	25
Proven research	8

Source: Our Study

7. What Himalaya's personal care products do you usually prefer? (Table 7)

Table 7. Personal care products

Personal care products	No. of respondents
Body care	51
Eye care	4
Face care	66
Hair care	20
Lip care	39
Oral care	5

Source: Our Study

8. Which is your preferred location to buy these products?

Table 8. Location

Location	No. of respondents	% of respondents
General store	26	26
Super market	44	44
Medical stores	24	24
Online	6	6
Total	100	100

Source: Our Study

Table 8 displays that 26% of the respondents would go to a general store to buy the products, whereas 44% would prefer to go to a super market, 24% buy the products from medical stores and 6% through online sites.
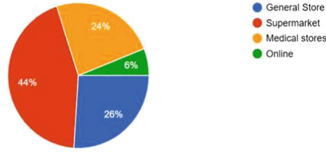
9. How much do you spend on these products? (Table 9)

Table 9. Money spent

Money spent	No. of respondents	% of respondents
>100	5	5
100–200	33	33
200–300	40	40
300–400	13	13
>500	9	9
Total	100	100

Source: Our Study

10. What rating do you give to Himalaya's personal care product? (Table 10)

Table 10. Rating

Rating	No. of respondents	% of respondents
1 Star	0	0
2 Stars	3	3
3 Stars	33	33
4 Stars	55	55
5 Stars	9	9
Total	100	100

Source: Our Study

11. Would you consider buying/using this product in the future? (Table 11)

Table 11. Considerations

Considerations	No. of respondents	% of respondents
Yes	70	70
No	2	2
Maybe	28	28
Total	100	100

Source: Our Study

12. Would you recommend Himalaya personal care products to your friends/relatives? (Table 12)

Table 12. Recommendations

Recommendations	No. of respondents	% of respondents
Yes	70	70
No	2	2
Maybe	28	28
Total	100	100

Source: Our Study

13. Any recommendations on how the products can be improved.
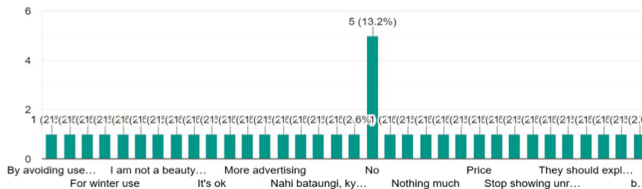
Source: Our Study

Graph shows the various suggestions given by the respondents. Some of them felt it lacks quality, some thought prices were high, others wanted to see more varieties and some were disappointed by unrealistic commercials.

5.8   Findings

The study observed that all respondents were aware of the Himalaya Personal care products. Amongst all respondents, 61% of the Consumer were below 25 years. Further, 70% of the crowd got to know about the product through television. Again, the most preferred brand amongst the consumers were L'Oréal and the least ones were Patanjali, Dove, Neutrogena, Lakme, Ponds, Joy, Bath and Body works, Nevia, Nivia, Nyle, Mama earth, Herbal Essence, Lacto Calamine, Tresemme, Clean & Clear, Innis free, Oriflame and Maybelline NewYork. The study also revealed that 73% of the Consumer liked Himalaya's Personal Care products. The study also finds that 69 respondents felt like they are attracted towards the natural ingredients used in the product. Again, 66 amongst them preferred face products whereas only 5 Consumer preferred oral products. 44% would buy these products from a supermarket whereas only 6% purchased these items online. 40% of the Consumer will be willing to spend 200–300 rs. on these products whereas only 5% respondents would spendless than 100 bucks on these products. 5 STARS were given but only 3% of the population but 4 STARS were given by 55% of the Consumer and nobody rated Himalaya as 1 STAR. Finally, the study found that 70% of the Consumer would not only buy but also recommend this product to others.

6   Limitations of the Proposed Research Study

The basic limitation of the study undertaken is that only one company product is taken into consideration. If the study would have included some more company and products, the study would have wider coverage. Another limitation is related to data availability that is only 100 respondents were considered for the study. It would have been extended to few more hundreds but due to ongoing Covid-19 pandemic authors found it difficult, although online data were collected. One more limitation is that Sample respondents are only of one particular city i.e. Vadodara. The possibility of biased responses can't be ruled out.

7   Conclusion and Suggestions

The conclude that given the importance of personal care product and its growing market with increase in market competition too it is very crucial for the firms to have strong hold of the consumers. No firm can afford any laxity with reference to change in preference and taste of consumers along with other determinants of demand along with change in macroeconomic parameters. Therefore, in modern context firms with their analytical capabilities undertake market research and so on to find out answers of many relevant questions (related to consumers) such as how many times do you make decisions of purchasing cosmetics? What should I go for? Chemical based or Herbalones? Which might be better for my s kin or what will make hair shine a bit more? If you think about it, we take many buying decisions every day without giving them much thought. And these decisions, however insignificant they may seem, keep marketers up at night. And this research mainly focuses on Consumer's buying behavior towards Himalaya's personal care products.

Studying consumer behaviour is important because this way marketers can understand what influences consumers 'buying decisions. By understanding how consumers decide on a product they can fill in the gap in the market and identify the products that are needed and the products that are obsolete. And therefore, it is important the Company works on suggestions given by people. Most of the respondents suggested that advertisement regarding their new products must be improved. The price of the Himalaya Personal Care products may be reduced to create more demand. The company has to focus on advertisement in the existing position to get more attention on consumers. Demonstration of Himalaya products may be improved. Also, some felt that door delivery is the best promotional measures. So, the company can concentrate on that factor. Some also stated that quality of the Himalaya product should be increased with the prevailing price rate.

In the present scenario Himalaya products are one of the very essential products for all walks of people. This research study was conducted to analyze Consumer's buying behavior while purchasing Himalaya's personal care product. The study reveals that most of the respondents are aware of the Himalaya products. Also, people liked Himalaya products because of its natural ingredients which states that people prefer such herbal products over chemical based ones. The present study also reveals that the customers have a good preference towards Himalaya product. The popularity of the brand also one of the factors urged the customer for their purchase duration. In overall the customer are satisfied with the brand, availability and price of the Himalaya products.

The company may attract its consumers by providing as many free gifts related to their products to maintain a long run market. If the above suggestions are implemented, the company will reach their highest target in the near future.

References

1. Bhasin, H.: SWOT Analysis of Himalaya Drug Company. Marketing 91 (2019). https://www.marketing91.com/swot-analysis-of-himalaya-drug-company/
2. Charwak, B.: The customer satisfaction towards Himalaya skin care products. Int. J. Acad. Res. **3**(3(2)), March 2016, ISSN: 2348-7666
3. Herbac Herbs. (n.d.). Herbac Brand. from Herbac Herbs. https://www.hebhac.com/brand/himalayawellness/. Accessed 6 April 2021
4. Himalaya. (n.d.). Himalaya Wellness. Retrieved 6 April 2021, from Himalaya. https://himalayawellness.in/pages/our-story, https://himalayawellness.in/pages/research-and-development-centers
5. Hossain, M.D., Shila, N.S.: Factors influencing consumer decision making for personal care products. Dhaka Univ. J. Biol. Sci. **29**(1), 53–59 (2020)
6. Kavitha, K.S., Anish Fathima, T.: A study on consumer satisfaction towards herbal products. Int. J. Current Res. Modern Educ. (IJCRME) Impact Factor, 6.725 **2**(2) (2017). ISSN (Online): 2455-5428
7. Lavuri, R., Sreeramulu, D.: Personal care products: a study on women consumer buying behavior. Int. J. Res. Rev. **6**(6), 271–279 (2019)
8. Mamta: Buying behavior of rural consumers towards personal care products. Int. J. 360 Manage. Rev. **07**(01), April 2019
9. Manimekalai, K.: A study on consumer buying behavior towards Lakme product. JASC: J. Appl. Sci. Comput. **VI**(I), 1878 (2019). ISSN NO: 1076-5131

10. Mohanpriya, A., et al.: A comparative study on the impact of SK in care products on the self- esteem of women users and non-users in Coimbatore city. Int. J. Recent Technol. Eng. (IJRTE) **7**(5S), January 2019. ISSN: 2277-3878
11. Panda, T.K., V.: Mark eting Management, vol. 2. Excel Books, New Delhi (2007)
12. Poranki, K.R.: Consumer attitudes and perception on personal care products and cosmetics at Visak hapatnam, India. Int. J. Res. Publication's **08**, 220–225 (2015). ISSN: 2251-1571
13. Praveena, R., Anitha, J.: A study on customer's satisfaction towards Himalaya product to Thiruthuraipondi Town. Int. J. Current Res. Multidisciplinary (IJCRM) **2**, 07–10 (2018)
14. Rajee, M., Kas inathan, S.: A study on impact of culture towards buyer behaviour of hair care products with special reference to Himalaya cosmetics. ELK Asia Pacific J. Mark. Retail Manage. **8**(4), December 2017
15. Rajee, M., Kasinathan, S.: Consumer preferences, usage pattern and satisfaction towards himalaya cosmetics in baby care products segment. ELK Asia Pacific J. Soc. Sci. **5**(2) (2019)
16. Rakshit, A.: Covid-19: Ayurvedic products become increasingly popular (2020). https://www.rediff.com/business/report/coronavirus-covid-19-ayurvedic-products-are-increasingly-popular/20200430.htm
17. Saravanakumar, A., Santhosh Kumar, B.: A Study on Female Customer Satisfaction on Hair Oil and Beauty Cream with Special Reference to Himalaya Products in Coimbatore District, (Special Is s ue 4), p. 23, August 2018
18. Sujatha, K., Amala, S.: A study on consumer satisfaction towards himalaya skincare products in Tiruchirappalli town. Int. J. Res. Eng. Appl. Manage. (IJREAM) **04**(09) (2018). ISSN: 2454-9150
19. Ujwala, B.: A study on the consumer buying behavior of personal care products in more super market, Chittoor District. World Acad. Inf. Manage. **1**(3), 28–32 (2012). ISSN: 2278-1315

Comparative Analysis of the Moroccan and Malaysian Takaful Regulatory Frameworks

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Abstract. The kingdom of Morocco has recently initiated implementing the Islamic finance system, with only the banking segment being operational so far; this makes the comprehensiveness of the Takaful framework a more substantial aspect that will ensure the system's integrity as a whole. This study analyzes the country's Law for Takaful and compares it with the Malaysian model, a leading country in this segment. This study adopted a comparative legal research approach, using the analytical method in studying Moroccan and the Malaysian legal documents about Takaful and a thorough review of existing literature, archives, and library research pertinent to the field. This study has found that Moroccan Law is generally comprehensive and can provide an excellent legal platform for an emerging Takaful industry. A circular about the internal operational code is published as stated in the law. However, the study has also pointed out some severe Shariah governance issues that need reconsideration, concerns about the general regulatory approach, and restrictive regulations concerning licensing and product design, among other minor issues.

Keywords: Takaful · Law · Comparison · Kingdom of Morocco and Malaysia

1 Introduction

The kingdom of Morocco is a unitary sovereign state governed by a constitutional monarchy with an elected parliament. Morocco is located in northwest Africa and has a surface area of 710,850 km^2 and 36.87 million in 2020, representing a 1.1% increase in population growth from 1.22% in 2019. And a male-to-female ratio of approximately one to one, 99% of which are Muslims.[1]

In contrast with the recent turmoil that the region of North Africa witnessed, Morocco still enjoys the luxury of political stability that its neighbors lack due to the wave of Arab spring of 2011 that dismantled most governments and the existence of the constant threat of terrorism. Besides the country's strategic location as a gateway

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[1] https://fanack.com/morocco/population-of-morocco/.

between Europe and Africa, Morocco is a major player in African economic affairs and an attractive destination for foreign investments. The World Economic Forum ranked it the 1st most competitive economy in North Africa in 2015, even though Morocco is only the 5th largest African economy.

The first appearance of Islamic products, or participatory products referred to in Morocco, was introduced in 2007. Under the 2006 Banking Law NO. 34-03 relating to similar credit institutions and organizations, with only some specifications about participatory banking, these shallow particularities were incorporated by a primary follow-up circular. In addition to a recommendation by the Governor of the Moroccan central bank Bank Al-Maghrib (BAM). Regardless, these products didn't succeed and failed when launched due to the industry's actors. This failure widely ranges from poorly informed customer service managers about the features of alternative products. The presence of discrimination against them is evident from the terms and conditions. They cannot mention any religious character such as halal, fatwa, Islamic, sharia, or similar advice [1].

The wheel of Islamic finance was also slowed down by Bank Al Maghreb (BAM) when they refused to create or grant accreditation to foreign specialized banks in Islamic finance. They allow few local banks to operate within the country, justifying it by the fear of destabilizing the financial sector in general. Also, among the reasons why Islamic finance didn't succeed was the implementation of some half measures when it comes to regulations, like the stipulation mandating the compliance with the international standards of AAOIFI, instead of establishing new guidelines that are more consistent with the specifics characteristics of the country [2].

In 2012 however, the industry was revived when Moroccan professors, researchers, converted conventional bankers, and experts decided to revive the matter and give it more exposure, coinciding with the Justice and Development Party (PJD) power. These factors ultimately resulted in the release of Law NO. 103-12 for credit institutions and similar organizations, including a chapter with 17 articles dedicated to participative banks, expanding their intervention field and allowing them to perform with the same efficiency and accessibility as the conventional ones, which wasn't possible with the previous Law [1]. The new law includes the regulation of 3 products: Mudaharabah, Salam, and Istisnaa' with the possibility of introducing other products later on, after only Ijarah, Murabahah, and Musharakah that were regulated before (Law NO. 103-12, 2015).

Subsequently, the Financial authorities encouraged local players to incorporate Islamic finance and collaborate with international players. The foresight in mind that the local players will ensure a deep understanding of the local practices and culture. In contrast, the foreign ones will bring their expertise and know-how in dealing with issues. So far, four licenses were granted for a joint venture between local banks and Islamic banks from the GCC region; in addition to 4 other windows licenses, 3 of them in favor of already established subsidiaries of French conventional Banks, and one for a subsidiary of a local traditional bank [3].

In July 2019, the Law n° 87.18 relative to the Moroccan Takaful regulatory framework has been approved by the second chamber of Parliament. In early September, the finalized law was put into effect after being published in the official journal of the Kingdom of Morocco.

However, since this regulatory framework is newly issued, little academic scrutiny has been devoted to certifying its suitability and comprehensiveness. Considering that the whole Islamic finance industry's prosperity is stringing on the degree of inclusivity of the bill's core components, these arguments warrant more research attention to this matter.

According to the Middle East insurance review, when the Takaful Law was at the drafting stage, the Moroccan authorities have sent officials to Bahrain and Malaysia to seek input and advice, considering that they are well established in this area [4]. This testimony embodies two statements: Moroccan officials are well aware that Takaful is a reasonably complicated product. They are under-experienced to regulate the industry on their own properly. Also, they require proper insight; the second one is that they consider Malaysia to be among the countries with a robust regulatory framework.

For these reasons, it is essential to get ahead and adequately examine the current Moroccan Takaful law and locate potential gaps and loopholes, if any, in contrast with another established experience in the field, i.e., the Malaysian Takaful regulatory framework.

2 Methodology

This study adopted a comparative legal research approach, using the analytical method to analyze the legal concepts and rules in different traditional systems. In this way, identifying commonalities and differences can facilitate future change [5].

For this paper, comparative legal research was employed to study the legislation related to the Takaful sector's regulatory framework, which is, in Malaysia's case, the IFSA 2013 that repealed the Takaful Act of 1984. In addition to another central supporting regulation, specifically the Takaful Operational Framework (TOF), the Risk-based Capital Framework (RBCF), and the Shariah Governance Framework (SGF); for the case of Morocco, the project law NO. 87-18 completing the previous law NO. 17-99 regarding the insurance Code.

The literature that the study is based on is mostly library-based consisting of primary and secondary data. The primary data is gathered from Bank Negara Malaysia and the Moroccan Parliament; the secondary information is based on published materials comprising relevant articles from journals, online databases, and Internet sources.

Legal research usually involves four analytical, philosophical, historical, and comparative [6]. In this study, the analytical method scrutinized the law documents about Takaful's regulatory framework to identify possible similarities and divergences between the two.

3   The Main Elements in the Law No. 87-18 and the Malaysian Framework

In the table below, the study summarized the most pertaining components of the law NO. 87-18 according to the adopted categorization approach as stated in the methodology and compared them with their correspondent sections in the IFSA 2013 and the other regulations in the Malaysian Takaful framework.

In the following sections of this paper, the study provides the precise analysis of the two frameworks and pinpoints the main omitted elements in the law NO. 87-18 when compared with the Malaysian framework within the perimeters of the said categories; while citing some examples and excerpts from the legislation to show the analyzing process that the research adopts (Table 1).

Table 1. Comparison of the main elements in the law No. 87-18 and the Malaysian framework

Elements	Law No. 87-18	Malaysian framework
Terminology and guidelines	- detailed definitions of the terminology associated with Islamic finance - adapting the code of insurance to include the terminology unique to the Takaful industry - Subjection of Takaful and Re-Takaful Funds to the regulations of the insurance code	The framework refers to a list of standards and guidelines to be followed in every IFIs operations aspect - the framework resorting to the Shariah standards, where all the contracts and their application conditions are adequately defined
Licensing specifications	- Single Takaful licensing for conventional insurance companies providing they enter in a Joint-Venture with another IFI - Re-Takaful is licensing for licensed Takaful operators wishing to specialize in Re-Takaful operations exclusively - Fire and theft Takaful coverage licenses for the micro-finance organization - Family Takaful, medical emergency and financing coverage licenses for participative banks	- Single licensing is prescribed for Takaful and Re-Takaful business to separate Family Takaful business from General

Table 1. (*continued*)

Elements	Law No. 87-18	Malaysian framework
Corporate Governance	- Mandatory establishment of an internal operational code, which should be communicated and signed by the participants - The Takaful fund is granted with a juristic personality, distinct from the Takaful or Re Takaful operator - The operator is only entitled to the agency fees and nothing of the funds' investments proceeds	- Internal policies and procedures should be consistent with the standards specified by BNM The operators' duties and responsibilities are defined through the Takaful Operational Framework to safeguard participants' interests better BNM develops-The Risk-Based Capital Framework (RBCF) guarantees that the Takaful operator has sufficient capital to keep the business running
Shariah Compliance	- Emphasis on the Shariah element of the Takaful business - Allocation of funds in Shariah-based investments only - Contributions should be based on Tabarru' - Inheritance, Hibah and Will (wassiah) should be managed according to Shariah regulation	- All activities should comply with Shariah standards and guidelines at all times - The board of directors, CEO, Senior Officers, and Shariah Committee must ensure proper compliance with the standards - The Shariah standards cover 14 products of Islamic finance
Shariah Governance	- Establishment of an internal control body with a minimum of one position for internal audit - Requirement position: sufficient knowledge about the workings of the Takaful business in addition to having a deep understanding of the Shariah	Establish a second statutory body under the Shariah Advisory Council (SAC) called the Securities Commission (SC) to deal with capital market matters. At the same time, the first one specializes in money and banking matters - Increase in the responsibility of the Shariah Committee to be equivalent to the Board of Directors and the Senior Management - Conduction of audit on Shariah compliance

4   Findings

4.1   Takaful Terminology

In-Law NO. 87-18, the definitions of the Takaful industry's terms are not that considerable. In contrast, they only cover the Takaful business's main aspects in the likes of "Takaful and Re-Takaful fund, Takaful contract, Takaful contribution…". Unlike the IFSA 2013, this latter reference, a more comprehensive range of terms relative to the industry. The first part of the legislation is a 14 page preliminary, dedicated to

defining the meaning of various words close to Islamic finance and referencing the specific sections in the same bill that further underlines the fundamental importance of the term; such additional definitions include: "Takaful broker, Takaful business, Takaful benefits, Takaful participant, Takaful claim"…

Regarding the comprehensiveness of the definitions in Law NO. 87-18, "Takaful Certificate," for instance, is defined as:

"…a contract obtained by the participant as a result of his contributions paid as a lump sum or on several periodical payments; and in exchange, the participant receives the initial capital contributed and its investment returns. The certificate is not subject to the death or life of the participant when assigning the amount due."

As for the IFSA 2013, "Takaful Certificate" is defined as follow:

"Takaful certificate includes a takaful cover note or any contract of Takaful for family takaful business or general takaful business whether or not embodied in or evidenced by an instrument in the form of a takaful certificate, and references—

(a) issuing a takaful certificate shall be construed as entering into a contract of Takaful, whether or not a formal agreement has been issued; and

(b) a takaful certificate of a takaful operator includes a takaful certificate in respect of which the takaful operator is under any liability, whether the takaful operator or the liability issued the takaful certificate was transferred to the takaful operator from another takaful operator."

When comparing the two definitions, the study found that the first one is comprehensive to some extent of the Takaful concept's relevant aspects, such as the subject matters, the parties involved, and some of the contracts' conditions. However, compared with the definitions of the IFSA, this latter is more extensive and includes more stipulations. Therefore, the study concludes that Malaysian regulation is more advanced in the area of definition.

4.2   Important Guidelines

Regarding the guidelines, it is hard to ascertain their inclusivity for two reasons: Morocco doesn't have a set of rules and procedures to conduct the operations, not only for Takaful but also for Islamic Finance in general. Moreover, the government has no formal recognition of foreign prudential standards and guiding principles for the industry like those issued by the Accounting and Auditing Organization for Islamic Financial Institutions (AAOFI) or the Islamic Financial Services Board (IFSB). Instead, the project law relies solely on the High Council of Ulemas' input and an internal operational code issued later.

The second reason why the study can't confirm the inclusivity of the set of regulations about Takaful operation's mechanics is that to do so, it requires the classification of the relative stipulations and coming up with a system that shall allow for comparing the two legislation. Therefore, the study concludes that it's a counterproductive approach. As mentioned in the Takaful regulatory framework as an enforceable supporting document, priority should be given to formulating a set of standards for the industry.

4.3 Licensing Specification

Concerning the licensing requirements to exercise Takaful and Re-Takaful operations, the Moroccan Law has mentioned the critical eligibility conditions for acquiring the said license by specifying the procedures to be practiced. Those who don't fall under the IFIs expertise and the types of institutions eligible to apply for a permit, in this regard, the study finds Law NO. 87-18 when IFSA 2013 for granting a Takaful and Re-Takaful license. However, the study observed no emphasis on the conditions for revoking the permit or the list of responsibilities under the individual top management officers. When breached, it gives a legitimate reason for canceling the license.

There is also no mention of penalties as preemptive measures before revoking the license. In the IFSA 2013, the duties and responsibilities are extensively cited, promoting strong corporate governance, and when breached, can have serious consequences. For instance, if an IFI engages in prohibited business conduct, the penalty can range from five years of imprisonment and a fine not exceeding ten million ringgits (Section 136).

4.4 Corporate Governance

As mentioned in the literature review, Law NO. 87-18 did not emphasize the area of corporate governance, at least in the traditional sense. Although as explained earlier, Law NO. 87-18 mandates establishing an internal operational code that should be communicated to the participants and signed by them. This internal functional code should explain all the related activities and operations of the funds, how they are managed, how the proceeds would be distributed, how the operator's remuneration is calculated, and the actions to be taken in case of deficiency Takaful funds.

Notwithstanding that, there is no mention of how exactly this operational code should be formulated, nor does the framework provides a model to follow. It only mentions that these concerns would be addressed through a publication issued later on, without a timeframe or a deadline for publication. The absence of a timetable suggests, after the Takaful regulatory framework is published and the Takaful licenses are granted, the operators will probably commence their activities under undetailed regulations. Precisely in the same fashion that the participative banks have started offering financing without a Takaful coverage.

On the other hand, the Malaysian framework is massively more insisting on corporate governance. It has further strengthened the powers of BNM and granted it the authority to enforce corporate accountability and ensure proper business conduct by Takaful operators. Also, shifting more responsibilities to the operators' Board of Directors emphasizes corporate governance.

This latter is more advanced when comparing corporate governance aspects by Law NO. 87-18 with the Malaysian framework. For instance, the Takaful Operational Framework (TOF) is more exhaustive in formalizing the principles that Takaful operators must follow, detailing the operational models and the provisions about managing funds and their segregation. Additionally, the Risk-Based Capital Framework (RBCF) is also a good benchmark of Law NO. 87-18 introduces a corporate governance model. The RBCF refers to an extensive list of Takaful operators' fiduciary

duties towards their participants, ensuring proper management of the Takaful funds and other objectives.

4.5   Shariah Compliance

With the Shariah compliance aspect, the study finds that law NO. 87-18 emphasizes compliance with Shariah in the same manner that the Malaysian framework does. The High Council has approved every aspect of the Moroccan bill of Ulemas from a Shariah standpoint. Both countries have a system that ensures the governance of Shariah.

However, in the study's opinion, the Moroccan framework contains some more consistent elements with the Maqassid Shariah than the IFSA 2013, which is intrinsically against the Shariah and only allowed on necessity. For instance, the Takaful operators' stipulation can't share the surplus with the participants in any form or manner. Their only income is through the agency fee. Unlike in Malaysia, Takaful models that allow surplus sharing is permitted.

Another example demonstrating the lead of the Moroccan framework in terms of the Shariah governance is the aging receivable accounts, whereby those accounts are forfeited after a certain period and not refunded to their legitimate owner after that; this aspect is not taken into consideration in the Malaysian framework.

4.6   Shariah Governance

The Moroccan centralized Shariah governance comprises nine members and one coordinator, possibly outsourcing five additional experts. It is insufficient to tackle all the Shariah-related issues anticipated to emerge in an economy relatively new to the Islamic financial system. Also, advise on particular matters encountered by the IFIs promptly, provide answers to day-to-day questions that might arise, and share them with all the other IFIs.

The Malaysian model does not differ much from the Moroccan one regarding Shariah advisory council members. But have another statutory body under the Securities Commission's name comprised of 8 members, so that anything related to the capital market shall fall under the Securities Commission's responsibilities. Meanwhile, any activities related to money and banking will be referred to the Bank Negara Malaysia (BNM); having two distinct entities is more efficient. The tasks are divided at the central level. This same rationale is expressed through Malaysia's two-tier Shariah governance infrastructure, a centralized Shariah committee at the central bank's status, and an internal one formed in each IFIs. The requirement for the internal Shariah committee in Malaysia is a minimum of 5 members. To ensure the most Shariah supervision, the Shariah Governance Framework (SGF) extensively details the committee members' list of fit and proper criteria and their duties, Responsibilities, and Accountability.

As for the Moroccan requirement in terms of the internal Shariah committee, only one position is mandatory for each institution; as for the qualifications, the law only mandates that the person has sufficient knowledge about the field without giving specific details requirements the position. The way the Moroccan model is set gives rise

to several legitimate concerns regarding Shariah governance enforcement. It contains weak points at the bank's level where there is a lack of position for Shariah enforcement, as only one place is insufficient to tackle all the potential Shariah issues that an IFI would face. Additionally, work congestion is imminent at the High Council of Ulemas' level when auditing and supervision tasks are performed. Ten members cannot be expected to oversee the Islamic finance industry, especially considering that Morocco strongly incorporates this latter. Therefore there is not yet a vast register of Shariah opinions unique to the Moroccan market.

5   Recommendations

5.1   Issuance of Standards for Islamic Financial Products

The structure of Islamic products is primarily based on the set of contracts acceptable under Shariah. Simultaneously, the economic effect is similar or even comparable to a certain degree with conventional products. There might be significant differences in their underlying structure, implying that their components' definitions may not be the same as their corresponding traditional counterpart [7].

Following an analysis of the terminology and guidelines, this study reveals a significant deficit in Definitions in Law NO. 87-18. When, contrary to the Malaysian framework, not only in numbers but also in fatigue. An important observation is that the Moroccan regulation references the definitions of only eight concepts relative to the Takaful industry, which decreases the ambiguity from a regulatory perspective and might constitute legal grounds for possible loopholes exploitation.

The study recommends that a set of standards be formulated, not only for Takaful but also for the whole Islamic finance industry. The characteristics of each Shariah product are carefully defined, and their application is thoroughly outlined.

The issuance of the said standards will serve two distinct purposes; on the one hand, the definitions' meticulousness will prevent any altercation of meaning and tighten the loopholes. On the other hand, it can broaden the power of the guidelines in the regulatory framework. For instance, if a particular concept is appropriately defined, it is sufficient to have a regulation that penalizes the operator in non-compliance rather than stating the cases that constitute misconduct. They won't be as practical since the concept itself is not outlined, not along with its malpractice cases.

5.2   Exclusivity for Takaful Operators at Offering Takaful Services

The Moroccan model is privileged to offer Family Takaful in favor of participating banks. And the condition that allows microcredit organizations to provide Takaful services in addition to traditional institutions. These features of the Moroccan regulation focus more on research for the purpose behind them. On the contrary, it goes against the promotion of Takaful as a separate segment of the financial system. Also, the removal of this unique attribute is in favor of the banking sector. The current study bases its assessment on a sustainable Islamic system, taking the Malaysian model as a

benchmark. It can be concluded; Institutions should be given additional benefits at an early stage.

For example, when the first Islamic bank in Malaysia started their activity, they were given a grace period of 10 years. No competitors were given a license to operate to provide them with a fighting chance against the already established conventional system.

5.3   Restoration of Public Confidence

With all the promises showed with participatory banking in recent years in Morocco, little can be said about the state of Islamic insurance, as the long-awaited launch of Islamic insurance in the kingdom is still subject to a tedious regulatory and Shariah process [8]. The regulating bodies' inefficiency has become apparent, especially after the banks granted the licenses started offering Murabahah financing while under no Takaful coverage, which poses a significant contradiction in achieving the minimum level of Shariah compliance.

A study was done by the market research firm "Sunergia" surveyed 1,000 Moroccans nationwide concluded that 52% of the 15–24 age group and 50% of the 25–34 age group considered participatory financing products to be not Halal. A second study was also conducted by Morocco's newspaper "L'Economiste," which confirmed the Moroccan population's disbelief about the industry's legitimacy. Four Moroccans out of ten believe that the industry is not genuinely Islamic.

It shows that Islamic finance's public perception is already fragile and couldn't afford any more bad publicity. However, it's fair to mention that this issue is not one of Shariah compliance; it is related to the Moroccan's substantial lack of understanding and awareness of the industry. A survey conducted in 2017 by Kantar TNS demonstrates that only 7% of the Moroccan population had heard about participatory finance, and 21% about Islamic finance [9].

Regardless of why Moroccans have such low confidence about the system's legitimacy, the fact remains that any additional factors could accentuate the problem. The newly approved law NO. 87-18 regulates many operational technicalities through a circular published later on. At the same time, no timetable of any sort is referenced in the bill. It turns out that even after Law NO. 87-18 is published, licenses will be granted to operators, and they will likely start practicing Takaful operations done under no operational regulations. In the same vein, participatory banks began sacrificing financing without Takaful regulation.

The matter of the delays in fully regulating the Takaful industry is of such paramount importance. It will take the necessary time. However, the process needed to be sped up [10]; it can constitute a setback to the public's acceptance of Islamic finance in general. The study recommends that the top priority should be given to issuing the circular mentioned in the law, which could serve as the operational framework for Takaful. The general approach to publishing the regulatory texts should be reconsidered to avoid more delays since its inefficiency is manifested by the long durations the Takaful law has taken to be brought up.

5.4 Removal of the Profit-Sharing Restriction

In-Law NO. 87-18, there is no mention of a particular Takaful operational model that Takaful and re-Takaful operators should adopt. However, section 3-10 stipulates that apart from the Qard Hassan repayment, the operator cannot take possession of any fraction of the funds' surplus. It implies that in terms of the range of operational models that an operator could adopt, this particular clause excludes the Mudharabah model and the Hybrid and Waqf model.

Since all of the Takaful above models are contingent on sharing the surplus between the operators and their participants, also known as the performance fee, the only model left that does not incorporate this latter is the Wakalah model pure form.

In Malaysia's case, the Takaful Operational Framework does allow the structuring of Takaful products by the applicable Shariah contracts, in the condition that BNM approves the model. While choosing to adopt, the performance fee is left to the operator's discretion; basically, this includes the contracts of Wakalah, Mudharabah, Qard, and Hibah [11]. Currently, Takaful operators mainly adopt the Wakalah based or the hybrid model. The reason for that is their ability to allow receiving the Wakalah fees that match the extent of the operational expenses, in addition to the greater flexibility offered in product pricing in a competitive market, and most importantly, the legitimacy of acquiring the underwriting surplus [13].

The pure Wakalah model is economically unattractive. It was the main reason that pushed scholars into developing the Hybrid model that allows the operators to legitimately collect the Wakalah fee and the performance fee using the contract of Mudharabah. The fact remains that the pure Wakalah model as the Moroccan Law is prescribing is more Shariah-compliant; however, since the Malaysian government is not yet exclusively mandating, it's still a progressive move the Malaysian market is not yet ready to implement.

Therefore, the study recommends that sections 3-10 of the law NO. 87-18 be amended in future publications. If developed Islamic finance such as Malaysia still allows the performance fee, perhaps it is wise for a new Takaful market not to venture into uncharted territories. Another reason for amending Sections 3-10 is that it will give the legal ground to develop other models that might mitigate the non-compliance to the Shariah, using the contracts based on the sharing of surplus.

5.5 Restructuring of the Shariah Governance Scheme

Shariah governance can be simplified as a system expected to guarantee compliance to the Shariah principles by the various components of a country's Islamic financial system, ranging from the Takaful segment to the banking sphere, going through the capital market sector. In this respect, Shariah's governance should be the regulator's primary focus. It is the most relevant aspect of the whole system, giving it credibility and distinguishing it from its conventional counterpart [12].

The Moroccan government adopts centralized Shariah governance, which is expected to oversee the Shariah compliance of all the Islamic finance industry segments. Realistically, the nine members that constitute the High Council of Ulemas committee are insufficient to provide adequate supervision, and all promptly. The study

suggests following the Malaysian model to create separate committees for the industry's different segments, alleviate work congestion, and increase efficiency.

There is also one position comprising the internal Shariah committee at each IFI's level, which is expected to communicate with the council and enforce the Shariah governance.

This study surmises that the number of positions for this committee is insufficient and advises that it be brought to a minimum of 3; also, this committee's importance is of paramount importance for its pre-requisite to be just summarized in "sufficient knowledge about the industry." Instead, a more selective approach should be adopted in selecting the occupant of these positions to maximize the quality of the Shariah governance.

6   Conclusion

The Moroccan experience with Islamic finance is, without a doubt, a leading model for implementing the Islamic financial system in the North African region. The government is mainly committed to the cause, setting a precedent for other North African countries with similar values and cultures. The level of comprehensiveness of the regulatory framework is a direct factor that will lead the country to serve as the regional hub for the industry, considering that a substantial number of Moroccan Banks are already implemented in Africa and could ultimately spread the Islamic finance system in the continent.

Even if the new law contains some missteps in the study's opinion, it is, in fact, comprehensive legislation to a certain degree, and that it is the result of collaboration with international bodies that are more established in the field, which resulted in avoiding some of the significant issues. However, now that the Takaful regulatory framework is in place, the next target should be aimed toward expediting the conception of an operational framework and the development of Takaful models, as well as the issuing of the policy documents as mentioned in law NO. 87-18, considering that this latter is incomplete without them.

Perhaps the next aim should instead be issuing Shariah standards and guidelines for the whole Islamic finance industry, considering that Morocco has only incorporated three segments so far into the country's financial fabric (participatory banking, Takaful, Sukuk). Therefore, the study believes it will be a counterproductive approach to repeat specific steps each time a segment of Islamic finance is regulated.

References

1. Soudi, L., Cherkaoui, A.: Morocco experience in islamic finance between the failure of the past and the promising future. Int. J. Finance Account. **4**, 153–162 (2015)
2. BAM. Recommandation n°33/g/2007. Bank Al-Maghrib, Rabat (2007)
3. Jouti, A.T.: Overview of Islamic Banking & Islamic Finance in Morocco. Towards Qualitative Growth and Standardization of Islamic Finance, Manama (2017)

4. MEIR. Morocco:Call to accelerate introduction of takaful rules, 30 April 2018. Retrieved from the middle east insurance review https://www.meinsurancereview.com/News/View-NewsLetter-Article?id=42457&Type=MiddleEast
5. Hoecke, M.V.: Methodology of comparative legal research. Law Method (2015)
6. Yaqin, A.: Legal Research and Writing Methods. Lexis Nexis, New Delhi, India (2008)
7. Ainley, M., Mashayekhi, A., Hicks, R., Rahman, A., Ravalia, A.: Islamic finance in the UK: Regulation and challenges. The Financial Services Authority (FSA), London (2007)
8. Boursier. Morocco: Insurance sector hopeful of takaful launch in 2019. Middle East Insurance Industry Review, 31 March 2018
9. Islamic Finance News Morocco Report (2018). https://redmoneyevents.com/MAIN/framework/assets/2018/reports/morocco.pdf
10. Zeroual, K.: Morocco: Call to accelerate introduction of takaful rules. (T. newspaper, Interviewer) Middle East Insurance Review, 30 April 2018
11. Islamic Financial Services Act (2013). http://www.bnm.Gov.my/documents/act/en_ifsa.pdf
12. Al-Sartawi, A.: Performance of Islamic banks Do the frequency of Shari'ah supervisory board meetings and independence matter? ISRA Int. J. Islam. Finance **11**(2), 303–321 (2019)
13. Yusoff, M.: Implementation of relationship marketing in takaful through. Int. J. Acad. Res. Bus. Soc. Sci. (2018)

Gender Diversity on Corporate Boards and Earnings Management: A Review

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Abstract. An increasing number of researchers were motivated by the enormous actions toward increasing the representation of women on corporate boards to test the relationship between gender diversity and Earnings management as it is considered a major ethical and risky dilemma. However, due to the inconclusive findings of the extant literature, the impact of gender diversity on earnings management is still vague. The aim of this paper is to critically review the previous studies that tested the relationship between female directors and different earnings management practices (accrual-based, real activities and classification shifting). Besides, the study highlights the gaps in the literature and suggests future studies.

Keywords: Gender diversity · Earnings management · Board · Real earnings management · Classification shifting

1 Introduction

Earnings management (EM) is a serious concern for many countries. Many regulators around the world are continuously seeking to tighten their corporate governance regulations in order to limit EM practices and to attain investors' confidence [104]. EM literature mainly classified EM methods into three categories: accruals-based management (ABM), real activities management (REM) [21] and classification shifting (CS) [2, 63, 65, 103, 106]. However, regardless of the method used to manage firms' earnings, all practices increase the information asymmetry between managers and interested parties and hide firm's actual performance, thereby, diminishing financial reporting reliability and credibility [52, 58]. Although the majority of EM literature consisted of ABM studies, the last decades comprised a changing balance in favour of REM [92]. Unlike ABM, REM is based on business decisions rather than accounting decisions, and it has a direct influence on cash flow generation [23, 38]. Also, a rising number of EM studies tackled the issue of CS. Although CS might not sound as a significant EM concern since it does not deal with managing the actual bottom-line earnings, it is considered as an increasingly important EM issue. [37, 43, 61, 65] argued that misclassifying income statement items can mislead investors especially when firms are constrained from managing other EM methods.

Different regulatory and corporate governance reforms were done in response to the financial crisis to make sure that the monitoring mechanisms are effective and to avoid future crisis [76]. Studies were motivated to test the impact of female directors on EM practices to see if they can contribute in constraining it. These studies relied on the behavioural difference of men and women in influencing EM practices [58, 93, 97]. For example, there is a general consensus regarding women differ than men in terms of psychological, physiological, behavioural aspects [12, 39, 41, 48] For example, women generally are perceived more conservative, independent, cautious, less aggressive decision-makers, risk averse, and less engage in fraud [1, 19, 25, 40, 45, 53, 77, 85, 91, 105]. Also, the board can benefit from the presence of female directors because they have mix perspectives, knowledge and non-business backgrounds [6, 56, 64, 90, 98]. Although EM literature includes a massive number of studies compared to the other accounting literature, a limited but rising number of studies tackled the issue of female board directors' role in monitoring EM practices. Some researchers argued that the consequences of board gender diversity are still vague if the decision to appoint female board directors is mainly driven by social and political pressures [44, 59, 70]. [46, 82] declared that the association between gender diversity and independence is still questionable.

2 Literature Review

Researchers were more motivated in testing EM practices within the American context. According to [92], 82.74% of EM researchers are from USA. Compared to studies in other regions worldwide, US studies were active in linking gender diversity issue with EM. For instance, in 2011, some studies found that women directors on the audit committee contribute to eliminating ABM by increasing negative discretionary accruals [85], while other studies revealed that the presence of female directors has no effect in eliminating ABM and they justified their results by stating that not all EM practices are unethical [70, 79]. More recent studies showed that in the US, female board directors enhance monitoring effectiveness of boards and reduce the rate of financial reporting errors and fraud [94].

[48] found that gender diversity on US listed audit committees eliminate ABM. More recent study by [37] showed that EM level decreased when the numbers of female directors on the board reached critical mass level (three female directors or more). Another study by [78] found that female board directors are more likely to reduce discretionary accruals. [15] examined the association between CEO gender and EM and found that ABM is not associated with CEO gender. [50] also find that compared to male CEOs, female CEOs in US firms are more risk averse and ethical which leads to using accounting conservatism techniques. Furthermore, another study by [78] which investigated the relationship between female CEOs and CS suggested that female CEOs tend to be more risk-averse, but it does not have to be more ethically sensitive than men. [14] found a positive relationship between firms with female directors and REM.

In Asia, limited but increasing number of studies investigated the relationship between gender diversity on corporate boards and EM practices. Perhaps the limited

representation of female directors on emerging corporate boards limits the studies related to this topic as well. Studies that linked EM with board gender diversity were really active in investigating ABM and REM e.g., [34, 42, 51, 80, 96, 101, 102], limited number of studies undertook investigating CS as part of EM mechanisms. Moreover, the literature showed inconclusive findings with regards to the relationship between corporate governance with EM. A number of studies showed positive relationship e.g. [80, 84, 96], whereas some studies revealed a negative relationship [47, 99]. [102] used a Chinese sample to test a specific board characteristic which is the gender of the CFO and its relationship with EM. The study used REM and ABM to measure EM practices. The study results indicated that male CFOs engage in more EM practices while female CFOs are found to be more risk-averse than male CFOs. The study included a large sample, long study period and different types of EM. However, the study focused only on the CFO gender. A more recent study by [89] found a significant association between woman on a compensation committee and the CEO's total compensation. [62] provided empirical evidence that female directors in China are effective corporate governance tool to mitigate REM.

[55] study, for instance, investigated the role of women executives in eliminating ABM. The study found a negative association between women executives and ABM. Similarly, in India, where gender diversity quota was introduced in 2013 which mandates having at least one female director on board, [11] revealed that a negative relationship is found between the presence of female board directors and ABM practices in India. Moreover, a recent evidence from Bangladesh by [49] showed that female directors are linked with greater REM level. In Africa, [9] which is one of few studies that linked female directors with CS, found that female directors are negatively but insignificantly related to CS. [73] revealed that board gender diversity is positively and significantly related to ABM. In Europe, which is the focal focus of the current study, the adoption of an effective corporate board has been the main concern of many corporate governance reports. [31] stated that the majority of the existed studies that tested the relationship between corporate governance mechanisms and EM in the literature included US based sample, while European studies were far less. A recent study by [8] revealed that internal audit and board of directors' quality affect EM negatively. Besides, the quality of internal audit function and boards of directors significantly increased after the introduction of the 8th Company Law Directive in the European Union and the passage of Sarbanes-Oxley Act in the US. With regards to EM using CS technique. Researchers in the UK were really active in investigating this type of EM [10]. For example, a recent study by [106] found that high quality of board and audit committees' characteristics can eliminate CS practices. This indicates that although the reporting standards related to the classification of income statement items are not very strict, having solid corporate governance mechanisms can curb CS.

Even though there were many initiatives to enhance the board effectiveness and independence, the incidence of the financial crisis in 2008 allowed legislators and regulators seek other corporate governance mechanisms that would contribute in

enhancing the monitoring of managers' activities and back then, having female director on corporate board was not popular, and the representation of female directors was generally poor. However, a few years later, countries across Europe started to emphasize on the importance of gender diversity on corporate boards since it reflects high firms' business ethics and at the same time it contributes in improving corporate governance system. Gender diversity on corporate boards became a trend, especially in the European region. In 2011, Davies report concentrated on female representation on corporate boards. The response of Davies report (2011) is worth mentioning, according to Davies annual report issued in 2015, there are no male dominant boards in the FTSE 100 London Stock Exchange and only 23 boards do not contain women in the FTSE 250. However, according to a more recent study conducted by [87], although the percentage of female directors has increased, the presence of female board directors remains rare in Europe, the researchers added that around 70% of the supervisory boards in Europe did not include at least one female director and 60% in the management boards. On the other hand, some researchers argued that Europe initiatives toward increasing female board directors' such as quotas were effective in increasing the percentage of female board members [12] and a considerable progress can be seen in Europe over the period 2010 – 2016 where the representation of women has doubled [74].

Several European countries have carried different initiatives to increase the board gender diversity such as enacted legislations and adopted a voluntary approach, these initiatives attracted growing research interests in Europe. Spain was the first EU country who applied gender quota law in 2007, and in 2015, Spain launched a new corporate governance code that recommends having at least 30% of female directors on corporate listed companies. In 2011, The Cope Zimmermann law in France played a huge role in increasing the number of female directors on French corporate boards. Italy introduced a law called Golfo Mosca in 2012 which aims to implement gender diversity quota by the year 2015. Hence, high number of European studies tested the board gender diversity issue from different firms' aspects. [26] conducted a study using 20 European Union bank boards. The study documented that the number of female board members is high with lower risk banks, banks with a potential growth orientation and banks with larger boards. A Spanish study by [75] showed that women directors on audit committees enhance the transparency of financial reporting.

A recent UK study conducted by [16] studied whether there is a link between female board directors and EM practices in FTSE 350 listed firms during the period 2005 to 2011. The study documented that conservative accounting techniques are used when the number of female board directors and independent female board directors is high, the results indicate that the female directors on the board in high debt firms do not impact the levels of EM. Also, there is a positive relationship between the number of female corporate directors and independent female corporate directors and ABM in low debt firms. The researchers justified the results by mentioned that the study results cannot be generalized to all types of firms because the sample included large publicly traded companies. Another UK based study by [46] conducted during the period of 2001 to 2013 and found that there is negative relationship between female board directors and income-increasing ABM. Unlike [16, 46] used Blau Diversity Index [108] to measure gender diversity on board. In addition, a German study by [67] found a negative relationship between female directors and ABM. However, a more recent UK

based study showed that when the percentage of women on board is low, EM level becomes also low [13]. The mentioned studies focused only on one country, each country has its own voluntary approach of appointing women on corporate board, and therefore including more European countries in the study sample would be much beneficial to understand this relationship in different regulatory environments.

[22] study have filled this research gap by testing the effect of board gender diversity on EM in all European companies. Also, the study period covers more years which is from the year 2002 to 2013. [22] measured EM using aggregate accruals and operating accruals [28, 60, 69]. The results show that a board with gender diversity can eliminate ABM in European countries who have a high gender equality. Although [22] included all European countries to their study sample which is relatively a huge sample, focusing only on certain type of EM would not be enough to represent EM. [46] also included a number of European countries in order to investigate the relationship between female directors on board and EM. Another study by [107] used a sample from European countries for the period 2006–2016. The study results confirmed that gender balanced board are more likely to eliminate ABM level. The number of French studies were relatively higher than other European countries. For instance, [36] conducted a study during the period 2008 and 2011 and found that the percentage of female board directors and female board chairperson are more likely to constrain ABM. Besides, the association between the presence of at least three female board directors and ABM is also negative. On the other hand, no significant relationship is found between female CEO and CFO and ABM. Two years later, [32] studied the period 2010 to 2014 and found that female directors are associated with lower level of ABM, and female CFO play an essential role in influencing this association. After one year, another French study by [3] claimed that previous studies that linked gender diversity and EM were based on the agency theory. However, their study tested whether the presence of female board directors affects EM depending on human capital theory and agency theory by considering the demographic attributes such as female directors' education, experience and skills. The findings revealed that the female directors and female CEOs eliminate EM practices. Also, the study showed that in order for female directors to be effective monitors on corporate boards, they should have a membership in the audit committee and business experience. At the same year, [86] found a significant negative effect of female board directors on ABM practices level. [12] also used a French sample and found a negative relationship between CEO gender and ABM. Overall, despite the increasing number of studies that linked board gender diversity with EM practices across the globe, the above inconsistent findings leave a question of whether gender diversity at the corporate boards can influence different EM practices. Moreover, the above studies' findings cannot be generalized since most of the studies concentrated on a specific country with exception to few studies e.g. [20, 22, 107]. In addition, the majority of previous studies focused on ABM by applying different models to measure the discretionary accruals [4, 28, 100] Moreover, although ABM studies were active across the regions, and the number of REM studies have been increasing recently and more attention is needed with regards to the association between gender diversity and CS.

3   Conclusion and Future Studies

The research findings related to the relationship between EM and gender diversity are still inconclusive. This inconsistency of findings can be due to a number of factors. First, most of the prior studies measured gender diversity simply using their percentage, presence or number and assumed that all women behave the same way, however, individual differences of women could reflect in behaving differently depending on their age, knowledge, experience, position and attributes [66, 68, 71, 74, 81, 83]. [54] argued that a major limitation in the accounting and gender diversity studies is focusing on female directors' dummy variables and ignored the other important characteristics of female directors such as age, education, background and experience which may strongly influence their behaviour aside from gender issue only. However, the focus on female presence only is expected because the initiatives toward enhancing the representation of female directors focus on their number and do not highlight other characteristics aspects. A French study by [3] investigated the relationship between female directors' attributes with EM. The study showed that certain demographic attributes can influence EM. However, this study was conducted in France and used ABM as EM proxy only. In addition, the dominant theory in the previous studies to explain the association between female board directors and EM practices is agency theory which assumes that statutory diversity is enough to reduce the agency conflict between shareholders and managers [33]. However, [17] argued that agency theory focused on statutory diversity which is not enough to explain the association between board diversity and firms' outcomes. [18, 24, 27, 29, 30, 94, 95] argued that agency theory ignores the fact that board of directors should have diverse skills to practice their responsibilities effectively. Recent studies claimed that statutory and demographic complement each other in enhancing board functioning [7]. As stated by [7], in order for statutory diversity to influence board effectiveness, directors' individual characteristics should be taken into consideration. In addition, in order to detect EM practices, it requires specific capabilities other than just the gender of the board director. It can be clearly noticed that the majority of above-mentioned studies focused on ABM only, while few studies focused on REM and CS. However, focusing on one type of EM would provide an incomplete picture of the relationship between female directors and EM because managers use all opportunistic EM practices to influence firms' earnings [2, 5, 10, 35, 57, 88, 106].

The rationale behind the importance of considering the three EM types in any study is because recent studies concurred that managers tend to use different EM practices to influence firms' earnings at the same time, therefore, As stated by [62] investigating one EM method fails to capture the overall effect of board gender diversity. In fact, there is a general agreement in the literature regarding that managers are more likely to use ABM, REM and CS practices as substitutes according to their costs and constrains. In particular, studies confirmed that REM and CS are more likely used as substitutes when ABM is restricted and because it is more costly compared to the other methods [2, 5, 35, 57, 106] Therefore, future studies should focus more on including different types of EM in order to better understand the relationship between female directors and EM. Besides, including female directors' attributes is important to understand exactly

the attributes that are related to improving women monitoring skills. Studies should also focus on female directors' proportion (i.e., critical mass) rather their percentage to know the impact of female director's proportion on board. Studies can also investigate the relationship between female directors and different types of CS such as revenue misclassification [63].

References

1. Faccio, M., Marchica, M.T., Mura, R.: CEO gender, corporate risk-taking, and the efficiency of capital allocation. J. Corp. Finan. **39**, 193–209 (2016)
2. Abernathy, J.L., Beyer, B., Rapley, E.T.: Earnings management constraints and classification shifting. J. Bus. Financ. Acc. **41**(5–6), 600–626 (2014)
3. Gull, A.A., Nekhili, M., Nagati, H., Chtioui, T.: Beyond gender diversity: how specific attributes of female directors affect earnings management. Br. Account. Rev. **50**(3), 255–274 (2018)
4. McNichols, M.: Discussion of the quality of accruals and earnings: The role of accrual estimation errors. Account. Rev. **77**(s-1), 61–69 (2002)
5. Anagnostopoulou, S.C., Tsekrekos, A.E.: The effect of financial leverage on real and accrual-based earnings management. Account. Bus. Res. **47**(2), 191–236 (2016)
6. Hillman, A.J., Cannella Jr., A.A., Harris, I.C.: Women and racial minorities in the boardroom: How do directors differ? J. Manag. **28**(6), 747–763 (2002)
7. Ben-Amar, W., Francoeur, C., Hafsi, T., Labelle, R.: What makes better boards? A closer look at diversity and ownership. Br. J. Manag. **24**(1), 85–101 (2013)
8. Commerford, B.P., Hermanson, D.R., Houston, R.W., Peters, M.F.: Auditor sensitivity to real earnings management: the importance of ambiguity and earnings context. Contemp. Account. Res. **36**(2), 1055–1076 (2019)
9. Orjinta, H.I.: Corporate board and classification shifting of earnings management. ISSN: 26352958 (2018). https://www.zbw.eu/econisarchiv/bitstream/handle/11159/4406/1695827821.pdf?sequence=1
10. Athanasakou, V., Strong, N.C., Walker, M.: The market reward for achieving analyst earnings expectations: does managing expectations or earnings matter? J. Bus. Financ. Acc. **38**(1–2), 58–94 (2011)
11. Debnath, P., Roy, C.: Gender diversity in corporate governance and earnings management: an Indian panorama. J. Gujarat Res. Soc. **21**(3), 31–44 (2019)
12. Belot, F., Serve, S.: Earnings quality in private SMEs: do CEO demographics matter? J. Small Bus. Manage. **56**(sup1), 323–344 (2018)
13. Abdou, H.A., Ellelly, N.N., Elamer, A.A., Hussainey, K., Yazdifar, H.: Corporate governance and earnings management nexus: evidence from the UK and Egypt using neural network. Int. J. Finance Econ. (2020, forthcoming)
14. Bhuiyan, M.B.U., Rahman, A., Sultana, N.: Female tainted directors, financial reporting quality and audit fees. J. Contemp. Account. Econ. **16**(2), 100189 (2020)
15. Peni, E., Vahamaa, S.: Female executives and earnings management. Manag. Finance **36**(7), 629–645 (2010)
16. Arun, T.G., Almahrog, Y.E., Aribi, Z.A.: Female directors and earnings management: evidence from UK companies. Int. Rev. Financ. Anal. **39**, 137–146 (2015)
17. Carter, D.A., Simkins, B.J., Simpson, W.G.: Corporate governance, board diversity, and firm value. Financ. Rev. **38**, 33–53 (2003)

18. Adams, R.B., Funk, P.: Beyond the glass ceiling: does gender matter? Manage. Sci. **58**(2), 219–235 (2012)
19. Charness, G., Gneezy, U.: Strong evidence for gender differences in risk taking. J. Econ. Behav. Organ. **83**, 50–58 (2012)
20. Chen, G., Crossland, C., Huang, S.: Female board representation and corporate acquisition intensity. Strateg. Manag. J. **37**(2), 303–313 (2016)
21. Gunny, K.: What are the consequences of real earnings management? Working paper, University of Colorado 2005
22. Kyaw, K., Olugbode, M., Petracci, B.: Does gender diverse board mean less earnings management? Financ. Res. Lett. **14**, 135–141 (2015)
23. Chi, W., Lisic, L.L., Pevzner, M.: Is enhanced audit quality associated with greater real earnings management? Account. Horiz. **25**(2), 315–335 (2011)
24. Al-Sartawi, A.: Information technology governance and cybersecurity at the board level. Int. J. Crit. Infrastruct. **16**(2), 150–161 (2020)
25. Croson, R., Gneezy, U.: Gender differences in preferences. J. Econ. Lit. **47**(2), 448–474 (2009)
26. De Cabo, R.M., Gimeno, R., Nieto, M.J.: Gender diversity on European banks' boards of directors. J. Bus. Ethics **109**(2), 145–162 (2012)
27. Arioglu, E.: Female Directors and Earnings Management: Director Characteristics and Affiliation. Available at SSRN 3291150 (2019)
28. Dechow, P.M., Sloan, R.G., Sweeney, A.P.: Detecting earnings management. Account. Rev. **70**(2), 193–225 (1995)
29. Joecks, J., Pull, K., Vetter, K.: Gender diversity in the boardroom and firm performance: what exactly constitutes a "critical mass? J. Bus. Ethics **118**(1), 61–72 (2013)
30. Al-Sartawi, A.: The effect of corporate governance on the performance of the listed companies in the gulf cooperation council countries. Jordan J. Bus. Adm. **11**(3), 705–725 (2015)
31. Doidge, C., Andrew Karolyi, G., Stulz, R.M.: Why do countries matter so much for corporate governance? J. Financ. Econ. **86**(1), 1–39 (2007)
32. Allemand, I., André, P., Brullebaut, B., Schatt, A.: Women Involved in the Financial Reporting Process and Financial Reporting Quality. Available at SSRN 3009375 (2017)
33. Fama, E.F., Jensen, M.C.: Separation of ownership and control. J. Law Econ. **26**, 319–337 (1983)
34. Alfonso, E., Cheng, C.A., Pan, S.: Income classification shifting and mispricing of core earnings. J. Account. Audit. Finance 0148558X15571738 (2015)
35. Fan, Y., Barua, A., Cready, W.M., Thomas, W.B.: Managing earnings using classification shifting: evidence from quarterly special items. Account. Rev. **85**(4), 1303–1323 (2010)
36. Lakhal, F., Aguir, A., Lakhal, N., Malek, A.: Do women on boards and in top management reduce earnings management? Evidence in France. J. Appl. Bus. Res. (JABR) **31**(3), 1107–1118 (2015)
37. Fan, Y., Jiang, Y., Zhang, X., Zhou, Y.: Women on boards and bank earnings management: From zero to hero. J. Bank. Finance **107**, 105607 (2019)
38. Galdi, F.C., Johnson, E.S., Myers, J.N., Myers, L.A.: Accounting for Inventory Costs and Real Earnings Management Behavior. Available at SSRN 3480492 (2019)
39. García Lara, J.M., García Osma, B., Mora, A., Scapin, M.: The monitoring role of female directors over accounting quality. J. Corp. Finan. **45**, 651–668 (2017)
40. Musleh Al-Sartawi, A.M.A. (ed.): The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. SCI, vol. 974. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-73057-4

41. Garcia Osma, B.: Board independence and real earnings management: the case of R&D expenditure. Corp. Gov.: Int. Rev. **16**(2), 116–131 (2008)
42. Abdullah, S.N., Ismail, K.N.I.K.: Women directors, family ownership and earnings management in Malaysia. Asian Rev. Account. **24**, 525–550 (2016)
43. Zalata, A.M., Roberts, C.: Managing earnings using classification shifting: UK evidence. J. Int. Account. Audit. Tax. **29**, 52–65 (2017)
44. Green, C.P., Homroy, S.: Female directors, board committees and firm performance. Eur. Econ. Rev. **102**, 19–38 (2018). https://doi.org/10.1016/j.euroecorev.2017.12.003
45. Francis, B., Hasan, I., Park, J.C., Wu, Q.: Gender differences in financial reporting decision making: evidence from accounting conservatism. Contemp. Account. Res. **32**(3), 1285–1318 (2015)
46. Guedes, M.J., Gaio, C., Soares, N.: Exploring the relationship between gender diversity and earnings management: does critical mass matter. In: International Conference on Gender Research, pp. 181–188. Academic Conferences International Limited, April 2018
47. Haw, I.M., Ho, S.S., Li, A.Y.: Corporate governance and earnings management by classification shifting. Contemp. Account. Res. **28**(2), 517–553 (2011)
48. Zalata, A.M., Tauringana, V., Tingbani, I.: Audit committee financial expertise, gender, and earnings management: does gender of the financial expert matter? Int. Rev. Financ. Anal. **55**, 170–183 (2018)
49. Debnath, N., Patnaik, B., Satpathy, I.: Female directorship and real earnings management in Bangladesh: towards an analytical assessment. Manag. Sci. Lett. **9**(11), 1723–1740 (2019)
50. Ho, L.C.J., Liao, Q., Taylor, M.: Real and accrual-based earnings management in the pre- and post-IFRS periods: evidence from China. J. Int. Financ. Manag. Acc. **26**(3), 294–335 (2015)
51. Osma, B.G.: Board independence and real earnings management: the case of R&D expenditure. Corp. Gov. Int. Rev. **16**(2), 116–131 (2008)
52. Sanad, Z., Al-Sartawi, A.: Financial statements fraud and data mining: a review. In: Musleh Al-Sartawi, A.M., Razzaque, A., Kamal, M.M. (eds.) EAMMIS 2021. LNNS, vol. 239, pp. 407–414. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-77246-8_38
53. Jianakoplos, N.A., Bernasek, A.: Are women more risk averse? Econ. Inq. **36**(4), 620–630 (1998)
54. Khlif, H., Achek, I.: Gender in accounting research: a review. Manag. Audit. J. **32**(6), 627–655 (2017)
55. Kim, H.A., Jeong, S.W., Kang, T., Lee, D.: Does the presence of female executives curb earnings management? Evidence from Korea. Aust. Account. Rev. **27**(4), 494–506 (2017)
56. Deszo, C.L., Ross, D.G.: Does female representation in top management improve firm performance? Strateg. Manag. J. **33**(9), 1072–1089 (2012)
57. Zang, A.: Evidence on the trade-off between real activities manipulation and accrual-based earning management. Account. Rev. **87**(2), 675–703 (2012)
58. Krishnan, G.V., McDermott, J.B.: Earnings management and market liquidity. Rev. Quant. Financ. Acc. **38**, 257–274 (2012)
59. Al-Sartawi, A.: Institutional ownership, social responsibility, corporate governance and online financial disclosure. Int. J. Crit. Account. **10**(3/4), 241–255 (2018)
60. Leuz, C., Nanda, D., Wysocki, P.D.: Earnings management and investor protection: an international comparison. J. Financ. Econ. **69**(3), 505–527 (2003). https://doi.org/10.1016/S0304-405X(03)00121-1
61. Poonawala, S.H., Nagar, N.: Gross profit manipulation through classification shifting. J. Bus. Res. **94**, 81–88 (2019)
62. Luo, J.H., Xiang, Y., Huang, Z.: Female directors and real activities manipulation: evidence from China. China J. Account. Res. **10**(2), 141–166 (2017)

63. Malikov, K., Manson, S., Coakley, J.: Earnings management using classification shifting of revenues. Br. Account. Rev. **50**(3), 291–305 (2018)
64. Singh, V., Terjesen, S., Vinnicombe, S.: Newly appointed directors in the boardroom: how do women and men differ? Eur. Manag. J. **26**(1), 48–58 (2008)
65. McVay, S.E.: Earnings management using classification shifting: an examination of core earnings and special items. Account. Rev. **81**(3), 501–531 (2006)
66. Orazalin, N.: Board gender diversity, corporate governance, and earnings management. Gend. Manag.: Int. J. (2019)
67. Panzer, L., Müller, S.: Earnings quality and gender diversity on German supervisory boards: an empirical analysis. Probl. Perspect. Manag. **13**(4), 9–18 (2015)
68. Pavlovic, V., Knezevic, G., Bojicic, R.: Board gender diversity and earnings management in agricultural sector-Does it have any influence? Custos E Agronegocio On Line **14**, 340–363 (2018)
69. Peasnell, K.V., Pope, P.F., Young, S.: Detecting earnings management using cross-sectional abnormal accruals models. Account. Bus. Res. **30**(4), 313–326 (2000)
70. Sanad, Z., Al-Sartawi, A.: Investigating the relationship between corporate governance and internet financial reporting (IFR): evidence from Bahrain Bourse. Jordan J. Bus. Admi. **12**(1), 239–269 (2016)
71. Reguera-Alvarado, N., de Fuentes, P., Laffarga, J.: Does board gender diversity influence financial performance? Evidence from Spain. J. Bus. Ethics **141**(2), 337–350 (2017)
72. Saona, P., Muro, L., Alvarado, M.: How do the ownership structure and board of directors' features impact earnings management? The Spanish case. J. Int. Financ. Manag. Acc. **31**(1), 98–133 (2020)
73. Waweru, N.M., Prot, N.P.: Corporate governance compliance and accrual earnings management in Eastern Africa: evidence from Kenya and Tanzania. Manag. Audit. J. **33**(2), 171–191 (2018)
74. Seierstad, C., Opsahl, T.: For the few not the many? The effects of affirmative action on presence, prominence, and social capital of women directors in Norway. Scand. J. Manag. **27**(1), 44–54 (2011)
75. Pucheta-Martínez, M.C., Bel-Oms, I., Olcina-Sempere, G.: Corporate governance, female directors and quality of financial information. Bus. Ethics: Eur. Rev. **25**(4), 363–385 (2016)
76. Alansari, Y., Al-Sartawi, A.: IT governance and E-banking in GCC listed banks. Procedia Comput. Sci. **183**, 844–848 (2021)
77. Sila, V., Gonzalez, A., Hagendorff, J.: Women on board: does boardroom gender diversity affect firm risk? J. Corp. Finan. **36**, 26–53 (2016)
78. Zalata, A.M., Ntim, C.G., Choudhry, T., Hassanein, A., Elzahar, H.: Female directors and managerial opportunism: monitoring versus advisory female directors. Leadersh. Q. **30**(5), 101309 (2019)
79. Sun, N., Salama, A., Hussainey, K., Habbash, M.: Corporate environmental disclosure, corporate governance and earnings management. Manag. Audit. J. **25**(7), 679–700 (2010). https://doi.org/10.1108/02686901011061351
80. Susanto, Y.K., Pradipta, A.: Corporate governance and real earnings management. Int. J. Bus. Econ. Law **9**(1), 17–23 (2016)
81. Al-Sartawi, A., Al-Rawahi, F., Sanad, Z.: Board characteristics and the level of compliance with IAS 1 in Bahrain. Int. J. Manag. Financ. Account. **9**(4), 303–321 (2017)
82. Terjesen, S., Sealy, R.: Board gender quotas: exploring ethical tensions from a multi-theoretical perspective. Bus. Ethics Q. **26**(1), 23–65 (2016)

83. Hannoon, A., Abdalla, Y.A., Musleh Al-Sartawi, A.M.A., Khalid, A.A.: Board of directors composition and social media financial disclosure: the case of the United Arab Emirates. In: Musleh Al-Sartawi, A.M.A. (ed.) The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. SCI, vol. 974, pp. 229–241. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-73057-4_18

84. Shen, C.H., Chih, H.L.: Earnings management and corporate governance in Asia's emerging markets. Corp. Gov.: Int. Rev. **15**(5), 999–1021 (2007). https://doi.org/10.1111/j.1467-8683.2007.00624.x

85. Thiruvadi, S., Huang, H.W.: Audit committee gender differences and earnings management. Gend. Manag.: Int. J. **26**(7), 483–498 (2011)

86. Triki Damak, S.T.: Gender diverse board and earnings management: evidence from French listed companies. Sustain. Account. Manag. Policy J. (2018)

87. Tyrowicz, J., Terjesen, S., Mazurek, J.: All on board? New evidence on board gender diversity from a large panel of European firms. Eur. Manag. J. **38**, 634–645 (2020)

88. Shihadeh, F.: Online payment services and individuals' behaviour: new evidence from the MENAP. Int. J. Electron. Bank. **2**(4), 275–282 (2020)

89. Usman, M., Zhang, J., Wang, F., Sun, J., Makki, A.M.M.: Gender diversity in compensation committees and CEO pay: evidence from China. Manag. Decis. **56**(5), 1065–1087 (2018). https://doi.org/10.1108/MD-09-2017-0815

90. Virtanen, A.: Women on the boards of listed companies: evidence from Finland. J. Manage. Governance **16**(4), 571–593 (2012)

91. Watson, J., McNaughton, M.: Gender differences in risk aversion and expected retirement benefits. Financ. Anal. J. **63**(4), 52–62 (2007)

92. Vladu, A.B., Cuzdriorean, D.D.: Detecting earnings management: insights from the last decade leading journals published research. Procedia Econ. Finance **15**, 695–703 (2014)

93. Volonté, C., Gantenbein, P.: Directors' human capital, firm strategy, and firm performance. J. Manage. Governance **20**(1), 115–145 (2014). https://doi.org/10.1007/s10997-014-9304-y

94. Wahid, A.S.: The effects and the mechanisms of board gender diversity: evidence from financial manipulation. J. Bus. Ethics **159**(3), 705–725 (2019)

95. Al-Sartawi, A.: Corporate governance and intellectual capital: evidence from gulf cooperation council countries. Acad. Account. Financ. Stud. J. **22**(1), 1–12 (2018)

96. Wang, Y., Campbell, M.: Corporate governance, earnings management, and IFRS: empirical evidence from Chinese domestically listed companies. Adv. Account. **28**(1), 189–192 (2012). https://doi.org/10.1016/j.adiac.2012.03.007

97. Gupta, M., Sikarwar, T.S.: Modelling credit risk management and bank's profitability. Int. J. Electron. Bank. **2**(2), 170–183 (2020)

98. Al-Sartawi, A.: Ownership structure and intellectual capital: evidence from the GCC countries. Int. J. Learn. Intellect. Cap. **15**(3), 277–291 (2018)

99. Siregar, S.V., Utama, S.: Type of earnings management and the effect of ownership structure, firm size, and corporate-governance practices: evidence from Indonesia. Int. J. Account. **43**(1), 1–27 (2008). https://doi.org/10.1016/j.intacc.2008.01.001

100. Kothari, S.P., Leone, A.J., Wasley, C.E.: Performance matched discretionary accrual measures. J. Account. Econ. **39**(1), 163–197 (2005)

101. Skousen, C., Sun, L., Wu, K.: The role of managerial ability in classification shifting using discontinued operations'. Adv. Manag. Account. **31**, 113–131 (2019)

102. Wei, C.Y., Chen, L.: Altruistic behaviors in family firm CEO replacement: a study based on asset impairment. Manag. World (3), 137–150 (2015)

103. Zalata, A., Roberts, C.: Internal corporate governance and classification shifting practices: an analysis of UK corporate behavior. J. Acc. Audit. Financ. **31**(1), 51–78 (2016)

104. Al-Sartawi, A., Sanad, Z.: Institutional ownership and corporate governance: evidence from Bahrain. Afro-Asian J. Finance Account. **9**(1), 101–115 (2019)
105. Chauhan, N., Tekta, P.: Fraud detection and verification system for online transactions: a brief overview. Int. J. Electron. Bank. **2**(4), 267–274 (2020)
106. Zhu, T., Lu, M., Shan, Y., Zhang, Y.: Accrual-based and real activity earnings management at the back door: evidence from Chinese reverse mergers. Pac. Basin Financ. J. **35**, 317–339 (2015)
107. Saona, P., Muro, L., San Martín, P.: Board of director gender diversity and its impact on earnings management: an empirical analysis for selected European firms. In: 31st Australasian Finance and Banking Conference, June 2018
108. Blau, P.M.: Inequality and Heterogeneity. Free Press, New York (1977)

Factor Affecting Environmental Enforcement Effectiveness: A Critical Review

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Abstract. The study aims to review the existing challenges and shortcoming of environmental compliance and enforcement systems and identify the factors hindering their effectiveness. Various factors were identified from the literature that hinder the effectiveness of environmental compliance and enforcement systems. The weak institutional capacity and commitment, lack of clear authority, inadequate collaboration and coordination including civic engagement, weakened understanding of environmental laws and regulations. Some of the previously identified factors affecting the effectives of environmental compliance and enforcement systems were either incorporated in the 5 discussed issues or excluded from the discussion.

Keywords: Environmental · Enforcement · Compliance

1 Introduction

Previous research has found that sufficient level of enforcement is vital, given that it compels persons and groups to adhere to the right standards of development and such include good governance and consider as part of the social responsibility [1–3, 11, 13, 17]. The research purports that acceptable degree of enforcement has become of central importance in both the developing and the well-established nations given that the issue of climate change is threatening the environment at a distressing rate. This has come despite the fact that a massive system of national and international laws, treaties, and agreements exist [13, 17]. Macrory [10] and Jones [7] indicated that there might be a series of factors that contributes towards the ineffective nature of the current policy system in curbing the detrimental results of climate change on the environment. Nonetheless, the researcher found out that deficient compliance and enforcement are of the most important. UNEP [21] purported that the current national legal systems only exists on "the books." The agency added that such legislation is not of any meaning when it comes to the fight against carbon emission and climate change in an attempt to protect the environment. [23], on his part, purports that an effective environmental regulatory system is largely dependent on the enforcement system.

2   Existing Literature

Various factors affect the effectiveness of environmental compliance and enforcement. Ijaiya and Joseph [6] documented that inadequacies of penalties and punishment along with the lack of clear authority directly responsible for enforcement are the primary factors affecting the enforcement of the current regulations. While B. J. Preston Chief Judge [19] acknowledged these issues as well, the scholar voiced that inadequate collaboration and coordination, insufficient circulation and sharing of information, and weakened understanding of environmental laws and regulations has contributed significantly towards ineffective environmental protection law enforcement. Other chief contributors were identified as commitment without proper enforcement, inadequate incorporation of international laws into the local legal system, corruption, lack of specialized courts and understanding of the ecological laws by judiciary systems, few civil suits, and the lack of necessary resources are critical hindrances to optimal enforcement [3, 8, 11, 14]. The enforcement regime has to emphasize on cooperation among governments, the private sector, and the individual citizens [23].

From Previous research several factors were identified to affect the compliance and enforcement of current environmental policies implementation. The factors identified were those pertaining to the direct enforcement process and institutions directly involved. The external factors affecting the effectiveness of environmental compliance and enforcement such as socioeconomic and legislative factors were not discussed. The following section will discuss some of these factors identified in more detail.

1. weak institutional capacity
2. weak legal systems
3. inadequate fines and penalties
4. corruption
5. lack of clear authority directly responsible for enforcement
6. inadequate collaboration and coordination
7. inadequate civic engagement
8. insufficient circulation and sharing of information
9. weakened understanding of environmental laws and regulations
10. inadequate incorporation of international laws into the local legal system
11. lack of specialized courts and civil suits

For the purpose of this review the factors affecting environmental compliance and enforcement will be categorized and discussed in 5 sections: weak institutional capacity and commitment, lack of clear authority, inadequate collaboration and coordination including civic engagement, weakened understanding of environmental laws and regulations. Some of the previously identified factors affecting the effectives of environmental compliance and enforcement systems were either incorporated in the 5 discussed section or excluded from the discussion.

2.1   Weak Institutional Capacity and Commitment

Creating institutional capacity is essential to achieve successful legislation [3, 11, 14, 20, 21]. Weak and uncommitted environmental institutions result in noncompliance.

Institutions which are incapable of effective monitoring, inspection, prosecution, and deterrence of environmental violations can result in the belief by the regulated entities that violations may go unpunished, resulting in noncompliance by some. This is applicable to all related entities involved in environmental compliance and enforcement [8]. This lack of strength and commitment often results in the decline of a natural resources, environmental degradation, and increased crime and corruption [20]. The lack compliance is an indicator of the state of commitment and seriousness of government and institutions to enforce environmental laws and regulations [21].

The allocation of adequate resources such as funding and human resources is major factor affecting the institution's capacity, being government, public, or private. No institute can function effectively without proper and sufficient resources [3, 14]. Although initial investment is essential in determining the institution's capacity, it also requires further continuous commitment to ensuring long term capacity and effective operations through proper training and development of human resources as well as allocating sufficient resources and manpower [21]. Quality and efficiency of human resources is crucial to the institute's capacity. No institute can function efficiently without the availability of highly qualified and trained personnel. "People are the heart of any institution, and institutions are only as capable as their staff." [21]. Recruitment of highly qualified staff and providing them with proper incentives and tools to ensure better performance is essential to the effective building of institution capacity. Also, to enhance resource allocation and quality both personnel and the institute should be provided with clear mandates [10, 11, 16].

2.2 Weak and Uncommitted Legal System

This can range from the legislative strength to the amount of resource available to ensure environmental compliance and enforcement. International protocols and national legal strategies also have a significant impact on the effectivness environmental law enforcement. In this regard, the strength of the legal system of the state plays a huge role in environmental law compliance and enforcement [3, 5]. Ijaiya and Joseph [6] also find that inadequacies of penalties and punishment. In localities with strong legal systems, the stipulated environmental laws are followed strictly. For instance, practices that adhere to pollution regulations and strive to be aligned with the law of the region. This type of structure is mostly seen in developed nations that take environmental conservation seriously. Additionally, in such countries, there exist high numbers of environmental activists who lobby for best practices. This pushed sustainable practices to be on the rise. On the other hand, in nations where the legal system is relatively weak, the inaction of set environmental laws is often challenged. For instance, in India, there are a number of legislation and Acts that support sustainable living [5]. Nonetheless, the environmental issue in the country is in a wary condition. This is because of the continued high rates of pollution, which is highly contributed to by continued emission of dangerous and untreated gases from factories. Additionally, deforestation is prevalent with the ineffective protection of wildlife. This provides proof that there is ineffectual enforcement of set environmental laws. Some of the factors that contribute to such a condition are high rates of corruption, the ineffective legal system,

and availability of capitalists who are highly driven by profits over the protection of the environment and people [5].

Other factors within the legal system is the inadequate incorporation of international laws into the local legal system [11, 14]. The level of political commitment and adoption of the international laws can be a hindering factor to the not only the international environmental effort but the national effort as well [21]. The integration of these laws into the national or local legal systems help create a unified effort that is transparent and measurable.

Also the is the factor of lack of specialized courts and civil suits [14]. The availability of specialized environmental courts that have a clear understanding of environmental laws and the impacts of environmental crime and degradation helps achieve effective results in ensuring compliance through strong deterrence of environmental crimes and violations. Through fair and strong prosecution of violators the institutions capacity is increased because of the rise of integrity of the institutions involved in environmental compliance and enforcement and effective deterrence [21]. The integrity of the institution is a detriment factor of the institution's capacity. Trust and accountability are key factors influencing public prepetition and involvement in the compliance and enforcement process [14]. Civil suits also increase the accountability of the institutions and increase public involvement in compliance and enforcement, especially with the availability of institutes with high integrity. Also, it can aid in reducing the pressure on enforcement institutions by spreading the responsibility across a wider range on entities to achieve effective compliance and enforcement of environmental laws and regulations [14, 19, 21].

2.3   Lack of Clear Authority

Effective environmental compliance and enforcement requires institution involved in environmental protection to have clear and transparent mandates, including their authority and jurisdiction. This enables the institutions to focus on enforcement efforts [20]. The lack of clear authority and mandates is one of the primary factors responsible for inadequate enforcement of the current regulations [6, 8].

Many countries lack clear environmental authority and confusion of roles because of the too many agencies are involved in environmental compliance and enforcement. This results in either regulatory overlap or underlap. Regulatory overlap occurs when several entities have authority, resulting in potential competition and conflict between institutes and confusion to the regulated community. Regulatory underlap occurs if there is no clear authority for institutions, resulting in an orphan issue or cause for which there is no effective government oversight [21].

Nemesio [10] purports that effective environmental protection and enforcement requires a central entity with an exclusive mandate to promote and ensure environmental goals are achieved. While also acknowledging that too much centralization can result in failure of enforcement because of the inability to tailor strategies and policies to specific regions or situations. Popa et al. [18] also find that the position of the central authority has influence on the forest inspector's intention to engage in forest law enforcement. While some researchers find centralization of environmental institutes effective others find a more decentralization approach is more effective. Zhang [22] in

the study on centralized approach to pollution control in China finds that due to the many challenges of the centralized approach such as data verification and trust the centralized enforcement approach is arguably ineffective addressing ineffective policy implementation. The adoption of authority and approach should be specific and applicable to the countries and regions characteristics and structure [11, 14, 21, 22].

2.4   Inadequate Collaboration and Coordination Including Civic Engagement

The issue of climate change and environmental degradation is threatening the environment at a distressing rate, despite the fact that a massive system of national and international laws, treaties, and agreements exist [13, 17]. Macrory [10] and Jones [7] indicated that there might be a series of factors that contributes towards the ineffective nature of the current policy system in curbing the detrimental results of climate change on the environment. Collaborative measures in the environmental policy implementation to be one of them. The enforcement regime has to emphasize on cooperation among governments, the private sector, and the individual citizens [3, 11, 23]. Inadequate collaboration and coordination, insufficient circulation and sharing of information, and weakened understanding of environmental laws and regulations has contributed significantly towards ineffective environmental protection law enforcement [3, 8, 11, 19].

Various researchers have indicated that collaborative approaches have positive impact on environmental policy implementation. Newig and Fritsch [12] state that "There is no denial that public participation *can* contribute to deliver effective, legitimate and efficient environmental policies in a multi-level context." They also acknowledged that current international and European Union environmental policies increasingly promote collaborative and participatory decision-making on appropriate and multiple governance levels as a means to attain more sustainable policies and a more effective and lasting policy implementation. Koontz and Newig [9] indicate that inclusion of multiple stakeholders and sources of information which are participatory approaches are expected to be solutions to addressing challenging environmental problems. Ubiquitous crowdsourcing and participatory sensing solutions lend themselves not only to monitoring the state of the physical world (e.g., measure pollution levels) but can at the same time also contribute to raising people's awareness of the issues at hand. Therefore, the motivation for collaboration in pollution assessment is twofold [9].

Within the issue of inadequate collaboration and coordination lies the issue on insufficient circulation and sharing of information between all related entities. The degree of information circulation and sharing between related entities was found to hinder the collaboration and coordination process as well as the environmental compliance and enforcement process as a whole. Various studies identified this factor to impact the efficiency of environmental compliance and enforcement [8, 14, 19, 21]. All the previous studies find that Information should be transparent and accessible by all the stakeholders including the public. This can aid in ensuring the accountability of all parties involved as well as increase the integrity of the institutions which should lead to increased trust and public participation.

2.5   Weakened Understanding of Environmental Laws and Regulations

The knowledge and understanding of legislation ranges from the general public's knowledge and understanding of the legislations to the enforcers and judiciary entities knowledge and understanding of the legislations. Various researcher found weakened understanding of environmental laws and regulations were major factors resulting in inadequate environmental enforcement and compliance [1, 7, 14, 19]. Giles [4] studied the next generation compliance program initiated by the EPA and finds that one of the reasons the water pollution of secondary sewage plants was successful in reducing pollution was because of the legislation and regulation had unambiguous rules to every plant which made it clear what the rules of the road are. That helped the related entities get a clear understanding and knowledge legislations and of the required practices and level of compliance with minimal regulatory intervention which in turn made it easier for environmental enforcement to monitor and enforce the regulations with minimal resources. Popa et al. [15] also found that unsuited regulation affected the behavioral intention of the newly formed Forest Inspectorates in Romania. The study used the Theory of Planned Behavior to investigate the intention of forest inspectors to engage in forest law enforcement. They also find the effect of ambiguity on behavioral intention since they state the very descriptive legislation can be a source of bureaucracy.

3   Findings and Discussion

Despite the fact that massive systems of national and international laws, treaties, and agreements exist, compliance assurance and enforcement are essential to international and national environmental organizations to achieve their goals, given that it compels persons and groups to adhere to the right standards of development and such include good governance [3, 13, 17]. Various factors have been found to contribute to the ineffective nature of the current policy system in tackling environmental issues, deficient compliance and enforcement were found to be one of the most significant [3, 7, 9, 11]. The study identified various factors affecting environmental compliance and enforcement. The five main factors were weak institutional capacity and commitment, weak and uncommitted legal systems, lack of clear authority, inadequate collaboration and coordination including civic engagement, weakened understanding of environmental laws and regulations.

Addressing the issues identified by the research to hinder the current environmental policy system can have an effect on the effectiveness of current compliance and important systems. The issues identified by the research have to be kept in mind by policymakers, decision-makers, and management when tailoring or adopting compliance and enforcement plans and systems. Some issues can be resolved by lower-level decision makers such as the related entities involved in compliance and enforcement. For example, information sharing coordination and collaboration can be increased by certain organization agreements between the entities. While other issues require higher-level decisions such as the forming of a more specialized environmental courts and increasing institutional capacities. The identification and investigation of the issues

hindering environmental compliance and enforcement can give both researchers and practitioners increased knowledge and understanding on the issue at hand. This knowledge is useful to further study these factors and to devise solutions to deal with these factors to enhance the effectiveness of the environmental compliance and enforcement systems.

The limitations of the study were that the factors reviewed were mostly internal factors within the institutions and related entities, the other factors that are considered external such as culture and legislation characteristics were not reviewed in detail. Also, the research studied factors in the general context rather than to specific regions or characteristics. Future research is essential to further knowledge and understanding of effectiveness of environmental compliance and enforcement systems to ensure these systems are effective in dealing with increased environmental degradation. Especially in identifying and investigating factors from different regions or domains which may have unique characteristics as well as including the external factors affecting environmental compliance and enforcement.

References

1. Al-Sartawi, A.: Does it pay to be socially responsible? Empirical evidence from the GCC countries. Int. J. Law Manag. **62**(5), 381–394 (2020)
2. Al-Sartawi, A.: Assessing the relationship between information transparency through social media disclosure and firm value. Manag. Account. Rev. **18**(2), 1–20 (2019)
3. Giles, J., Grosjean, G., Le Coq, J.F., Huber, B., Le Bui, V., Läderach, P.: Barriers to implementing climate policies in agriculture: a case study from Viet Nam. Front. Sustain. Food Syst. **5**, 439881 (2021)
4. Giles, C.: Next generation compliance: environmental regulation for the modern era. Environ. Energy Law Prog. Harvard Law Sch. (2020)
5. Glicksman, R.L., Paddock, L.C.: Introductory chapter to Elgar encyclopedia of environmental law: decision making in environmental law (2016)
6. Ijaiya, H., Joseph, O.T.: Rethinking environmental law enforcement in Nigeria. Beijing L. Rev. **5**, 306 (2014)
7. Jones, M.: Enforcement of US fisheries laws in the EEZ: an illustration of the value of the coast guard's deepwater missions to the nation and the need to provide it with adequate deepwater resources. Ocean Coast. Law J. **13**, 2 (2016). 4 p.
8. Komaki, K., Fluharty, D.: Options to improve transparency of environmental monitoring governance for polymetallic nodule mining in the Area. Front. Mar. Sci. **7**, 247 (2020)
9. Koontz, T., Newig, J.: From planning to implementation: top-down and bottom-up approaches for collaborative watershed management. Policy Stud. J. **42**(3), 416–442 (2014)
10. Karolak, M., Razzaque, A., Al-Sartawi, A.: E-services and M-services using IoT: an assessment of the Kingdom of Bahrain. In: Musleh Al-Sartawi, A.M.A., Razzaque, A., Kamal, M.M. (eds.) EAMMIS. LNNS, vol. 239, pp. 523–533. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-77246-8_48
11. Macrory, R.B.: Regulation, Enforcement, and Governance in Environmental Law, 464 p. Bloomsbury Publishing, London (2014)
12. Milmanda, B.F., Garay, C.: The multilevel politics of enforcement: environmental institutions in Argentina. Polit. Soc. **48**(1), 3–26 (2020)

13. Munang, R., Mgendi, R.: How smart policies can lessen effects of climate change. Africa Renewal **30**(2), 32–33 (2016)
14. Nemesio, I.V.: Strengthening environmental rule of law: enforcement, combatting corruption, and encouraging citizen suits. Georget. Int. Environ. Law Rev. **27**, 321 (2014)
15. Newig, J., Fritsch, O.: Environmental governance: participatory, multilevel – and effective? UFZ Discussion Papers, GoverNat 8, Helmholtz – Centre for Environmental Research UFZ (2008)
16. Otoo, S., Agapitova, N., Behrens, J.: The capacity development results framework (2009)
17. Paddock, L., Qun, D., Kotze, L.J., Markell, D.L., Markowitz, K.J., Zaelke, D.: Compliance and Enforcement in Environmental Law: Towards More Effective Implementation, 712 p. Edgar Elgar Publishing, London (2011)
18. Popa, B., Niță, M.D., Hălălișan, A.F.: Intentions to engage in forest law enforcement in Romania: an application of the theory of planned behavior. Forest Policy Econ. **100**, 33–43 (2019)
19. Preston, B.J.: Enforcement of Environmental and Planning Laws in New South Wales. Land and Environment Court of NSW. The Law and Sustainability Symposium, University of Southern Queensland Law School and the Australian Center for Sustainable Business and Development, Brisbane (2011)
20. UNEP: Enforcement of Environmental Law: Good Practices from Africa, Central Asia, ASEAN Countries and China. United Nations Environment Programme (2014)
21. UNEP: Environmental Rule of Law: First Global Report. United Nations Environment Programme, Nairobi (2019)
22. Zhang, X.: Implementation of pollution control targets in China: has a centralized enforcement approach worked. China Q. **231**, 749–774 (2017)
23. Zinn, M.D.: Policing environmental regulatory enforcement: cooperation, capture, and citizen suits. 21 Stan. Envtl. L. J. 81, 83 (2012)

Proposed SG Framework in Government Linked Investment Companies: A Study on Permodalan Nasional Berhad

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Abstract. This paper attempts to propose SG Framework (SGF) in Malaysian's Government Linked Investment Companies (GLICs), particularly Permodalan Nasional Berhad (PNB). PNB is essential to the Malaysian economy, while SGF is practiced by the Islamic Financial Institutions (IFIs) in Malaysia to ensure end-to-end *Shariah* compliant process in the business operation of the banks and takaful operators. When PNB holds fatwa from Muzakarah Fatwa Kebangsaan and Fatwa from all states in Malaysia which declared that the investment in Amanah Saham Nasional Bumiputera (ASNB) unit trust funds falls under hukm Harus, PNB should revisit its SG to ensure it is in line with its aspiration, which aims to provide *Shariah* compliant returns to their investors (public). The move should need the supports from all stakeholders as majority of the investors in PNB's Unit Trust Funds, particularly in Amanah Saham Bumiputera (ASB) are muslim, thus demanding for a Shariah compliant dividend is expected. As for the IFIs in Malaysia, the Central Bank of Malaysia requires that all IFIs establish an SGF to ensure their activities comply with Shariah principles.

Keywords: Government Linked Investment Companies · Permodalan Nasional Berhad · SG Framework · Shariah compliance · Islamic finance

1 Introduction

Government Linked Companies (GLCs) and GLICs play their major role in contributing to the enhancement of Malaysian economy. In July 2015, Malaysia was ranked as the eighth most efficient government globally by the World Economic Forum. Malaysia's economic growth and development would not have been successful if the Government Linked Companies Transformation Programme not been initiated in order to transform the Government Linked Companies (28 July 2015) (Putrajaya Committee on GLC high performance, 2015b, p. 9). It was also supported by the secretariats to the Putrajaya Committee on Government Linked Companies High Performance, Tan Sri Dato' Azman Hj. Mokhtar and Mohd Izani Ashari through their statement regarding the Government Linked Companies that have made RM 153.9 billllion worth of domestic investments from FY 2004 to FY 2014 and employed 225,050 Malaysians in 2014 (28 July 2015) [16, 19, 20] This shows that the GLCs (especially GLICs) strongly supports the growth of Malaysian economy especially in

its financial system. In Malaysia, there are several GLICs that can be considered as "giant asset management companies", which have plenty of money to be invested in companies listed in Bursa Malaysia. Examples of these GLICs are Lembaga Tabung Haji (LTH), Employee Provident Fund (EPF), Khazanah Nasional Berhad (Khazanah) and PNB.

In Malaysia, there has been a parallel growth in both conventional and Islamic financial systems. Islamic finance has been taken seriously and included in the Malaysian Financial Sector Blueprint whereby financing based on Islamic principles are expected to grow up to 40% of the total financing in 2020 [3]. This shows that Malaysia is aiming to grow their Islamic finance industry and indirectly increase other Islamic instruments such as Sukuk, Islamic Capital Market (ICM), Takaful and so on. The growth of Islamic finance is evidenced by the increase of Shariah compliant securities and stocks traded in Bursa Malaysia whereby, 76.86% of the securities listed are Shariah compliant [23].

With the growth and progress of the Islamic finance industry, many believe that Islamic finance should not only stopped at the financial institution level as it should extend their capacity to GLICs as they are working in a similar environment with other financial sectors. To be precise, the similarity is appeared when GLICs also takes deposit from public, invests according to their strategic planning and gives return to the stakeholders, which is also called as dividend. The public who represents the Muslim majority in Malaysia expects to receive clean dividend (*halal*), as same as they treat the other financial portfolio. Due to that, Shariah needs to be taken as the top priority in financial activities handled by the GLICs.

Islamic finance is still new to the GLICs, which leads the institution to learn from the established Islamic finance industry such as Islamic banking and takaful. All Islamic banking business activities must comply with regulatory standards and its Shariah requirement set by the Bank Negara Malaysia (BNM) and Securities Commission (SC). The rationale of the compliancy is based on the nature of Islamic institutions; the competition is circulated among Islamic banking industry and conventional banks, which the latter has been in the industry far longer than Islamic banks. Since IFIs need to adhere to Shariah principle that laid out from the Holy Quran and Hadith, it is a challenge for them to balance the practice of Shariah requirements and regulation set by the regulators while providing attractive yields and services in order to compete with the conventional system.

This research focuses on the lack of SG in GLICs specifically PNB, which is the main GLICs in Malaysia. The objective of this research paper is to propose a SG Framework in PNB.

2   Problem Statement

There are no regulatory requirements for GLICs to comply with Shariah requirements in their operations and thus lead to no specific framework to govern the Shariah activities. SGF is governed by IFSA 2013 [3]. On September 2019, BNM has issued a policy document on SG (hereby referred to as SGPD BNM 2019) [4] which is also a continuing effort of the SGF that has been set in 2010 for IFIs. The policy document,

which takes effect from 1st April 2020 aims to further strengthen the effectiveness of SG implementation and reinforce a closer integration of Shariah considerations in business and risk strategies of IFIs.

However, the GLICs were excluded from the obligation of setting up a SGF. These GLICs have their own task in fulfilling the mandate set by the government. Different GLICs were created for different purposes and will carry different mandates set by the government. For examples, LTH was mandated to manage the public's money in helping the Muslims to attain the 5th pillar of Islam which is to perform Hajj (LTH 2017); Kumpulan Wang Persaraan (Diperbadankan) (KWAP) was mandated to assist the Federal Government in funding its pension liability [13, 14]; EPF was mandated to provide the best retirement savings for Malaysians [13, 14]; while PNB was created as an instrument of the Government's New Economic Policy (NEP) [11] that promotes share ownership in the corporate sector among the *Bumiputera* (sons of the soil) [18] Although there was no direct mandate from the government to increase its Shariah compliant investment, it can be assumed that the initiative came from th e institutions themselves.

This research focuses on PNB as it is working in a similar manner with IFIs, whereby it is using public's deposit or investment to invest according to their investment portfolio. The GLICs can be considered as institutions that need to have a strong governance structure. Moreover, banks or financial institutions naturally became the favourite 'hunting ground' for politicians as this group seemed as a fountain of wealth or funds provider [21]. Hence, a proper governance is needed in the financial sector (not to mention IFIs). [22] highlighted that there are issues pertaining corporate governance and political inference whereby the GLICs were used to bail out politically the connected business.

In 2013, the government has introduced the Islamic Financial Services Act (2013) or IFSA whereby it penalises the offenders who breach the Shariah principles with heavy punishment up to RM25 million or/and 8 years imprisonment. According to [17], the IFSA provides a comprehensive legal framework that is in full compliance with Shariah in all aspects of regulation and supervision of the IFIs in Malaysia. Based on the literature available, most of the GLICs are trying to introduce Shariah compliant investment and meet the expectations from the public.

The implication on the absence of Shariah Governance (SG) in IFI is going to be as a disadvantage to the *ummah*. It is about time for the governance of these institutions to uphold all aspects including Shariah compliant and activities as *amanah* in Islam. PNB being the largest asset management house is managing Malaysians investments through its Unit Trust Funds.

3   Government Linked Investment Companies and Shariah Governance

Table 1. The development of SG in Malaysia

Year	Regulation	Description
1983	Islamic Banking Act 1983	Provides the duties and responsibilities of the internal Shariah committee in advising the respective IFIs on Shariah matters (superseded by the SGF for IFIs)
2004	Guidelines on the Governance of the Shariah committee for IFI	Provides specific clauses on Shariah advisory council in the Sections 51 to 58 as well as the power of BNM to issue guidelines on Shariah matters in Section 59
2009	Central Bank of Malaysia Act 2009	Set out the expectation of BNM on SG structures, processes and arrangements, duties and responsibilities of board, management and Shariah committee, as well as Shariah compliance functions to ensure Shariah compliance
2010	SGF for IFIs	Shariah compliance and SG provisions specifically covered under Section 27 to Section 38 of the Act
2013	IFSA 2013	Repeals the Islamic Banking Act 1983 and Takaful Act 1984
2019	Policy Document on SG	Repeals the SGF for IFIs 2013

Looking at the development of SG in Malaysia as per the table above, there has been several initiatives to strengthen the SG over the years. However, looking at the GLICs such as PNB in Malaysia, they are not required to apply the SGF as required to the IFIs. The SGF was introduced by BNM in 2010, (later repealed by the policy document on SG in 2019) and the related IFIs (IFIs) under this framework are the Islamic banks licensed under Islamic Banking Act 1983 (IBA), takaful and retakaful operator registered under the Takaful Act 1984 (TA), financial institutions licensed under the Banking and Financial Institutions Act 1989 (BAFIA) and the development financial institution prescribed under the Development Financial Institutions Act 2002 (DFIA) that participates in the Islamic banking scheme [6]. In the list above, somehow the GLICs are excluded from the obligation of setting up a SGF. Despite of ensuring the operation and business activities are in accordance with Shariah, this framework provides a comprehensive guidance to the board, Shariah committee and management of the IFI in discharging their duties in matters relating to Shariah, by outlining the functions relating to Shariah review, Shariah audit, Shariah risk management, and Shariah research. The new policy document outlines clearly the role of the functions of Shariah risk management, Shariah review, Shariah audit, and Shariah secretariat (Table 1).

SG is important to ensure the operation of an institution is within the principles of Shariah. From the SGF document by the BNM, the framework is designed to meet 3 objectives [5]. Firstly, it is to set out expectations of an Islamic financial insitutitons structures to ensure that its operations are deemed as Shariah compliant. Structure is the first important aspects of SG. Secondly, it provides a comprehensive guidance to the board, Shariah committee and management of an IFI. Hence, the people who is responsible to manage SG is the second important aspect. Lastly, it outlines the functions relating to Shariah review, Shariah audit, Shariah risk management and Shariah research. Process is the third important aspect of SG. In conclusion, there are 3 important aspects of SG that needs to be highlighted:

a) **Structure:** The structure on SG is important because its role is to set out expectations of an Islamic institution's SG structures. This is to ensure all operations, process and business activities are in accordance with Shariah. Hence, there is the need for Shariah review, Shariah audit, Shariah risk management and Shariah research.

b) **People:** The people in an Islamic institution need to carry their task in duties relating to Shariah. This includes the BOD, Shariah committee and the management team.

c) **Process:** The process to undertake Shariah compliant investment is important. For example, the Standard Operating Procedure in handling Shariah compliance investment must be adhered at all times.

Since there is no specific requirement on SGF to be applicable for GLICs such as PNB, the researcher managed to find information and traces on SG by observation through company website, document review and interviews.

4   Research Methodology and Research Design

The research method should be suitable for the nature of research and appropriate for the researcher to gather the information from the sources. In this case, the source is found from people who are related to PNB. As a new research area, this study can be considered as an exploratory study that have its own challenges. This is because the issue selected is an issue that has not been raised before.

This research is limiting its focus by solely examining the suitability of SG's implementation in PNB as the specific GLIC. Hence, this research falls under qualitative approach. [8] defines qualitative approach as exploring attitudes, behaviour and experiences through such methods as interviews or focus groups. [1] further supports this as they describe qualitative as research that emphasises on a specific case, a focused and a bounded phenomenon that embedded in its context.

The lack of literature review on the topic selected would also be among the challenges for this research. Hence, among the practical methodology for this research is interview. The interview method is used in order to seek for the opinion of parties involved in PNB and to get the information on the SG practices in the institution. Among the challenges are the limitations on experts in PNB who have experience with the structures of SGF as per practiced in IFIs. Secondly, due to the person involved in

structuring a governance framework lies at the top management of PNB, the availability of these personnel to be involved in an interview session turns as a challenge to the researcher of this study.

As a qualitative research, this study includes library literature that helps the researcher to prepare for the interviews with the related individuals. According to [10], "a library research involves the step-by-step process used to gather information in order to write a paper, create a presentation or complete a project". In a library-based research, the researcher collects information from available materials such as annual report, publication, news, magazines and others. The researcher collects all available information on the previous and current practices of SG in PNB through its annual report.

4.1 Data Collection

There are a few techniques and models used by researchers to gather data depending on the types and nature of the study. The data collection of this research paper is shaped by objective of the study. The researcher has found interviews and document analysis as the best methods for data collection which is a reliable method to attain a credible result [17]. [2] defines document analysis as a "systematic procedure for reviewing or evaluating documents-both printed and electronic (computer-based and Internet-transmitted) material" (p. 27). Hence, the researcher has searched the available documents such as annual report, research books and policy manual or frameworks by the regulators. These data will be analysed systematically in order to gather the findings and articulate this research thoroughly. The literature review and document analysis will help the researcher to prepare interview questions to conduct interview to PNB's staff for the purpose of establishing this case study.

Another part of data collection for this study will be derived from the interview method. The interviews will not be a structured interview since it falls under quantitative end of the scale, which used in survey approaches [9]. The type of interview that will be used is more on unstructured interview that allows flexibility for the researcher to align the questions to the respondents and ensuring the session is meeting the objectives required. The structured interview is based on a set of questionnaires that may be asked with little flexibility to the researcher. In this research, the interview will also invite opinion on related matters from the interviewees that may supplement the interview questions.

Primary data can be considered as a fresh or new information to the researcher that has never been published before. As stated by [24, 25], primary data refers to information obtained firsthand by the researcher on the variables of interest for the specific purpose of the study. Examples of primary data are individuals, focus groups, panels of respondents that respond specifically on the questions set by the researcher. In obtaining information regarding SG in GLICs such as PNB, the respondents for the interview are the top management that are involved with the SG related functions which include the SAC of PNB, Deputy President, Chief Investment Officer, Head of Shariah Management Department, Head of Corporate Services Department, Head of Human Resource Department. The top management of PNB are chosen as the respondents due to the fact that they have the power to implement and adopt SG into the institution. Among others, the researcher tried to interview.

The number of the interviewee for this research is 8 people which according to [7] and [12] are sufficient number for a qualitative research study. All respondents have been serving PNB for more than 15 years except 1 (3 years). However, due to confidentiality of information, their exact tenure of service is not made public in this study.

The interview is processed using Atlas.ti software whereby the data collected will be framed and coded. The quotations from the interviews will be analysed and with the use of the triangulation method, only the quotations that have been repeated at least 3 times or more shall be inserted as findings in this study.

5   Analysis and Findings

This section discusses the findings of the current practice of the SG in PNB based on the three (3) key aspects of SG which are structure, people and process. The findings generally found that PNB has implemented some aspects of SG practices in their operation. However, there are areas for improvements that needs to be taken into consideration. The discussion in this part explains the existing practices and the areas of enhancement that are proposed to be considered by PNB.

A) Structure

Since PNB has taken its initiatives to establish a structured SGF, it is recommended for the company to establish a structure that similar to the IFIs in Malaysia. However, PNB should tailor made the processes and roles in order to suit the core activities of GLICs. There should not be a new structure to be implemented in PNB. The theoretical framework shall remain, and the diagram below portrays the proposed SGF of PNB.
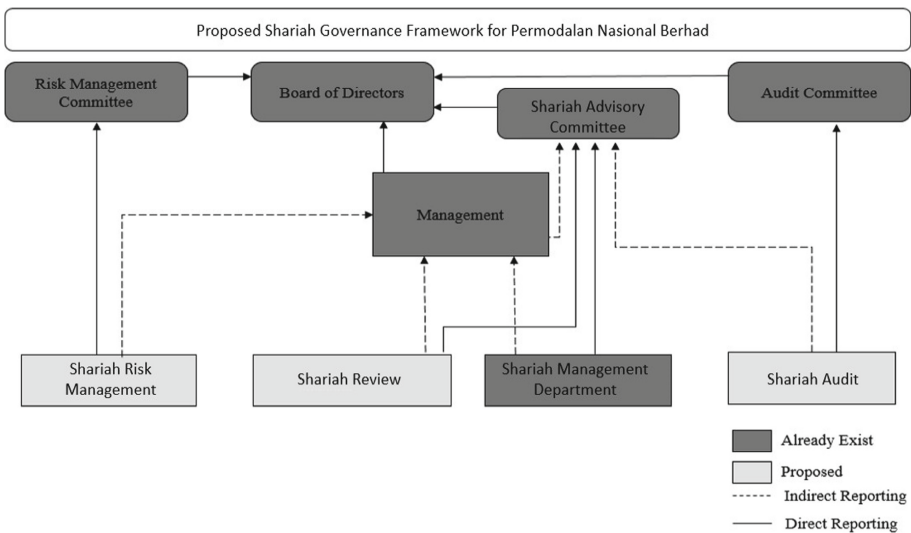
Diagram 1. Proposed SGF for PNB

PNB already has Risk Management Department that reporting to the Risk Management Committee; Compliance Department and Audit Department reporting to the Audit Committee; while Shariah Management Department deal with its own SAC. The Shariah Management acts as a secretariat for the SAC, by undertaking the Shariah research functions and feeds the information to the SAC. PNB is having a lack of roles such as the Shariah Risk, Shariah Audit and Shariah Review, and this study has proposed for PNB to establish these 3 functions in its organisation.

B) **People**

PNB has the BOD to oversee the operations of the company. It would be recommended if the BOD could re-evaluate the company's mandate and include a mandate that emphasise on PNB in managing Shariah compliant investment. This would pave a way for management to enhance its SGF as it is now mandated for proper management. The new SGF may also include the responsibility of SG towards the BOD of PNB. This way, the SG could be handled in a professional manner.

In addition, similar to what was proposed during the interview, the liability of SAC on SG should also be stipulated in the new framework (SGF) of PNB. The new SG Policy (2019) has included the Shariah committee of the IFIs as to be responsible on SG. This can be seemed as the best practice and worth to be considered by PNB. PNB could follow BNM in limiting the tenure of its SAC for up to 9 years. The company should be open in hiring quality employees in order to manage the SGF of the company. Currently, PNB has the management, Audit Committees, and Risk Committees. It is best if PNB could designate a person in charge for Shariah Risk, Shariah Audit and Shariah Review.

C) **Process**

SG process involves a dedicated Shariah control functions responsible towards ensuring Shariah compliance in the institution. This includes Shariah Risk Management, Shariah Compliance and Shariah Audit (SGPD BNM 2019). Presently, PNB already has Risk, Compliance, Audit and Shariah Management Department respectively and its own SAC. However, the process of SG in PNB is not extensive whereby the Shariah related functions is not embedded in the respective departments. Thus, the company must improve the SGF. Refering to the Diagram 1, it is proposed for the Shariah risk to report to the Risk Committee, Shariah audit to report to the Audit Committee, while the Shariah review could report directly to the SAC. The responsibilities of these functions should be under the accountability of the President and Group Chief Executive Officer. This way, there is no need for the management to create 3 new departments that focuses solely for Shariah Audit, Shariah Review and Shariah Risk, as these functions could work well together within the existing structure.

Other Shariah Governance Aspects

Another important aspect of SG is the imposition of punishment on Shariah non-compliance events occurred in an organisation. Under IFSA 2013, an IFI could be punished by 8 years imprisonment or RM25 million penalty. PNB should not be that stringent in implementing such punishment since it is not under the ambit of the BNM. Being GLICs, there is no regulator that regulates PNB particularly on the Shariah

compliance aspect. Hence, the company could internally impose disciplinary action towards individuals who breaches the SG process and the severity of punishment is to be decided by the management.

PNB should consider including the requirement on Shariah pronouncement to the public on an annual basis. The pronouncement is to be made by the SAC of PNB, in line with the practice by other IFIs.

Another important observation in this research is that PNB is a unique institution which is not similar with other IFIs. PNB may consider certain aspects of existing SGF based on IFSA 2013 and SG Policy of BNM. However, the suitable framework may depart from the regulation such as the stringent requirement on the penalty of fine of RM25 million and/or 8 years imprisonment. As PNB is not an Islamic Institution as its mandate initially is to promote share ownership in the corporate sector among the Bumiputera community, there are some restriction in operating its activity. Interestingly, as part of its Shariah compliance effort, PNB is adopting the Maqasid Shariah screening approach with the approval of its SAC, together with the endorsement from National Fatwa Council as part of the Shariah governance initiative.

Having the similar SGF with the IFI may restrain the company to deliver its mandate given by the government. On the contrary, the proposed Framework that are slightly different is beneficial to PNB. Firstly, it provides a more robust, stringent and structured SG to oversee the end to end process of PNB's operation to ensure it is in line with the principle of Shariah. Secondly, it create more roles from pre to post product or Shariah resolution. As opposed to IFIs like Islamic banks and Takaful, GLICs such as PNB would not have new product launches every year to their customers. However, more emphasise should be put on how the company manages its investment to ensure it is carried in a proper manner. Once approved by the SAC, there will be reviewing process to ensure the investment activities and operations are in accordance with the Shariah Resolutions or Shariah Manual. Lastly, the legal requirement will ensure that the SG will be carried in a proper manner, to avoid bad reputation and legal actions to the person who is liable for the breach of SG.

PNB could benefit more if the SG is not as stringent as the SG for IFIs. This is due to the fact that a lot of resources spent on unnecessary roles could be saved as GLICs do not have a lot of new products, unlike the IFIs. Therefore, PNB might not need to have a robust structure and the SG roles needed could be carried and established in the current structure.

6   Conclusion

Due to the lack of SGF in a GLICs, the impact of SGF is important to be highlighted in this thesis. A SGF has resulted to an end to end Shariah compliance monitoring in an organisation. After reviewing the current SG practice in PNB, there are gaps to be filled and improved as the company did not have a strong structured SGF.

Lastly, the proposal to implement a structured SGF has been highlighted in the early part of this chapter and this would be ended as the conclusion of this thesis. The proposal aims to address issues that has been identified during the interview. The proposal is also capable to answer issues related to the non existence of Shariah

mandate in the company, lack of a structured SGF, lack of clarity on the responsibility of managing SG in PNB, and the implications if there were any breach in managing SG in the company. The proposal could eventually improve the SG in PNB. Having said that, it is important to state that it is timely for SGF to be adopted in the GLICs in Malaysia.

References

1. Miles, M.B., Huberman, A.M., Saldana, J.: Qualitative Data Analysis: A Methods Sourcebook. Sage, Thousand Oaks (2014)
2. Bowen, G.A.: Document analysis as a qualitative research method. Qual. Res. J. **9**(2), 27–40 (2009). https://doi.org/10.3316/qrj0902027
3. Central Bank Malaysia: Shariah Governance Framework 22 (i) (2010). http://www.bnm.gov.my/guidelines/05_shariah/02_Shariah_Governance_Framework_20101026.pdf
4. Central Bank Malaysia: Financial sector blueprint 2011–2020'. Strength. Future **LXIX**(4), 1–198 (2011).https://doi.org/10.1080/00346764.2011.592329
5. Central Bank Malaysia: Islamic Financial Services Act 2013, pp. 1–187 (2013)
6. Central Bank Malaysia: Policy Document on Shariah Governance (2019). https://doi.org/10.1016/S0141-6359(03)00004-7
7. Creswell, J.W.: Qualitative Inquiry & Research Design: Choosing among Five Approaches. Sage, Thousand Oaks (2013)
8. Dawson, C.: Practical Research Methods: A User-Friendly Guide to Mastering Research. Vasa, p. 153 (2008). https://doi.org/10.1017/CBO9781107415324.004
9. Edwards, R., Holland, J.: What is Qualitative Interviewing? 'What Is?' Research Methods Series, vol. 7 (2013). https://doi.org/10.5040/9781472545244
10. Elmer E. Rasmuson Library: Library research process (2018). https://library.uaf.edu/ls101research-process
11. Jabatan Penerangan Malaysia: Dasar Ekonomi Baru (2017). http://pmr.penerangan.gov.my/index.php/maklumat-kenegaraan/237-dasar-ekonomi-baru-.html
12. Kuzel, A.J.: Sampling in Qualitative Research (1999)
13. KWAP: About KWAP (2017). http://www.kwap.gov.my/EN/Aboutkwap/Background/Pages/default.aspx
14. KWSP, Kumpulan Wang Simpanan Pekerja: Overview of EPF (2017). http://www.kwsp.gov.my/portal/en/about-epf
15. Lembaga Tabung Haji: About Us (2017). http://www.tabunghaji.gov.my/information
16. Miskam, S., Nasrul, M.A.: Shariah governance in Islamic finance: the effects of the Islamic financial services act 2013, no. November, p. 455–463 (2013)
17. O'Leary, Z.: The essential guide to doing research. The essential guide to doing research, pp. 28–41 (2004). http://books.google.com/books?hl=en&lr=&id=ItKeqNfgNW0C&oi=fnd&pg=PA1&dq=The+Essential
18. PNB, Permodalan Nasional Berhad: Corporate Information (2017). http://www.pnb.com.my/about_e.php
19. Putrajaya Committee on GLC high performance. GLC transformation programme graduation report (2015). http://www.pcg.gov.my/media/1118/glctp-vol1-graduation-report.pdf
20. Putrajaya Committee on GLC high performance. Reflections on a transformation journey. The GLC Transformation Programme 2005–2015, p. 208 (2015). http://www.pcg.gov.my/PDF/GLCTPVol2Voices.pdf

21. Rahman, N.A.: Case Study of Shari'Ah Governance Practices for Islamic Banking Institution in Malaysia, no. October, pp. 1–16 (2016)
22. Satkunasingam, E., Shanmugam, B.: Disclosure and governance Islamic banking Malaysia. J. Int. Bank. Regul. (2015)
23. Securities Commission: Securities commission annual report (2020)
24. Sekaran, U.: Research Methods for Business, vol. 65 (2013).https://doi.org/10.1017/CBO9781107415324.004
25. Yin, R.K.: Qualitative research from start to finish (2011)

Taxation Framework for Sukuk in Malaysia and Indonesia

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Abstract. This research intends to explore and compare tax framework, particularly tax incentives provided in relation to Sukuk for both Malaysia and Indonesia. Tax framework and incentives on Sukuk is essential in promoting Sukuk growth. Malaysia and Indonesia are chosen as the countries of study because both are the leading countries in the Asia region for Sukuk issuance, according to the global Sukuk report [6]. This research adopts a qualitative method by comparing legislation and regulations on tax between two countries. However, this paper would not explore other aspects such as Shariah aspects, structures or process of Sukuk, which already abundant. A library research approach used, whereby secondary data utilized to gather information through literature examination. A gap analysis will be done to identify the current state of Indonesia tax incentives on Sukuk compares to the tax incentives provided by the Malaysian authority. This study finds that Malaysia offers substantial tax incentives in promoting Sukuk compared to Indonesia, as per the claim by several studies. Besides just imposing tax neutrality, Malaysia's tax regime provides vast tax incentives to each Sukuk originator, issuer, Special Purpose Vehicle (SPV), and investor. Indonesia, on the other hand, provides specific incentives only to domestic and foreign investors. This research proposes that the Malaysian regulator maintain some tax incentives that significantly benefit Sukuk, especially Sukuk Ijarah and Wakalah, which have a significant impact since both structures are preferred among the issuer. This paper also recommends Indonesian regulator to provide tax incentives by taking Malaysia as a benchmark.

Keywords: Taxation · Sukuk · Malaysia · Indonesia

1 Introduction

Global Islamic Finance Report (GIFR) publish a report on the Islamic Finance Country Index (IFCI) scores from 2011 until 2019 for 48 countries indicate that, Malaysia has shown consistent growth in IFI. On the other hand, Indonesia had recorded a sudden surge in their IFCI score from 24.13 in 2018 to 81.93 in 2019 out beat the top five (5) top scorers. Evidently, Indonesia has finally overtaken five (5) countries and, most importantly, Malaysia to become the number one country under the Islamic finance index for 2019.

One of the factors that contribute to the calculation of the IFCI scores are Sukuk. Sukuk contribute 6.6% out of the total contribution and remain one of the crucial

Islamic products. Although Malaysia is known as the largest Sukuk producer in the world, with a total issuance at 36.8% [23], it is interesting that Indonesia has started to show a sign of competing. This is due to Indonesia being recognized as number one ranking on IFCI [7] and issuance of sovereign Sukuk (USD denominated) in the World in 2019 [10].

To draw the investors interest in Islamic investment and Sukuk subscriber, Malaysia's tax code has been reform to provide substantial incentives, which put Sukuk at an advantage over conventional bonds. The tax reform was not only practice in Malaysia but also some other countries such as United Kingdom, Kenya, and many more. A study by Ainley, M., et al. [2] explains the Islamic finance development in the UK has improved by the significant change in public policy and taxation in the Finance Act 2003. This law avoids multiple charges on Stamp Duty Land Tax based on Islamic mortgages. Subsequently, the introduction of Finance Acts 2005 and 2006 put other Islamic products on similar position with the conventional. There is a continuous progress in tax and policy reform in a sequence of tax and legislative amendments to neutralize the taxation or giving the advantage to support Islamic Finance's growth. Kenya, on the other hand, reformed its tax framework later than other countries, especially Malaysia. In a comparative study done by Uthmani, M.T. [25] in 2017, an amendment was made on its Income Tax Act under its Finance Act 2017 to include Islamic finance provision. The amendment made the same changes to their stamp duty Act to include a provision for Islamic finance products including sukuk.

2   Literature Review

2.1   Sukuk and Its Development in Malaysia and Indonesia

Sukuk is defined by Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI) as a "certificates of equal value representing undivided shares in ownership of tangible asset, usufructs, and services (in the ownership of) the asset of particular project or special investment activity" [1]. Islamic Financial Services Board (IFSB) defined the Sukuk as "certificates that represent the holder's proportionate ownership in an undivided part in tangible assets, or a pool of predominantly tangible assets, or a business venture" [4, 6]. Sukuk represents the pro-rata ownership of their holders in the fund's tangible assets and not the liquid amounts or debts. They are entirely negotiable and can be traded in the secondary market. It also represents all the rights and obligations of the Sukuk holder. The Sukuk price is typically determined based on the market forces and based on their profitability [23]. Sukuk transaction either typically involves an underlying asset to be purchased or constructed, and the returns based on the underlying asset's performance. Therefore, Sukuk are essentially Islamic bonds that provide investors with a share of the underlying asset and the accompanying upside or risk attached to the asset, without the concept of interest [5].

According to the Global Sukuk report from the International Islamic Financial Market (IIFM) [9] for the period of January 2001 until December 2019, Sukuk Ijarah has been the favorite structure of international issuers with a percentage of issuance of

50.23%. At the same time, Sukuk Wakalah is sitting at a second-place of globally issued with 22.96% for the same period.

In the first ten years from 1990, the growth of Malaysian sukuk was limited to the Malaysian domestic market only. It was more on the familiarization and the introduction to the market as well as the players on the concept and mechanism. Since the structure based on BBA and Murabahah, it received resistance from the Islamic scholars from the Middle East and the Gulf Cooperation Council (GCC) countries due to the existing element of sale of debt (bay' al-dayn) which is not permitted by them. As a result of this, Malaysia made the transition from debt to non-debt Sukuk to resolve the previous problems, started with the first global sovereign Sukuk Ijarah issued by Guthrie. At present, the Malaysian Sukuk is no longer restricted to debt securities [21].

In 2014, Malaysia continued to lead the World on Sukuk by introducing the Sustainable and Responsible Investment (SRI) Sukuk framework. This involves renewable energy, energy efficiency, pollution prevention and control, sustainable water and wastewater management and many more. For SRI Sukuk issuance, tax deduction was granted for the SRI Sukuk issuance expenditure approved or authorized by the Securities Commission until the year of assessment 2023 [22]. This show that the regulator is serious about promoting SRI Sukuk in achieving the world sustainable Development Goals.

According to Statista, as of December 2019 Malaysia is the biggest Sukuk issuer, followed by Saudi Arabia and Indonesia with 36.8%, 14% and 13.5% respectively for sukuk issuance global issuance [23].

In Indonesia, the Sukuk is known as Shariah bonds. In 2002, the National Shariah Council issued fatwa No: 32/DSN-MUI/IX/2002 concerning Shariah Bonds. Following-up to the fatwa, in October 2002 PT. Indosat Tbk issued Sukuk for the first time in the Indonesian capital market with a yield of 16.75%, and this yield is higher than the average return on conventional bonds [11]. It was continued by PT. Tenker's Diamond Laju that issued Shariah bonds with an issue of Rp. 175 billion on May 28th 2003. PT. Bank Bukopin issued Shariah Mudharabah bonds on July 10th 2003, with an emission value of Rp. 45 billion. PT. Bank Muamalat Indonesia (BMI) on July 15th, 2003, with Rp. 200 billion emissions. PT.Cilandra Perkasa on September 26th, 2003, with an emission value of Rp. 60 billion, PT. Islamic Bank Mandiri (BSM) on October 31st, 2003, with an emission value of Rp. 200 billion [13].

Shariah bond issuers in Indonesia come from various types of businesses, from telecommunications companies, plantations, transportation, financial institutions, property to the tourism industry. Sukuk's presence increases Indonesia's Islamic financial assets and plays a role in financing the State Revenue and Expenditure Budget that has suffered a deficit every year.

According to IIFM [9], for the year 2019, Malaysia and Indonesia, among other countries, contributed to the international Sukuk issuance by 24.77% and 5.46%, respectively. Despite being the top of the issuer in the Asia region, Malaysia is also the highest issuer globally, with 31 issuances valuing at USD9.5 billion, while Indonesia comes second in the Asia region with three issuances amounting to USD2.1 billion.

On domestic issuance, Malaysia remains the biggest in Asia with 704 issuances at USD54.1 billion, followed by Indonesia with 81 issuances taking 16.15% market value. These have accumulated to Malaysia and Indonesia's total number of domestic

issuances from January 2001 to December 2019 at 6,952 and 469, respectively. The report further showed that Malaysia is the most significant global Sukuk issuer since 2001, with the total number of issues at 7,090 at a total value of USD734 billion. While Indonesia is ensuring in climbing the ladder, they have issued 490 Sukuk globally since 2001, taking their portion at the value of USD99 billion.

Above all that, Indonesia is considered the World's most prominent international sovereign Sukuk issuer (USD denominated), followed by Saudi Arabia, Emirates of Dubai, and Malaysia, with a total outstanding USD18.2 billion, USD13 billion, USD 8.2 billion and USD 7 billion, respectively [10].

2.2   Tax Incentives for Sukuk Issued in Malaysia and Indonesia

One of the reasons that make Sukuk attractive is tax incentives given by the Malaysian government. The tax incentives were introduced to attract the investors as well as to allow both Islamic and conventional have fair competition and ensure the sustainability of the IFI. Tax incentives were not only mean for Sukuk but also other IFI products. However, for the purpose of this paper, the discussion will be focused on Sukuk.

In 2003, the Securities Commission Malaysia announced a new tax treatment that benefitting Islamic Finance Institutions. The special incentives announced [19] involving capital market sectors, products and services impacting Sukuk, Islamic Fund Management, Business Trust, Islamic Real Estate Investment Trust (REIT) and Non-Resident expert in Islamic Finance. Special incentives were provided to Sukuk, benefitting the issuer, originator, Special Purpose Vehicles (SPV) and Investor. The stakeholders allowed to receive an exemption for income tax, stamp duty and real property gain tax (RPGT) subjected to certain conditions.

In Malaysia, the Income Tax Act 1967 (ITA) is the primary tax legislation that governs taxation matters in Malaysia. The ITA clearly state the taxability of income and any deductibility for expenses. According to special incentives published by the Securities Commission Malaysia [20], there are eight income tax incentives applicable to the issuer, originator, SPV, and investors.

Stamp duty is a direct tax chargeable on instruments and not on the transaction [18]. The rate of stamp duty varies according to the nature of instruments and transacted values [15]. Meanwhile, whether they are resident or not, every entity is subject to RPGT on any gains arising from actual property disposal, including shares in a real property company (RPC) [18]. Real property refers to any land situated in Malaysia and any interest, option or other rights in or over such land. Disposal of the land usually cause upon transfer of ownership from one entity to another party, whether through sale, conveyance, assignment, settlement or alienation.

In the context of Indonesia, Ernawati [6], highlight that it is necessary to accord several forms of incentives for Islamic banking, one of them is tax incentives. However, compared by other type of businesses, the Islamic banking sector is rarely received tax incentives.

Badan Kebijakan Fiskal Kementerian Keuangan Republik Indonesia [17] or Fiscal Policy Agency of the Ministry of Finance of the Republic of Indonesia explains that according to the results of field interviews with Sukuk players, it is found that tax incentives are an urgent policy to implement. The type of Sukuk that needs attention

Sukuk Ijarah, where there is a double tax due to the imposition of "Pajak Pertambahan Nilai" (PPn) or value-added tax (VAT).

The government of Indonesia must provide tax incentives for Sukuk as a way to increase the growth rate of domestic Sukuk. OJK, Ministry of Finance and Directorate General of Taxes must coordinate in taking steps to resolve tax problems on corporate Sukuk. This is very important as a way out for implementing tax incentive policies on corporate Sukuk. A comparative study is to be conducted on tax incentive policies in several countries that have successfully implemented them.

Ernawati and Wijayanti find that Sukuk development strategy relies on the perception of each player, both underwriters, investors, and issuers. The priority order of policies is to create an encouraging Sukuk market through a clear regulation, tax regulation transparency, and a profound incentives policy that will promote Sukuk [27]. In the perspective of issuers, the Government must provide an incentive for the company to issue Sukuk based on a clear tax treatment.

Recently, in 2020, a study done by Laila, N., & Anshori, M. [14] suggests that one of the priorities that stimulate the development of national Sukuk is by optimising the Government's role and a facilitative tax incentive. They recommended that certainty of taxation through revised regulation and tax incentive must be done immediately. There should be a similar tax treatment between the Sukuk and bond, so Sukuk can compete equally in the capital market.

Unfortunately, according to Komite Nasional Ekonomi dan Keuangan Syariah (KNEKS) or National Committee on Shariah Economics and Finance [3], there are still unclear regulations regarding fiscal policy found in Islamic banking and finance, especially regarding lease transactions with the Ijarah or Al Ijarah al Muntahiya bit Tamlik (IMBT).

In 2019 Peraturan Pemerintah Republik Indonesia 55 tahun 2019 was introduced whereby Sukuk is among the objects that enjoys a discount. Sukuk instruments that receive a tax deduction includes the Sukuk that is intended for collective investment contracts (KIK) for infrastructure, real estate, asset-backed securities, and mutual funds registered by the Financial Services Authority (OJK).

In contrast with Malaysia Sukuk incentives, the incentive granted for Indonesia Sukuk is in the form of a percentage, which is 15% (fifteen per cent) for resident taxpayers and the permanent establishment and 20% (twenty per cent) or in accordance with the tariff based on the approval of double tax avoidance for foreign or non-residents taxpayers. The residents' companies are the companies that are incorporated in Indonesia, while non-resident companies are a company incorporated overseas but receive or accrue income from Indonesia.

3 Finding and Discussion

The original form of taxation imposed for Islamic financial instruments such as Sukuk in Malaysia or Indonesia may become oppressive because it will lead to double taxation imposed in fulfilling the Shariah requirement. Without reducing or eliminating the originally double layers of the tax, the cost of Sukuk is very high and make it unable to compete fairly with the conventional securities. In achieving its objective to promote

Sukuk, Malaysia takes a bold step by introducing special incentives in 2003. The incentives involving income tax, stamp duty and also RPGT. To make it even more interesting, some incentives specifically cover Sukuk and its stakeholder.

Malaysian income tax incentives vary from originator, issuer, SPV and investor. The originator enjoys a deduction for expenditure on the cost of issuance of the Sukuk. According to Income Tax (Deduction on the Cost of Issuance of The Islamic Securities) Rules 2007 – P.U. (A) 176, the company that established the SPV is given a deduction on the cost of Sukuk issuance. However, the SPV must be established solely to comply with the principles of Shariah in the issuance of Sukuk.

In respect to the issuer, there are two (2) types of incentives given either a deduction on expenditure or exemption. Based on observation, the tax deduction have a validity period. However, the exemption incentives have no dateline period where it is valid unless the law is revise. The exemption may be given for the purpose of neutrality or benefit (income tax exemption).

SPV also is not excluded from receiving such incentives. Section 601 and No 14 order 2007 – P.U. (A) 180 stated that any source of income of an SPV (established for the purpose of issuing Islamic securities) excluding asset-backed securities is treated as a source and income of the originator. This means that any income derived by the SPV on the issuance of Sukuk is exempted from the income tax. This incentive has excluded SPV from paying income tax in total.

To ensure the Sukuk issued is attractive to investor, the authority allows the investor to maximise their gain by providing income tax exemption to any investor of non-ringgit Sukuk and unit trust listed as closed-end fund. The incentives are not limited to domestic investor but also to non-resident companies in respect of RM denominated Sukuk. Allowing the non-resident investor to enjoy such incentives will attract foreign investment into Malaysia.

Indonesia in contrary only provides income tax incentive to investors. This in contrast with Malaysia's incentives to all four stakeholders regardless of whether they are exempted or deducted. Furthermore, the incentives provided is just 15% for resident investors and 20% for non-residents. The incentives as introduced in Peraturan Pemerintah Republik Indonesia Nomor 55 Tahun 2019 provides an incentive to the bondholder without specifically mentioned about Sukukholder. However, based on the Government Regulation Number 25 of 2009 the tax treatment for Sharia-based business activities shall apply mutatis mutandis to the provisions in the income tax law.

The implementation of mutatis mutandis means that the tax provisions that are generally applicable to conventional also apply to Shariah-based business activities. For example, tax treatment regarding interest also applies to compensation for the use of third-party funds that are not included in the company's capital category. According to the Shariah transaction approach used, this reward can be in the form of a third party's right to profit sharing, margin, or bonus.

Originally, without tax incentives Malaysia stamp duty is at a disadvantage compared to Indonesia. Indonesia implements a single tariff fee compared to Malaysia, where the tariff is according to the threshold. It is noted that the Sukuk issuance typically involves a vast amount of money and back by the exact value of the asset. Hence, the Malaysian Sukuk will incur more stamp duty than the original tax tariff. However, with the introduction of tax incentives, it turns the table around. Malaysia

stamp duty is cheaper since the regulator gives exemption to all originator, issuer and SPV. In contrast with Indonesia, there is no exemption given on stamp duty. Consequently, with Shariah multiple agreements involves in Sukuk issuance, the cost of the Sukuk will be expensive, although, without doubt, it will increase government revenue. In this context Malaysia is at a better advantage against Indonesia when comparing the stamp duty fee applicable for Sukuk.

Similar treatment is also found on RPGT, where Indonesia offers only a single tariff while Malaysia has a multi-threshold according to age and property value. The incentives given by the Malaysian regulator have reduced its cost, whilst by not by not recognizing the need for double tax exemption, Indonesia Sukuk becomes pricier.

It is interesting to note any Indonesian individual or entities may get an exemption from income tax if the transferee is religious bodies or educational bodies or social bodies, or small entrepreneurs including cooperatives that are stipulated by the Minister of Finance. This is provided in PP Nomor 48 Tahun 1994 Pasal 5(c). However, this exemption is not applicable to Sukuk since Sukuk is business in nature.

4   Conclusion

As a conclusión, this study found that Malaysia tax framework is conducive to promoting Sukuk since it provides many tax incentives for originator, issuer, SPV, and investors. A vast gap shows that the Indonesian tax framework does not provide as many incentives as Malaysian treatments. Indonesian regulator only provides an income tax discount between only 5% and 10%. However, there is no special treatment on stamp duty and RPGT for Indonesian Sukuk compared to Malaysia.

This paper would like to make the following recommendations to both Malaysia and Indonesia based on the gap found in tax incentives provided by both countries:

 i. Continuation of law on tax incentives in Malaysia

There are numbers of law on tax incentives that is introduced in Malaysia has met its dateline or discontinued. Although some of the law is meant to be a temporary measure, it is believed that discontinuation may affect the current Sukuk attractiveness. Such law was Income Tax (Deduction for Expenditure on Issuance of Sukuk) Rules 2015 – P.U. (A) 318. This law provides tax deduction to the issuer for the issuance of Sukuk according to the principles of Ijarah or Wakalah (comprising a composite component of asset and debt) until the year of assessment 2018 [20]. Another law that was discontinued is the Income Tax (Deduction for Expenditure on Issuance of Retail Debenture and Retail Sukuk) Rules 2016. This law also applies to the issuer of retail Sukuk that valid until the year of assessment 2018. This law provides a tax deduction on additional expenses incurred to the issuance of retail Sukuk structured according to the principle of Ijarah or Wakalah comprising a composite component of asset and debt. It is strongly believed that the continuation of these two laws positively impacts Sukuk attractiveness since both Sukuk Ijarah and Sukuk Wakalah are the two most preferred structures by most of the issuer respectively. Hence, continuing these laws will put Malaysia at an absolute advantage against, thus increasing foreign investors to

Malaysia. Subsequently, this may escalate Malaysian economic growth and award Malaysia to be a developed country.

ii. Comprehensive study on other option for investors

There is an urgent need for a comprehensive study on other options or incentives that can be awarded to investors, especially non-resident. Since the investor is the primary source of funds for Sukuk, suitable incentives need to be crafted to attract them to subscribe the Malaysian Sukuk. This study finds that most of the incentives provided to reduce the cost of Sukuk and directly beneficial to the investors. However more need to be done to retain their investment and encourage them to continue investing in Malaysia. One of the incentives that may be further considered is an option to convert their Sukuk to the callable preferred share for originator. It means, rather than paying back the investors for their investment on Sukuk, the originator will offer the investors to exchange their investments with the share. This option will allow the originator to maintain its cash flow and retain the investors. This will automatically help the originator to inject more capital into their company to finance its operation or perhaps future expansion. Another benefit of this option is that it will encourage the investor to increase their investment. From the investors side, this option benefits them to enjoy the continuation of dividend income as declared by the originator. If the convertible option is to ordinary share, the investor will have a voting right on the company's direction. The originator also may leverage this opportunity in getting more opinion in the boardroom. If the investor is non-residents, it will open the door for potential international business for the originator.

iii. Consideration on tax incentive by Indonesia regulator

Finally, this study recommends that the Indonesian regulator provide more tax incentives in relation to Sukuk as the current incentive is still not enough to attract investors. This recommendation also aligns with several studies that Indonesian scholars have done to suggest more tax incentives. It is proven that the tax incentive is powerful tools in encouraging growth and attraction towards any product. Indonesian regulator may start providing a tax deduction for expenses incurred on the issuance of Islamic securities similar with the Malaysian treatment in Income Tax (Deduction on the Cost of Issuance of The Islamic Securities) Rules 2007. This allows SPV to receive a tax deduction on an amount equivalent to the cost of issuance of Islamic securities. Meanwhile, for retail Sukuk, the Indonesian regulator may also adapt Income Tax (Deduction for Expenditure on Issuance of Retail Debenture and Retail Sukuk) Rules 2016. This law provides explicitly a tax deduction for expenses on the issuance of retail debenture and retail Sukuk. This tax deduction is applicable to Sukuk structured under the principle of Murabahah, Mudarabah, Musharakah, Istisna', Ijarah, Wakalah or any other principle which is approved by the Securities Commission Malaysia. Since investor already received a discount in their income tax rate (Peraturan Pemerintah Republik Indonesia Nomor 55 Tahun 2019), it is timely for the Indonesian regulator to give a full exemption for the income generated from Sukuk, as practiced in Malaysia. Income tax exemption affirmatively increase the attractiveness of Sukuk as the investor did not have to pay tax which allows them to keep more money.

Next, since the Sukuk structure requires multiple asset transfer of ownership, it is recommended that the Indonesian regulator implement an exemption for both stamp duty and RPGT. This recommendation aligns with concerns raised on the unclear regulations regarding fiscal policy found in Islamic banking, especially regarding lease transactions, particularly the Ijarah contract. Therefore, by providing tax incentives or tax exemption as per Malaysian practices on stamp duty and RPGT, may potentially increase demand on Indonesian Sukuk. Last but not least, it is observed that Malaysia's tax incentive put Sukuk at an advantage. One of the ways to develop Indonesian Sukuk, a tax incentive must be provided and clarity of appropriate tax treatment must be introduced.

References

1. AAOIFI, A. a.: Shariah Standards, pp. 463–488 (2009)
2. Ainley, M., Mashayekhi, A., Hicks, R., Rahman, A., Ravalia, A.: Islamic Finance in the UK: Regulations and Challenges. Financial Service Authority (2007)
3. Andika, R., Lutvia, A.: Komite Nasional Ekonomi Dan Keuangan Syariah, July 2020. https://knks.go.id/berita/272/kebijakan-fiskal-untuk-perkembangan-bank-syariah?category=1
4. Al-Sartawi, A., Reyad, S., Madbouly, A.: Shariah, presentation and content dimensions of Web 2.0 applications and the firm value of Islamic financial institutions in the GCC countries. J. Islamic Mark. (2021, accepted article)
5. Bhupalan, R.: An Introduction to Islamic Finance and the Malaysian Experience (2009)
6. Ernawati, W.D.: Menyongsong Indonesia Sebagai Kiblat Ekonomi Syariah Melalui Insentif Fiskal (2016)
7. GIFR: Global Islamic Finance Report 2019 (2019)
8. IFSB, I.F.: Capital adequacy requirements for sukuk. Securitisastions and Real Estate Investment (2005)
9. IFSI: Islamic Financial Service Industry Stability Report 2019 (2019)
10. IIFM: Sukuk report: a comprehensive study of the global sukuk market. International Islamic Financial Market (2020)
11. Jarkasih, M., Rusydiana, A.S.: Perkembangan Pasar Sukuk: Perbandingan Indonesia, Malaysia dan Dunia (2009)
12. KPMG: Indonesia Tax Profile. In KPMG (2018)
13. Kurniawati, D.D.: Analisis Perkembangan Sukuk (Obligasi Syariah) dan Dampaknya Bagi Pasar Modal Syariah (2014)
14. Laila, N., Anshori, M.: The development of sovereign sukuk in Indonesia. Int. J. Innov. Creat. Change **11**, 390–397 (2020)
15. LHDN: Stamp duty (general) (2021). http://www.hasil.org.my/bt_goindex.php?bt_kump=5&bt_skum=5&bt_posi=1&bt_unit=1&bt_sequ=9&bt_lgv=2
16. Mohammed, N.: Islamic Finance Foundation (2014). https://www.sukuk.com/article/sukuk-taxation-legal-structures-2332/
17. Nasution, L.Z.: Analisis Pemberian Insentif Perpajakan pada Produk Keuangan Syariah: Studi pada Sukuk Korporasi. Badan Kebijakan Fiskal Kementerian Keuangan Republik Indonesia (2017). https://fiskal.kemenkeu.go.id/kajian/2017/06/21/181347312508103-analisis-pemberian-insentif-perpajakan-pada-produk-keuangan-syariah-studi-pada-sukuk-korporasi
18. PWC: 2019/2020 PWC Malaysian Tax Booklet. PricewaterhouseCoopers Taxation Services (2019)

19. SC (i): Islamic Capital market. Security Commission of Malaysia (2003). https://www.sc.com.my/development/islamic-capital-market/special-incentives
20. SC (ii): Securities Commission Malaysia. Special Incentives (2003). https://www.sc.com.my/development/islamic-capital-market/special-incentives
21. SC: The Islamic Securities (SUKUK) Market (2009)
22. SC: Sustainable and Responsible Investment Sukuk Framework an Overview. Securities Commission of Malaysia (2019)
23. Sigit: Apakah Sukuk dapat Potongan Pajak? Pajakku (2020). https://www.pajakku.com/read/5d6381d86a0a225035fca44d/Apakah-Sukuk-dapat-Potongan-Pajak
24. Statista: Statita (2020). https://www.statista.com/statistics/649298/distribution-of-sovereign-sukuk-issuance-by-country/
25. Uthmani, M.T.: An Introduction to Islamic Finance: The Hague. Kluwer Law International (2002)
26. Wanjiru, K.I.: Taxation of Islamic banking products in Kenya: a comparative case study of Malaysia and Kenya (2018)
27. Wijayanti, L.: Strategi Pengembangan Sukuk Ritel Korporasi di Indonesia (2018)

Ethical Concerns in Artificial Intelligence (AI): The Role of RegTech and Islamic Finance

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Abstract. Artificial Intelligence (AI) is being applied across all areas of business and society. It is also one of the most researched topics during the current period. Banks and financial institutions nowadays are collecting large amounts of customer information which are imposed with AI and machine learning; however, the succeeding of all information remains unknown. This study attempts to identify the ethical issues in the application of Artificial intelligence and offers remedies from the Shariah principles. It also examines the role of Regulation technology (RegTech) in Islamic financial institutions. This study is exploratory in nature and used mainly primary data for the analysis purpose. The primary data is collected through the structured questionnaire obtained from the sharia scholars living in Gulf Cooperation Council (GCC) countries. The findings of the study suggest that the there is a significant relationship between ethical issues in AI implementation, role of RegTech and Islamic finance. The findings also suggest that the effective and intelligent utilization of RegTech and Islamic finance tools can reduce the ethical concern related to the AI implementation.

Keywords: Artificial intelligence · Ethics · Ethical issues · Islamic finance

1 Introduction

Artificial Intelligence (AI) systems and applications can be observed in various aspects of our lives which range from interacting with smart speakers, chatbots on a bank website, or receiving messages/email and auto categorization/classifications into different sections, recommender systems on streaming services [3, 7, 8]. However, the increased use of AI has been in parallel with the increase in its misuse. During the last decade, there have been many concerns regarding the misuse of the AI, especially in terms of data privacy, trust, and security [23, 60].

During the current period, the technology of AI has further matured, and it has been and can be integrated into several areas of life [42, 50]. The accessibility of AI has also increased with more and more people are capable to use this technology [29, 55]. Creating an intelligent machine creates a lot of ethical issues related to ensuring that the machine does not harm a human or any other living being [20]. The AI equipped driverless car has already travelled several million miles, it can make its own decision

and it can have social, moral and ethical implications [6, 9, 22, 37]. At the same time, this car can make an accident and it can affect the life of a person or animal, as in May 2016 a Tesla car in an auto pilot mode caught in an accident and a person was killed [46]. Artificial Intelligence has been a growing strand of literature implementing it in a various field ranging from machine translations [43] to sophisticated self-deriving vehicles. On the other hand, there has been also a rising attention given to studies exploring the ethics and governance of AI [5, 28, 36].

This paper has three main objectives. First, it identifies the ethical issues related to the implementation of AI in Islamic financial institutions. Second, it investigates whether the Shariah principles can help to mitigate these ethical issues. Third, it examines the role of RegTech in Islamic financial institutions. Ethics in Artificial Intelligence is mainly inspired by the societal view of the ethics which suggests that the AI is programmed to follow the ethics of the society which is usually does not have an aggregate ethical view. There are three main challenges for AI social choice decisions which are standing, measurement and aggregation. Standing challenge means that whose views should be considered, whereas, measurement refers to the fact that whose views are recognized or identified, and aggregation refers to the fact that how different views are consolidated to form a single view to program AI [10, 13]. Each of these challenges is a concern on its own and if not addressed appropriately can create a major issue in social choice and ethical behavior of AI. The role of RegTech, being an application of AI, in Islamic financial institutions remains to be under-researched area in the literature.

2   Review of Literature

Despite the long history of debate and research there is still no standard definition of Intelligence which suggests that the intelligence can be properly described but it is difficult to define [33]. Different scholars have defined Artificial intelligence in different ways. Some of the most popular definitions are mentioned here; Jon McCarthy coined the term 'Artificial Intelligence' in 1956 and he is also considered as the father of AI [4, 15, 53]. According to [49] "an intelligent machine or an intelligent computer-based program which has the ability to understand human language and reach to a problem or goals like human being" [49]. AI is the innovation in the field of computer science of creating a machine which human considers as intelligent. It can plan and respond according to the situation [40]. There are several different definitions given by several researchers such as [48] defines the goal of AI as to solve and identify information processing challenges. While, [54] defines it as the development of intelligent agents that learns from the environment and take actions to affect that environment.

2.1 Social Choice, Ethics and Artificial Intelligence

Machine learning, a subset of Artificial Intelligence, is based on solutions and systems which learns from experience over time without requiring to be programmed again. However, its main problem is that, unlike humans, it does not have a consciousness. For instance, children have a consciousness and an ability to identify, quantify and combining multiple viewpoints to make social choice based on ethics, which is not the same for AI. There are only a few researchers who have discussed social choice in AI ethics [34, 39]. [59] discusses social choice in the context of Coherent Extrapolated Volition (CEV). [24] explores computation social choice in a more comprehensive way [38]. AI and its subsets such as machine learning, natural language processing has been applied in various ways [17] such as to communicate with human beings, to convert texts from one natural language to another natural language [25, 35, 47, 58] to analyze the human beings' sentiments based on their social posts [56] etc. AI bots, chatbots or chatter bots are an application of AI which use machine learning and natural language processing to communicate and act like a human being [40, 41].

AI ethics should not be considered as a formality, but it should play a major role in implementation of the technical details of the AI and machine learning systems.

2.2 Ethics in Islamic Finance

Ethics as a discipline or "Islamic Ethics" does not exist in Islamic literature, however, a lot of relevant material is available from *Tafseer* (Quranic interpretation), and *Fiqh* (Understanding of Sharia). Ethics in Islam draws its resources from the revelation (The sense of god's presence' or the 'Sense of God's Guidance' becomes the guiding principle for the ethics in Islam [12, 41, 52]. Ethics is an important branch of human philosophy that guide human behavior to become a good human being. Ethics is the branch of study where fundamental issues about life, like how should a human live their life to become a good human being are taught [44]. With the emergence technologies such as artificial intelligence, it becomes increasingly important to empower people using it with more ethical awareness. Better ethical knowledge will enable the owner of the technology to bring positive changes in the society and keep the negatives away [1, 45]. Ethics can be defined as the motivation of human behavior. Whether a person is being ethical or not it cannot be determined from his actions, but it can only be determined by studying the motivation for that action. A person may look very honest and works in a trustworthy manner, but his intentions are a material gain then his behavior cannot be called as ethical behavior. This argument was raised about 2000 years ago by the famous philosophers *Plato and Aristotle*. In the words of *Plato* and *Aristotle* 'Materialism is the source of our moral sickness, if a person believes in the materialism, it encourages him to cheat, lie, steal and become dishonest. To get away from these actions we must be materialistically better off [21, 26, 30] (Table 1).

Table 1. Ethical issues in AI implementation

No.	Ethical Issues in AI Implementation	Explanation
1	AI reduces customer autonomy	Recent innovations in Artificial intelligence and automation has reduced the customer's choices of being in center of decision making. Starting from email to self-checkout counter in supermarket. It has resulted in excluding those customers who did not use it and it also resulted in reduction of customer wellbeing [11]
2	AI and cyber security	Some of the AI innovations are based on Blockchain has provided more transparency and security, however, cyber security seriousness and frequency are expected to increase. AI can be used in targeted attacks in which customers' financial data can be used for inappropriate purposes [43]
3	Customer consent and privacy	Every customer has the right to protect his privacy. The companies take the consent of customers using long term and conditions forms which is highly unethical as it is not possible for the users to read these many pages and make decision. It is also a kind of undue influence
4	Transparency of AI algorithm	The FinTech companies do not provide the detailed algorithm data about the AI based machines. Users have the right to know what kind of data has been used. The transparency ill regard to the type of data will also reduce the unnecessary fears in the mind of users and increase trust
5	Fairness/Biasness	The data used for AI algorithm are majoritarian based and minority section of the population are not properly represented. The biases are there in the initial data itself. The AI based machines must be fair, unbiased and rational
6	Accountability	Ideally, the FinTech companies producing these machines must take the accountability for any consequences arising from it
7	Accuracy and reliability	It is very important that the AI based machines are producing the accurate and reliable result. It should be trained with different kind of data sets which allows it to produce more reliable and accurate results

2.3 Islamic Finance Perspective of AI and Ethics

There are many verses in Holy Quran explaining ethics and morality, in one of the occasion Allah says in Holy Quran (Surah As-Shams Verse 8–10).

> *"And We inspired the soul with knowledge of evil and piety. Those who purify their souls will certainly have ever lasting happiness and those who corrupt... ... happiness and those who corrupt their soul will certainly be deprived of happiness".*

Explanation: When creation of the man was completed, and it came to be being. Allah given man the ability to distinguish between good and bad, right and wrong. This is the exclusive gift given to the human being only. Allah says that the success, prosperity and salvation of man depends on man himself, even a man can get higher position than

the angels. To achieve this a man should have pure heart and soul, he should not try and harm anyone, he should be ethical in all his business and other dealings. Allah further says that if you have pure heart will get the everlasting happiness and those who try, and cheat will not get anything.

It is beyond the scope of the present study to discuss in detail the Islamic moral and ethical values. Following are some of the ethical code of conduct applicable in business activities, suggested as per the Islamic teachings [31, 34, 37].

| Sr. No.	Name of Islamic ethical values	Explanation	Proof asper Islamic Quran/Sunnah
1	*Zakat*	Zakat is the annual payment made by the Muslims to help poor and needy people	It is one of the five pillars of Islam along with Shahadah, Salah, Fasting and Hajj
2	*Rizq-Al-Halal*	Lawful earning. The earnings which a person is taking home shall not be coming from unlawful and unethical manner	Mentioned in Holy Quran, *(Surah ALBaqra, Verse, 168)* "Eat of what is lawful and pure in the earth, and do not follow in Satan's steps"
3	Account of Income and Expenditure	The income earned as well as the expenditure made shall be as per sharia. A Muslim shall not spend any money on haram things Earnings and expenditures are also to be controlled and regulated as per *Quran a*nd *Sunnah*	Ibn-Moosa Narrates a Hadith from Tirmidhi that *"Prophet (Peace be upon him) said, on the day of judgment, All will ask How did you earn your livings and how did you spend your income"*
4	Honesty in Business Transactions	Muslims must be honest in all their business dealings with Muslims as well as non-Muslims. On numerous occasions Allah and his prophet stresses on being honest	Allah says (*Surah Nisa*, Verse 58). *Allah* says, "*Allah* commands you to deliver trusts back to their owners" Prophet says that breaking trust is assign that a person is hypocrite and a lier. (*Bukhari* 33)
5	Humanity in business Transaction	One shall have human values and flexibility in business dealings. There shall always be the scope for revoking the transaction with minimum loss for either parties	Allah says (*Surah Al-Luqman*, Verse 19). "*Be moderate in your voice and lower your voice*"
6	Legal Consent of the parties to transaction	The consent of the parties to the transaction must be obtained legally. The consent must not be obtained by means of coercion, undue influence or by any unlawful means	Allah says in Holy Quran (Surah *Al_Nisa*, Verse 30). "*And whoever commits that through aggression and injustice, we shall cast him into the fire, and that is easy for Allah*"

<div align="right">(continued)</div>

<div align="center">(continued)</div>

Sr. No.	Name of Islamic ethical values	Explanation	Proof asper Islamic Quran/Sunnah
7	Mutual Respect and Peaceful Co-existence	Mutual respect and peaceful co-existence are the basic principle of Islam. There are no concept as selfish earnings in Islam. There shall be mutual respect in all business dealings	On various occasion in Holy Quran, Allah emphasizes on the respectful dealings. *Allah love kindness and ask us to be kind with others.* (*Surah Al Imran,* Verse 119 and *Surah Al Mai'dah,* Verse 54)

2.4   Need and Role of Regulation Technology (RegTech)

RegTech is a term which was coined by the Deloitte in 2015. It is basically created to address the regulatory challenges of the financial institutions with technology. In other words, it is a part of financial technology which not only help in delivering the financial services efficiently but also it helps in complying the regulatory requirement [27, 57]. We are in the midst of the fourth Industrial Revolution (4IR), the way we work with each other, the way we live our day to day lives and the way interact with each other is going to change dramatically in the next 3 to 5 years and consequently this change will reach to the financial services industry. It is also expected that there will be a huge change in the regulatory framework. The role and relevance of RegTech is significant Since the financial crisis of 2008, banks globally have spent around 320 billion dollars in fines due to failure on part of the banks due to regulatory failings [16]; in 2016, the SEC alone have issued 868 enforcements, amounting to the $4 billion in penalties ordered [16]. the cyber threat is becoming the major day to day concern for the business and financial institutions [32]. Recent statistics reveal that the cybercrime has increase a notch from the common sources like, mobile devices and IoT [18]; modern business models are essentially linked with the innovative technologies. The new innovations brought to the regulatory requirements can be disruptive and damaging [10, 14] and the regulatory landscape has changed completely as organizations are creating a culture of regulatory compliance, there is a transformed culture of increased investment in the compliance operations and organizations which is keeping a pace with the regulatory landscape [19] (Fig. 1).
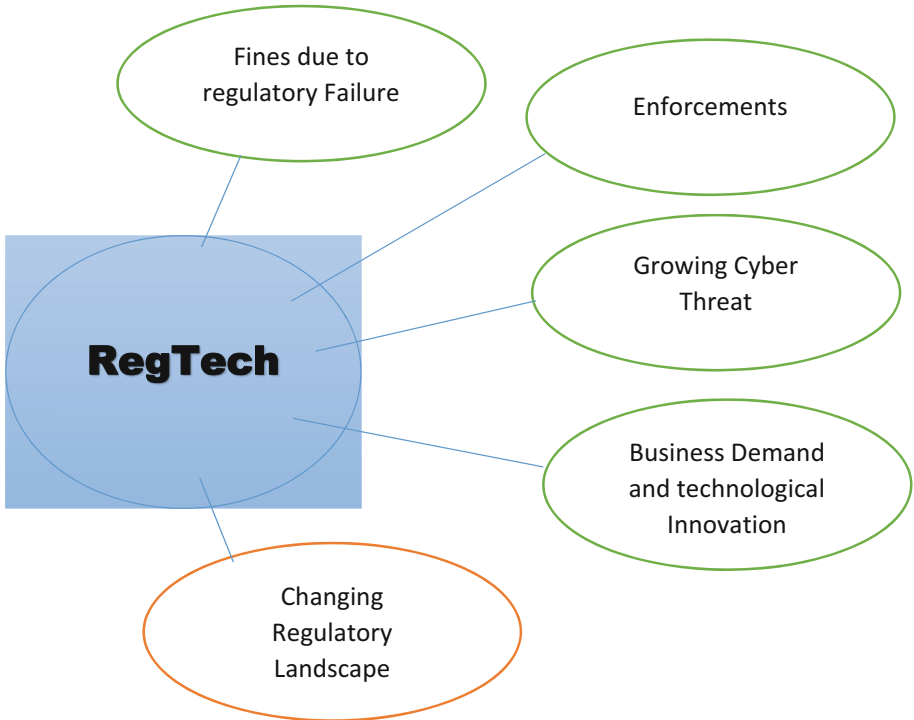
Fig. 1. Role and relevance of RegTech (Developed by Authors)

2.5   AI Applications in RegTech

The Boston Consulting Group (BCG) reported in 2017 that banks and financial institutions are averaging more than 220 regulatory revisions per day [16]. RegTech is often defined as the use of technology called cloud computing and Software-as-a-service (SaaS) with the objective that the business meets the regulatory requirement efficiently and without incurring much cost [2, 37, 51] The application of AI in terms of regulatory compliance can be summarized into the following three components:

- Financial Forecast models and Stress testing.
- AI based application for automatic tracking of regulatory changes.
- Application of machine learning for organizational email filtering.

3   Conclusion

Artificial Intelligence has already affected various areas of our lives. The use of AI can be seen from small applications such as image processing to some advanced level usage such as medical technologies, self-driving cars etc. Various researchers have defined AI in different ways; however, they agree that AI is a technology by which

computing machines try to solve a problem by applying a human-like approach. As the innovations are growing in financial technologies (FinTech), financial institutions may not be able to overlook the use of AI. However, as the use of AI increases it also increases the problem of ethical issues. There have been cases of misuse of the users' data in the name of better services with the growing FinTech innovations.

This paper uses primary data obtained from GCC Shariah scholars and Islamic finance experts to investigate how ethical issues in AI implementation can be solved with effective utilization of Islamic finance principles and technological innovations like RegTech. We employ correlation analysis and regression model to achieve our objective. The findings show that there is a significant relationship between ethical issues in AI implementation, RegTech and Islamic finance principles. To conclude, RegTech along with the *Shariah* principles can help in solving these ethical issues in the implementation of Artificial Intelligence.

References

1. Qadir, J., Suleman, M.: Teaching ethics, (Islamic) values and technology: musings on course design and experience. In: 2018 7th International Conference on Computer and Communication Engineering (ICCCE), pp. 486–491. IEEE, September 2018
2. Rabbani, M.R.: The competitive structure and strategic positioning of commercial banks in Saudi Arabia. Int. J. Emerg. Technol. **11**(3), 43–46 (2020)
3. Abdullah, S.M.: Artificial intelligence (AI) and its associated ethical issues. Islam Civ. Renew. (ICR) **10**(1), 124–126 (2019)
4. Memdani, L.: Demonetisation: a move towards cashless economy in India. Int. J. Electron. Bank. **2**(3), 205–211 (2020)
5. Winfield, A.F., Jirotka, M.: Ethical governance is essential to building trust in robotics and artificial intelligence systems. Philos. Trans. Roy. Soc. A: Math. Phys. Eng. Sci. **376**(2133), 20180085 (2018)
6. Ziaee, A.A.: A philosophical approach to artificial intelligence and Islamic values. IIUM Eng. J. **12**(6) (2011)
7. Agarwal, R.: 15 examples of artificial intelligence you're using in daily life (2018). https:// beebom.com/examples-of-artificial-intelligence/. Accessed 20 Feb 2020
8. André, Q., et al.: Consumer choice and autonomy in the age of artificial intelligence and big data. Cust. Needs Solut. **5**(1–2), 28–37 (2018)
9. Yampolskiy, R.V.: Taxonomy of pathways to dangerous artificial intelligence. In: Workshops at the Thirtieth AAAI Conference on Artificial Intelligence, March 2016
10. Baum, S.D.: Social choice ethics in artificial intelligence. AI Soc. **35**(1), 165–176 (2017). https://doi.org/10.1007/s00146-017-0760-1
11. Andrew, G., Arora, R., Bilmes, J., Livescu, K.: Deep canonical correlation analysis. In: International Conference on Machine Learning, pp. 1247–1255, February 2013
12. Haider, M., Khan, S., Rabbani, M.R., Thallasinos, Y.E.: An artificial intelligence and NLP based Islamic FinTech model combining Zakat and Qardh-Al-Hasan for countering the adverse impact of COVID-19 on SMEs and individuals. Int. J. Econ. Bus. Adm. **8**(2), 348–361 (2020)
13. Musleh Al-Sartawi, A.M.A. (ed.): The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. SCI, vol. 974. Springer, Cham (2021). https://doi.org/10.1007/ 978-3-030-73057-4. Kacprzyk, J. (ed.)

14. Baden-Fuller, C., Haefliger, S.: Business models and technological innovation. Long Range Plan. **46**(6), 419–426 (2013)
15. Andresen, S.L.: John McCarthy: father of AI. IEEE Intell. Syst. **17**(5), 84–85 (2002)
16. Boston Consulting Group: Global Risk 2017: Staying the Course in Banking Report (2017)
17. Khan, S., Mishra, R.B.: Translation rules and ANN based model for English to Urdu machine translation. INFOCOMP **10**(3), 36–47 (2011)
18. Arner, D.W., Barberis, J.N., Buckley, R.P.: The emergence of RegTech 2.0: from know your customer to know your data (2016)
19. Lennox, C.: The changing regulatory landscape. Int. J. Audit. **13**(2), 79–85 (2009)
20. Bostrom, N., Yudkowsky, E.: The ethics of artificial intelligence. Camb. Handb. Artif. Intell. **1**, 316–334 (2014)
21. Dobson, J.: The role of ethics in finance. Financ. Anal. J. **49**(6), 57–61 (1993). https://doi.org/10.2469/faj.v49.n6.57
22. Etzioni, A., Etzioni, O.: Incorporating ethics into artificial intelligence. J. Ethics **21**(4), 403–418 (2017)
23. Bouarfa, L., et al.: The European commission's high-level expert group on artificial intelligence: ethics guidelines for trustworthy AI. Working Document for Stakeholders' Consultation, Brussels, pp. 1–37 (2018)
24. Brandt, F., Conitzer, V., Endriss, U., Lang, J., Procaccia, A.D.: Handbook of Computational Social Choice. Cambridge University Press, Cambridge (2015)
25. Shahnawaz, Mishra, R.B.: Rule-based approach for handling of case markers in English to Urdu/Hindi translation. Int. J. Knowl. Eng. Soft Data Paradigms **4**(2), 138–165 (2013). https://doi.org/10.1504/IJKESDP.2013.058128
26. Burton, E., Goldsmith, J., Koenig, S., Kuipers, B., Mattei, N., Walsh, T.: Ethical considerations in artificial intelligence courses. AI Mag. **38**(2), 22–34 (2017)
27. Al-Sartawi, A.: Shariah disclosure and the performance of Islamic financial institutions. Asian J. Bus. Acc. **13**(1), 133–160 (2020)
28. Taddeo, M., Floridi, L.: How AI can be a force for good. Science **361**(6404), 751–752 (2018)
29. Hannoon, A., Al-Sartawi, A.M.A.M., Khalid, A.A.: Relationship between financial technology and financial performance. In: Musleh Al-Sartawi, A.M.A. (ed.) The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. SCI, vol. 974, pp. 337–344. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-73057-4_26
30. Hagendorff, T.: The ethics of AI ethics–an evaluation of guidelines. arXiv preprint arXiv:1903.03425 (2019)
31. Islam, S., Nordin, R.B., Rani, B.A., Hanapi, B.M.N.: Ethics of artificial insemination: an islamic perspective. J. Islamic Med. Assoc. North America **39**(1) (2007)
32. Al-Sartawi, A.: Information technology governance and cybersecurity at the board level. Int. J. Crit. Infrastruct. **16**(2), 150–161 (2020)
33. Legg, S., Hutter, M.: A collection of definitions of intelligence. Front. Artif. Intell. Appl. **157**, 17 (2007)
34. Masum, A.K.M., Ullah, M., Azad, M., Kalam, A.: Information technology (IT) ethics in the light of Islam (2012)
35. Shahnawaz, Mishra, R.B.: An English to Urdu translation model based on CBR, ANN and translation rules. Int. J. Adv. Intell. Paradigms **7**(1), 1–23 (2015)
36. Alansari, Y., Al-Sartawi, A.: IT governance and E-banking in GCC listed banks. Proc. Comput. Sci. **183**, 844–848 (2021)
37. Hashimak, R., Mahamoodb, S.F.: Humanoid robots for SCill augmentation of gifted children: teachersΓ perceptions and Islamic implications. Proc. Comput. Sci. **42**, 345–350 (2014)

38. Arrhenius, G.: The boundary problem in democratic theory. In: Tersman, F. (ed.) Democracy Unbound: Basic Explorations I. Filosofiska Institutionen, Stockholm, pp 14–29 (2005)
39. Hayat, U., Malik, A.: Islamic Finance: ethics, concepts, practice. Practice (November 2014). CFA Institute Research Foundation L2014-3 (2014)
40. Janet, F., Dix, A.: Artificial Intelligence, p. 262. UCL Press (1996)
41. Khan, S., Rabbani, M.R.: Artificial Intelligence and NLP based Chatbot as Islamic banking and finance expert (2020, unpublished)
42. Khan, S., Rabbani, M.R.: Artificial intelligence and NLP based chatbot as Islamic banking and finance expert. In: 2020 International Conference on Computational Linguistics and Natural Language Processing (CLNLP 2020), Seoul, South Korea on 20–22 July 2020 (2020)
43. Khan, S., Rabbani, M.R.: Artificial intelligence and NLP based chabot as islamic banking and finance expert. Int. J. Inf. Retrieval Res. (IJIRR) Spec. Issue: Optim. Converg. Mach. Learn. Algorithms Leverag. IoT Block Chain and Artif. Intell. (2020)
44. Hassan, M.K., Rabbani, M.R., Ali, M.: Challenges for the Islamic finance and banking in post COVID era and the role of fintech. J. Econ. Coop. Dev. (2020)
45. Khan, S., Rabbani, M.R.: In depth analysis of blockchain, cryptocurrency and sharia compliance. Int. J. Bus. Innov. Res. (2020)
46. Levin, S., Nicky, W.: Tesla driver killed while using autopilot was watching Harry Potter, witness says. The Guardian (2016). https://www.theguardian.com/technology/2016/jul/01/tesla-driver-killed-autopilot-self-driving-car-harry-potter
47. Shuttleworth, M., Wilson, L.T.: Definition of reliability (2009). https://explorable.com/definition-of-reliability. Accessed 18 July 2020
48. Marr, D.: Artificial intelligence—a personal view. Artif. Intell. **9**(1), 37–48 (1977)
49. McCarthy, J.: What is artificial intelligence? Computer Science Department, Stanford (2004)
50. Musleh Al-Sartawi, A.M., Razzaque, A., Kamal, M.M. (eds.) Artificial Intelligence Systems and the Internet of Things in the Digital Era. EAMMIS 2021. Lecture Notes in Networks and Systems, vol 239. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-77246-8
51. Rabbani, M.R., Khan, S., Thalassinos, I.E.: FinTech, blockchain and Islamic finance: an extensive literature review. Int. J. Econ. Bus. Adm. **8**(2), 65–86 (2020)
52. Rahman, S.N.M.A., Ibrahim, A.: Safety plan and control of artificial intelligence: integrating maqāṣid al-sharī'ah, hisbah and tasawur as mechanism. J. Islamic **4**(23), 01–08 (2019)
53. Razali, N.M., Wah, Y.B.: Power comparisons of Shapiro-Wilk, Kolmogorov-Smirnov, Lilliefors and Anderson-darling tests. J. Stat. Model. Anal. **2**(1), 21–33 (2011)
54. Russell, S.J., Norvig, P.: Artificial Intelligence: A Modern Approach. Pearson Education Limited, Malaysia (2016)
55. Shihadeh, F.: Online payment services and individuals' behaviour: new evidence from the MENAP. Int. J. Electron. Bank. **2**(4), 275–282 (2020)
56. Shahnawaz, Astya, P.: Sentiment analysis: Approaches and open issues. In: 2017 International Conference on Computing, Communication and Automation (ICCCA) (2017). https://doi.org/10.1109/ccaa.2017.8229791
57. Aziz, S., Dowling, M.: Machine learning and AI for risk management. In: Disrupting Finance, pp. 33–50. Palgrave Pivot, Cham (2019)
58. Shahnawaz, Mishra, R.B.: Statistical machine translation system for English to Urdu. Int. J. Adv. Intell. Paradigms **5**(3), 182–203 (2013). https://doi.org/10.1504/IJAIP.2013.056421
59. Tarleton, N.: Coherent extrapolated volition: a meta-level approach to machine ethics. The Singularity Institute, Berkeley, CA, University Stanford, CA 94305 (2010)
60. Chayjan, M.R., Bagheri, T., Kianian, A., Someh, N.G.: Using data mining for prediction of retail banking customer's churn behaviour. Int. J. Electron. Bank. **2**(4), 303–320 (2020)

Big Data, Blockchain and Security

Blockchain in Environmental Compliance and Enforcement

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Abstract. The blockchain applications are a relatively new innovation, especially in the field of envirinmental law enforcement. The review of the existing literature on blockchain applications seems to point out the availability of great potential for these application in the field of environmental compliance and enforcement. The study aims to review the existing blockchain technologies in environmental compliance and enforcement and other relevant fields. The study recommend that Future research is required to further investigate the potential and impact of blockchain application on environmental enforcement.

Keywords: Environmental · Compliance · Enforcement · Technology · Blockchain

1 Introduction

Effective environmental data management and analysis is an essential factor in retrieving and applying environmental data. Sensor technology advancement have made sensors more compact, low cost, and smart and power efficient. Which in turn, has led to deployment of large numbers of sensors for generation of real-time spatiotemporal environmental data and environmental monitoring. Effective environmental data management systems are dependent on the integration and consolidation of the sensor data streams [9]. In this study we will reviewing currently used blockchain applications and their effect on the environmental compliance and enforcement strategies and processes.

2 Exsisting Literature

This section presents a review of the literature on blockchain technology and its impact on environmental enforcement. The existing body of the literature provides crucial insights regarding the applications and benefits of blockchain technology. The section begins with the definition of blockchain technology and its application in various industries. This is followed by the review of the impact of blockchain technology on environmental enforcement. Therefore, this section presents the findings and theories presented in previous studies.

2.1   Overview of Blockchain Technology

Blockchain is regarded as a digital list of records in which involved parties record transactions in blocks (each block is encrypted piece of data) and link them using cryptography. Once they fill a block with data, they seal and add it to the blockchain in a chronological manner. Once sealed, no alteration is done without the consensus of the parties involved. Scholars agree that blockchain technology is promising since it places trust and authority in a decentralized network [2–4]. They suggested that eliminating a centralized authority makes the technology appropriate to solving national and global challenges. The blockchain facilitates entities to securely exchange data and values without the need for a third party [1]. Many sectors can benefit from these applications [1]. For example, blockchain technology is applied in banking [3, 20], auditing [2, 6, 20], the energy sector [5], and the security industry [20], with the aim of bringing significant benefits and advancements to their operation. According to Andoni et al. [5], blockchain technology ensures a transparent, tamper-proof, and secure systems. Therefore, it is critical to assess the application of blockchain technology on the enforcement of environmental laws and regulations, as lawmakers and regulators understand the need to protect the environment.

Abeyratne and Monfared [1] identified various domains in which blockchain technologies are or can be applied, such as the financial sector, social sector, and legal sector. One of the application in the legal sector that is increasingly getting attention as a means enhancing the execution assurance and enforcement process is the smart contracts [1]. Abeyratne and Monfared [1] postulate that smart contracts are self-automated software that achieve actions after certain actions or criteria are met (e.g., automatically transfers assets after payment is received). Also, smart contracts might theoretically automate the colossal quantity of legal resources needed to prepare, execute, and enforce contracts, hence lowering the need for manpower. The making of daily agreements through smart contracts might come sooner than people believe [1].

According to Shackelford and Myers [16], most of the things that people buy are not made by a single entity, rather through several entities in the supply chain that provide components for the end product, for instance, graphite for pencils is provided by a different entity than the final brand. The issue with this system is that if one of these mechanisms fails, the brand takes the backlash brunt. Effective tracking of the components is essential to achieve the quality and quantity needed by the final entity. Blockchain application have been increasingly used as an effective tool across the supply chain to achieve transability of the components and products [12, 14]. Truby [17] finds that knowing the source of the supply chain is a very vital thing. This assists in ensuring that quality is guaranteed and protects the business from the poor choices of other people. The notion behind using blockchain for this could be that the ledger on the blockchain offers a clear and encrypted manner to ensure people are buying what they believe in safely [17]. The economists list skuchain and provenance as up and coming players in a blockchain-enabled supply chain tracker industry [16].

2.2 Blockchain in Environmental Compliance and Enforcement

Businesses have an essential role to play in protecting the environment, including ensuring compliance and enforcement of the laws and regulations related to protecting the environment. A study [2] investigated the application of blockchain technology in environmental auditing. According to the findings, environment protection agencies stand a better chance to achieve their objectives using the blockchain technology. For example, the technology allows a decentralized system, where personnel on the ground can record data. Once they fill a block with data, they seal and add it to the blockchain in a chronological manner. This is critical in environmental enforcement since no one is allowed to alter the data at a later date [1, 2].

Once sealed, no alteration is done without the consensus of the parties involved. Therefore, it becomes easier for environmental law enforcement agencies to handle cases transparently. As noted by [3–5], blockchain technology ensures a transparent, tamper-proof, and secure systems. [6–9] agreed that it is difficult for people to tamper with the initially entered data once blockchain technology is applied. For law enforcer, this is critical for availing accurate, transparent, and tamper-proof data on how individual or firms are observing laws and regulations. It is through such benefits that environmental enforcement is significantly improved since it will facilitate the provision of the much-needed evidence [16, 21].

[13] researched and analyzed more than 65 blockchain technologies and applications for environmental protection from a range users of block chain technologies across industry, big tech, research and government. They identify several blockchain "game changers" with great potential to deliver innovative solutions to environmental challenges. They summarize them as 8 "game changers" [13]:

1. "See-through" supply chains
2. Decentralized and sustainable resource management
3. Raising trillions – new source of sustainable finance
4. Incentivizing circular economies
5. Transforming carbon (and other environmental) markets
6. Next-gen sustainability monitoring, reporting, and verification
7. Automatic disaster preparedness and humanitarian relief
8. Earth management platforms

The two game changers we find to have potential in the field of environmental compliance and enforcement are the "see through" supply chain and the Next-gen sustainability monitoring, reporting, and verification. The "see through" supply chain through blockchain has the potential to create transparency in the supply chain. The blockchain provides an immutable record provenance data through recorded transactions throughout the supply chain, which provides a traceable source of data from the source to the store [13, 22, 23]. This aspect can have potential to trace violations and illegal trade [4, 13, 15, 17]. One such example is a pilot study conducted in the Pacific to trace the tune fishing industry from landing of fish to the consumer [15, 17, 21]. The aim of the project is to improve tuna traceability to help stop illegal and sustainable fishing practices in the Pacific Islands tune industry.

In the Next-gen sustainability, monitoring, reporting, and verification game changer the blockchain technology can potentially transform the sustainability assurance and reporting process in corporations, especially if combined with third party verification and monitoring tools (e.g., sensors), which would give independent and accurate data [13]. This method (third-party reporting and assurance) increases transparency and data authenticity. This can be achieved by implementing smart contracts to access trusted, real-time data that is difficult to manipulate (reduce fraud) [4, 10–12].

[18] proposed and evaluated and IoT and blockchain based distributed system for automated measurements, storage, and monitoring of water and air quality data in the environment. The researchers purport from their evaluation of their system that the data has high accuracy and authenticity which can considered reliable source of pollution evidence [4, 15–20].

Blockchain technology has the potential to increase transparency, data authenticity, and speed of data transfer in environmental monitoring and measurement, especially when incorporated to IoT monitoring tools (smart sensors). Ibba et al. [14] proposed a blockchain system to manage the environmental context. The proposed project named Citysense which similar to previously reviewed projects such as citisense, that use IoT connected sensors (moving or fixed) to monitor the environment such as air quality. In their research they propose to add a blockchain system (Fig. 1), which they suggest will provide accurate real-time data which can be used to deliver real-time solutions and counter measures [14]. They also suggest that the project will increase collaborative measures through the collaboration of the stakeholders. This project has clear potential for improving the environmental enforcement processes through collaborative blockchain IoT solutions, which can show violations and infringements in real-time. Since the data in secure and authentic it also can be used as evidence and proof of noncompliance [11].
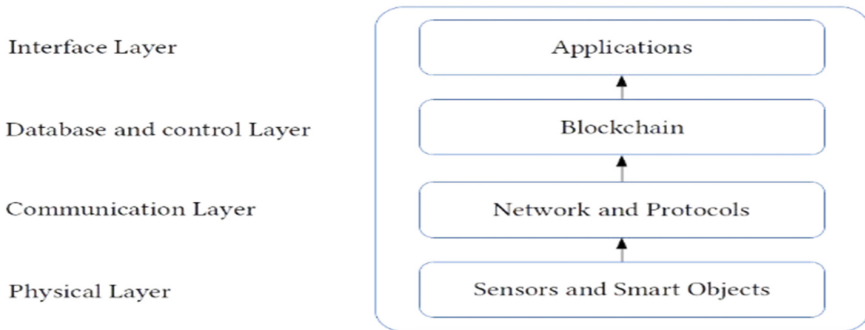

Fig. 1. CitySense proposed project layers [11]

3 Findings and Discussion

The blockchain applications are a relatively new innovation, especially in the field of envirinmental law enforcement. The review of the existing literature on blockchain applications seems to point out the availability of great potential for these application in the field of environmental compliance and enforcement. The blockchain technologies when integrated with other technological advancements such as smart sensors and smart networks provide an increasingly fast, secure, transparent, immutable, and authentic data source in which several parties can monitor, verify, authenticate data. The databases provided by blockchain technologies provide improved data for environmental monitoring, measurement, and enforcement. The implementation of smart contracts gives users trusted, real-time data that is difficult to manipulate which lowers the chances of any malpractice or errors [7, 21].

From the review the main aspects in which blockchain technologies can be useful for environmental enforcement systems were through improving the speed, quality, authenticity, and transparency of data in various processes. The proper implementation of these technologies can be beneficial in ensuring data safety, accuracy, and unalterable data. This can be useful especially for systems which are interested in increasing the integrity of their institutions by providing data that is trusted and audited by several parties. As well as, enhancing their processes and procedures The limitations for this study were the relevantly low abundance of research in blockchain technology in the field envirnmental compliance and enforcement. Future research is required to further investigate the potential and impact of blockchain application on environmental enforcement. Also, the feasibility and limitations of blockchain applications in the field on environmental enforcement processes and procedures to further understand the impact of these technologies.

References

1. Abeyratne, S.A., Monfared, R.P.: Blockchain ready manufacturing supply chain using the distributed ledger (2016)
2. Abreu, P.W., Aparicio, M., Costa, C.J.: Blockchain technology in the auditing environment. In: 2018 13th Iberian Conference on Information Systems and Technologies (CISTI), pp. 1–6. IEEE, June 2018
3. Al-Saqaf, W., Seidler, N.: Blockchain technology for social impact: opportunities and challenges ahead. J. Cyber Policy 2(3), 338–354 (2017)
4. Allena, M.: Blockchain technology for environmental compliance. Environ. Law 50(4), 1055–1103 (2020)
5. Andoni, M., et al.: Blockchain technology in the energy sector: a systematic review of challenges and opportunities. Renew. Sustain. Energy Rev. 100, 143–174 (2019)
6. Al-Sartawi, A.: Does it pay to be socially responsible? Empirical evidence from the GCC countries. Int. J. Law Manag. 62(5), 381–394 (2020)
7. Al-Sartawi, A.: Assessing the relationship between information transparency through social media disclosure and firm value. Manag. Acc. Rev. 18(2), 1–20 (2019)

8. Al-Sartawi, A.: The big data-driven digital economy: artificial and computational intelligence In: Kacprzyk, J. (ed.) Studies in Computational Intelligence, vol. 974. Springer, Heidelberg (2021)

9. Bible, W., Raphael, J., Taylor, P., Oris Valiente, I.: Blockchain technology and its potential impact on the audit and assurance profession. Aicpa.Org (2017)

10. Cook, B., Zealand, W.N.: Blockchain: Transforming the seafood supply chain. World Wide Fund for Nature (2018)

11. Dujak, D., Sajter, D.: Blockchain applications in supply chain. In: Kawa, A., Maryniak, A. (eds.) SMART Supply Network, pp. 21–46. Springer, Cham (2019)

12. Gong, J., Geng, J., Chen, Z.: Real-time GIS data model and sensor web service platform for environmental data management. Int. J. Health Geogr. **14**(1), 2 (2015)

13. Hannoon, A., Abdalla, Y.A., Musleh Al-Sartawi, A.M.A., Khalid, A.A.: Board of directors composition and social media financial disclosure: the case of the United Arab Emirates. In: Musleh Al-Sartawi, A.M.A. (ed.) The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. SCI, vol. 974, pp. 229–241. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-73057-4_18

14. Ibba, S., Pinna, A., Seu, M., Pani, F.E.: CitySense: blockchain-oriented smart cities. In: Proceedings of the XP2017 Scientific Workshops, p. 12. ACM (2017)

15. Kouhizadeh, M., Sarkis, J.: Blockchain practices, potentials, and perspectives in greening supply chains. Sustainability **10**(10), 3652 (2018)

16. Kshetri, N.: Will blockchain emerge as a tool to break the poverty chain in the global south? Third World Q. **38**(8), 1710–1732 (2017)

17. Mahyuni, L.P., Adrian, R., Darma, G.S., Krisnawijaya, N.N.K., Dewi, I.G.A.A.P., Permana, G.P.L.: Mapping the potentials of blockchain in improving supply chain performance. Cogent Bus. Manag. **7**(1), 1788329 (2020)

18. Niya, S.R., Jha, S.S., Bocek, T., Stiller, B.: Design and implementation of an automated and decentralized pollution monitoring system with blockchains, smart contracts, and LoRaWAN. In: NOMS 2018–2018 IEEE/IFIP Network Operations and Management Symposium, pp. 1–4. IEEE, April 2018

19. Shackelford, S.J., Myers, S.: Block-by-block: leveraging the power of blockchain technology to build trust and promote cyber peace. Yale JL Tech. **19**, 334 (2017)

20. Truby, J.: Decarbonizing Bitcoin: Law and policy choices for reducing the energy consumption of Blockchain technologies and digital currencies. Energy Res. Soc. Sci. **44**, 399–410 (2018)

21. Visser, C., Hanich, Q.A.: How blockchain is strengthening tuna traceability to combat illegal fishing (2017)

22. Xu, X., Weber, I., Staples, M.: Architecture for Blockchain Applications, pp. 1–307. Springer, Berlin (2019)

23. Yeoh, P.: Regulatory issues in blockchain technology. J. Financ. Regul. Compliance **25**(2), 196–208 (2017)

Enhancing Quality of Sustainability Reporting by Using Big Data Analytics: A Conceptual Framework Based on Stakeholder Engagement

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Abstract. With the increased use of sustainability reporting in company and stakeholder decision-making, a wave of criticism about the quality of such reports has emerged in the literature. Measures or frameworks to conceptualize the quality of these reports have received much too little attention. Little is known about employing modern information processing technologies like big data analytics to improve the quality of sustainability reporting. This study presents a conceptual framework for enhancing sustainability reporting (QSR) through stakeholder engagement initiatives utilizing big data analytics (BDA). The framework might aid in developing a substantial research agenda for the relationship between QSR and BDA to improve research and practice through the efficient use of data resources.

Keywords: Quality of sustainability reporting · Big data analytics · Stakeholder engagement · Conceptual framework

1 Introduction

Stakeholder expectations of enterprise transparency and responsibility are increasing, which necessitates assessing and reporting the effect of corporate decisions on society and the environment. Various companies may publish sustainability reports to highlight their achievements in this area. Sustainability reporting[1] is primarily a voluntary activity that has gained popularity in the corporate world [1].

The adoption of sustainability reporting might bring several internal and external benefits to the organization. It is an excellent tool for giving external and internal stakeholders a look "under the hood" of the business. Sustainability reporting promotes involvement and openness in a company's relationships with its external environment and how it produces long-term value for stakeholders [2]. A sustainability report, in this sense, is the start of an information asymmetry between the company and its

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[1] In this paper sustainability reporting refers to non-financial reporting, corporate social reporting (CSR), and integrated reporting (IR).

stakeholders about whether the report contains relevant and reliable information. As a result, the absence of information provided to stakeholders on some issues lowers the firm's quality of decision-making [3].

Most research has focused on the emergence of sustainability reporting [4, 5], firm characteristics such as size, country, or industry regarding sustainability reporting [6, 7], and its impact on financial figures [7, 8].

According to Cho et al. [9] sustainability reporting practices may not give a higher quality of information and may be utilized as symbolic acts. Despite voluntary uniformity, however, sustainability reports have been chastised for lacking credibility [10], being pseudo-transparent [11], and being of poor quality [12]. As a result, sustainability reports have been accused of contributing to corporate greenwashing by widening the credibility gap [13, 14]. In addition to reporting non-relevant sustainable information [15] and jeopardizing a company's legitimacy in society rather than facilitating dialogue with stakeholders [16].

A firm that publishes sustainability reports must focus on stakeholder engagement[2] to address these issues. Thus, this paper conceptualizes and operationalizes the two primary characteristics of QSR (relevance and reliability) based on stakeholder engagement initiatives.

Some academics, however, advocate for additional study into how to improve the QSR by utilizing new information processing capabilities via big data analytics (BDA) as the primary source of information creation [18]. Previous techniques all assumed that information discovery and processing had already been performed.

On the other hand, information quality is determined by the information system, which encompasses the organizational processes, procedures, and responsibilities involved in the collection, processing, distribution, and use of data. In addition, rather than suppliers or custodians of information, such as IT departments, information quality should be established by information consumers [19].

As a result, this paper uses a unique alternative method that relies on BDA as the primary source of data. The assumption of possible improvement for QSR is based on the understanding that information relevance and reliability are closely related to data quality.

The main goal of this paper is to develop and construct a conceptual framework for leveraging BDA to improve QSR by implementing stakeholder engagement initiatives.

The paper is one of the first studies to look at the relationship between QSR and BDA. The conceptual framework could help develop a significant research agenda for the relationship between sustainability reporting quality and big data analytics, leading to specific research questions and areas for future research.

The paper was broken into three sections. After an introduction, the first section reviews previous frameworks for conceptualizing QSR; the second section includes a recommended conceptual framework to enhance QSR; and lastly, conclusions, implications, and limitations are drawn.

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[2] Greenwood (P.318) [17] defined stakeholder engagement as "practices that the organization undertakes to involve stakeholder".

2 Quality of Sustainability Reporting Frameworks: Literature Review

Although many studies have highlighted concern about the quality of sustainability reporting, few studies have addressed metrics or frameworks for conceptualizing the QSR. These studies may be divided into three groups. Some research focused on assessing QSR using the GRI or WBCSD methodology. Other research uses their frameworks to assess QSR. Another set of studies in the field of information systems proposed methods for evaluating information quality.

Several studies have used an assessment of quality reporting standards proposed by the Global Reporting Initiative (GRI G4) [20] or the World Business Council for Sustainable Development (WBCSD) [21] so far [2, 15, 22, 23]. Both the GRI and WBCSD standards provide quality criteria that are comparable and generic.

According to the GRI (G4 GRI) [20] principles, reports should cover various criteria, including vision and strategy, company profile, governance structure and management systems, GRI content index, and performance criteria. There are two types of criteria: core and additional. Additional criteria evaluate innovative practices applicable to certain companies but not to the majority, whereas core criteria apply to most businesses.

The GRI identifies four criteria in terms of the report's content: materiality, stakeholder inclusion, sustainable context, and completeness. Materiality refers to the idea that the information in the report should represent the organization's economic, environmental, and social consequences and be decisive in stakeholders' evaluations and choices. Stakeholder inclusion means the report should take into account and respond to stakeholders' expectations and interests. The organization's performance in the larger domain of sustainability is the sustainability context. Completeness means that the report's subjects and bounds should be sufficient to represent the company's significant participation in social and environmental concerns and allow stakeholders to assess the success of specified goals.

The GRI, G3, and G4 editions also specify the following elements for determining the quality of non-financial reporting: clarity, correctness, timeliness, comparability, and dependability. Information should be clear, comprehensible, and available to all stakeholders. In order to evaluate firm performance, information should be sufficiently precise and thorough for stakeholders. Timeliness means that reporting should be completed regularly and made available promptly so that stakeholders may explain and discuss their decisions. Comparability refers to the information given to provide stakeholders with an overview of performance throughout time in terms of goals and achievements accomplished in prior years, allowing for comparisons with other companies. Information and methods used to create reports are acquired, recorded, collated, analyzed, and disseminated in ways that allow them to be reviewed. The quality and materiality of the information to be determined.

Other studies use their approach to evaluate the quality of sustainability reporting. Lock and Seele [14] used four of their original categories to assess the credibility of sustainability reports: understandability, truth, sincerity, and honesty. According to the government-mandated paradigm, Gao et al. [24] evaluated QSR on the five aspects of

relevance, clarity, dependability, responsiveness, and coherence. The QSR is defined by Michelon et al. [25] in terms of relative quantity, density, accuracy, and managerial orientation. According to Chauvey et al. [26] five critical properties of QSR information: relevance, comparability, verifiability, clarity, and neutrality. In recent research, Helfaya et al. [27] underlined the need to develop a multi-dimensional "quality" construct. The QSR was envisioned via three dimensions: content, credibility, and communication, and was created based on feedback from preparers and users from both developed and developing countries.

Some studies in the field of information systems offered methodologies for assessing information quality. The characteristics of significance to information consumers were determined using a market research technique by Wang and Strong [28]. The research establishes four aspects of information quality representation: (1) intrinsic, (2) contextual, (3) representational, and (4) accessible. Gardyn [29] on the other hand, concentrated on user-relevant aspects of information quality, such as accuracy, completeness, consistency, currency, and accessibility. Lee et al. [30] presented a methodology that categorized information quality into four quadrants: sound, valuable, useable, and dependable data.

According to the above literature study, the characteristics or dimensions to assess the QSR relate to the contents of sustainability reports. Some of them might pertain to the quality of various forms of data. However, the presence of sustainability reporting practices in a company does not automatically imply an improvement in the quality of sustainability reporting data. Instead, the availability of many sustainability initiatives (both internal and external) performed by management signals the quality of sustainability reporting. These initiatives tend to improve the quality of reported sustainability data by increasing its relevance and reliability. Thus, an essential question that has yet to be addressed in the literature is how to propose a conceptual framework that would assist companies in reporting sustainability initiatives in a relevant and reliable manner to stakeholders.

3   A Conceptual Framework for Enhancing QSR Based on Stakeholder Engagement by Using BDA

In the literature, QSR measurement is a relatively new phenomenon. As a result, to conceptualize the quality of sustainability reporting information, the paper develops a "quality" construct based on characteristics derived from previous research. The term 'quality' encompassed the two most important dimensions of QSR, namely relevance and reliability. Through stakeholder engagement initiatives, the proposed conceptual framework attempts to improve the characteristics (dimensions) of QSR utilizing BDA. These initiatives demonstrated serious efforts to embed sustainability practices inside companies and raise awareness of company performance's environmental and social consequences. Furthermore, these initiatives might show if a company's commitment to sustainability reporting is substantive or symbolic.

The suggested conceptual framework is made up of three components that function in sequential order, as illustrated in Fig. 1:

1. QSR management approach: Symbolic vs. Substantive (The impact).
2. Establish quality characteristics (relevance and reliability) and their connections to stakeholder engagement initiatives.
3. Using BDA to improve QSR.

3.1   QSR Management Approach: Symbolic vs. Substantive (The Impact)

Sustainability information is reported by companies for a variety of reasons, according to scholars. For example, their reporting efforts help them manage influential stakeholders [31], adhere to regulatory standards [32], and maintain credibility [25, 33]. Stakeholders may not accept the reporting unless there is proof of substantial efforts to enhance QSR [34]. The symbolic and substantive dimensions of QSR have been described using concepts from the new institutional and legitimacy theories [35].

The symbolic components are intertwined with the ideas of "decoupling" in institutional theory and "pragmatic" validity in the legitimacy literature [35]. According to Dillared et al. [36] decoupling occurs when the formal organizational structure is separated from actual organizational activities. In other words, the organizational practice is not incorporated into the management and operational processes of the company.

According to Suchman [35] companies take a symbolic posture to demonstrate that they are trying to satisfy societal expectations and are willing to embrace externally requested initiatives to preserve and restore organizational legitimacy. The symbolic approach to a company's sustainability initiatives illustrates "greenwashing" techniques, earning little credibility among stakeholders [37]. According to the new study, companies use these symbolic behaviors to manage influential local stakeholders [35].

On the other hand, under the substantive approach, sustainability practices are regarded as the result of a sense of accountability, fueled by companies' concrete commitment and actions to their external stakeholders [25]. As stated by Rodrigue et al. [38] substantive sustainability practices cause internal organizational changes that result in enhanced sustainability performance. A firm's core activities in the substantive approach ongoing stakeholder engagement; sustainability objectives linked to the firm's long-term business strategy; performance measurements and target sets for sustainability activities; external assurance of the sustainability information disclosed; performance data reported over time; and ongoing stakeholder consultations and reporting [25, 26, 37]. According to Chauvey et al. [25] sustainability information meets the criteria of "decision usefulness" when given with a meaningful purpose, ensuring the information's relevance, comparability, and reliability across time.
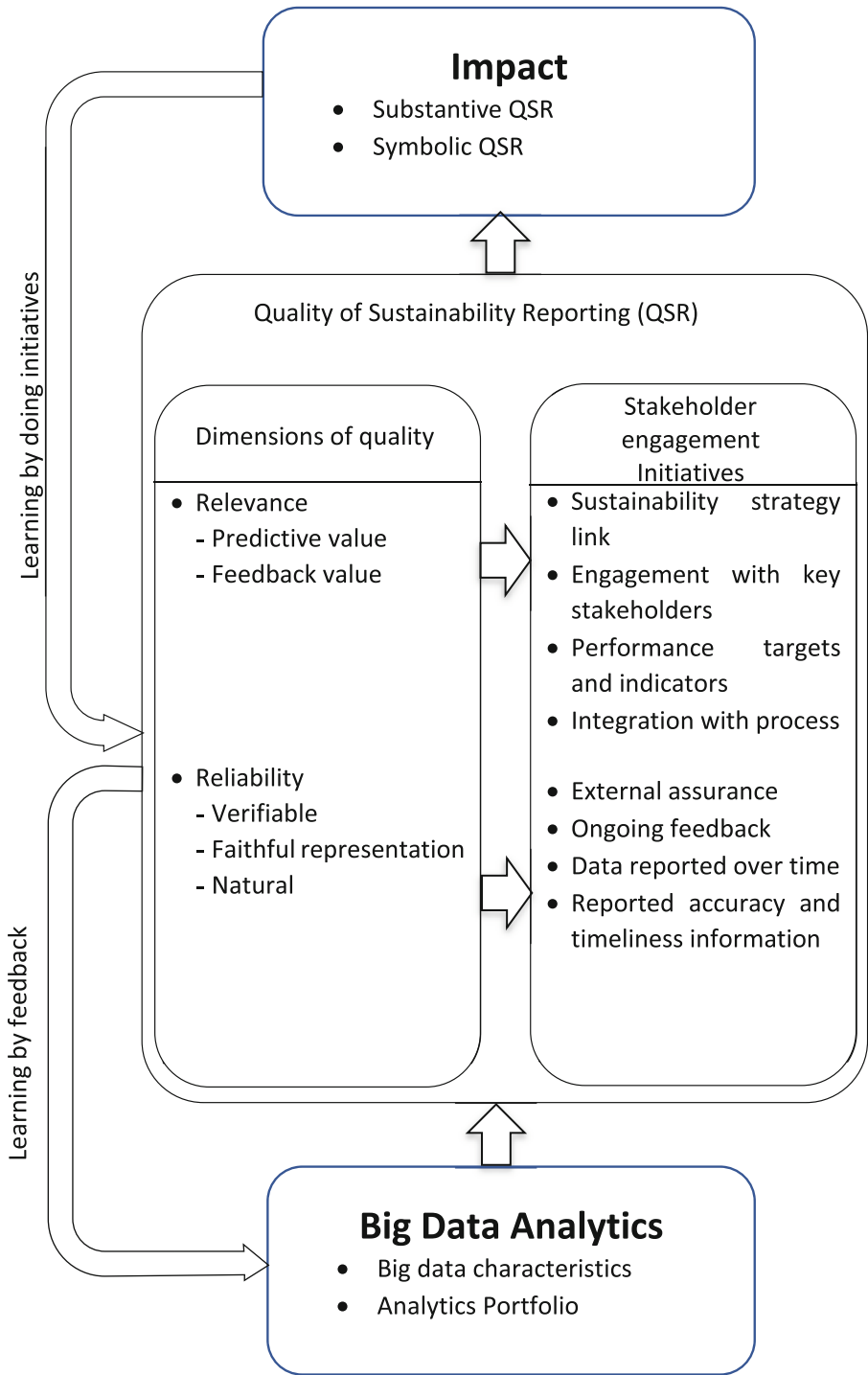
Fig. 1. A conceptual framework for enhancing QSR by using BDA

3.2   Establish Quality Characteristics (Relevance and Reliability) and Their Connections to Stakeholder Engagement Initiatives

Two important concepts, "relevance" and "reliability," have been identified as necessary for financial reporting quality by the International Accounting Standards Board (IASB) and the Financial Accounting Standards Board (FASB). Scholars have argued that the informative characteristics specified by financial accounting standard setters are equally applicable to sustainability reporting quality since the goal of both financial and sustainability reporting is to offer information to help users in making decisions [39].

The GRI defines "relevance" in the context of sustainability information as the importance of non-financial information for stakeholders' choices and possessing essential qualities of stakeholder inclusion and engagement and appealing to stakeholders [26].

Because disclosing non-financial information is helpful to preparers and users, the GRI underlines that the firm's internal sustainability initiatives and related risk factors should be included within the scope of the "relevance" of information [26].

In this paper, the "relevance" dimension covers critical stakeholder engagement, integrating its sustainability strategy with its business strategy, performance objectives, performance indicators, and integration with business processes/operations. Firms can better identify their requests for information, which are essential to both parties, by engaging with key stakeholders. These are most likely the company's internal initiatives and pledges to sustainable practices, essential for stakeholders' decision-making.

Stakeholders can see internal changes made by companies to integrate their sustainability strategy into their business strategy through these initiatives. These concerns become significant for stakeholders as other critical areas, such as sustainability performance indicators, performance objectives, and comparisons, improve. Performance indicators and targets, for example, allow stakeholders to see how businesses have achieved their goals. As a result, the higher the quality of provided sustainability information, the more meaningful the sustainability performance. The firm's QSR initiatives will thus tend to become "substantive."

"Reliability," which improves information credibility, is another essential quality of accounting information considered in the financial accounting literature. The word "reliability" in this paper is defined as the perceived correctness, verifiability, consistency, and timeliness of provided sustainability information, which enhances the information's trust for users, according to Chauvey et al. [26]. It has been claimed that stakeholders will trust reported sustainability information if it is very trustworthy, generated through an ongoing stakeholder consultation process, and offers both timely and comparative data [40]. Stakeholders will regard the information to be credible if it is complete and accurate, with assured clarity [25, 26].

The reliability dimension of sustainability data is reflected in this article through continual feedback and stakeholder engagement and verifiability, trends over time, accuracy, and data value/timeliness. Stakeholders may trust provided sustainability information if it has been independently validated, is simple to comprehend, and provides timely and comparable data across time.

Stakeholders will judge whether or not reported sustainability information is trustworthy based on their self-evaluation [27]. As a result, the more trustworthy the

sustainability information, the better the QSR data, and firms' QSR initiatives are seen as meaningful. In particular, if the information's reliability is enhanced, the informative quality of sustainability reporting will improve.

3.3   Using BDA to Improve QSR

The essential premise of the proposed framework is that the dimensions of QSR are determined by data quality. As a result, effective and efficient data processing has the potential to enhance outcomes.

Grover et al. [41] claim that digital networks now link a growing number of people, devices, and sensors, transforming how organizations create, communicate, share, access, and analyze data as well as adapting to environmental changes. At unprecedented rates, a wide range of data is created internally and outside from public, proprietary, and bought sources. Big data refers to structured and unstructured data, such as text documents, online material, videos, audio, pictures, and sensor data, all kept in traditional databases and data warehouses. The majority of big data is unstructured. The initial 3-V's[3] for describing big data were Volume, Velocity, and Variety.

Because of the big data emergency, there is now a significant trade-off between size, time, quality, and cost of information generation that cannot be handled by traditional business intelligence capabilities [43]. Furthermore, it may even lead to a situation where companies are confronted with data deluge [44]. As a result, we believe that big data analytics can help enhance the quality of sustainability report information.

The use of statistical, processing, and analytics approaches to enormous data for business advancement is known as big data analytics. Big data analytics is becoming increasingly crucial to meet specific stakeholder needs critical to gaining and maintaining a competitive edge [45].

Big data analytics' main goal is to increase insight, decision-making, and process automation by analyzing (complex) data sets in a cost-effective manner. Analytics of streams of structured and unstructured data can provide answers to problems that businesses have never considered. Furthermore, data are only the source of information and insights used to make better decisions. The value of data is apparent when combined with the creation of insights and its actual application. As a result, companies require high-quality data and suitable analytics to create relevant information and insights for decision-making.

In terms of sustainability reports, the result is an improvement in information quality due to extensive processing in big data analytics for multiple stakeholder engagement initiatives related to the relevance and reliability of the information contained in sustainability reports, resulting in an improved QSR.

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[3] In the beginning, Doug Laney's META Community study entitled "3-D Data Management: Managing Data Volume, Velocity, and Variety" was generally associated with the word Big Data, released in 2001. Following further studies and innovations, the so-called "5-V" is now proposed to define big data issues: volume (quantity of data), variety (data from different categories), velocity (fast new data generation), veracity (data quality), and meaning (in the data) [42].

4   Conclusions, Implications, and Limitations

Improving a reporting company's QSR may benefit both the reporting company and stakeholders. However, as the use of such reports has grown, there has been a wave of criticism in the literature about their quality (lack of reliability, irrelevant information presented, endangering corporations' reputation in society). Nonetheless, a significant portion of this field's study focuses on the emergencies and the advantages that arise from such reporting, and the characteristics of the companies that adopt such reports. Measures or frameworks for conceptualizing the features of QSR have received much too little attention, and little is known about how to enhance the QSR utilizing novel information processing tools like BDA.

Using BDA, the paper develops a conceptual framework for QSR based on stakeholder engagement initiatives. The proposed framework is novel and, to our knowledge, has never been used before; the strength of adopting the recommended framework to leverage QSR is based on two factors. First, the framework connects the characteristics of QSR through stakeholder engagement initiatives, based on the assumption that sustainability reporting adds no value unless it involves stakeholders, creates an ongoing dialogue with them, and influences both firms' and stakeholders' decisions and behavior. Second, most stakeholder engagement initiatives needed a large amount of data, which was frequently separated and compartmentalized. From the analysis of (complex) data sets under economically realistic conditions, BDA helps increase insight, long-term decision making, and process automation.

The paper focuses on the literature's most important two QSR qualities (relevance and reliability) while ignoring the others. As a result, future study might suggest additional characteristics and their relationship to stakeholder engagement initiatives. Future studies might also investigate the direct impacts of BDA on QSR and the mediating effects of stakeholder engagement initiatives on the relationship between QSR and BDA.

References

1. Van Marrewijk, M.: Concepts and definitions of CSR and corporate sustainability: between agency and communion. J. Bus. Ethics **44**, 95–105 (2003)
2. Badia, F., Bracci, E., Tallaki, M.: Quality and diffusion of social and sustainability reporting in Italian Public Utility Companies. Sustainability **12**, 1–17 (2020). https://doi.org/10.3390/su12114525
3. Herremans, I.M., Nazari, J.A., Mahmoudian, F.: Stakeholder relationships, engagement, and sustainability reporting. J. Bus. Ethics **138**(3), 417–435 (2016)
4. Marimon, F., del Mar Alonso-Almeida, M., del Pilar Rodríguez, M., Alejandro, K.A.C.: The worldwide diffusion of the global reporting initiative: what is the point? J. Clean. Prod. **33**, 132–144 (2012)
5. Hahn, R., Kühnen, M.: Determinants of sustainability reporting: a review of results, trends, theory, and opportunities in an expanding field of research. J. Clean. Prod. **59**, 5–21 (2013)
6. Chen, S., Bouvain, P.: Is corporate responsibility converging? A comparison of corporate responsibility reporting in the USA, UK, Australia, and Germany. J. Bus. Ethics **87**(1), 299–317 (2009)

7. Fifka, M.S.: Corporate responsibility reporting and its determinants in comparative perspectives review of the empirical literature and a meta-analysis. Bus. Strategy Environ. **22**(1), 1–35 (2013)

8. Cheng, B., Ioannou, I., Serafeim, G.: Corporate social responsibility and access to finance. Strateg. Manage. J. **35**(1), 1–23 (2014)

9. Cho, C.H., Michelon, G., Patten, D.M.: Impression management in sustainability reports: an empirical investigation of the use of graphs. Account. Public Interest **12**, 16–37 (2012)

10. Musleh Al-Sartawi, A.M.A. (ed.): The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. SCI, vol. 974. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-73057-4

11. Coombs, W.T., Holladay, S.J.: The pseudo-panopticon: the illusion created by CSR-related transparency and the internet. Corp. Commun.: Int. J. **18**(2), 212–227 (2013)

12. Milne, M.J., Gray, R.: W(h)ither ecology? The triple bottom line, the global reporting initiative, and corporate sustainability reporting. J. Bus. Ethics **118**(1), 13–29 (2013)

13. MacLean, R., Rebernak, K.: Closing the credibility gap: the challenges of corporate responsibility reporting. Environ. Qual. Manage. **16**(4), 1–6 (2007)

14. Lock, I., Seele, P.: The credibility of CSR reports in Europe. Evidence from a quantitative content analysis in 11 countries. J. Clean. Prod. **122**, 186–200 (2016). https://doi.org/10.1016/j.jclepro.2016.02.060

15. Khan, H.Z., Bose, S., Mollik, A.T., Harun, H.: "Green washing" or "authentic effort"? An empirical investigation of the quality of sustainability reports by bank. Account. Audit. Account. J. **34**(2), 338–369 (2021). https://doi.org/10.1108/AAAJ-01-2018-3330

16. Seele, P., Gatti, L.: Greenwashing revisited. In search for a typology and accusation-based definition incorporating legitimacy strategies. Bus. Strategy Environ. **26**(2), 239–252 (2015). https://doi.org/10.1002/bse.1912

17. Greenwood, M.: Stakeholder engagement: beyond the myth of corporate responsibility. J. Bus. Ethics **74**(4), 315–327 (2007)

18. Wanner, J., Janiesch, C.: Big data analytics in sustainability reports: an analysis based on the perceived credibility of corporate published information. Bus. Res. **12**(1), 143–173 (2019). https://doi.org/10.1007/s40685-019-0088-4

19. Michnik, J., Lo, M.C.: The assessment of the information quality with the aid of multiple criteria analysis. Eur. J. Oper. Res. **195**, 850–856 (2009)

20. G4 Sustainability Reporting Guidelines. Reporting Principles and Standard Disclosures. https://www.globalreporting.org/resourcelibrary/GRIG4-Part1-Reporting-Principles-and-StandardDisclosures.pdf

21. Sustainable Development Reporting—Striking the Balance. http://www.wbcsd.org/Projects/Reporting/Resources/Sustainable-Development-Reporting-Striking-the-balance

22. Chang, W.F., Amran, A., Iranmanesh, M., Foroughi, B.: Drivers of sustainability reporting quality: financial institution perspective. Int. J. Ethics Syst.ms **35**(4), 632–650 (2019)

23. Ching, H.Y., Gerab, F., Toste, T.: Analysis of sustainability reports and quality of information disclosed of top Brazilian companies. Int. Bus. Res. **6**, 62–77 (2013)

24. Gao, F., Dong, Y., Ni, C., Fu, R.: Determinants and economic consequences of non-financial disclosure quality. Eur. Account. Rev. **25**(2), 287–317 (2016)

25. Michelon, G., Pilonato, S., Ricceri, F.: CSR reporting practices and the quality of disclosure: an empirical analysis. Crit. Perspect. Account. **33**, 59–78 (2015)

26. Chauvey, J.N., Giordano-Spring, S., Cho, C.H., Patten, D.M.: The normativity and legitimacy of CSR disclosure: evidence from France. J. Bus. Ethics **130**(4), 789–803 (2015)

27. Helfaya, A., Whittington, M., Alawattage, C.: Exploring the quality of corporate environmental reporting. Account. Audit. Account. J. **32**(1), 163–193 (2019)

28. Wang, R.Y., Strong, D.M.: Beyond accuracy: what data quality means to data consumers. J. Manage. Inf. Syst. **12**(4), 5–34 (1996)
29. Gardyn, E.: A data quality handbook for a data warehouse. In: Proceedings of the Conference on Information Quality, Cambridge, MA, pp. 267–290 (1997)
30. Lee, Y.W., Strong, D.M., Kahn, B.K., Wang, R.Y.: AIMQ: a methodology for information quality assessment. Inf. Manage. **40**, 133–146 (2002)
31. Belal, A.R., Owen, D.L.: The views of corporate managers on the current state of, and future prospects for, social reporting in Bangladesh: an engagement-based study. Account. Audit. Account. J. **20**(3), 472–494 (2007)
32. Deephouse, D.L., Carter, S.M.: An examination of differences between organizational legitimacy and organizational reputation. J. Manage. Stud. **42**(2), 329–360 (2005)
33. Deegan, C.: The legitimising effect of social and environmental disclosures–a theoretical foundation. Account. Audit. Account. J. **15**(3), 282–311 (2002)
34. Cho, C.H., Guidry, R.P., Hageman, A.M., Patten, D.M.: Do actions speak louder than words? An empirical investigation of corporate environmental reputation. Acc. Organ. Soc. **37**(1), 14–25 (2012)
35. Suchman, M.: Managing legitimacy: strategic and institutional approaches. Acad. Manage. Rev. **20**(3), 571–610 (1995)
36. Dillard, J., Rigsby, J., Goodman, C.: The making and remaking of organization context: duality and the institutionalization process. Account. Audit. Account. J. **17**(4), 506–542 (2004)
37. Edgley, C.R., Jones, M.J., Solomon, J.F.: Stakeholder inclusivity in social and environmental report assurance. Account. Audit. Account. J. **23**(4), 532–557 (2010)
38. Rodrigue, M., Magnan, M., Cho, C.H.: Is environmental governance substantive or symbolic? An empirical investigation. J. Bus. Ethics **114**(1), 107–129 (2013)
39. Al-Sartawi, A.: Does it pay to be socially responsible? Empirical evidence from the GCC countries. Int. J. Law Manage. **62**(5), 381–394 (2020)
40. Diouf, D., Boiral, O.: The quality of sustainability reports and impression management: a stakeholder perspective. Account. Audit. Account. J. **30**(3), 643–667 (2017)
41. Grover, V., Chiang, R.H.L., Liang, T.P., Zhang, D.: Creating strategic business value from big data analytics: a research framework. J. Manage. Inf. Syst. **35**(2), 388–423 (2018). https://doi.org/10.1080/07421222.2018.1451951
42. Khan, I.U., Rehman, S.U.: A review of big data security and privacy in healthcare applications. In: García Márquez, F., Lev, B. (eds.) Big Data Management, pp. 71–90. Springer, Switzerland (2017). https://doi.org/10.1007/978-3-319-45498-6_4
43. Schön, D.: Planung und Reporting—Grundlagen, Business Intelligence, Mobile BI und Big-Data-Analytics. Springer, Cham (2016). https://doi.org/10.1007/978-3-658-08009-9
44. Müller, O., Fay, M., vom Brocke, J.: The effect of big data and analytics on firm performance: an econometric analysis considering industry characteristics. J. Manage. Inf. Syst. **35**(2), 488–509 (2018)
45. Prabhu, C.S.R., Chivukula, A.S., Mogadala, A., Ghosh, R., Livingston, L.M.J.: Big Data Analytics: Systems, Algorithms, Applications. Springer, Singapore (2019). https://doi.org/10.1007/978-981-15-0094-7

Development of a Prototype for Use of Blockchain Technology for Transparent and Efficient Land Records

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Abstract. This study is an attempt to bring transparency and efficiency in the current land record management system through use of emerging technology of Blockchain. Historically Indian Land records have always in a bad shape in India and there has been regular reforms including digital reforms to improve the system but even after four decades the system has not improved since the present system of digitization is highly dependent on Government agencies and man power bringing inefficiency in the system. Thus, this study first through quantitative analysis identifies the issues in the system and suggest a framework of improving the transparency in the land record management system. Finally, a prototype has been suggested and developed exploring the use of permissible public blockchain system for registry and transferring ownership and updating records.

1 Introduction

Land records in many nations have seen a plethora of reforms from oral contacts, to paper-based registration, to digital title-based systems etc. Since the land records in most of the nations are driving towards digitization, hence use of blockchain technology during this digitization stage will help to make the system more transparent and robust. All the financial systems such as banks along with registration department can coordinate together and fit in a much accessible blockchain based system.

Blockchain technology is in a very nascent stage but is being researched to be the best solution for transparent transactions. It is emerging as a universal technology which can be used by any individual at any place on the earth for transactions [1].

The term Blockchain as the name suggest is the chain of blocks which has a complete information of transaction of records [2]. The term may also be referred to as digital information stored in public ledgers. Digital information may be referred as blocks and public ledger as chains.

The most important aspect of Blockchain technology is that it is considered to be the most secured digital transaction system in the world.

According to [3] the important features of blockchain technology are approachability, persistence, decentralized, time stamped records and direct control on records. [1] mentions three important aspects of blockchain- decentralization, transparency and immutable system. Advantages of blockchain listed by [4] are decentralization, distributed ledger, information transparency, tamper proof construction and openness.

Another researcher explored the attributes of blockchains as security, privacy, data integrity, performance, scalability etc. [5].

Hence from all the studies of literature the emerging features of blockchain which makes it most trustworthy in today's world are decentralization, transparency, tamper proof and accessibility or approachability [9].

1.1 History of Blockchain Technology

The first evidence of blockchain technology was given by [6] in the year 2008. According to him a trustworthy system for electronic transactions is required which would help to prevent double spending. He proposed a peer-to-peer network which is robust for recording history of transactions which will be tamper proof. It was in this paper in 2008 the term bitcoin as a digital currency supported by cryptography emerged and digital transaction between two parties without any third party or mediator was envisaged.

After 2008 there was a gap of good literature and research on the nascent blockchain technology. Suddenly after 2015 the research on blockchain technology started growing exponentially. This can be supported that till the year 2014 there was no high quality research paper in this domain but gradually it increased from 4 in the year 2015 to 40 in 2016 and till 2019 a total of 925 high quality research papers have been published on blockchain technology [4].

Generations of Blockchain
Blockchain ahs evolved exponentially since 2008 and the stages can be defined as three generations of blockchains:

First Generation: Bitcoin and digital Currency- In this generation cryptocurrency and distributed ledger were introduced.

Second Generation: Ethereum – In the second generation in addition to cryptocurrency, distributed ledger smart contract was evolved which changed the transaction in various industries and sectors.

Third Generation: Scalability- Third generation led to the addition of scalability in addition to distributed ledger and cryptocurrency [4].

The use of blockchain after the first generation has now getting explored in various industries related to health care, finance, personal well being etc. since it is being considered a revolution for transparent and efficient system [9].

2 Land Record Management System in India

Land record management deals with documentation in the form of recording, processing, description and dissemination of information about ownership, value, use of land and its associated resources. (Shipi Agarwal). Broadly two types of land record management systems are there:

Title Based and Deed Based

In India we follow the deed-based land record management system which is presumptive in nature.

The registrar does not check the legal validity of the ownership papers. Deed registration is only a proof of transaction between parties but it is never considered to be a proof of ownership. In simple words according to [7] deed registration just registers the transaction in the register also known as presumptive title. It mentions the facts that the transaction has happened but the responsibility always is on the buyer to check the true status of land transition process.

The underlying problem related to land records goes back to history which suggested maintenance of land records were only required for financial purpose to collect taxes on the produce of the land which led to major land record issues in urban areas where no agriculture produce was there hence no records.

Present process of land record management in India:

The deed registration process followed in the country has three parts:

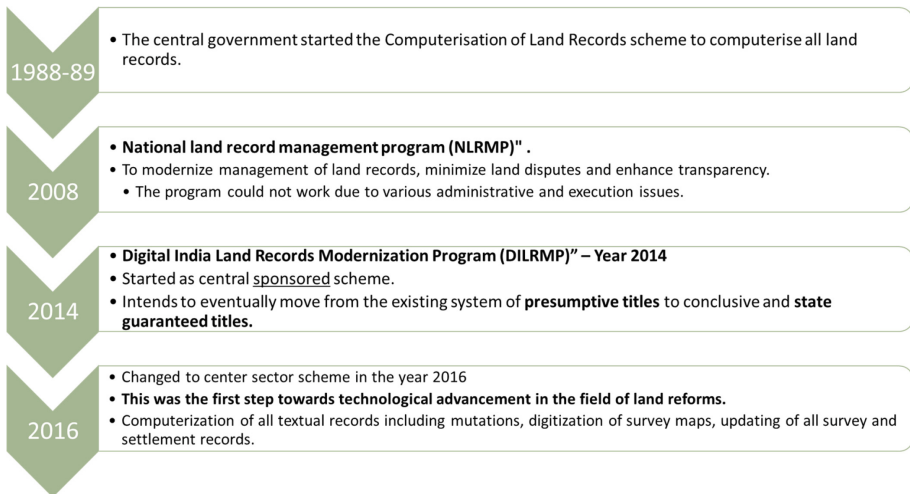Registration of property in form of sale deed.

Record of rights in the form of mutation, Jamabandi in the revenue department.

Spatial records in the form of khasra and village maps.

There has been time and again attempts and proposals to integrate the three systems but until there is a policy change in the form of shifting to title registration the integration at all levels is difficult to implement.

2.1   Government Interventions for Digitization of Land Records in India

As already established form literature land ownership and maintenance of land records has always been an issue of concern in India. As a result, immediately after Independence during the first and second five-year importance of proper maintenance of land records was strengthened and acknowledged by the stakeholders (Fig. 1).

1988-89
- The central government started the Computerisation of Land Records scheme to computerise all land records.

2008
- **National land record management program (NLRMP)" .**
- To modernize management of land records, minimize land disputes and enhance transparency.
  - The program could not work due to various administrative and execution issues.

2014
- **Digital India Land Records Modernization Program (DILRMP)" – Year 2014**
- Started as central sponsored scheme.
- Intends to eventually move from the existing system of **presumptive titles** to conclusive and **state guaranteed titles.**

2016
- Changed to center sector scheme in the year 2016
- **This was the first step towards technological advancement in the field of land reforms.**
- Computerization of all textual records including mutations, digitization of survey maps, updating of all survey and settlement records.

Fig. 1. The chronology of various digitization efforts by the Government for land record management system (Source: DILRMP)

Despite all the reforms for managing land record management system, there has been problems related to the system. Digitization could also not solve much of the issues. Some of issues which emerged during the digital reforms of land records were:

They were prone to manipulation.

The software could be hacked and the data could be compromised.

The manpower was not technically trained to update the data.

The problems in the land record documents were replicated same without correcting the mistakes.

The revenue officers patwari due to fear of loosing their monopoly did not verify the updated records since they were technically equipped to the system.

The spatial data was not digitized due to lack of finances and technical manpower.

Since it was not under the review of the registrar to check the transaction details hence digital registries were done without cross verifying the authentication of the transaction.

The system was not integrated, registries were digitized but mutation were not hence no improvement in number of procedures or time.

No check on the authentication of the uploaded documents for registry of sale deed.

The entire process of customer journey for change of ownership of property started from the beginning was studied by the authors and the journey was mapped. The time, procedure, number of visits were observed and many problems were found in the system. Ease of doing business ranked India at rank 155 for property transactions and minimum average time taken is 45 days, whereas the country with rank one has transaction time less than one single day, thus time, number of procedures are the biggest emerging issues in the current system (Fig. 2).
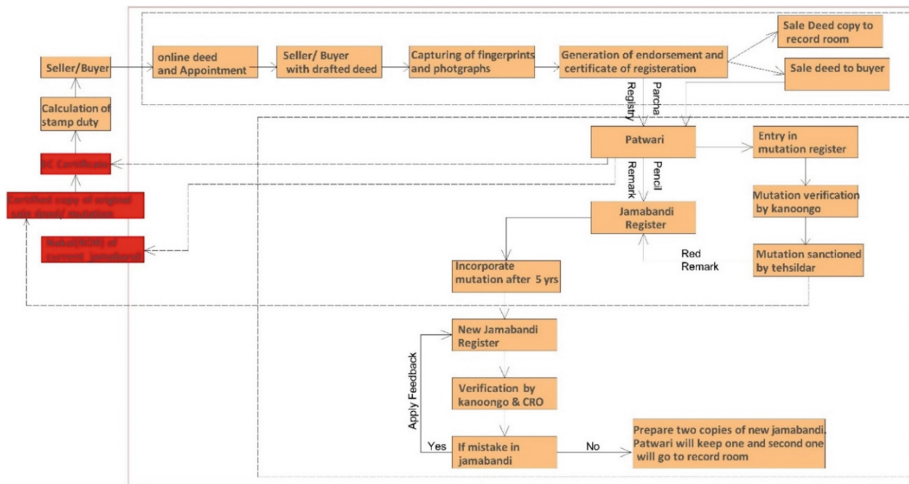

Fig. 2. Bottlenecks highlighted in red in the property transaction process.

Further the process of property transaction was divided into stages of pre-registration which is mostly digitized and post registration. By mapping the journey of an individual on the parameter of time, number of processes, number of departments visited the problem areas were identified through primary survey by the authors in the registration and revenue department (Table 1).

Table 1. Mapping the individual journey and addressing the bottlenecks in the system through primary survey.

Procedure	Action item		Steps	Time taken (Days)	Number of visits
Pre-registration	Proof of ownership/Fard of Jamabandi	1	Copy of ROR	5 to 15	1
	certified copy of original old sale deed/Mutation	2	Mutation copy, old original sale deed	1 to 3 after computerization	1
	Encumbrance certificate	3	Encumbrance CERTIFICATE	5 to 15 days	1
	Calculation of the stamp duty	4	Circle rates	half day	
Registration	Submission of deed	5	Preparation of deed	1 day	1
		6	Purchase of stamp paper	1 day	
		7	Get appointment	2–3 days	
		8	Online submission	1 day	
		9	Offline submission on the day of appointment	1 day	
	Appearance before sub registrar	10	Personal appearance	1 day	1
		11	Biometric & photo	1 day	
		12	Registration fees and service charge Payment	1 day	
	Delivery of deed	13	Appearance with appointment slip	1 day	
Post-registration	Deed scanning	14	Deed to be scanned	2–3 days	
	Mutation	15	Application for mutation	1 day	1
		16	Mutation verification	15 days	1
		17	Mutation sanction	15 days	1
	Jamabandi	18	Jamabandi entry red remark	5 days	1
		19	Mutation incorporation	1 day	1
		20	Jamabandi entry black pen	5 years	
Total days				63 Days	10

3   Use of Blockchain Technology for Land Records

Land records in many nations have seen a plethora of reforms from oral contacts, to paper-based registration, to digital title-based systems etc. Since the land records in most of the nations are driving towards digitization, hence use of blockchain

technology during this digitization stage will help to make the system more transparent and robust. All the financial systems such as banks along with registration department can coordinate together and fit in a much accessible blockchain based system.

3.1   Use of Blockchain Technology for Land Records in Various Nations

Republic of Georgia is considered to be pioneer in experimenting blockchain technology for its land record system in the year 2016 [8]. They adopted this system for reducing corruption and mismanagement. Next country to follow the technology was Sweden in the year 2017. The aim of introducing blockchain in Sweden was to streamline the systema and reduce the number of processes, documents and make the system easy. India started blockchain experiment with the state of Andhra Pradesh in the year 2018 while building a new capital city for a newly formed state of Andhra Pradesh. Many countries since 2016 have explored the possibilities of use of blockchain technology and the leaders among them are UAE and Dubai. These two nations are aggressively exploring blockchain technology through its UAE Blockchain Strategy 2021 [8].

Several other countries which explored blockchain technology include Brazil, Kenya, Ghana, Ukraine, Sweden etc. [10].

Various reasons and type of blockchain technology adopted by different nations for land administration are: [10].

The main reason of developed countries using blockchain technology was to reduce the number of processes, number of documents and the speed of transaction. Countries such as Sweden, Dubai, UAE were part of this system to make the transaction speedy and smooth.

Developing countries adopted blockchain technology to bring transparency, and reduce corruption since the records were immutable in this system. Some of the examples are Kenya, Bangladesh, Georgia etc.

Another reason for countries adopting this system was it being part of e Government initiative where digitization of land records is one of the pilot projects. Examples of nations having it under the e governance initiative are Estonia, India etc.

4   Research Methodology

Quantitative research was used to identify the variables affecting the transparency & efficiency in the present system. Sample of approx. 400 respondents were collected through structured questionnaire which was quantified and analysed through AMOS and SPSS. Further a suggested framework was developed to overcome the issues. Later a 100 acres residential township was identified where the blockchain technology can be applied and a prototype using python was developed for the township. The entire prototype was developed using GIS image of the 100 acres township having unique property numbers. The prototype has been tested for transferring property from one owner to another, including property on the blockchain records etc. (Table 2).

Table 2. Research design summary

Particulars	Details
Target respondents	Farmers/land owners
Sample size of pilot study	20
Sample size of the main study	400 Respondents
Methods of data collection	Online/personal interviews/google forms/field visits
Statistical techniques	RII, EFA, CFA, SEM, chi square, Descriptive statistics
Statistical tools	Excel, SPSS 26 & AMOS 22

5   Analysis

Using Structural model analysis four unobserved variables were identified which were a bottleneck for the efficient land record management system. The various quantitative test performed for the analysis were Cronbach alpha, factor analysis, scree test and eigen value which led to the identification of three important unobserved variable with 12 observed variables (Figs. 3 and 4).
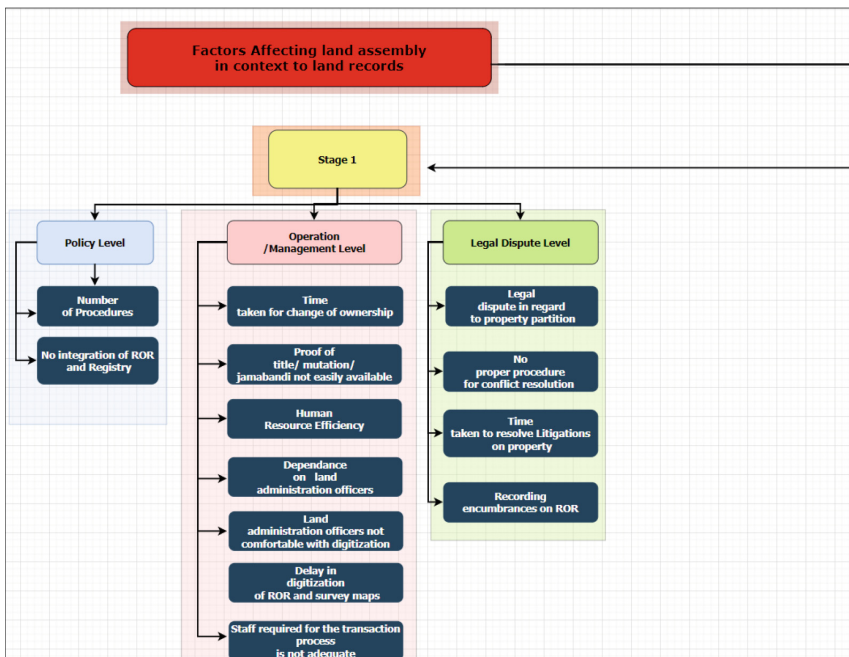
Fig. 3. Factors affecting land record management system for individual transactions
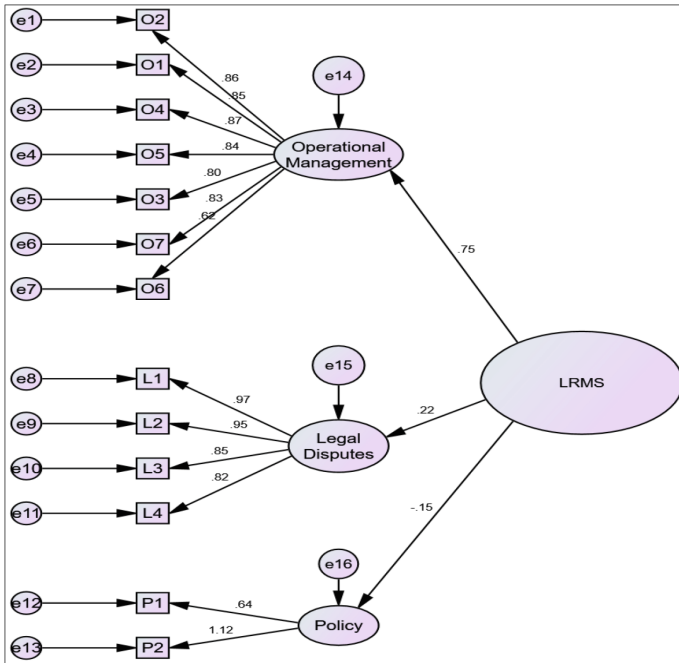
Fig. 4. Final structure equation model

6 Results

During the analysis it was found that the most important factors affecting land record management system are:

- Operation management, Legal Disputes and Policy level

The most import factor which emerged form the analysis was that operation level issues had approximately 75% effect on the entire system. Hence the need to improve operation and management level issues are the most critical. Further it was also observed that to improve the system only digitization of land records or spatial records is the solution but a robust solution has to be suggested which can not be manipulated and has minimum human dependence and are transparent and efficient (Fig. 5).
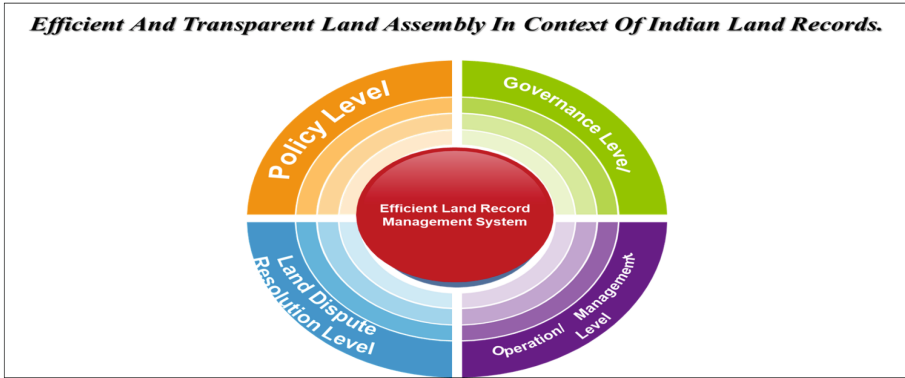
Fig. 5. Proposed model for efficient and transparent land records

7   Prototype Development

A 100-acre site was identified and the area was referred. The prototype was developed to perform the following functions: Recording property on blockchain, transferring property, mining to make it secure and merging or adding more properties to the data base. Layout identified: 100 acres township which was initially an agriculture land was purchased from farmers by the developers, serviced plots were developed and sold to end user (Table 3).

Table 3. Transaction procedure

| Step 1: Farmer (First Stakeholder) | | | | | Step 2: Developer (Second Stakeholder) | | | | | Step3: End User (Final Stakeholder) | | | | | | |
| Initial Land Detail | | | | | Purchase from Farmer | | | | | Purchase from Developer | | | | | | |
Rec. No.	Khasra No.	Owner Name	Area(Acres)	Area (Sq.mts)	Rec. No.	Khasra No.	Owner Name	Area(Acres)	Area (Sq.mts)	Rec. No.	Khasra No.	Plot No.	No. Of Plots	Area (Sq.mts.)	Total Area(Sq. mts)	Total Area (Acres)
	6	Owner 1	1	4046.856		6	Developer	1	4046.856		6	2003-2009	7	250	1750	0.43
	5	Owner 2	1	4046.856		5	Developer	1	4046.856			2077-2081	5	250	1250	0.31
	15	Owner 3	0.8	3237.4848		15	Developer	0.8	3237.485		5	2120-2125	6	260	1560	0.39
126					126					126		2149-2160	12	250	3000	0.74
											15	2203-2208	6	240	1440	0.36
												2139-2144	6	250	1500	0.37
												Total	42		10500	2.59

8   Prototype Interphase Developed

Stage1: Adding new property detail:

Rectangle number, khasra number, geo coordinates, initial owner name, register documents, area of land are added to the database (Figs. 6, 7, and 8).
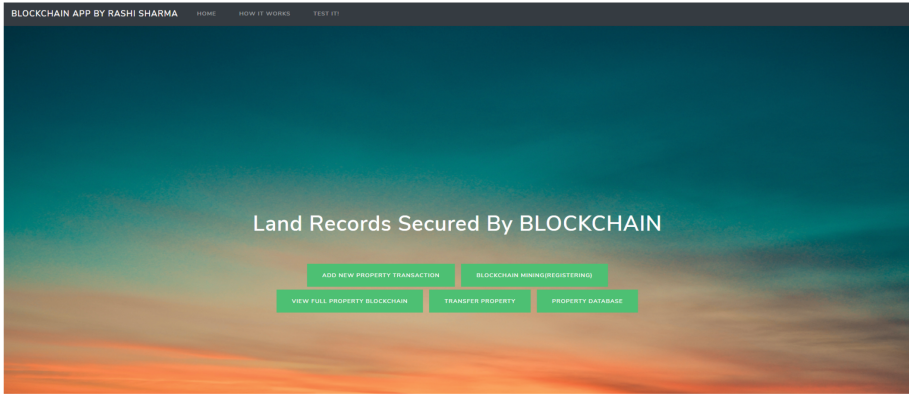
Fig. 6. Blockchain app homepage

Fig. 7. Entering new property details

```
{
 "chain": [
   {
     "index": 1,
     "previous_hash": "1",
     "proof": 100,
     "timestamp": 1624901460.3546581,
     "transactions": []
   },
   {
     "index": 2,
     "previous_hash": "834bbebecf9d13921c19f7102c3dd43524e7436407765217b07b9ee9fcf824a6",
     "proof": 44361,
     "timestamp": 1624901573.9509165,
     "transactions": [
       {
         "area_acres": "1",
         "area_sqm": "1",
         "image": "APPROVED_LAYOUT_PLAN111.594ACS.jpg",
         "khasra_no": "1",
         "owner_name": "rashi",
         "rec_no": "1"
       }
     ]
   },
   {
     "index": 3,
     "previous_hash": "0f821255221f823f3c555e2530b7f9d3b58e6a392ce3445b003432d9e9d67ee5",
     "proof": 6979,
     "timestamp": 1624901678.5708377,
     "transactions": [
       {
         "area_acres": "1",
         "area_sqm": "1",
         "image": "APPROVED_LAYOUT_PLAN111.594ACS_2.jpg",
         "khasra_no": "1",
         "owner_name": "sg",
         "rec_no": "1"
       }
```

Fig. 8. New hash developed which can not be altered or changed.

After the data is mined the hash is developed which cannot be altered by anyone bringing transparency in the system.

Stage 2: Transferring Property from one owner to another:

Since the previous property details are there and they cannot be further altered only new details are added thus new transfer of owner is facilitated but history of ownership cannot be deleted (Figs. 9 and 10).

Fig. 9. Transferring property

```
{
  "chain": [
    {
      "index": 1,
      "previous_hash": "1",
      "proof": 100,
      "timestamp": 1624901460.3546581,
      "transactions": []
    },
    {
      "index": 2,
      "previous_hash": "834bbebecf9d13921c19f7102c3dd43524e7436407765217b07b9ee9fcf824a6",
      "proof": 44361,
      "timestamp": 1624901573.9509165,
      "transactions": [
        {
          "area_acres": "1",
          "area_sqm": "1",
          "image": "APPROVED_LAYOUT_PLAN111.594ACS.jpg",
          "khasra_no": "1",
          "owner_name": "rashi",
          "rec_no": "1"
        }
      ]
    },
    {
      "index": 3,
      "previous_hash": "0f821255221f823f3c555e2530b7f9d3b58e6a392ce3445b003432d9e9d67ee5",
      "proof": 6979,
      "timestamp": 1624901678.5708377,
      "transactions": [
        {
          "area_acres": "1",
          "area_sqm": "1",
          "image": "APPROVED_LAYOUT_PLAN111.594ACS_2.jpg",
          "khasra_no": "1",
          "owner_name": "sg",
          "rec_no": "1"
        }
      ]
    },
    {
      "index": 4,
      "previous_hash": "b003b8f26ff0222988b85a2af1078eb80beee3275a7dffa2707f6ccbf6daa09d",
      "proof": 45090,
      "timestamp": 1624902135.3862674,
      "transactions": [
        {
          "area_acres": "1",
          "area_sqm": "1",
          "image": "APPROVED_LAYOUT_PLAN111.594ACS_1.jpg",
          "khasra_no": "1",
          "owner_name": "sg",
          "rec_no": "1"
```

Fig. 10. Hash created

Finally, the property details are entered in the system which once verified can be viewed by any individual and are more accessible, temper proof, simple and efficient (Fig. 11).

- { Record number:1 Khasra Number:1 Owner Name:1 Area(acres):1.0 Area(sqm):1.0 Image:APPROVED_LAYOUT_PLAN111.594ACS_1.jpg
- { Record number:1 Khasra Number:1 Owner Name:1 Area(acres):1.0 Area(sqm):1.0 Image:APPROVED_LAYOUT_PLAN111.594ACS_1.jpg
- { Record number:1 Khasra Number:1 Owner Name:rashi Area(acres):1.0 Area(sqm):4046.0 Image:APPROVED_LAYOUT_PLAN111.594ACS_1.jpg
- { Record number:1 Khasra Number:1 Owner Name:sg Area(acres):1.0 Area(sqm):4046.0 Image:APPROVED_LAYOUT_PLAN111.594ACS_1.jpg
- { Record number:1 Khasra Number:1 Owner Name:rashi Area(acres):1.0 Area(sqm):1.0 Image:APPROVED_LAYOUT_PLAN111.594ACS.jpg

Fig. 11. Data entry visible to everyone along with spatial, textual and registry records

9   Discussion

The Blockchain technology has proven to be transparent and tamper proof in various sectors. Though still in nascent stage this technology as tested through the prototype will help to make the system more efficient and transparent. Some of the problems which can be resolves in land record management system and as proved through the prototype are:

Integration: All the documents have to be uploaded in the system for updating or entry of records. All the details required for integration are uploaded like ownership

from record of rights, GIS image for location and deed registry for transfer hence the system has been integrated in a title registration system.

Transparency: Sine the records once verified can be viewed by everyone to know actual owner, area and location thus making the system transparent.

Time Management: The entire transaction which took approx. 45 days as per the questionnaire details could be done in a single day thus bringing remarkable reduction in the time.

Efficiency: Since very less human dependence is there in the blockchain system it will help to bring efficiency in terms of a smaller number of procedures, less manpower involved and a smaller number of documents.

Thus, this study highly recommends use of blockchain technology to improve the digitization process in the country which is a centrally governed scheme. The technology is very new thus the implementation can start on pilot basis for planned areas where the documents are already in place for urban development. The blockchain technology can be seen and forecasted as the emerging paradigm to bring transparency and efficiency in the system which has a history of problems and lacunas attached to it.

References

1. Aslam, U., Manzoor, S., Babar, M.I., Sciences, E.: Systematic Literature Review of Blockchain in Requisites of Big Systematic Literature Review of Blockchain in Requisites of Big Data and its Applications, September 2019
2. Ghosh, J.: The blockchain: opportunities for research in information systems and information technology. J. Glob. Inf. Technol. Manag. **22**(4), 235–242 (2019). https://doi.org/10.1080/1097198X.2019.1679954
3. Singh, P.: Role of Blockchain technology in digitization of land records in Indian scenario. IOP Conf. Ser. Earth Environ. Sci. **614**(1), 012055 (2020). https://doi.org/10.1088/1755-1315/614/1/012055
4. Xu, M., Chen, X., Kou, G.: A systematic review of blockchain. Financ. Innov. **5**(1), 1–14 (2019). https://doi.org/10.1186/s40854-019-0147-z
5. Koteska, B., Karafiloski, E., Mishev, A.: Blockchain Implementation Quality Challenges : A Literature Review, pp. 11–13 (2017)
6. Nakamoto, S.: Bitcoin: A Peer-to-Peer Electronic Cash System, pp. 1–9
7. Henssen, J.: Basic principles of the main cadastral systems in the world. In: Proceedings of FIG Commission 7 Working Group "Cadastre 2014" One Day Seminar on Modern Cadasters and Cadastral Innovations, May 1995, pp. 5–12 (1995). https://www.oicrf.org/-/basic-principles-of-the-main-cadastral-systems-in-the-world
8. Alam, K.M., Ashfiqur Rahman, J.M., Tasnim, A., Akther, A.: A blockchain-based land title management system for Bangladesh. J. King Saud. Univ. - Comput. Inf. Sci. (2020). https://doi.org/10.1016/j.jksuci.2020.10.011
9. Al-Sartawi, A. (ed.): The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. SCI, vol. 974. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-73057-4
10. Sladić, G., Milosavljević, B., Nikolić, S., Sladić, D., Radulović, A.: A blockchain solution for securing real property transactions: a case study for Serbia. ISPRS Int. J. Geo-Inf. **10**(1), 35 (2021). https://doi.org/10.3390/ijgi10010035

GFLibPy: An Open-Source Python Toolbox for Genetic Folding Algorithm

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Abstract. In this paper, a toolbox is proposed for the genetic folding algorithm for classification and regression problems using Python programming language. Although the Genetic Folding algorithm represents the brain activity in the toolbox, it uses various machine learning techniques. The Support Vector Machine (SVM) for classification and regression was applied to the UCI dataset. The toolbox enables the use of the activity to classify both UCI binary and multi-classification datasets and also to do regression on some other UCI datasets. In the research work, the objective was to find the best GF model that improve results through various generic GF chromosomes. The 23 python files implemented and 15 datasets were used in this research and contributed to the GFLibPy of the GF algorithm. Scaling the UCI dataset was used in the toolbox. The datasets were inputted into two machine learning algorithms: Genetic Folding (GF) and Support Vector Machines (SVMs). This paper shows that this toolbox holds some promise for the classification of various datasets, which can be used in any dataset in the context of classifying and predicting models. The focus of the work will be on the relationship between the kernel generations and the predefined based kernels and classifications such as binary and multi-classifications. The paper defined the simulation performance of the GF based kernels in a detailed analysis of multi and binary classifications. At present, there is nothing available for free tools to include any of the basic tools for GF algorithm in Python language. For different continuous goal, GF kernels are competitive with their respective generated models.

Keywords: Genetic folding · Evolutionary algorithms · Classification · Regression · Logic data · Python · Toolbox

1 Introduction

Ever since John Holland proposed a genetic algorithm [1], the study of the evolutionary algorithm has become one of the profound research fields, for instance, in genetic programming [2] as well as in gene expression programming [3]. Genetic Folding algorithm (GF) is a technique used for optimization that mimics the similitude of natural biological evolution [4]. This method works on a population with potential solutions while at the same time applying the rule of natural selection to make dynamic as well as better approximations to a solution.

At each generation of a GF, a new set of approximations is created by the process of selecting individuals according to their level of fitness in the problem domain and reproducing them using operators borrowed from natural genetics. This process prompts the advancement of populaces of people that are more qualified to their condition than the people from which they were made, similarly as in natural selection. GF has been demonstrated to be a powerful technique in the off-line plan of control frameworks by various professionals. For example, GF Toolbox MATLAB [5] and Ant Optimization MATLAB Toolbox [6] have demonstrated how the genetic folding algorithm can be used in a MATLAB platform. The MATLAB platform used a [7] library to perform SVM. Different MATLAB [9] and Python [10, 11] libraries are devoted to ensemble learning and visualization.

SoftSeg works at solving the regression problem, not the classification problem. This is done by eliminating the one-hot features after preprocessing and applying softmax for the regression tasks (instead of the traditional Dice loss) [12]. In [13], a graphical user interfaces MATLAB toolbox for the classification of fragment data. The toolbox offered users 22 types of functionality derived from the scattered data. The toolbox supported 7 types of machine learning algorithms for classification in different file formats.

In [14] article, a Matlab toolbox was prepared and a total of 30 algorithms were designed. The tool is checked on a dataset containing 163 ultrasound images. Whenever there were breast masses, 15 features are extracted. The [15] presented Audiogmenter, a novel audio data augmentation library in MATLAB. The toolbox offered 14 different augmenting strategies for audio and five for spectrograms.

With the expanded availability of tech tools in [16], social scientists will now have access to two or three additional resources. Functions included the overwhelming variety of mathematical models. The toolbox combined current large datasets using covariates to strengthen the models. In [17], MLaut, a tool is presented for using Machine Learning in the Python data science ecosystem. Mlaut dynamically tests algorithms on large arrays of datasets. MLaut offers a high-level workflow interface to machine learning algorithms.

The [18] is a library designed for online learning of high-dimensional data and is useful for processing vast volumes of data. The library serves up a range of online learning algorithms that are ideal for large-scale classification activities at reasonable speeds. The tool was implemented in pure C++ and equipped with a large collection of easy-to-use command-line methods, library calls, and documentation for both novice and intermediate users. There is a good modular toolbox for biosignal called "NeuXus" [19]. NeuXus is an independent platform and open-source, with simple installation and deployments provided in Python.

Orange [20] is an open-source machine learning/data mining package for data processing. The tool exposed the visual collection of functions which helps to build the components to make any person write simple and transparent Python programs. The tool is well-suited for advanced developers also to be used for data mining.

Pyts [21] is an open-source Python program to analyze time series. The tool provided robust data collection and cleaning utilities as well as recent algorithms. Pyts depended on the standard science Python packages; numpy, scipy, scikit-learn, joblib, and numba, which are all open-source software packages. The paper provided the instructions for installation, interface specifications, APIs, and even sample programs. In [22], an imbalanced learn toolbox was introduced to offer a wide variety of approaches to deal with imbalanced datasets.

In [23], the thesis presented a new Python toolbox called Gumpy, designed for a hybrid human brain-computer interface. Gumpy is a series of signal processing algorithms and resources that have been heavily used by the brain-computer interface community. Also, Gumpy has a wide variety of classification models that spans from classical machine learning algorithms to neural networks are available.

The GFLibPy toolbox introduced here is based on a very general method of representing the GF chromosomes and GP trees of linear-folding genes. The GFLibPy initialize solutions by "folding" these genes. Several well-known UCI datasets [8] are provided for such classifications as the iris and the ionosphere datasets and regression, such as the housing dataset.

2   A Simple GF Toolbox

A significant plan objective of the Python library is to give exceptionally modular and basic engineering for managing the kernel algorithms. Specifically, the GF algorithm in the toolbox is parameterized to enable its user to supply both of the predefined portions, or another user characterized kernel. Besides, the executions of the algorithms are completely structured in an isolated folder from the information folders in which it permits an extra of a greater number of datasets.

The first step in solving a problem in GFLibPy is to initialize the suitable parameters for the GF algorithm. The GF algorithm will run several predefined times to construct an appropriate objective function. A typical technique in the GF toolbox is to incorporate constraints into *inipop* file to construct a predefined number of valid GF chromosomes. The toolbox is then called the main file *genpop* which compounds *calcfitness*, selection, crossover, mutation modules. The *calcfitness* finds the fitness values of a population using the generic GF kernel. The selection adopted then for this population with the maximum value of the generic GF function. Then, the toolbox applies genetic operators described in [24]. Figure 1 shows an outline of the operational structures of GFLibPy code files, including the simple GF algorithm.
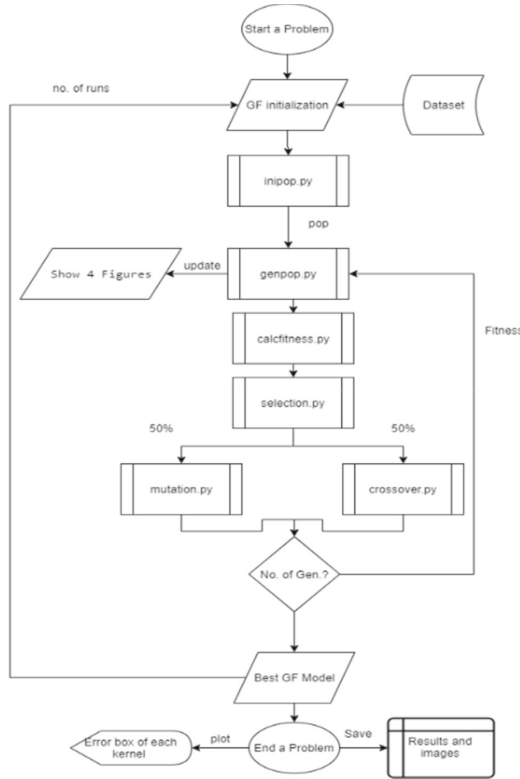
Fig. 1. GF algorithm in PyCharm environment

2.1   GF Simple Python Code

The GFLibPy library is a Python toolbox that consists of different Python functions for generating a suitable computing kernel of each problem GF tackles. GFLibPy provides implementations of a simple GF algorithm with support vector machines, including popular kernels such as RBF linear and polynomial. It also includes operations for classification and regression problems. All of these kernels are implemented using a Pycharm compiler with a standard GF algorithm. This design allows standard kernels to be compared with several generic GF-kernels that perform cross-validation, thereby reducing the number of mutation rates, crossover rates, problem type, the number of populations, and generation size. The GFLibPy fitting a generic GF-kernel chromosome to the GP-tree output to make comparison interpretable in tree formats.

All GFPyLib files of the toolbox can be downloaded from https://github.com/mohabedalgani/GFlibPy. This toolbox, along with the evaluation modules, makes the library easily extensible by other developers. Figure 2 shows a simple GF algorithm that is used in the main files of this toolbox. The below shown GF algorithm is used in binary.py, multi.py, and regress.py files.

```python
# dictionary Declaration
params = dict()
totalMSE = dict()

# problem type: binary, multi, regress
params['type'] = 'binary'
# Type of data file
params['data'] = 'odd_3_parity.txt'
# kernel type: rbf, linear, polynomial, gf
params['kernel'] = 'gf'
# mutation probability
params['mutProb'] = 0.01
# crossover probability
params['crossProb'] = 0.5
# max generation
params['maxGen'] = 50
# population size
params['popSize'] = 100
# number of cross validation portions
params['crossVal'] = 5

# Operators and operands used
params['opList'] = ['Plus_s', 'Minus_s', 'Multi_s', 'Plus_v', 'Minus_v', 'x',
'y']

# Kernel-SVM used in comparison with GF in the toolbox
kernels = ['poly', 'rbf', 'linear', 'gf']
# include all kernels' types
for ker in kernels:
    totalMSE[ker] = list()
# run the algorithm for 5 runs and comparisons
for i in range(5):
    for index, kernel in enumerate(kernels):
        params['kernel'] = kernel
        print(f'''SVM Kernel:{params['kernel']} \n''')
        if kernel == 'gf':
            # generate initial population
            pop = inipop(params, max_chromosome_length)
            # the best population from the initial one
            mse = genpop(pop, params, i)
        else:
            # calculate using a selected kernel-SVM
            mse = typicalsvm(params)
            #Append the MSE of each kernel respectively
            totalMSE[kernel].append(mse)
        print('\n')
```

Fig. 2. GF algorithm in PyCharm environment

3   The Python GF Toolbox

The GFLibPy toolbox extends the capabilities of the core GF algorithm by providing functions for many commonly encountered problems such as logic synthesis, logic multiplexers, and odd parity problems. Methods for the performance analysis of fitness values, structure complexity, population diversity and accuracy versus complexity were conducted in the toolbox. The GFLibPy toolbox described in this paper is intended to provide the users of Python with a comprehensive set of functions and solutions for the most common problems in classification and regression. While the software package described in this paper is currently the one offering Python package, there is a MATLAB toolbox [5] for other users and environments. Python is hugely popular among data scientists for the fact of data analysis environment in machine learning and data sciences. Also, the huge number of packages available as open-source makes Python one of the top programming languages for data science.

GFLibPy supports the encoding and decoding of representations over the GF Chromosome. The efficient and simple methods to address this challenge is currently underway. For basic GF operations such as crossover, mutation, and selection operators, GFLibPy reuses primitive MATLAB types found in [6]. For further accessibility, GFLibPy is compatible with the open-source git platform, and that compatibility is tested.

3.1   Data Structures

GFLibPy is essentially designed for one data type, a floating-point of real or complex numeric elements (separated by dots). The main data structures are chromosomes, phenotypes, objective function values, fitness values, and genetic operators. The chromosome structure stores the entire kernel operations (operators and operands) in a single array of size Noperator × Noperand, where Noperator is the number of operators generated in a chromosome and Noperands is the number of operands needed to build a solid chromosome structure. GFLibPy determines the number of operators based on the following equation:

$$\text{oplimit} = \text{int}((\text{max\_chromosome\_length} - 3)/4) \tag{1}$$

oplimit stores the limits of operators needed for generation. where max_chromosome_length is a predefined user number inserted for the length of the GF chromosome. Generally, the GF chromosome formulated randomly is based on the number of oplimit values. In all of these data structures, each gene (operator) in the GF chromosome corresponds to a particular element (operands) on the same chromosome.

The encoding and decoding processes of the GF chromosomes are as represented linearly as follows (Table 1):

Table 1. GF representation of an individual program

Index	1	2	3	4	5	6	7	8	9
Operator/Operand	*	/	−	+	7	11	9	2	4
GF indices	2.3	4.5	6.8	7.9	0.5	0.11	0.9	0.2	0.4

As GF represents every single model by a chromosome, each chromosome holds a generic operator and a respective number of operands. GF algorithm generates several operators and operands based on the equation shown in (1). Details of GF encoding and decoding are described in details in [4].

3.2 Toolbox Structure

GFLib's engineering assumes a profoundly secluded and parameterized structure, which enables various users to profits from it at various degrees of profundity and knowledge. What pursues is a visual portrayal of this structure, alongside brief clarifications of some activity subtleties and control parameters. The operational structure of GFLibPy is depicted in Fig. 1. There are two main modules, namely, *inipop* and *genpop*, where each represents the initialization and generation life cycle, respectively. Inside each main module, the submodules are executed from top to bottom *calcfitness*, selection, mutation, and crossover. Any module in the toolbox depends on the parameters necessary for execution.

Every module may utilize at least one parameter and at least one invocation. This module creates the initial population (*inipop*) and ascertains its fitness *calcfitness*. The people in GFLibPy are exhibit structures made utilizing the encoding component in *inipop*. The operators are generated by the means of an irregular number and all the essential operands are made in the runtime. The operator lists used are:

params['opList'] = ['Plus_s', 'Minus_s', 'Plus_v', 'Minus_v', 'Sine', 'Cosine', 'Tanh', 'Log', 'x', 'y'].

Population Representation and Initialization: *inipop.py, genpop.py*

Inipop.py is known as an algorithm that randomly generates the initial population. It starts by setting parameters to opCount = 0 which are set to the current number of operators in the chromosome, count = 0 is set to guarantee that the last two (2) values in the chromStr array which would be x,y variables, pos = 0 and are used for the final chromosome length, while len = 0 is used for tree nodes indexing.

The parameters of *inipop* file take parameters, and return values are as follows:

- params: passed from binary.py, multi.py, regress.py with links to the dataset, problem types, and initial params for GF algorithm

- max_chromosome_length: the maximum length of the chromosome
- Returning value: returns the list of chromosomes; their positions and the corresponding tree structure

The file *genpop* generates a new population of chromosomes from the initial population. The file also plots the graphs of metrics for different generations. The parameters which the function receives and returns a value is as follows:

- pop: the initial chromosome population
- params: containing the information of parameters, about population and about the task we are solving
- The returning value: -MSE for regression and accuracy * 100 for classification of the newly generated chromosomes

Calculating Fitness: *calcfitness.py*

Fitness is, by default, the MSE for regression tasks and accuracy* 100 for the binary and multi-classification tasks. The MSE accurately calculates the differences between the acquired and expected outcomes in all fitness cases. In regression problems, the lower the value of fitness, the better the person. In classification problems, the higher the value of fitness, the better the person. The *calcfitness* file reads the data of type params['type'] and with the data path params['data'], then fits the SVC or SVR model depending on the params['type'] with the custom kernel, determined by the "pop" parameter, thereby calculating the resulting metrics for the input population.

- param (pop): population, which will determine the custom kernel for the SVM model
- param (params): parameters, containing the info about population and about the task to solve
- Returning result: -MSE for regression task, Accuracy * 100 for the binary, and multi-classification tasks.

Custom Kernel GF Function: *kernel.py*

Used as a custom function to pass into SVM kernel the following parameters.

- U: full X data passed to SVM fit
- V: full Y target data passed to SVM fit
- Returning value: the Gram matrix a.k.a. Kernel Matrix (often abbreviated as K).

Kernel Operations: *kernelvalue.py*

GF performs a certain operation on column vectors xi, x2 (row index of the entire X dataset) passed from the kernel function.

Calling *kernelvalue* on all combinations of i, j fills the Gram matrix

- xi: row i of X passed to SVM fit() method.
- xj: row j of X passed to SVM fit() method.
- str: a string of operations for the current chromosome
- num: a string of connections between operations for the current chromosome
- returning result: vector or scalar from a certain operation on xi, xj values.

GF Operators: *mutation.py, crossover.py, selection.py*

The *selection* routine picks a specified number of individuals from the existing population based on their fitness and returns a column vector to their indices. The presently available routine in GF is a roulette wheel selection method.

The genetic operator of the GF algorithm undergoes either a crossover or mutation which takes a probability of 50% for each. The *crossover* routine recombines pairs of individuals with a specified likelihood to deliver posterity. Contingent upon the portrayal of the length of the parents, the algorithm is given below can be applied:

- Single-point where each selected parent will be swapped with another selected parent within its length. This will allow parents not to hold more indices than they have.

Another half of the population, 50%, undergoes *mutation* to generate offspring. Offspring variables are mutated by small perturbations (size of the transformation step), with low likelihood. The variable representation dictates the used of the algorithm. Two types of operations are explained:

- The mutation operator for first indexed; if GF generates a probability less than the predefined one, then GF replaces plus_s with minus_s; otherwise plus_s will be replaced in a parent by any other operator type.
- The mutation for other indices. The *mutation* routine mutates one gene each time with a given probability to produce offspring. The operators in parents will be replaced with a random operator and operands will be replaced with a random operand.

4   Example Applications

In this section, a simple example of experiments demonstrating how the GFLibPy toolbox can be applied to classify the problems. The results at this stage are generated with varying parameter values, that are found with the best performance results of different figures. See the parameters of all experiments shown below for each type of problem.

4.1   Binary Classification Problem

In binary classification, 50 individuals are randomly generated in every generation and the best individual from this set is chosen as a parent. This procedure is rehashed often as individuals must be picked. These chosen parents produce uniform offspring randomly. The parameter for crossover and mutation is a predefined probability. The mutation rate takes values ranging from 0.1 to 0.01 probability rate, and the crossover

rate takes a probability rate of 0.5. GF algorithm is run 5-times to have an average of the results. Figure 3 shows the best GF tree generated in each run, and Fig. 4 shows the performance analysis between 25 generation sizes and the crossover fold is 5-folds. The best GF chromosome string was generated from the odd_3_parity.txt dataset and shown in Fig. 3 (e) for the sake of simplicity:

['Minus_s', 'Minus_s', 'x', 'Minus_v', 'x', 'x', 'Multi_s', 'x', 'x'].

The best GF chromosome folding indices are:

['1.2', '3.4', '0.2', '5.6', '0.4', '0.5', '7.8', '0.7', '0.8'].

a. 1-run

b. 2-run

c. 3-run

d. 4-run

e. 5-run
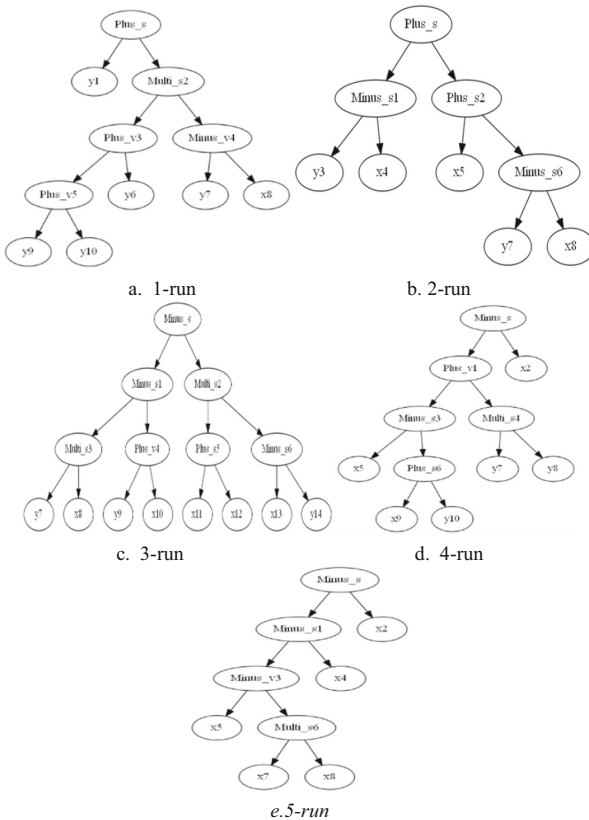
Fig. 3. Binary classification of GF-Tree based results; a. the best tree found in the 1st-run, b. the best tree found in the 2nd-run, c. the best tree found in the 3rd-run, e. best tree found in the 5th-run.

So, even for a population diversity (Fig. 4(c)), implementing the 50%-50% genetic operators in a different channel manner delivers impeccable results (the algorithm finds the global optimum often or with fewer function evaluations). The Mean Square Errors (MSE) results show the best MSE value found:
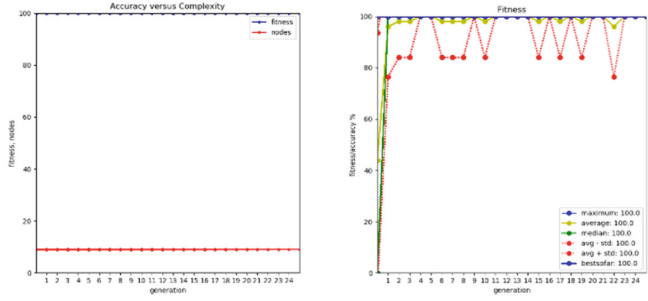
a.   Accuracy vs. Complexity   b. Fitness Values
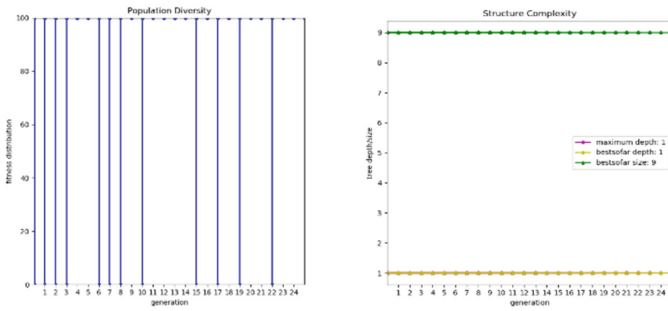
c.   Population Diversity   d. Structure Complexity
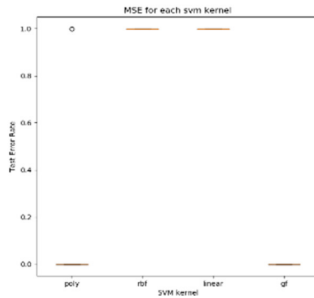
e. Mean Square Error

Fig. 4. Binary Classification figures. Runs with 20 GF size length, mutation rate: 0.01, crossover rate: 0.5, 25 generations, 50 population size, cross-validation: 5-folds.

4.2   Multi Classification Problem

The multiclassification implementation of the iris_scale.txt dataset showed not only speed up in computation time, but it also needed less number of folding genes (15 best so far size as shown in Fig. 6(d)) when compared to an RBF, linear, and polynomial kernels.

The results found for the best GF chromosome string are:

['Plus_s', 'x', 'Plus_v', 'y', 'Minus_s', 'Tanh', 'Sine', 'Plus_s', 'Tanh', 'x', 'Cosine', 'x', 'y', 'y', 'x'].

The best GF chromosome folding indices are:

['1.2', '0.1', '3.4', '0.3', '5.6', '7.8', '9.10', '11.12', '13.14', '0.9', '0.10', '0.11', '0.12', '0.13', '0.14'].

The best chromosome built after 5 runs by GF algorithm represented in a tree-based format as follows (Fig. 5):
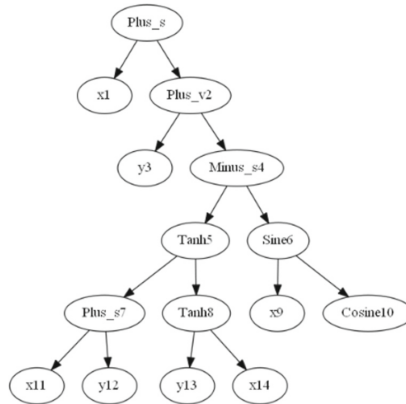
Fig. 5. Multi-classification of GF-Tree based results

Figure 6 gives a detailed description of the performance analysis migration scheme for 5 runs and 5 folds with fitness-based selection. Subfigures a, b, c, and d shows an analysis performance of the best GF individuals (fitness-based migration). Fitness distribution values (Fig. 6(b)) uniformly maintain an average which means that the GF pool replaces the worst individuals with best/average individuals. This cycle is performed for every subfigure to ensured that no subpopulation will holds individuals folds from itself.
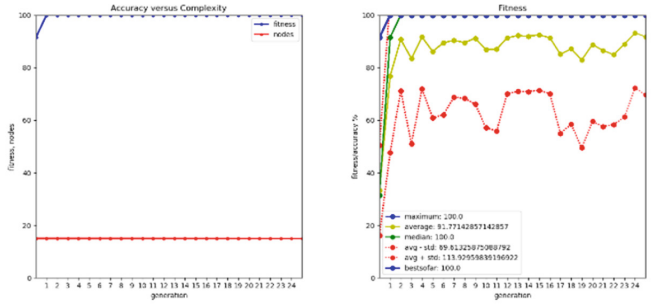
a. Accuracy vs. Complexity   b. Fitness Values
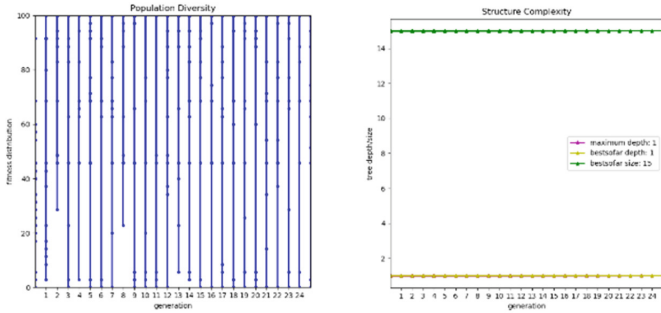
c.Population Diversity   d. Structure Complexity
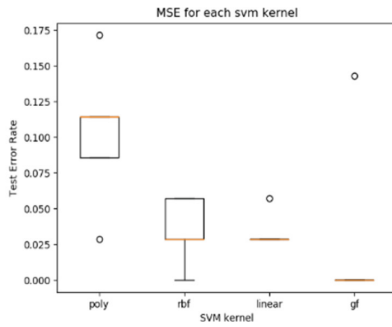
e. Mean Square Error

Fig. 6. Multi-classification figures. Runs with 20 GF size length, mutation rate: 0.1, crossover rate: 0.5, 25 generations, 50 population size, crossvalidation: 5-fold.

5 Conclusion

The paper describes the GFLibPy toolbox for performing the classification of the selected UCI datasets in Python. The toolbox covers a wide range of applications, from binary and multi-classifications to regression. The toolbox supplies the reader with

parametric and nonparametric methods for testing a variety of hypotheses about classification and regression dataset, including testing of logic synthesis, 6-multiplexers as well as odd parity testing. The toolbox will make the GF algorithm available to a broader range of researchers, especially in applied Python in machine learning applications.

A promising result shown in the development of the toolbox was as a result of the combination of several optimization strategies by keeping up the profitable attributes of every strategy (hybridization). This brought about an unbending combination of two optimization strategies; SVM and GF algorithm. For instance, the SVM would work the whole time for classification and regression, whereas the GF algorithm would only be switched on from time to time to exploit new kernels.

References

1. Holland, J.H.: Adaptation in Natural and Artificial Systems. University of Michigan Press, Ann Arbor (1975)
2. Koza, J.R.: Genetic programming - on the programming of computers by means of natural selection. Complex adaptive systems (1992)
3. Ferreira, C.: Gene Expression Programming: Mathematical Modeling by an Artificial Intelligence (Studies in Computational Intelligence). Springer, New York (2006). https://doi.org/10.1007/3-540-32849-1
4. Mezher, M., Abbod, M.: Genetic folding: a new class of evolutionary algorithms. In: Bramer, M., Petridis, M., Hopgood, A. (eds.) Research and Development in Intelligent Systems XXVII. SGAI 2010, pp. 279–284. Springer, London (2011). https://doi.org/10.1007/978-0-85729-130-1_21
5. Mezher, M.: GFLIB: an open source library for genetic folding solving optimization problems. Artif. Intell. Adv. **1**, 11–17 (2019)
6. Mezher, M.A., Abbod, M.F.: Genetic folding MATLAB toolbox: solving Santa Fe trail problem. Int. J. Comput. 54–59 (2017)
7. Chang, C.-C., Lin, C.-J.: LIBSVM: a library for support vector machines. ACM Trans. Intell. Syst. Technol. **2**(3), 1–27 (2011)
8. Dua, D., Graff, C.: UCI Machine Learning Repository. University of California, School of Information and Computer Science, Irvine (2019). http://archive.ics.uci.edu/ml
9. Chipperfield, A.J., Fleming, P.J.: The MATLAB genetic algorithm toolbox. In: IEE Colloquium on Applied Control Techniques Using MATLAB, UK (1995)
10. Kazakov, V., Király, F.J.: Machine learning automation toolbox (MLaut). CoRR abs/1901.03678 (2019)
11. Guedj, B., Desikan, B.: Pycobra: a python toolbox for ensemble learning and visualization. J. Mach. Learn. Res. Arch. **18**(1), 1–5 (2017)
12. Gros, C., Lemay, A., Cohen-Adad, J.: SoftSeg: advantages of soft versus binary training for image segmentation. Medical Image Analysis, Computer Vision and Pattern Recognition. arXiv (2020)
13. Teimouri, M., Seyedghorban, Z., Amirjani, F.: Fragments-expert: a graphical user interface MATLAB toolbox for classification of file fragments. arXiv
14. Yu, S., et al.: A matlab toolbox for feature importance ranking. In: 2019 International Conference on Medical Imaging Physics and Engineering (ICMIPE). IEEE (2019). https://doi.org/10.1109/icmipe47306.2019.9098233

15. Maguolo, G., Paci, M., Nanni, L., Bonan, L.: Audiogmenter: a MATLAB toolbox for audio data augmentation. arXiv (2020)
16. Pan, Y., Mai, Q., Zhang, X.: TULIP: a toolbox for linear discriminant analysis with penalties. arXiv (2019)
17. Kazakov, V., Király, F.J.: Machine learning automation toolbox (MLaut). arXiv (2019)
18. Wu, Y., Hoi, S.C.H., Liu, C., Lu, J., Sahoo, D., Yu, N.: SOL: a library for scalable online learning algorithms. arXiv (2016)
19. Vourvopoulos, A., Legeay, S., Figueiredo, P.: NeuXus: a biosignal processing and classification pipeline for real-time brain-computer interaction. arXiv (2020)
20. Demšar, J., et al.: Orange: data mining toolbox in Python. J. Mach. Learn. Res. **14**, 2349–2353 (2013)
21. Faouzi, J., Janati, H.: pyts: a Python package for time series classification. J. Mach. Learn. Res. **21**, 1–6 (2020)
22. Lemaître, G., Nogueira, F., Aridas, C.: Imbalanced-learn: a Python toolbox to tackle the curse of imbalanced datasets in machine learning. J. Mach. Learn. Res. **18**, 1–5 (2016)
23. Tayeb, Z., et al.: Gumpy: a Python toolbox suitable for hybrid brain-computer interfaces. J. Neural Eng. **15**, 065003 (2018). https://doi.org/10.1088/1741-2552/aae186
24. Mezher, M.A., Abbod, M.F.: Genetic folding for solving multiclass SVM problems. Appl. Intell. **41**(2), 464–472 (2014). https://doi.org/10.1007/s10489-014-0533-1

Blockchain and Ecological Impact: Between Reality and Accusation?

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Abstract. The blockchain is a decentralized ledger that enables information transfers to be carried out in a secure manner. It is also a solution mentioned by several sectors, particularly industrial and financing with the creation of crypto currency. The blcokchain minimizes waste thanks to the real-time traceability it provides. But following the growth of mining operations linked to this technology, bitcoin slayers are denouncing an ecological disaster because the activity of mining crypto currencies requires enormous resources of electricity. Other research has disputed these accusations, and presented digit minus in terms of ecological impact. But well aware of the impact of certain democratized crypto currencies, other modes of operation based on renewable energies have emerged in order to reduce their impact on the environment. And some researchers have even considered it as an anti energy-waste on the one hand and on the other hand, this technology is a vector for the growth of renewable energies. The blockchain is therefore seen as an 'ideal' ecological alternative. Other schools of thought have considered this technology to be energy intensive, but when compared to other traditional computerized sectors, the ecological impact is quite relative.

Keywords: Blockchain technology · Ecology · Crypto-currencies · Energy consumption

1 Introduction

Blockchain technology is perceived as an energy chasm, since these new technological developments are often put in opposition to the challenge of the energy transition. In general, innovation could be essential to achieving sustainable development goals by providing transparency, agility and real-time monitoring of the consumption of the different resources [5]. And blackchain tecknology is one of the most significant and controversial innovations in recent years. In fact, since 2018, the subject matter of the ecological cost which was insignificant in the past has become essential. This concern is quite legitimate since bitcoin has reached new heights, and the alarm on the ecological impact and the carbon footprint of cryptocurrencies have been sounded during research on the spectacular consumption of electricity by the mining activity relating to cryptocurrency. This sequence is marked during the spectacular rise in the price of Bitcoin in early 2018, which led some researchers to consider that bitcoin could cause a 2 degree increase in the global warming. One of the first studies by [19] claimed that Bitcoin's energy consumption was similar to that of a country like Ireland. In fact, the

study wrote in its conclusions that the energy of Bitcoin mining is around a range of 0.1 to 10 gigawatts, in which a range that includes countries like Ireland only used for comparison because the above mentioned researches are Irish. But this study had limitations, since it confused electricity and energy. This was shown by [15] in his study, he considered that Bitcoin has been accused of consuming as much energy as a country like Ireland, or Denmark, and that these figures are presented in a spectacular way in an exaggerated and inflated manner. [3] quad to them, tried to calculate the energy consumption from Bitcoin mining. His comparison between the Bitcoin network consumption of energy, and that of Ireland becomes a common reference to decry blockchains' gargantuan appetite for Gigawatts. Calculating the ecological footprint of blockchains is a complicated exercise that requires taking into account many variables, some of which suffer from a lack reliable information. Among these different ecological factors, identifying the origin of the electricity consumed by Bitcoin is a central issue. Indeed, the consumption of electricity produced by coal results in a carbon footprint 170 times greater than that from hydropower. Beyond these factors about which there is, today, no precise information, it would be necessary to add to the calculation the side effects resulting from this consumption, such as the energy expended to cooling the mining centers, or the pollution related to technological waste as well as the extraction of rare metals [2]. Then this consumption should be compared to traditional systems of transfer and storage of value (such as the banking network) and of value creation (such as gold mining). [27] unveiled the obstacles encountered by this type of calculation and have taken up many subsequent works and articles, even that of the calculations by [24] which resulted in bitcoin electricity consumption is twice as lower than that obtained by [20], and which emphasizes the flaws in the reasoning. The objective of this study is to try to provide a complete answer to the ecological impact of blockchains and crypto currencies. We will begin our study by a definition of the basic concepts, namely crypto currencies and blockchains, their creation and evolutions. In the second part, we will present the two opposing thoughts, those which affirm the energy-intensive nature of this blockchain technology, and the opposite current which minimizes the ecological impact. A third part dedicated to the questioning of these accusations and the solutions suggested for an optimal ecological impact. And finally the conclusion.

2 Definitions of Concepts

A cryptocurrency is a decentralized digital currency, which uses cryptographic algorithms and a protocol called blockchain to ensure the reliability and traceability of transactions. Cryptocurrencies are completely virtual, they can be stored in a digital wallet protected by a secret code belonging to its owner. Exchange platforms (Binance, Coinbase, Bitstamp, etc.) are used to buy and resell cryptocurrency online. The first and most famous crypto-currency is Bitcoin. Created in 2008 by programmer Satoshi Nakamoto, it used blockchain as an exchange platform. Soon after, many other digital currencies encrypted by crypto-traders were created. A crypto-currency is an alternative currency that does not have a physical form and is completely virtual. It is traded directly from peer to peer without the intermediary of a bank or other controlling

institution. Cryptocurrencies are used to buy goods and services, and it can also be exchanged for other currencies [34]. Many Internet sites but also permanent stores accept this currency, which main advantages is the low cost of transaction fees. This volume decreases by half every 4 years, during an event called "Halving". This process gradually increases the scarcity of cryptocurrency, making it more and more difficult to obtain through mining. It aims to minimize natural resources like precious metals and protect the virtual currency from hyperinflation. Legislation on cryptocurrencies varies greatly from country to country. Central banks do not recognize them the same way as national currencies and their legal status does not exist yet. The blockchain is a code deemed to be inviolable which allows for the accounting of the currency. Each link in the chain depends on the code of the previous one to be able to be issued. All the links in the chain are therefore unique, preventing any attempt of forgery. It is this high level of safety as well as its decentralized nature that is the strength of this new [22] technology. The main users called minors, devoted their time and the computing power of their computers to manage the blockchain. This operation called "mining" allows these people to be paid, in bitcoin. The value of crypto currencies is maintained by mining software which adapts the intensity of calculations to the number of active miners. To use crypto currencies like bitcoins, you have to create a virtual wallet that will be funded by going to stock exchange, to convert cash or by selling goods or services online. Several platforms offer the conversion of dollars, euros or yuan into bitcoins.

3   Crypto Currency and Energy Consumption

Several studies have considered cryptocurrencies to be large consumers of electricity in their transactions. According to [3] each bitcoin transaction generates an average of 300 kg of carbon dioxide (CO2), the equivalent of the carbon footprint produced by approximately 750,000 Visa cards. This is because almost all cryptocurrencies, including bitcoin, document every transaction on what is called a public ledger, which guarantees the transparency and security of transactions, but permanently requires additional storage space, or "blocks". Blocks are created by miners, who receive bitcoins in exchange for their hard work, by executing code around the clock on special hardware called "rigs" a process that consumes the same amount of energy (about 78.5 terwatt per hour) annually as countries like Chile, Austria and Finland. Mining networks are largely based in China, which derives much of its energy from fossil fuels like coal. In fact, as cryptocurrency becomes more popular, its energy consumption has increased tenfold since 2017 [25]. Bitcoin mining operations have a heavy ecological impact, given the high consumption of electricity during their operations. The mining activity is considered to be the heart of the crypto currency mechanism, since it requires the work of huge numbers of computers. The main activity of mining is to validate and secure transactions on the blockchain (or blockchain). This proof of work is the base for the principle of decentralization of this digital currency, and requires very significant computing power. Indeed, these mining operations constituting proof to work, used thousands of computer systems, in the form of "mining farms", which will provide this service all over the world. This work is pretty well paid, since the reward is

6.25 bitcoins (BTC) per block, formed every 10 min approximately, and this has become a source of attractiveness especially in recent years thanks to the increase in the price of the cryptocurrency, to more than 60,000 euros currently (nearly $ 70,000). In fact, one hour of calculation alone generated four million dollars for [30]. But this innovation has ecological effects. According to [33], this bitcoin mining in China represents 65% of planetary activity, and will reach a consumption of electricity of 296.59 TWh (terawatt-hour) by 2024. The equivalent of the annual electricity consumption of a country like Italy or Saudi Arabia. From an ecological point of view, the carbon emission bill will thus amount to 130 million ton per year. This is largely due to the fact that 40% of mining in China still derives its electricity from coal-fired power stations. Several studies have been launched in recent years to see the impact of increasing energy consumption by crypto currencies and especially bitcoin. The University of Cambridge has created a tool called the Cambridge Bitcoin Electricity Consumption Index, to calculate and assess the consumption of electricity by the mining servers used by the blockcahin. This index is currently estimated at 143 TWh of electricity consumption over the year (for the whole world). In fact this index is calculated by taking into account a multitude of constantly evolving data, such as the daily income of miners, and the times spent during difficulties in finding a block during a day, and also the computing power weighed according to the "hash rate". But the methods of calculating these indexes are not shared by all researchers and mathematicians specialized in the calculation of block operations. [19] in his study presented a consumption estimated at "about 80 TWh per year, which constitutes almost half of the consumption presented by the Cambridge Index. While other subsequent calculations came to the conclusion that previous studies on Bitcoin's energy footprint were grossly exaggerated, the analysis on Bitcoin's energy consumption figures leads to overly hasty and controversial conclusions. But why are these differences in calculation leading to different conclusions?

3.1 Different Protocols Imply Different Levels of Consumption

To say that the blockchain consumes a lot of energy does not make sense if you do not specify the calculation methods used. In addition, there are other cryptocurrencies besides bitcoin, which are associated to other blockchain protocols. While some of these protocols work similarly to that of Bitcoin, other protocols were based on very different algorithms that consume much less energy (example of the Tezos blockchain) or are intended to switch to such J Sedlmeir algorithms; [17] (this is in particular the case of Ethereum, which aims to bring about a decentralized web, under development). Remember also that there are public blockchains, which worked with crypto currencies like bitcoin or etherum, etc.), and private blockchains, which operating mode is very different and also more energy efficient. These private blockchains are built mostly by private companies, in the banking and financial sectors or by companies from other industries using blockchain technology. (private blockchains that can be used to improve traceability in pharmaceuticals, food, fashion, logistics, transport, etc.). Thus we can say that all cryptocurrencies and all blockchains are far from having the same level of energy consumption [26, 29]. On the other hand, these other blockchains often do not have the same level of security as Bitcoin. This can be explained as follows: the

energy consumption of Bitcoin for example is one of the key components of the security of the network and of the transactions carried out by cryptocurrencies. [28] in his study asserted that the consumption of electricity by Bitcoin's algorithms, through mining operations, represents the security barrier that generally opposes any tampering with the blockchain. To remedy this gigantic consumption of electricity, miners are encouraged to use the cheapest energy, that is, to use the overcapacity of renewable energy production infrastructure [21]. This overcapacity is due to imperfections in the electricity distribution networks to which new hydraulic, geothermal or solar power plants must be connected to absorb the overproduction. But since fossil fuels are not excessively available, therefore, the Bitcoin contributes both indirectly and directly to the development of renewable energies; [5]. Another calculation protocol that has been overlooked in calculating the energy footprint is that technical advances are often overlooked in analyzes and calculations. This at the level of the material (hardware) used especially by the miners who validate the transactions. It should be remembered that the energy consumption of Bitcoin for example, depends mainly on the material used by the miners [17]. However, the power/consumption ratio of hardware has changed radically over the past few years, especially with innovation and the use of new chips that are more efficient in terms of computing speed. But efficiency gains do not necessarily lead to reduced electricity consumption: they do radically increase the security of the network. But by taking action At the level of protocol layers, several researchers have observed improvements in energy consumption, especially with the innovation of the Lighting Network. The Lightning Network mechanism is a technology capable of increasing the capacity of the Bitcoin network. The advantage of this Lightning Network innovation is that it makes it possible to increase the number of transactions without proportionately increasing energy consumption [35, 36].

3.2   Renewable Energies and the Mining Energy Mix

The research of [23] has shown that an increasing number of mining activities is located in Canada and the US, in regions where renewable energy capacities are abundant. The study showed that the majority of mining facilities rely on an energy mix including renewable energies. The authors also found that the share of renewable varies considerably from one mining site to another: while some used it marginally, others operated almost exclusively with renewable energies. [9] in his research work found that renewable energy accounts for over 77% of total bitcoin mining. Indeed, the electricity used to mine bitcoin comes mostly from renewable energy. This is due to the interest of miners in reducing their costs by reducing their energy bill thus increasing their profitability. Miners were always looking for available and economical sources of energy, often through hydropower stations and other renewable energy stations. According to [24] miners are encouraged to use the cheapest energy where they can find it: hydroelectric dams (Sichuan, Canada, Georgia…), geothermal energy (Iceland) but also coal (Mongolia interior, Siberia, United States, Australia…). But the cheapest energy is still coal, and those who burn it are unaware of the consequences of global warming. And according to [5, 9] a significant portion of Bitcoin miners are indeed in China, the world's largest coal producer. And this country, responsible for a significant portion of CO_2 emissions today, also accounts for more than 30% of global

hydroelectric consumption. So if the mining farms are often Chinese, they are far from operating all with coal power stations, for the low cost of this energy. Other authors have found that a significant portion of the electricity used for mining in China comes from hydropower plants in the mountains of Sichuan [1]. This is not only renewable energy, but also and above all unconsumed produced energy because it is located in places where supply exceeds demand. Researchers agree on the strong growth of this energy consumption linked to mining, since the practice is proving to be particularly lucrative for those who invest time and money in it.

3.3 Energy Consumption and Ecological Impact

According to [23], the excess renewable energy used by some mining actors, have lower environmental impacts on the energy consumed than the estimates made by previous research. According to the authors, the ecological footprint of electricity consumption depends closely on the means used to produce that electricity. Thus, taken into consideration the case of CO_2 pollution, the same quantity of electricity produced can correspond to very different quantities of CO_2. In the same way, [29] in their research, found that the sources of pollution are some means of electricity production more than others. And the only problematic CO_2 is the one that comes from fossil fuels like coal, oil and gas. But it should be mentioned that sometimes the electricity produced is unused [10]. This is the case with solar panels, hydroelectric dams or nuclear power stations that generate electricity continuously. And the main problem is the lack of storage, and the electricity is very difficult to transport it. However, according to the study by [6], much of the electricity now used in Bitcoin is in fact electricity from underused hydroelectric infrastructure. (Initially dedicated to the production of aluminum in China, production which fell due to a drop in demand). Thus the Bitcoin has benefited from a large amount of unused electricity and therefore very cheap, both ecologically and economically [7]. A study by [9] leads to the same conclusion: hydropower is believed to be the main source of energy for Bitcoin mining today. The attractive financial incentive of mining has started a race for related mining equipment. According to [31], precious state-of-the-art computer equipment, rich in rare metals, is necessary for the calculations requested by the blockchain. And the great demand for this type of computer hardware has increased the demand for useful precious metals. This has led to the use of mining, causing the consumption of drinking water and releasing materials and gases harmful to our planet such as mercury and co2.

4 Cryptocurrency and the Energy Transition

According to [8] Mining is a promising way to promote progress in energy efficiency, since miners have an interest in minimizing their costs. And their profitability depends on this efficiency. As a result, some researchers believe that it is thanks to mining that the greatest advances in energy efficiency and innovations in the optimal use of green and renewable energy will emerge. Indeed, according to [32], mining helps support renewable energy production sites while waiting for them to become profitable. The energy transition is not happening fast enough and solar or wind power plants are not

as abundant. Mining can allow renewable electricity projects, which are not yet profitable, to see the light of day now. Producing energy is one thing, but then you have to be able to transport it in order to sell it, and there is not necessarily an immediate correlation between production and demand. For example, the hydroelectric dams created have a capacity which depends on the driving force of the water. If the ability to build a 100 MW dam, allows the sale of 20 MW immediately, and the need to wait a few years to create the distribution network or to sell the additional 80. With mining, the dam and its infrastructure are profitable. Also, one of the largest solar parks in Africa is in Morocco. It was created in 2018, but currently the station is low in its production, and the station needs a significant mining consumption to be profitable. Thus, mining is the ideal customer for green electricity producers, since it has characteristics that can be adapted to this type of energy: full mobility, possibility of settling in the most remote areas, because there are few employees to come, no need for suppliers nearby, no need for transport infrastructure to ship production, nor infrastructure storage of its production [18]. For example, a Bitcoin mine can make 20 kW like 20 MW, it can settle for 5% or 10% of the production of an electrical site and can commit to using 100% of the production. Mining does not suffer from fluctuating demand, it is very tolerant of outages. Currently, large wind and solar projects include mining in their feasibility and profitability calculations. So with Bitcoin for example, cryptocurrency mining has become an undeniable engine for the energy transition. According to [15] if the public authorities and the research world really wish to limit the ecological impact of blockchains and cryptocurrencies without compromising the attractiveness of these innovations, it is necessary to support the responsible actors mining. [13], argued that the States which favor this path, will benefit from this outlet for overproduced electricity. In Cananda, Quebec has decided to allow miners to exploit excesses from hydroelectric dams. Other countries like Georgia and Kazakhstan, big producers of hydroelectricity, have encouraged the installation of miners. Similarly, it is good to support miners who intelligently harness the heat produced by their servers.

4.1   Mining and Energy Waste

To address the issue of excessive energy consumption, it is interesting to rely on the study by [16], in fact the latter analyzed the tendency of blockchain projects to settle in areas of surplus energy, ie where energy is the cheapest. These areas are not based on coal-fired power plants but on hydroelectric plants that were running at full capacity and producing too much energy for regions that were generally empty. Some French mining companies have even set up in Kazakhstan in the Almaty region. Since electrical energy cannot be stored, mining therefore avoids significant energy waste. Moreover, by responding to this gap between demand and production, blockchain technology by mining makes it possible to valorize these projects. For some researchers the blockchain favored in a way, the creation of green energy especially when it is still impossible to store the surplus energy, which avoids the waste of energy. The miners and farms that make the blockchain can thus adapt to areas of optimal energy production. And blockchain can be considered as an eco-friendly technology. Especially with the long-term implementation of eco-responsible energy consumption. With the

support of green energy production projects, blockchain technology appears to be compatible with sustainable development [1].

4.2   The Problem of Energy Linked to Blockchains?

Being concerned about the energy consumption of cryptocurrencies is legitimate, and this concern frequently mixes with controversial thoughts. Certainly the subject of blockchains and cryptocurrencies is raised, in order to reject them in the name of their ecological impact, while this same ecological impact has not been questioned for other issues that we would rather not mention; [11]. According to [14], Very few researches has studied the ecological impact of the classical financial system. This impact is of course difficult to assess but it suffices to start listing the energy consuming items to realize that this sector is very considerable in terms of energy consumption and the ecological costs generated. Among the items drawn up we find high frequency robot traders; data centers; various security systems; office towers; transport of funds; distributors; payment devices; etc. In fact all factors linked to the conventional finance system have typical characteristics of high energy consumption. Another aspect that must be mentioned, a great source of value creation, and also a large consumer of energy and whose ecological impact is disastrous, is mining in search of rare and precious metals such as gold. According to [29] the extraction of 1 kg of gold generates: 2.3 million litters of water, nearly one ton of sulfur oxide (responsible for acid rain), 2000 tons of mining waste or 4000 tons of CO_2, 27 g of mercury and 22 g of arsenic released in the atmosphere. Another factor, which has not been taken into consideration, is the energy consumption of digital technology (PC servers…), and Internet users. In fact, according to a study by [2] the (French Environment and Energy Management Agency), digital technology could represent in 2020 nearly 4% of greenhouse gas emissions in Europe. And the annual carbon footprint of a Gmail user, for example, is estimated at 1.08 million tones of CO_2 emitted per year. Likewise, more than 600 tons of CO_2 would be emitted every day just because of YouTube, or 219 million tons of CO_2 every year. To be concerned about the ecological impact of only cryptocurrencies and not the rest of the digital sector would not be fair and pretty suspicious. The energy consumption of the digital world is admittedly huge and distinguishing energy consumption from cryptocurrencies is arguably dubious. According to [12], the contributions of the various digital services should therefore be put into perspective with respect to their ecological cost in order to try to estimate each of their ecological cost.

5   Conclusion

The computer network that allows the operation of crypto currency exchanges and their security consumes a significant amount of electrical energy. This amount of energy consumed by the grid is continuously increasing, given the increasing volatility of cryptocurrency values. This is due to the very close relationship between the electricity expenditure of the network and the price of crypto currencies. The energy consumption estimates are all approximate because it is impossible to know in detail the electricity

expenditure in mining operations and the extraction of new bitcoins. Thus, there were two camps of research competing for this energetic evaluation: On the one hand, there is a pessimistic camp which presented high figures for electricity consumption and which expresses concern and mistrust vis-à-vis cryptocurrencies whose ecological footprint is considered to be unreasonable. And another more optimistic camp that had numbers roughly twice as low. In fact [24] tried to show that this power consumption is not serious because he has had links with the industry that produces the specialized chips for this bitcoin mining. The expenditure of electricity is certainly important, but we must agree on the valuation methods between the optimists and the pessimists, and analyze the financing resources of these mining operations. Nowadays bitcoin mining has become an industry, 80% of which is located in China. The electrical cost of this operation is certainly significant and in the medium term and it can equalize with a certain percentage of the value of the bitcoins issued and the commissions associated with the transactions. It should be made clear that the electrical cost is not the only cost in the calculation of mining operations. Because miners must buy the new specialized chips, and set up the premises for bitcoin mining operations. In fact today, these new premises are veritable factories composed of several buildings and employing workers and technicians. [37] estimated that power consumption represents a fairly stable percentage of the cost of running and depreciating these digital mines in the order of 50%. And so the electricity spent is estimated to be around 50% of the revenue generated by the bitcoins created and the commissions. In the end, between optimists and pessimists, we therefore have a result varying from single to double, as we have already indicated. But one thing is certain here, the electrical expenditure of the bitcoin network is therefore proportional to the price of bitcoin. And if bitcoin grows in value, the electrical cost of operating its network increases proportionally in the months that follow. Ditto for the drop: the cost of electricity drops. Another aspect that needs to be taken into consideration is the creation of new bitcoins and the impact on the cost of energy. It would therefore be necessary to integrate in the long-term forecasts of the electricity expenditure of the network, a division by two of the electricity expenditure once every four years. However, this calculation should also include the consideration of commissions associated with transactions that are in addition to the bitcoins issued by the protocol and also contribute to the remuneration of miners. These commissions evolve in complex ways, but basically they increase as the value of bitcoin increases. Our study opens the doors for other future research, more in-depth between the field of blockchain and field of energy and establish quantitative studies on the impact of the energy blockchain on the environment.

References

1. Killingtveit, A.: Hydroelectric Power Future Energy Improved, Sustainable and Clean Options for our Planet Book, 3rd ed., pp. 315–330 (2020)
2. ADEME. Agence De l'Environnement et de la Maîtrise de l'Énergie (2020)
3. de Vries, A.: Bitcoin's growing energy problem. Joule **2**, 801–809 (2018)

4. Al-Sartawi, A. (ed.): The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. SCI, vol. 974. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-73057-4

5. Mika, B., Goudz, A.: Blockchain-technology in the energy industry: blockchain as a driver of the energy revolution? With focus on the situation in Germany. Energy Syst. **12**(2), 285–355 (2020). https://doi.org/10.1007/s12667-020-00391-y

6. Bitmex research. Why china dominant in bitcoin mining? (2017). https://blog.bitmex.com/wp-content/uploads/2017/09/2017.09.15-Mining-Incentives-Part-2-Why-is-China-dominant-in-Bitcoin-mining_.pdf

7. Cambridge Centre for Alternative Finance (CCAF) (2020)

8. Jeanneau, C.: Blockchain et écologie: sont-elles vraiment incompatibles? (2019). https://fing.org/blockchain-et-ecologie-sont-elles-vraiment-incompatibles-questions-a-clement-jeanneau/

9. Bendiksen, C.: RE: Cost of Bitcoin Mining Misconceptions. Head of Research at CoinShares (2018). https://medium.com/coinshares/re-cost-of-mining-misconceptions-e3fcff1ce726

10. Favier, J., Bataille, A.T., Collomb, A., Sok, K.: Blockchain et autres registres distribués: quel avenir pour les marchés financiers ? In: Opinions & Débats, Institute (2017)

11. Casino, F., Dasaklis, T., Patsakis, C.: A systematic literature review of blockchain-based applications: current status, classification and open issues. Telematics Inf. **36**, 55–81 (2019). https://doi.org/10.1016/j.tele.2018.11.006

12. Pitron, G.: la guerre des métaux rares la face cachée de la transition énergétique et numérique. Livre d'Economie (2018)

13. Ferreboeuf, H.: Pour une sobriété numérique, Le rapport, Pour une sobriété numérique, du think tank The Shift Project 2018 (2018)

14. Marquetti, I., Rodrigues, J., Desai, S.: Ecological impact of green computing using graphical processing units in molecular dynamics simulations. Int. J. Green Comput. **9**(1), 35–48 (2018)

15. Favier, J, Huguet, B.T., Bataille, A.T.: Bitcoin – Métamorphoses De l'or des fous à l'or numérique ? (2018)

16. Busnel, J.-C.: Bitcoin and its energy footprint (2018). https://fr.slideshare.net/JeanChristopheBusnel/bitcoin-and-its-energy-footprint-120685901?from_action=save

17. Sedlmeir, J., Buhl, H.U., Fridgen, G., Keller, R.: Informatik Spektrum (2021). https://link.springer.com/article/10.1007%2Fs00287-020-01321-z#Ack1

18. Jean-Luc, S.: Rapport 2019 Bitcoin.fr (2019)

19. Delahaye, J.P.: Consommation électrique des crypto-monnaies et des blockchains. In: 4 juin 2018 France Stratégie Université de Lille CRISTAL: Centre de recherche en informatique, signal et automatique deLille(UMR9189CNRS) (2018). http://cristal.univlille.fr/~jdelahay/temporaire/DelahayeFranceStrat4juin2018.pdf

20. O'Dwyer, K.J., Malone, D.: Bitcoin mining and its energy footprint. ISSC 2014 / CIICT 2014, Limerick, 26–27 June 2014 (2014)

21. Diestelmeier, L.: Changing power: Shifting the role of electricity consumers with blockchain technology – policy implications for EU electricity law. Energy Policy **128**, 189–196 (2019)

22. Chenguel, M.B., Mansour, N.: Blockchain and Crypto currency: Recent development and Regulation. Working paper 2021 (2021)

23. Rauchs, M., Blandin, A., Klein, K., Pieters, G., Recanatini, M., Zhang, B.: 2nd Global Cryptoasset Benchmarking Study (2018). https://www.jbs.cam.ac.uk/wp-content/uploads/2020/08/2019-09-ccaf-2nd-global-cryptoasset-benchmarking.pdf

24. Bevand, M.: Serious faults in Digiconomist's Bitcoin Energy Consumption Index (2017). Accessed 1 Feb 2017, http://blog.zorinaq.com/serious-faults-in-beci

25. Bevand, M.: Electricity consumption of Bitcoin: a market-based and technical analysis, consulté le (2017). Accessed 16 Oct 2017
26. Abdalmuttaleb, M.A., Al-Sartawi, M., Razzaque, A., Kamal, M.M. (eds.): Artificial Intelligence Systems and the Internet of Things in the Digital Era: Proceedings of EAMMIS 2021. Springer International Publishing, Cham (2021)
27. Lei, N., Masanet, E., Koomey, J.: Best practices for analyzing the direct energy use of blockchain technology systems: Review and recommendations. Working Paper (2020). Accessed 1 June 2020
28. Noizat, P.: France, où est ta stratégie? (2018). Educat.fr https://e-ducat.fr/2018-08-22-france-strategie/
29. Ploum, Jamar, M.: Le Bitcoin va-t-il détruire la planète? Bitcoin, blockchain, écologie (2018)
30. Decoster, R.: Non, la Blockchain n'est pas «LE» gouffre énergétique qui va définitivement sceller le sort de notre planète. La Tribune (2019). https://www.latribune.fr/opinions/tribunes/non-la-blockchain-n-est-pas-le-gouffre-energetique-qui-va-definitivement-sceller-le-sort-de-notre-planete-802546.html
31. Perras, R.B.: Gestion des rares résiduelles en contexte Quebécois. Cebtre de formation en environnement et développement durable Université de Shaurebrooke (2014)
32. Schultze-kraft, R.: Bitcoin On-Chain Exchange Metrics: The Good, The Bad, The Ugly. Glassnode insights (2021)
33. Gouspillou, S.: Bitcoin va-t-il faire rôtir la planète? (2019). https://soundcloud.com/21millions/21millions-episode-11-bitcoin
34. Jiang, S., et al.: Policy assessments for the carbon emission flows and sustainability of Bitcoin blockchain operation in China. Nat. Commun. **12**, 1938 (2021)
35. Sanad, Z., Al-Sartawi, A.: Financial statements fraud and data mining: a review. In: Abdalmuttaleb, M.A., Al-Sartawi, M., Razzaque, A., Kamal, M.M. (eds.) Artificial Intelligence Systems and the Internet of Things in the Digital Era: Proceedings of EAMMIS 2021, pp. 407–414. Springer International Publishing, Cham (2021). https://doi.org/10.1007/978-3-030-77246-8_38
36. Faure-Muntian, V., De Ganay, C., Le Gleut, R.: Comprendre les blockchains: fonctionnement et enjeux de ces nouvelles technologies. In: Rapport, no. 584 (2017–2018)
37. Denisova, V., Mikhaylov, A., Lopatin, E.: Blockchain infrastructure and growth of global power consumption. Int. J. Energy Econ. Policy **9**(4), 22–29 (2019)

Competition Between Cryptocurrency and Fiat Currency: Control Over the Future of Global Economy

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Abstract. Cryptocurrency has become a buzzword globally. The number of stakeholders in the cryptocurrency takeover has increased at an unprecedented level and what was once mocked and speculated upon only as a theoretical construct may now very well be implemented globally. The ethos guiding the cryptocurrency revolution is in stark contrast with the existing economic structure and thus appears to be in direct competition with the existing fiat currencies. The authors ponder upon the regulatory challenges related to cryptocurrencies specifically with the lens of competition law in this article and suggest some probable remedies which might help tame this volatile resource.

Keywords: Cryptocurrency · Digital economy · Competition · Digital market

1 Introduction

The 21st century is commonly believed to be the Information Age, aided by global digitalization. The digital revolution has touched upon every aspect of modern society and one would be hard-pressed to find an area that has not been influenced by it. It was, therefore, only a matter of time that the digital revolution would alter the very nature of currencies, and that moment happened in 2008 when Satoshi Nakamoto released the Bitcoin Whitepapers ushering in the cryptocurrency and blockchain movement [1].

Cryptocurrencies are digital currencies backed not by the sanction of governments or the value of precious objects, but by the integrity, immutability and decentralized nature of the blockchain. The cryptocurrencies do not have any intrinsic value but their value depends on their future demand and this future demand is created in various manners by the different blockchain programs [2].

An estimated 6000 cryptocurrencies are under circulation right now including about 1500 coins and 3700 tokens (non-fungible tokens or NFTs) [3]. All these different cryptocurrencies have some degree of faith from their progenitors and investors. While a lot of these cryptocurrencies would probably turn out to be scams or transparent Ponzi schemes, the rest of them, the ones at the top of the market cap pose some serious threat to the conventional fiat currencies [4].

According to the most recent crypto-market trends, the crypto-assets market cap rose from $1.5 Billion to $2.5 Trillion in May 2021 [5]. This exponential growth has attracted the attention of investors, policymakers, legislators, businessmen and entrepreneurs.

The global lockdown protocols enforced due to the COVID19 pandemic proved to be a boon for the entire crypto-industry. The already lucrative growth rate of the crypto-assets was further boosted by an influx of fresh investors and a capital surge [6].

Although there is no consensus among the different governments across the world in the form and extent of crypto-asset regulation, this lack of regulation does not pose any difficulty to the expansion of the crypto-assets as by design they are envisioned to be self-regulating and free from any centralized regulation. Still, the market capital of crypto-assets has become too huge to be left unchecked and this has prompted different countries to undertake different approaches for their regulation.

There are several daunting challenges for effective regulation of cryptocurrencies which *prima facie* appear to be unsolvable by any existing policy approaches. This challenge, therefore, demands some innovative and novel regulatory initiatives, both from common law and competition policy perspectives.

The design and influence of cryptocurrencies and crypto-assets as a whole demand the attention of a diverse group of experts including computer scientists, data scientists, economists, lawyers, policymakers, jurists and other stakeholders. Even though some altcoins (cryptocurrencies other than Bitcoin are jointly classified as altcoins) have fallen in value over 99% of their all-time high market cap further providing fuel to the fiery argument that all cryptocurrencies are just bubbles waiting to be popped [7], the hype surrounding them does not seem to wane.

The rise in interest in cryptocurrencies is signified by a decline in the trust of people in their government's currency which appears to be the most prominent reason for their widespread acceptance. The lower institutional trust of the public at large is in direct correlation with higher confidence in cryptocurrencies [8].

As the large-scale adoption of cryptocurrencies is slowly but steadily taking shape, the different governments are also gearing up to retaliate and address the situation in earnest. Many jurisdictions have banned the use of cryptocurrencies and others have started taxing crypto-asset based transactions. The only uniformity one can observe among the different approaches adopted by the countries is that they are sincerely speculating introducing their own Central Bank Digital Currencies (CBDC) as an alternative payment solution and legal tender [9].

2   Cryptocurrency *vs* Fiat Currency

The origin of cryptocurrency is widely believed to be the release of Bitcoin Whitepapers by the pseudonymous developer or group of developers going by the alias Satoshi Nakamoto in the year 2009. The genesis block (first created a block in a blockchain is known as *Block 0* or *Genesis Block*) of Bitcoin contained the message "The Times 03/Jan/2009 Chancellor on brink of second bailout for banks". This cryptic message is generally interpreted as being the guiding principle behind the establishment of blockchain-based, decentralized, peer-to-peer and cryptographically encrypted currencies [10]. The generally accepted view in the crypto-community is that Nakamoto loathed the idea of financial institutions being 'too big to fail' and envisioned Bitcoin to be the evolutionary successor to obsolete economic structures and conventional currencies.

Cryptocurrency is in essence a decentralized register spread open to its users over the internet in the manner of a distributed ledger and edited employing cryptography. An extremely diluted illustration of blockchain framework is data stored in *blocks* and linked with other blocks by the means of cryptographically encrypted *chains*, hence the name *blockchain*. The blocks of data contain the records of all transactions ever executed on the network and these records are by design immutable and unalterable in general. This solves the problem of double-spending (a person spending the same money for multiple transactions) as the blockchain uses massive computing power to constantly check and verify its integrity and all transactions are permanently recorded and available on the network.

The formation of blockchain-based cryptocurrencies have enabled them to serve three essential purposes of money as they can be digitally traded or exchanged and function (a) as a medium of exchange, (b) a unit of account and (c) a store of value. The only purpose which was so far beyond the domain of cryptocurrencies i.e. the status of being a legal tender has changed as El Salvador became the first country in the world to recognize Bitcoin as a legal tender in their country [11]. While the legislation to recognize Bitcoin as legal tender in El Salvador was passed with a majority consensus in their parliament, an estimated 77% of the country's citizens took to the streets protesting the implementation of the law and demanding its revocation [12].

El Salvador's experimentation with Bitcoin is still in its nascent stages and the results would indubitably be closely monitored since this would be the first practical example and take the arguments for making cryptocurrencies legal tender beyond the realm of speculation.

Fiat currencies, on the other hand, have had a very illustrative journey, to say the least. Historically speaking, transactions between individuals started in the form of bartering goods. The bartering of goods posed a problem that not all commodities were in demand all the time and so an alternate means of payment was required. Thus, developed the mode of payment consisting of assets or goods that had some sort of intrinsic value and which can be traded in the future. Commodities such as grains, seeds, rare and precious metals were used to facilitate payments and enhance trade and commerce. There have also been recorded instances of using things that had no intrinsic value but were harder to obtain like seashells or animal teeth as modes of payment. The human enterprise kept growing and states with sovereign authorities started manifesting. The rulers of these states issued coins minted from precious metals like gold, silver, copper, bronze and mandated the use of these currencies as legal tender and guaranteed their future value and generated a demand for it by obligating tax payments in the same currencies. Merchant guilds and traders started the first institutions for banking and they also issued private currencies for facilitating credit, loan, deposit and withdrawal i.e. the most basic banking transactions in the society. Unfortunately, both the rulers and the private banks were prone to greed and corruption. The rulers were tempted to dilute the coins by mixing lesser precious metals and ultimately reducing the future value of the coins and the banks were tempted to profit on debt by issuing more banknotes than their asset holdings permitted them [1]. Institutional reforms, policy changes and several centuries of progress have given the financial institutions and economy their current shape.

The current system is not necessarily the best currency and payment system, and it is not foolproof in terms of gaining trust. We have experienced many times that banks have given too much credit, far beyond their capabilities relying on the central banks to bail them out in the worst-case scenario, causing asset bubbles and pops. Since bank currency is a liability of a bank, the credit of bank assets and exposure to the market have led to a loss of confidence in the bank's ability to meet its obligations. Panic and financial crises arose from this. Various banking regulations and public policies have been introduced, such as capital regulation, deposit insurance and the lender of last resort (LLR) assistance policies, to promote trust in bank funds. However, experience shows that this is not enough to prevent crises [1]. These flaws in the system when pushed to the extreme, have caused national and global financial crises pushing the social order into an economic recession. In light of these facts, it is no wonder that alternatives to the traditional currencies and a decentralized economic model were continuously being explored.

In theory, cryptocurrencies boast of having all of fiat currencies' strengths and none of their weaknesses. The cryptocurrencies claim of having superior security and anonymity than traditional forms of currencies. All cryptocurrency transactions are permanently recorded on the blockchain and the records are decentralized and immutable, providing superior security. The anonymity of conducting a hand to hand transaction with cash, leaving no traces or records is addressed by cryptocurrency in a novel way that the parties to the transaction are capable of not knowing each other's identity and still conclude the transaction safely and securely. The transaction might be permanently recorded but it is often extremely difficult and nearly impossible to ascertain the identities of the parties to the transaction.

Before the cryptocurrency and blockchain revolution reached its currently gargantuan proportions, there was already a sort of anarchist, neo-liberalized, anti-government sentiment running amok the general populace [31]. This was largely due to the increasingly oligopolistic concentration of wealth and power under the garb of capitalism and socialism in all the evolved, democratic governments around the world. The first appearance of Bitcoin just after the global financial crisis of 2007–2008, which, before the COVID19 induced recession, was the worst financial crisis in nearly eight decades, was opportune and expertly timed by Nakamoto [13].

The global recession shattered people's faith in the centralized banking institutions and highlighted the flaws of the existing currency-based transactions. Enter Bitcoin, a decentralized, peer-to-peer, electronic currency that eliminates the need for third-party intervention or any financial institution between two parties to a transaction [1].

Cryptocurrencies currently offer exchange and transaction fees at a fractional cost of the traditional banks and exchanges dealing with fiat currencies. This amounts to a huge portion of the revenue of the financial institutions and in turn, a huge cost on the consumers [14]. Cryptocurrency transactions can afford to be executed at such a comparatively lower cost because such transactions remove the third-party intervention and the exchange facilitating the transaction charges a nominal fee. The absence of third-party intermediaries also enables cryptocurrency transactions to be executed much faster than their traditional counterparts. While international transfers of fiat currencies can take days to execute completely, cryptocurrency transactions are executed almost instantaneously [15].

Another line of comparison which can be drawn between cryptocurrencies and fiat currencies is the issue of chargebacks. While tracing funds and reverting wrongly made transactions in traditional banking is theoretically possible even if not always feasible, any transaction made via cryptocurrencies is almost untraceable and in turn, unalterable by design. While this element of design is always promoted as a feature of cryptocurrencies, it also makes it impossible to revert any wrongly made transactions. Cryptocurrency transferred mistakenly is lost forever.

The debate between the efficacy and utility of both cryptocurrency and fiat currency will probably still need some more time to reach maturity as fiat currency has had centuries to evolve and integrate into society while cryptocurrency has the advantage of technology and is still in the early stages of integration.

Different countries have taken varying approaches towards the regulation of cryptocurrencies and all of them recognize the groundbreaking utility of blockchains and digital currencies. The regulation of cryptocurrencies is strife with speculations, estimations and observations. Any events related to cryptocurrencies make global headlines regularly and needless to say, all stakeholders involved are both hopeful and apprehensive regarding this volatile asset.

3 Competition Law Concerns Relating to the Regulation of Cryptocurrencies

The underlying principle of competition law is to promote free competition, open markets and consumer welfare in the economy. Based on these factors alone, one may be forgiven for assuming that cryptocurrencies and blockchain mechanisms will prove to be an invaluable ally for competition policymaking. To be fair, it is still too early to ascertain that a person thinking so is mistaken or not. On one hand, blockchains are speculated to be a revolutionary breakthrough due to their utilities with smart contracting and decentralized, distributed ledger schematics, on the other hand, cryptocurrency regulation is appearing to be an annoying nuisance with no viable solution.

The Organisation for Economic Co-operation and Development (OECD) released an issues paper in 2018 with the specific goal of identifying the issues related to Blockchain and Competition Policy [16]. The issues paper identifies the impact blockchain technology will have in the relevant markets if it were to be implemented at a scalable level. The scalability of blockchain technology is not a huge issue as Ethereum is thriving and enjoying a dominant position because almost all decentralized finance (DeFi) applications are being created on its blockchain network and paid for by its cryptocurrency Ether (ETH) [17].

The implementation of blockchain technology will reduce huge transactional costs, contract enforcement costs and eliminate the need for intermediaries in payment services. These alone are enough to completely alter the existing financial structure and create a new order where finance is decentralized and not in control of governments who make bad financial decisions for which the general populace has to suffer [18].

Probably the most lucrative part of the entire blockchain technology integration with everyday contracts and transactions at large is the transparency of the entire network. The competition authorities can demand access to observe the blockchain

networks on which enterprises operate in real-time, ensuring stricter monitoring and ease of spotting suspicious activities which might pose a threat to the market competition. This facet of the blockchain enforcement would only be enjoyable by the competition authorities if all competitors chose to operate on the same blockchain. If the competitors chose to operate on their private blockchains, much like private internet servers, then this feature would remain beyond the grasp of the competition authorities. Regulation and policymaking might make it mandatory for the competitors to operate on the same blockchain but this could also enable the competitors to tacitly collude among themselves without any direct or indirect contact, which seems highly likely given the oligopolistic state of the current tech space [16].

There appears to be a dearth of authoritative literature exploring the issues arising out of competition policy in the cryptocurrency markets. General industrial organization literature is optimally utilized to study the strategic competition concerns in cryptocurrency markets [1]. A considerable barrier to the widespread adoption of cryptocurrency as a viable alternative payment system to existing traditional payment methods was that both consumers and merchants needed to accept and use the cryptocurrencies. An individual cannot pay with cryptocurrency if the merchant does not accept payments in cryptocurrency and similarly, merchants have no incentive to accept payments in cryptocurrencies unless consumers insist on paying with cryptocurrencies. This chicken-and-egg problem seems to have resolved itself as the userbase of cryptocurrencies keeps increasing at an aggressive rate [19, 32].

The global market cap of cryptocurrencies as of July 2021 is estimated to be around $1.31 Trillion of which, Bitcoin (BTC) enjoys 46% market share and Ethereum (ETH) enjoys 17.7% market share [20]. These numbers fluctuate with heavy swings considering the volatility of the crypto-asset markets. The volatility is further exacerbated by the fact that social media sentiment influences the market value quite heavily as evidenced by an empirical study [21]. Researchers in the study were able to predict the value fluctuations of Bitcoin and Ethereum with an 8% margin of error. They further speculated that their accuracy would increase with an increase in crypto-user engagement on social media platforms and crypto-communities.

The numbers speak for themselves and it is undeniable that the crypto-asset industry is in dire need of a proper regulatory framework.

4   Natural Monopoly? Dominance *vs* Abuse of Dominance

As long as discussions are in the realm of speculation, the authors take some creative liberty and propose a fictional prompt as the groundwork for further deliberation.

Imagine a company XYZ that comes up with a social media platform that takes off and becomes an instant global hit. It attracts users of all backgrounds from all over the world. Its popularity becomes so huge that within a couple of years it becomes the most dominant player in the social media markets and no one even comes close to it. Some innovations happen and some different types of social media platforms emerge and as soon as they are getting traction, XYZ acquires these newcomers too. These platforms keep their erstwhile features and remain fundamentally the same but the control of power and decision-making shifts and goes into the hands of XYZ. XYZ was already

huge, but with these new acquisitions, its power reaches beyond previously estimated limits. The designation of dominant player fails to portray the exact dimension of the market power enjoyed by our fictional company. This company essentially offers its services to its users for free of cost and earns its revenue by showing them ads and collecting their usage data and selling it to other companies [22]. In a data-driven economy like ours, it is believed that whoever masters data would rule the world [23]. XYZ now plans to foray into the cryptocurrency market and plans to introduce its cryptocurrency. XYZ releases a global update to its existing social media platforms and integrates a cryptocurrency wallet in them. Its users get the option to use the cryptocurrency wallet free of cost, bundled with the existing social media services and they only need to pay a nominal cost if they make any transaction.

This fiction came close to be realized as Facebook planned to introduce its cryptocurrency by the name of *Libra* and integrate its cryptocurrency wallet named *Calibra* with its existing social media platforms [24]. Other players in the digital marketplace like Wechat, Walmart, Alibaba, Yahoo!, Line, Telegram, Viber are also contemplating or already working on introducing some sort of virtual currency through their existing platforms [25].

These developments, although not going as smoothly as envisioned by their instigators, are nonetheless impossible to keep in hold forever. Technology always progresses at an exponential pace and it is simply a matter of time that the largely unregulated territory of cryptocurrencies would be invaded by these tech giants. This thought induces one to ponder upon the implications of such market expansion. It is no secret that the digital marketplace is dominated by a few maverick players and they regularly indulge in exclusionary tactics [26]. These platforms with their unparalleled stores of data on their users and unwillingness to indulge in data sharing with the authorities or encourage inter-operability pose a serious threat to competition on the digital marketplace [27].

The problems are further aggravated by the usual competition law concerns such as how to define the relevant market area? Is a dominant player *per se* abusing its dominance? How does one ascertain the abuse of dominance in a market so segregated and widespread and deeply integrated with a bundle of services all with their distinct quality?

There are also a host of other concerns that arise from the very structure of cryptocurrency operations. Most cryptocurrencies are created by the process known as mining and this process uses a large degree of computing power and is thus very energy-intensive. Bitcoin network alone consumes about 116 terawatt-hours, or 116 trillion watts per year, which roughly translates to about 0.5% of the total electricity in the world- much more than the electricity consumption of many countries [28]. This huge energy demand has led miners to pool their computing power and form mining pools and mining farms to mine cryptocurrencies more efficiently [29]. These mining pools and farms take the natural appearance of cartels. Even though they appear to be cartels, they do not compete for lower transaction costs to the users, they compete for faster block verification and ultimately benefit the cryptocurrency's underlying blockchain structure. This also poses a regulatory challenge to the competition authorities.

United American *vs* Bitmain holds the unfortunate claim of being the first case of an alleged antitrust violation involving cryptocurrencies. Briefly stating the facts of the case, Bitmain held around 75–80% market share in the manufacturing power of ASIC (Application Specific Integrated Circuits, computers optimized for the specific process of mining cryptocurrencies) and around 60% control over the global hashing (mining) power. During a scheduled software update in November 2018 for the Bitcoin Cash (BCH) blockchain network, there arose a difference between the choice of update between Bitcoin ABC 0.18.4 and Bitcoin SV 0.1.0 and the dispute was decided to be resolved by following the *Nakamoto Consensus* i.e. miners using their computing power to vote for their choice of the software update and the option with the most votes would be implemented [1]. Bitmain conspired with miners from the Bitcoin (BTC) main servers and rented them to come and hijack the voting process by using their hashing power. This act increased the hashing power of Bitmain miners by over 4000%. This in turn manipulated the democratic voting process and allowed Bitcoin ABC to be implemented in the Bitcoin Cash blockchain network unfairly as before the hostile takeover by the rented miners, the native miners on Bitcoin Cash had voted in favour of Bitcoin SV update with a 70% majority. The case for antitrust violation was filed by United American who is also a player in the cryptocurrency economy with its operations in mining, crypto-exchange, cryptocurrency development etc., in the Southern District Court of Florida, United States of America. The case was eventually dismissed in 2021 due to a lack of factual evidence for prosecuting Bitmain [30].

This case holds an important position in the crypto-economy as it brazenly highlights the issues with prosecuting offences involving cryptocurrency operations. A preliminary reading of the facts of the case leads one to observe several antitrust violations but making those violations count in a court of law is an altogether different matter.

5   Conclusion and Suggestions

The promise of technological breakthroughs by blockchain revolution and economic liberation by cryptocurrencies might sound too good to be true, but if we make an honest assessment of these bold claims, we would have to concede that there is at least some weight behind these assertions. Whether or not these lofty goals would be realized, depends hugely on the way these futuristic innovations are regulated. Given a proper environment and backing to grow and bloom, it might not be a far-fetched vision that these innovations can succeed in changing the course of the world as we know it, at least in the digital & economic sphere.

As far as competition law concerns that have been highlighted throughout this article, the authors make the following suggestions that might allow the cryptocurrencies to compete on an even footing with the fiat currencies.

Firstly, the authorities around the world in charge of regulating cryptocurrencies should take particular care not to be unbiased or unfairly apprehensive towards cryptocurrencies. Since cryptocurrencies are competing with the fiat currencies, issued by the sovereign state itself, it might appear to be threatening and there might be a conflict of interests which might lead to stifling and ultimately stunting the growth of a valuable new class of assets.

Secondly, since the global villagers are embracing this new form of decentralized currency, there ought to be a multi-lateral treaty for the regulation of cryptocurrencies. This would help in alleviating the issue of jurisdiction calculation as cryptocurrencies are elusive in that regard by their very design. Considering the decentralized nature of the cryptocurrencies, they should be allowed self-regulation subject to following the state-issued laws concerning their operations.

Thirdly, the authors suggest the competition authorities come up with specialized teams consisting of lawyers, economists, data scientists, computer scientists and other stakeholders who are trained to be familiar with the underlying principle and structure of cryptocurrency and make them monitor different aspects of the crypto-economy. This specialized team can monitor the activities of mining pools, mining farms, crypto-exchanges, ASIC manufacturers, energy providers and suppliers and keep them from engaging in any activity that may have any appreciable adverse effect on the market competition.

Fourthly, the authors propose that the different authorities devote some resources for monitoring the crypto markets. There is a serious dearth of authentic authoritative research data from the various regulatory authorities. All figures and numbers related to the crypto-economy are primarily collected and evaluated by different stakeholders in the crypto market. The authorities around the world shall employ their data-gathering teams and conduct intense research regarding cryptocurrency trends and market sentiments. Such data gathered would be of utmost importance for the definitive appraisal of cryptocurrencies and encourage further research in the area.

Lastly, the authors suggest that existing dominant players in the digital markets should be kept under strict scrutiny. They have the potential to indulge in practices that might endanger the entire progress of cryptocurrencies and use their existing market power to gain such a foothold that they gather a critical mass and become unstoppable by any authority or regulator.

References

1. Nakamoto, S.: Bitcoin whitepapers (2008). https://bitcoin.org/en/bitcoin-paper
2. Østbye, P.: The Adequacy of Competition Policy for Cryptocurrency Markets (2017). https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3025732
3. Cryptocurrency List. https://www.coinlore.com/all_coins
4. What To Know About Cryptocurrency and Scams. https://www.consumer.ftc.gov/articles/what-know-about-cryptocurrency-and-scams
5. Jouman Hajjar, A.: 44 Cryptocurrency Stats: History, Market, Adoption, Users and Crimes, June 2021. https://research.aimultiple.com/cryptocurrency-stats/
6. The Pandemic Couldn't Have Provided a Better Environment for Crypto. https://www.investing.com/news/cryptocurrency-news/the-pandemic-couldnt-have-provided-a-better-environment-for-crypto-2137631
7. White, L.H.: The market for cryptocurrencies. Cato J. **35**(2), 391
8. 2021 Global Crypto User Index, Binance Research. https://research.binance.com/en/analysis/global-crypto-user-index-2021
9. Boar, C., et al.: Impending arrival- a sequel to the survey on central bank digital currency, BIS Papers No. 107, January 2020. https://www.bis.org/publ/bppdf/bispap107.pdf

10. Tardi, C.: Genesis Block, July 2021. https://www.investopedia.com/terms/g/genesis-block.asp
11. Rhodes, D.: Analysis - Bitcoin Adoption in El Salvador. https://komodoplatform.com/en/blog/bitcoin-adoption-el-salvador/
12. Lanz, J.A.: El Salvador Bitcoin Law Has Citizens Protesting, July 2021. https://decrypt.co/76576/el-salvador-bitcoin-law-citizens-protesting
13. Singh, M.: The 2007–2008 Financial Crisis in Review, January 2021. https://www.investopedia.com/articles/economics/09/financial-crisis-review.asp
14. Global Industry Snapshot: Cryptocurrency and Exchanges, August 2020
15. NOWPayments.io: Why is crypto better than fiat? November 2020. https://nowpayments.io/blog/why-is-crypto-better-than-fiat
16. OECD: Blockchain and Competition Policy- Issues Paper by the Secretariat, June 2018. https://one.oecd.org/document/DAF/COMP/WD(2018)47/en/pdf
17. Decentralized Finance (DeFi). https://ethereum.org/en/defi/
18. Goldman Sachs: Global Macro Research, Issue 98, May 2021. https://www.goldmansachs.com/insights/pages/crypto-a-new-asset-class-f/report.pdf
19. Ang, L.L. et al.: Fintech Developments and Antitrust Considerations in Payments, Chicago Antitrust, vol 35, issue 2, p. 73, Spring 2021
20. Global Cryptocurrency Charts. https://coinmarketcap.com/charts/
21. Young, B.K., et al.: Predicting fluctuations in cryptocurrency transactions based on user comments and replies. PLOS One, August 2016. https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0161197
22. Robertson, V.H.S.E.: Antitrust Market Definition for Digital Ecosystems, Concurrences, Competition Law Review, On Topic, February 2021. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3785986
23. Soysal, M.A.: Data is King- Who masters the Data will rule the World!, March 2017. https://blog-archive.global.fujitsu.com/data-is-king-mastering-the-data/
24. Musleh Al-Sartawi, A.M.A. (ed.): The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. SCI, vol. 974. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-73057-4
25. Bilotta, N., et al.: Tech Giants in Banking: The Implications of a New Market Power, Istituto Affari Internazionali (2019). https://www.iai.it/en/pubblicazioni/tech-giants-banking-implications-new-market-power
26. Stylianou, K.: Exclusion in digital markets. Michigan Technol. Law Rev. **24**(2), 181 (2018). https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2963648
27. Lundqvist, B.: The EU Regulation of Data-Driven Economy, Stockholm Faculty of Law Research Paper Series No 90 (2021). https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3830058
28. Doyle, P.: Why is Bitcoin Mining so Energy Intensive?, Crypto Channel, ETF Trends, June 2021. https://www.etftrends.com/2021/06/why-is-bitcoin-mining-so-energy-intensive/
29. Daniels, P.: These are the largest Bitcoin Mining Farms in the World, July 2018. https://www.digitaltrends.com/cool-tech/largest-bitcoin-mining-farm/
30. United American *vs* Bitmain Inc & others, United States District Court for The Southern District of Florida, Case 1:18-cv-25106-KMW (2018)
31. Memdani, L.: Demonetisation: a move towards cashless economy in India. Int. J. Electron. Banking **2**(3), 205–211 (2020)
32. Hannoon, A., Al-Sartawi, A., Khalid, A.: Relationship between financial technology and financial performance. In: Musleh, Al-Sartawi, A.M.A. (eds.) The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. Studies in Computational Intelligence, vol. 974. Springer, Cham (2021)

The Innovation Resistance Theory: The Case of Cryptocurrencies

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Abstract. After the 2008 financial crisis, cryptocurrency has received attention from businesses, and individuals as an instrument of investment and financial exchange. The number of cryptocurrencies users is increasing rapidly. Despite this increase, there is still a great discrepancy between the number of users based on countries. This discrepancy suggests that there is still a need to understand what factors influence individuals to adopt this innovation or refrain from adopting it. In this conceptual paper, we are considering the factors that are causing resistance to adopt cryptocurrencies regardless of being available in the market for more than 19 years and all the associated benefits of this technology. Moreover, we are utilizing the innovation resistance model to propose potential variables that affect individuals' decisions to avoid adopting cryptocurrencies.

Keywords: Blockchain · Cryptocurrency · Innovation resistance theory · Financial technology

1 Introduction

During the first two decades of the twenty-first century, the world has witnessed great developments in the field of financial technology, which is defined as financial innovations that are created to intensify aspects of financial services [6–8]. This development included innovations such as internet banking, mobile banking, and the most recent innovation blockchain payment technology of cryptocurrency.

Cryptocurrencies have been proposed as a peer-to-peer digital currency that can be exchanged using non-digital or other digital currencies in reference to a specific exchange rate [4].

After the 2008 financial crisis, cryptocurrency has received attention from businesses, and individuals as an instrument of investment and financial exchange. This interest was magnified because of several benefits associated with cryptocurrency that helped to overcome current financial systems' pitfalls such as lack of privacy, high transaction cost, and relatively slow transaction processing [5].

The number of cryptocurrencies users is increasing rapidly, in a recent stat, the number of cryptocurrencies users globally increased by 190% between the years 2019–2020 [10]. Despite this increase, there is still a great discrepancy between the number of users based on countries. For example, when comparing the number of an individual client of cryptocurrencies in Europe and North America with those in the Asia Pacific,

statistics shows the percentage of users in the United States and Europe is 63–70% and compared to three out of four clients in the Asia Pacific [11].

When asked, the majority of American adults, did not perceive cryptocurrencies as an instrument for investment, yet the number of American adults who are aware of cryptocurrencies has increased between the years 2019 and 2021 [12].

The discrepancy in numbers between individuals who desire to adopt cryptocurrencies as a mean of exchange and investment in different region, and, the inability of some to perceive cryptocurrencies as an exchange tool regardless of the increased knowledge and awareness of the innovation, made it necessary to conduct a study to understand the factors that result in investors' resistance to adopt the digital currency as an investment tool.

Hence, this conceptual paper comes to provide a research direction that is based on innovation resistance theory to answer the question "what are the main factors that cause individuals to resist adopting cryptocurrencies as an exchange tool".

The following parts of this paper are organized as the following. First, we will introduce cryptocurrency adoption based on the related literature. The second part of the paper will present the innovation resistance model as a theoretical background followed by an introduction to the proposed conceptual model. Finally, we will suggest a methodology plan.

2 Literature Review

2.1 Cryptocurrency

Cryptocurrency is one of the applications of the blockchain that is defined as "a virtual currency that is designed as an alternative to standard fiat currency, allowing consumers to execute digital payment for goods and services without the need for intermediaries" [2].

The cryptocurrency was first used in 2009 when Bitcoins were introduced as a way of payment and a financial asset [13]. Since it was introduced, cryptocurrency resulted in a major development in the financial market by decentralizing the process of financial exchange. The peer-to-peer payment system allowed customers to perform the financial exchange independently without the need for third-party authorization [27].

Blockchain is perceived as an economic innovation and technological innovation [19] and as cryptocurrencies is one of its applications it is also perceived as a technology innovation. Hence, it is possible to apply technology adoption models to understand how potential customers adopt cryptocurrencies.

2.2 Cryptocurrency Adoption Studies

There are a limited number of studies investigating factors that encourage customers to adopt cryptocurrencies. These studies attempted to study these factors using several technology acceptance models and theories [8] such as the diffusion of innovation theory [26], the technology acceptance model (TAM) [9], the unified theory of technology acceptance (UTAUT) [29] and technology readiness index (TRI) [22].

For example, [28] investigated the adoption of cryptocurrencies among Chinese customers. In their study, the researchers have based their model on TAM. The researchers extended the model by combining it with awareness and perceived trustworthiness. The results of their study showed a significant relationship between TAM's main constructs, awareness, perceived trustworthiness, and intention to adopt cryptocurrencies.

In a more recent study, [14] have introduced a fuzzy analytical framework that included variables from UTAUT, TAM, and social support theory to investigate what variables have the most significant effect on investors' intention to adopt cryptocurrency. Despite some of its issues such as no regulatory framework, results of the study show a significant relationship between eight variables and intention to adopt cryptocurrencies as a form of investment these are social influences. These social influences were financial literacy, facilitating conditions, performance expectancy, effort expectancy, perceived trust, perceived usefulness, and social support. In this study, researchers reported significant results with factors that influence adoption but did not look at factors that create resistance.

A similar result was reported by [18] who investigated the adoption of blockchain technology in the Malaysian context by extending UTAUT. The results of his study showed a significant relationship between the adoption of blockchain technology such as cryptocurrency and UTAUT variables in addition to trust. However, the influence of technology awareness on intention to accept blockchain was reported not significant.

While UTAUT has focused on system features that lead to cryptocurrencies adoption another stream of research has utilized TRI to discover the effect of specific personality traits on cryptocurrencies adoption. [1] have reported that individual who possesses innovativeness and optimism towards technology, in general, has an eagerness to adopt cryptocurrencies. They have also reported that individuals who are insecure around technology have no eagerness to adopt cryptocurrencies. However, there was no reference in their study if there is a role for Insecurity and Discomfort as a cause of resistance to adopting cryptocurrencies.

Looking at all of the previous studies, and available literature on the topic of cryptocurrencies adoption, and to the best of our knowledge, all available literature utilizes different models and theories to discover what factors affect the adoption of this financial innovation and technology. This type of study contains a pro-change bias because they assume that users tend to adopt innovations and technologies. Hence, they focus on the positive attributes of the system or personal traits that will result in adopting the system (i.e., innovation acceptance) [15, 16].

As the topic of what causes resistance to adopting innovation such as cryptocurrencies is neglected in the literature [21], we attend to investigate this aspect using one of the main theories that look at resistance which is the innovation resistance theory.

3 Theoretical Background and Propositions

Innovation resistance theory (IRT) was first introduced by [23] and adjusted by [24]. TRI's main call is to provide a framework to understand the resistance-oriented behavior of users towards innovation [17].

Innovation resistance is defined as an individual's decision to avoid adopting a specific innovation due to personally believe that adopting innovation will cause changes to the existing status and perversion from current belief systems [15].

Customer resistance can be divided based on innovation characteristics into two types: active and passive resistance. Active resistance emerges from innovations that require individuals to change established behaviors or habits. On the other hand, passive resistance emerges from innovations that cause individual a psychological conflict [30].

The IRT offers a theoretical framework for customer resistance that accommodates both types of resistance. To study the active resistance IRT included three variables: usage barrier, value barrier, and risk barrier. And to study the passive barriers IRT included two variables: image barrier and tradition barriers [17].

Usage barrier refers to a situation when an innovation causes chaos and incompatibility to current practices or habits [25]. Cryptocurrencies are relatively new to any market. The emergence of cryptocurrencies has coincided with several problems such as exchange rate fluctuation, legal banning, and fraud among other issues. All of these issues brought several serious problems that might overcome the positives of the cryptocurrency hence, we hypothesis.

H1: That there is a negative relationship between the usage barrier and intention to adopt cryptocurrencies.

Value barrier is a functional barrier that compares the cost of innovation to its existing substitute using performance to price ratio [21, 25]. Individuals who are considering adopting cryptocurrencies are expected to compare the cost of using the innovation to the cost of using traditional financial systems and chose to refrain from using the cryptocurrencies if the performance to price ratio is expected to exceed using the current financial systems hence, we hypothesize.

H2: That there is a negative relationship between value barrier and intention to adopt cryptocurrencies.

According to [23] perceived risk is conceptualized as 'the consumer's subjective expectation of suffering a loss in pursuit of the desired outcome.' In general, there are several perceived risks experienced by individuals and associated with uncertainty, for example, an individual may identify performance, social, financial, psychological, and physical risks [3]. Hence, having to deal with cryptocurrencies as innovation individuals are expected to have a limited amount of information regarding cryptocurrencies which will result in them perceiving several risks which are expected to be financial at most. Therefore, we hypothesize.

H3: That there is a negative relationship between risk barrier and intention to adopt cryptocurrencies.

Social norms play a vital role in any society, people are expected to follow and obey social norms within a group [20]. Therefore, it is expected that an individual will decide to avoid adopting an innovation if the adoption will result in deviating from social norms. Current financial systems have been adopted by the public for a very long period. People who are important for individuals and peers might discourage adopting cryptocurrencies as a means of exchange or investment. Hence, we are hypothesizing.

H4: That there is a negative relationship between the Tradition barrier and intention to adopt cryptocurrencies.

Individuals may possess a specific image for each innovation. This image may emerge from different sources such as word of mouth and media and play a major role in individual decisions to adopt the innovation [21]. Cryptocurrencies have had a controversial reputation since it was introduced. While some references have referred to it as the future and emphasized its benefits other sources have focused on its dark side like using it to perform illegal transactions. It is expected that some individuals will be affected by the negative image and reputation of cryptocurrencies hence we hypothesize.

H5: That there is a negative relationship between image barrier and intention to adopt cryptocurrencies.

Consequently, five hypotheses were developed (see Fig. 1).
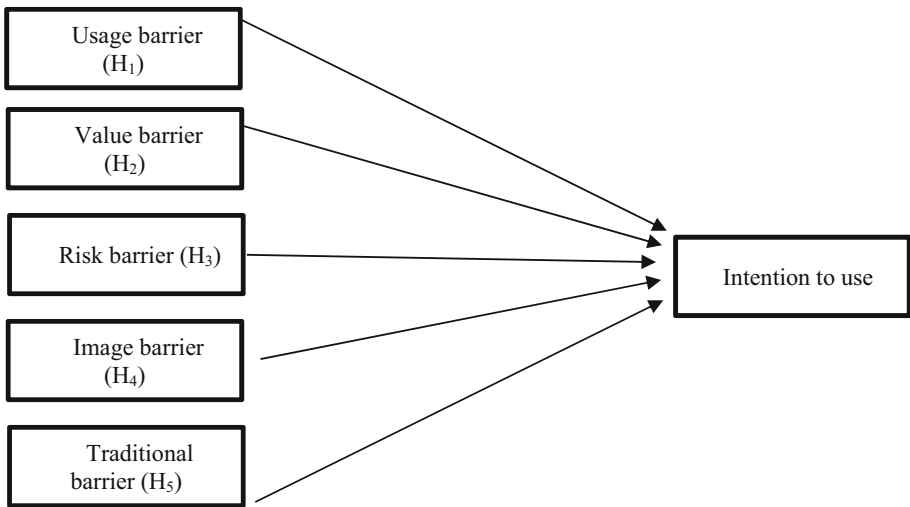
Fig. 1. Theoretical framework

4 Proposed Research Methodology

This research aims to understand what factors cause resistance to adopting cryptocurrencies among potential users. Therefore, the sample of this study will be cryptocurrencies potential users and will include adult males and females in any age group that makes them legally allowed to purchase cryptocurrencies. To collect the data, we are proposing quantitative survey-based research. This research aims to measure the effect and to determine the direction of the relationship between active and passive barriers and potential users' resistance to adopt cryptocurrencies.

5   Conclusion

Cryptocurrency is one of the most important financial inventions which plays an important role in changing the map of financial transactions. With a large number of advantages provided by this invention, it became necessary for financial organizations to understand the mechanism used by investors and customers to adopt or to resist adopting cryptocurrency. This research comes as part of the literature that assumes that customers and investors are not necessarily willing to adopt innovation and resist moving towards new technologies. Hence, this conceptual paper is proposing IRT as the theoretical background to investigate what factors results in resisting Cryptocurrency adoption and which factors have the most effect.

References

1. Alharbi, A., Sohaib, O.: Technology readiness and cryptocurrency adoption: PLS-SEM and deep learning neural network analysis. IEEE Access **9**, 21388–21394 (2021)
2. Al-Amri, R., Zakaria, N.H., Habbal, A.M.M., Hassan, S.: Cryptocurrency adoption: current stage, opportunities, and open challenges. Int. J. Adv. Comput. Res. **9**(44), 293–307 (2019)
3. Alalwan, A.A., Dwivedi, Y.K., Rana, N.P., Williams, M.D.: Consumer adoption of mobile banking in Jordan: examining the role of usefulness, ease of use, perceived risk, and self-efficacy. J. Enterp. Inf. Manag. **29**(1), 118–139 (2016)
4. Al Shehhi, A., Oudah, M., Aung, Z.: Investigating factors behind choosing a cryptocurrency. In: IEEE International Conference on Industrial Engineering and Engineering Management, pp. 1443–1447 (2014)
5. Alzahrani, S., Daim, T.U.: Evaluation of the cryptocurrency adoption decision using hierarchical decision modeling (HDM). In: Portland International Conference on Management of Engineering and Technology (PICMET), pp. 1–7 (2019)
6. Musleh Al-Sartawi, A.M.A. (ed.): The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. SCI, vol. 974. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-73057-4
7. Alansari, Y., Al-Sartawi, A.: IT governance and E-banking in GCC listed banks. Procedia Comput. Sci. **183**, 844–848 (2021)
8. Cheng, R.J.: UTAUT implementation of cryptocurrency-based Islamic financing instrument. Int. J. Acad. Res. Bus. Soc. Sci. **10**(9), 873–884 (2020)
9. Davis, F.D.: Technology acceptance model for empirically testing new end-user information systems theory and results, Unpublished Doctoral Dissertation, MIT (1986)
10. De Best, R.: Estimate of the number of cryptocurrency users worldwide 2016–2020 (2021). World Wide Web. https://www.statista.com/statistics/1202503/global-cryptocurrency-user-base/. Accessed 21 July 2021
11. De Best, R.: Customer profile of companies that offer cryptocurrency services 2020, by region (2021). World Wide Web. https://www.statista.com/statistics/1222954/crypto-customer-base-type-region/. Accessed 21 July 2021
12. De Best, R.: User experience with cryptocurrency in the U.S. in 2019 and 2021. World Wide Web. https://www.statista.com/statistics/1203934/cryptocurrency-experiences-usa/. Accessed 21 July 2021
13. Giudici, G., Milne, A., Vinogradov, D.: Cryptocurrencies: market analysis and perspectives. J. Ind. Bus. Econ. **47**(1), 1–18 (2019). https://doi.org/10.1007/s40812-019-00138-6

14. Gupta, S., Gupta, S., Mathew, M., Sama, H.R.: Prioritizing intentions behind investment in cryptocurrency: a fuzzy analytical framework. J. Econ. Stud. (2020)
15. Hew, J.J., Leong, L.Y., Tan, G.W.H., Ooi, K.B., Lee, V.H.: The age of mobile social commerce: an artificial neural network analysis on its resistances. Technol. Forecast. Soc. Chang. **144**, 311–324 (2019)
16. Hannoon, A., Al-Sartawi, A.M.A.M., Khalid, A.A.: Relationship between financial technology and financial performance. In: Musleh Al-Sartawi, A.M.A. (ed.) The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. SCI, vol. 974, pp. 337–344. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-73057-4_26
17. Kaur, P., Dhir, A., Singh, N., Sahu, G., Almotairi, M.: An innovation resistance theory perspective on mobile payment solutions. J. Retail. Consum. Serv. **55**, 102059 (2020)
18. Khazaei, H.: Integrating cognitive antecedents to UTAUT model to explain adoption of blockchain technology among Malaysian SMEs JOIV: Int. J. Inform. Vis. **4**(2), 85–90 (2020)
19. Lindman, J., Rossi, M., Tuunainen, V.K.: Opportunities and risks of blockchain technologies in payments-a research agenda. In: Hawaii International Conference on System Sciences (2017)
20. Laukkanen, P., Sinkkonen, S., Laukkanen, T.: Consumer resistance to internet banking: postponers, opponents, and rejectors. Int. J. Bank Mark. **26**(6), 440–455 (2008)
21. Ma, L., Lee, C.S.: Understanding the barriers to the use of MOOCs in a developing country: an innovation resistance perspective. J. Educ. Comput. Res. **57**(3), 571–590 (2019)
22. Parasuraman, A.: Technology Readiness Index (TRI) a multiple-item scale to measure readiness to embrace new technologies. J. Serv. Res. **2**(4), 307–320 (2000)
23. Pavlou, P.A.: Integrating trust in electronic commerce with the technology acceptance model: model development and validation. In: The Seventh Americas Conference in Information Systems, pp. 816–822. ACM, New York (2001)
24. Ram, S.: A model of innovation resistance, NA - Advances in Consumer Research, vol. 14, pp. 208–212 (1987)
25. Ram, S., Sheth, J.N.: Consumer resistance to innovations: the marketing problem and its solutions. J. Consum. Mark. **6**(2), 5–14 (1989)
26. Rogers, E.M.: Diffusion of Innovations, 1st edn. Free Press, New York (1962)
27. Sas, C., Khairuddin, I.E.: Design for trust: an exploration of the challenges and opportunities of bitcoin users. In: The 2017 CHI Conference on Human Factors in Computing Systems, pp. 6499–6510 (2017)
28. Shahzad, F., Xiu, G., Wang, J., Shahbaz, M.: An empirical investigation on the adoption of cryptocurrencies among the people of mainland China. Technol. Soc. **55**, 33–40 (2018)
29. Venkatesh, V., Morris, M.G., Davis, G.B., Davis, F.D.: User acceptance of information technology: toward a unified view. MIS Q. **27**(3), 425–478 (2003)
30. Yu, C., Chantatub, W.: Consumers' resistance to using mobile banking: evidence from Thailand and Taiwan. Int. J. Electron. Commer. Stud. **7**, 21–38 (2016)

Digitalization

HOW the Innovation Performance in GCC HEIs is Affected by the Knowledge Management in the Era of Knowledge Economy

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Abstract. In the knowledge economy era, Higher Education Institutions (HEIs) plays a vital role in the nation's sustainable development through innovation. Knowledge Management (KM) is one of most critical determinants for the overall performance of the Higher Education Institutions (HEIs) and specially to their innovation performance. The purpose of this study is to analyse the impact of different processes of KM on the Innovation Performance (IP) of the GCC HEIs.

It was found that the highest implemented process of KM in GCC HEIs is Knowledge Sharing (KS) and the reward performance in GCC HEIs is the highest among all other pillars of the IP. Factors which significantly impact the IPs are: exchange of ideas and knowledge; creating new knowledge from existing knowledge; the respond to employees' ideas; having mechanisms in place to capture knowledge from stakeholders were significant; encouragement for participation in informal discussions to share knowledge; use of latest files sharing systems to share knowledge efficiently; implementation of mechanisms that match sources of knowledge to problems and employees' encouragement to apply their knowledge to solve problems.

Keywords: Knowledge management · Innovation performance · HEIs · GCC

1 Introduction and Problem Statement

The role of HEIs become more crusal in the current era of knowledge economy as they contribute in innovation which is very important determinant of the economic development. Many variables affect the innovation performance (IP) in HEIs. On another hand, the KM of HEIs is closely related to the main mission of HEIs which includes research, education and society service. KM includes four main processes: Knowledge Creation (KC), Knowledge Capture and Storage (KSC), while Knowledge Sharing (KS) and Knowledge Application and Use (KA). The well knowledge performance impacts the overall performance of HEIs, including the innovation performance, and contributes in achievement of their goals.

This sheds the light on the need to have deep understanding to the KM processes which significantly affect the innovation performance of GCC HEIs. This is the core problem of this research. Hence, there are six research questions needs to be investigated in this research: i) What is the level of Knowledge Management processes implemented in GCC HEIs? ii) What is the level of Innovation Performance implemented in GCC HEIs? iii) What are the KM processes significantly affect the IP in GCC HEIs?

2   Literature Review

2.1   The Era of Knowledge Economy and the GCC Countries

The concept "knowledge economy" has been initiated in 1960s. Since this time, its' role increased significantly and became more important as compared to other production factors. The knowledge society extended to all aspects related to the contemporary economies [17] and became one of the main engines of economic growth. The GCC countries have taken significant steps towards build up human capital and move towards the knowledge economy within their plans to diversify their economies and increase the share of non-hydrocarbon sector in the GDP [40]. Therefore, some of GCC countries have articulated their visions and policies to foster the knowledge economy [57, 65]. In this direction, Saudi Arabia has formed the "Saudi Vision 2030", Bahrain formed the its' 0 2030, while Kuwait has its vision for 2035 called "Sate vision of Kuwait 2035" and Sultanate of Oman articulated its' Oman 2040 vision. UAE and Qatar also have their respective initiatives for the same [9].

Despite the research for more than fifty years on the knowledge economy, still there is no widely accepted definition about it. However, there are many definitions introduced by scholars or institutions. Table 1 demonstrates some of these definitions:

Table 1. Some definitions of the knowledge economy

Definition	Author (s)
"Those which are directly based on the production, distribution and use of knowledge and information"	[46]
"Production and services based on knowledge-intensive activities that contribute to an accelerated pace of technological and scientific advance as well as equally rapid obsolescence"	[50]
"The utilization of knowledge as one of key engines of economic growth in a country or region. It is an economy where knowledge is ac-quired, created, disseminated and used effectively to enhance economic development"	[17]

The World Bank outlined the frame of the knowledge economy in five main pillars, they are: i) Economic Performance; ii) Institutions; iii) Education and Human Resource; iv) Innovation system and v) Infrastructure for Information.

[40] analysed the knowledge economy for the GCC countries for 2017 and found that UAE got the first rank in GCC countries with score 5.4, followed by Qatar in the second rank with score 5.33. Bahrain and Saudi Arabia are ranked in the third rank with score 4.68 followed by Oman in the fifth rank. Kuwait ranked in the sixth position.

2.2   KM in HEIs

KM is one of most important matters for HEIs as it is closely linked to the three of their missions: research; education and service to society [68]. KM drives the ability of HEI to collect and analyze information, transform knowledge and apply novelties [59, 62]. It is the *"processes of the creation, dissemination and utilisation of knowledge to fulfil organisational objectives"* [2]. KM plays an essential role in developing better quality for HEIs as it leads to develop a knowledge database for the organizations to enhance the knowledge investment of the organization [44]. The KM leads to benefit for HEIs in all their processes: curriculum development, research, student and alumni services and administrative services [16].

The KM has three processes: Knowledge Creation (KC), knowledge Capture and Storage (KCS), Knowledge Sharing (KS) and Knowledge Application and Use / Transfer (KA). There are many factors are considered as enablers and other factors are barriers for KM. These factors are organizational culture and structure, technology, rewards and incentives, leadership, industry–academia linkages, human resources and research repositories [68]. Another challenge is that HEIs need the recognition of knowledge as intellectual capital and creation of knowledge environment [48]. Knowledge management is a continuous process based on routines and activities undertaken.

Knowledge Creation (KC)

KC is the first stage in knowledge management process [3] and it is considered as the core process of KM. KC is the *"development of new knowledge and know-how and the formation of new ideas through interactions between explicit and tacit knowledge in individual human minds"* [45]. It refers to *"the search for and generation of new knowledge by academics for their personal advancement and to enhance the organisational knowledge base for service to society"* [51]. KC reflects the ability of the organization to Elaborate new ideas that could be useful [32]. It's worth to say that KC corresponds one of the main HEIs mission which aim to expand the boundaries of human knowledge and promoting creativity [8]. KC leads to increase the knowledge through interactions between explicit knowledge (Which is documented) and tacit knowledge (embedded in people) in individual human minds [68].

Organisations, especially HEIs, create knowledge through a variety of means, such as, scientific discovery or discussion [23, 61] and exchange of ideas and knowledge between individuals and groups. Knowledge in HEIs is also created via the researchers' scientific socialisation, the combination of scientific findings, and publishing the findings of research [40]. The interactions between explicit and tacit knowledge in HEIs can be done via various means such as doctoral training, scientific discovery and codified knowledge [8, 24]. The created knowledge would take different format such as *"discovering new content or reconfiguring the foreground and background knowledge*

of existing content within all kinds of knowledge owned by the organization" [3]. Enhancing KC in HEIs requires an improvement of the creative environment with its' two main components (soft and hard aspects) by using personalisation and technology strategies [66].

Knowledge Capture and Storage (KCS)

Building institutional knowledge commences by capturing the knowledge from individuals for storage in a knowledgebase and keep the accumulated knowledge available for use in the future [21]. Hence, capture ideas from employees and other stakeholders is the base of the KCS building in any HEI. Effective KCS requires a clear mechanism in place to patent and copy right new knowledge "including disclosures, patenting, licensing, job creation through spin-off companies, contracts and consultancy research, continuous professional development (CPD), and access to facilities and equipment" [68]. The capture of knowledge is followed by review process by knowledge experts to validate the content captured and approve it for storage in the knowledge base for later use [21, 63].

Knowledge Sharing (KS)

KS is considered the most important and challenging process of KM [10, 61]. It is"the exchange of knowledge between academics and researchers among peers within a university, in order to enhance their knowledge base and that of their universities" [51, 68]. KS is a natural activity and an integral part of HEIs, it has many forms: seminars; symposiums; conferences; workshops; training sessions; publications and teaching & learning activities. More involvement in such activities means more readiness to share knowledge [18, 54]. The existence of KS culture helps HEIs to strengthen their research and teaching activities [23, 54]. Hence, each HEI needs to have a culture and environment facilitate KS through nurturing teamwork, networking and collaboration [10, 23, 29, 31]. On another hand, Organizational culture plays a vital role in support or hinder the KS. The practices of KS may be hindered as a result of "lack of effective organization communications, a lack of organizational training, a lack of trust in the organization and a culture that does not support knowledge-sharing" [3].

Knowledge Application and Use/Transfer (KA)

KA from HEIs to non-academic partners, such as industry, the public and service to society considered the 'third mission' or 'third stream activity' of HE activities in participation of the nations' sustainable development [8, 51]. It is *"the dissemination of knowledge created by the academics and researchers within a university to external stakeholders or partners for its application and use and for service to society"* [51, 68]. HEIs worldwide transfer the knowledge as a respond to any emerging need of society and the economy, [12]. HEIs staff conduct the research to solve problems through networking and team learning [42, 60, 75]. Different KA activities are viewed as 'soft' (public lectures and consulting) and 'hard' (licensing or spin-off creation in universities engaged in a greater level of third-stream activities) [24, 53].

KA from academia to industry and public face may challenges as it requires quite space of time to develop a shared understanding and identification for mutual interests with them [26, 67]. The challenge been worsen for the HEIs in developing countries where there are weak linkages between HEIs and the industry. practically, HEIs in

developing countries consider *"publications, presentations, web sites, white papers, teaching and learning activities, policies, and reports as mechanisms to disseminate/transfer knowledge"* [52].

2.3   Innovation Performance in HEIs

"Innovation is equated with the adoption and application of new knowledge and practices, including the ability of an organisation to adopt or create new ideas and implement these ideas in developing new and improved products, services, and work processes and procedures" [14]. HEIs are different from other organization in terms of "their mission, their context with campus communities and other stakeholders, their location, their private/public status, their educational and scholarship initiatives, and more" [64]. Consequently, the assessment of the innovation performance for them should be in ways that capture their own nature.

The innovation performance for HEIs can be assessed by their ability to offer new programmes and their ability to revise their offered programmes to match the new contemporaries. The leadership style and organizational structure may be a vital factor enforce the innovation in the HEI. Another indicator to assess the innovation performance is the HEIs is the published papers which are very. They are important and critical for industrial technology development [43]. This can be assessed by the scientific papers [2, 69, 73] and the citation patterns [56]. Another indicator to assess the innovation performance of HEIs is the patents which are the means of protecting original inventions. "Patents are a key indicator to assess invention performance, the diffusion of knowledge, and the internationalization of innovative activities at different levels" [30]. Having patents by HEIs is a reflection of proper innovation and owning a policy enforce that. The patents are a sever example of collaboration between HEIs and the collaboration which is know as formal collaboration. There are also many other informal channels of collaboration, such as consultation, personal contacts between academic and industry researchers [1, 3, 5, 35].

3   Discussion and Conclusion

Knowledge Sharing was found to be the the most important process among knowledge management processes in GCC HEIs. The other three KM processes Knowledge Creation (KC), Knowledge Capture and Storage (KSC), and Knowledge Application and Use (KA) were found to be closely following Knowledge Sharing (KS) with moderate implementation scores. This is in line with previous studies that emphasize the importance of Knowledge sharing among HEIs [6, 10, 36, 37, 75]. The HEIs can try to improve the practice of knowledge sharing for improved performance. The main reasons behind reluctance to share knowledge are rewards [9, 18, 70], performance evaluation-plus-reward [71], social interaction and organizational climate [4, 22, 34, 72]. Other KM processes- knowledge creation, Knowledge Capture and Storage and Knowledge Application and Use were found to have moderate implementation in knowledge management processes in GCC HEIs. The importance of Knowledge Capture and Storage and Knowledge Application and Use was emphasized in GCC context by [6]

among IT managers and found that rewards are not as important as training and matching users' needs while implementing KM processes which is in line with the results obtained here. The least rated item among all KM processes was KC3 - Rewards employees for new ideas and knowledge. Their research also strengthens the results obtained here for two of the four processes. KM in GCC was studied by [28] also to arrive at the similar results that KM processes are moderately implemented among IT companies in GCC. Moderate implementation of KM processes is supported by yet another research done by [17]. In their research among large construction companies in GCC they found that GCC companies are much behind their British counterparts in implementing KM. The first hypothesis provides many KM areas of improvement for HEIs as reflected in Table 1. In order to improve KM processes, HEIs can focus more on items that are scoring less like KC3 - Rewards employees for new ideas and knowledge, KCS4 - Captured knowledge is codified and is stored in company's knowledge repositories, KS4 - Employees use latest files sharing systems to share knowledge efficiently, KA2 - Application of knowledge is enhanced by mechanisms in place that match sources of knowledge to problems, KCS3 - Has mechanism in place to patent and copy right new knowledge and KCS5 - Stored knowledge is readily accessible for employees who need it.

The implementation results of innovation put all the items almost at the same level (moderate implementation), indicating that all are important. Item related to innovative teaching methods scored highest among six items. This result is well supported by previous researches highlighting its importance in HEIs [13, 15, 19, 20]. The studies related to innovation in HEIs identified these factors as important: organisational culture [72], leadership and constructivism [39], new programmes [4, 11, 70], research & industry collaboration [7, 25, 27, 74]. For improving performance of HEIs innovation is proven to be important as indicated by the result of this study and supported by many other studies [31, 34].

The relationship between KM processes and performance in GCC context is not researched much, there was one close research found on SMEs and support the results obtained in this research that KM contributes to performance [55]. The results of this study indicate that innovation performance is significantly affected by two of the knowledge creation items. Items related to KC3 - Rewards employees for new ideas and knowledge and KC4 - Has mechanism for creating new knowledge from existing knowledge indicate that HEIs, in order to improve their innovation performance, can focus on these two items. Rewarding employees for new ideas is recommended in many studies [20, 28, 47] However, the studies were not found in HEIs context. Like KC3, KC4 is also well supported by literature [33, 58, 65].

The other dimension of KM, KCS had two items that were driving innovation-Responds to employees' ideas and documents them and Has mechanisms in place to capture knowledge from stakeholders. These items are specifically important for improving performance of HEIs for innovation because education is all about idea generation, capturing and putting these in practice. Many ideas are lost because there is no mechanism to capture ideas from various sources and not acknowledging people for their ideas. The similar thoughts are echoed in research by [19].

The third dimension of KM, Knowledge Sharing has 'encouraged to frequently participate in informal discussions to share knowledge' and 'use latest files sharing

systems to share knowledge efficiently' items significantly affecting Innovation Performance of HEIs. Informal discussions are a good platform for discussing sharing knowledge and are perceived as less risky by employees [17, 41]. Using latest files sharing systems to share knowledge is found to be effective for innovation in many studies [12, 18, 39, 42, 77] though none in HEIs.

The Knowledge Application (KA) has *Application of knowledge is enhanced by mechanisms in place that match sources of knowledge to problems and encouraged to apply their knowledge to solve problems* items significantly affecting innovation performance. Matching sources of knowledge to problems is emphasized by [25,38; 47]. Knowledge without application to problem solving doesn't really contribute to innovation and is more suitable for pure research organizations [45, 49, 77]. HEIs can try to maximize their innovation by matching knowledge sources to problems faced by them. Application of knowledge to solve problems is core for any organization and HEIs are no different.

Summarizing, HEIs in order to improve their innovation performance, can focus on the items and dimensions mentioned here. In present competitive environment where education institutions are majorly ranked based on their innovation capabilities and performance, these pointers can provide strategic direction. There are not many researches available related to HEIs on this topic though there were numerous found in corporate sector and public sector organizations. Hence, this study can act as starting point and further researches can be done to increase the scope and validate the results obtained here.

References

1. Abdul Madhar, M.: Knowledge Management in Higher Educational Institutions with Special Reference to College of Applied Sciences (CAS). Ministry of Higher Education, Sultanate of Oman, August 2010. https://doi.org/10.2139/ssrn.1663543
2. Adhikari, D.R.: Knowledge management in academic institutions. Int. J. Educ. Manage. **22**(2), 94–104 (2010)
3. Adeinat, I.M.: Organizational culture and knowledge management processes: case study in a public university. VINE J. Inf. Knowl. Manage. Syst. **49**(1), 35–53 (2019). https://doi.org/10.1108/VJIKMS-05-2018-0041
4. AlDhaen, E.S., Mahmood, M.: HEIs practices and strategic decisions toward planning for delivering academic programs for a sustainable future. In: Sustainable Development and Social Responsibility, vol. 2, pp. 89–93. Springer, Cham (2020)
5. Al-Sartawi, A.: Does it pay to be socially responsible? Empirical evidence from the GCC countries. Int. J. Law Manag. **62**(5), 381–394(2020)
6. Al-Sartawi, A., Reyad, S., Madbouly, A.: Shariah, presentation and content dimensions of Web 2.0 applications and the firm value of Islamic financial institutions in the GCC countries. Journal of Islamic Marketing. Accepted article (2021)
7. Al-Sartawi, A.: The Effect of Corporate Governance on the Performance of the listed companies in the Gulf Cooperation Council Countries. Jordan J. Bus. Adm. **11**(3), 705–725 (2015)

8. Ali Al-Busaidi, K., Olfman, L.: An investigation of the determinants of knowledge management systems success in Omani organizations. J. Glob. Inf. Technol. Manag. **8**(3), 6–27 (2005)

9. Al-Sartawi, A.: Information technology governance and cybersecurity at the board level. Int. J. Crit. Infrastruct. **16**(2), 150–161 (2020)

10. Al-Lamki, S.M.: Higher education in the Sultanate of Oman: the challenge of access, equity and privatization. J. High. Educ. Policy Manag. **24**(1), 75–86 (2002)

11. Musleh Al-, A.M.A. (ed.): The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. SCI, vol. 974. Springer, Cham (2021). Doi: https://doi.org/10.1007/978-3-030-73057-4

12. Amin, T.: Prospects of knowledge economies in the Gulf. Prospects of Knowledge Economies in The Gulf. Observer Research Foundation, January 2020

13. Alansari, Y., Al-Sartawi, A.: IT governance and E-banking in GCC listed banks. Procedia Comput. Sci. **183**, 844–848 (2021)

14. Arntzen, A.A.B., Worasinchai, L., Ribière, V.M.: An insight into knowledge management practices at Bangkok University. J. Knowl. Manag. **13**(2), 127–144 (2009)

15. Banerjee, P.: HEIs as Centres of Excellence: Creating New Ethos through Innovations and Best Practices. Stud. Indian Place Names **40**(7), 1–8 (2020)

16. Bano, S., Taylor, J.: Universities and the knowledge-based economy: perceptions from a developing country. High. Educ. Res. Dev. **34**(2), 242–255 (2014)

17. Bashir, S., Syed, S., Qureshi, J.A.: Philosophical and methodological aspects of a mixed-methods research: a review of the academic literature. J. Independent Stud. Res. **15**(1), 32–50 (2017)

18. Bates, R., Khasawneh, S.: Organizational learning culture, learning transfer climate and perceived innovation in Jordanian organizations. Int. J. Training Dev. **9**, 96–109 (2005)

19. Borisova, O.V., Vasbieva, D.G., Malykh, N.I., Vasnev, S.A., Bírová, J.: Problem of using innovative teaching methods for distance learning students. Int. Electron. J. Math. Educ. **11**(5), 1175–1184 (2016)

20. Brewer, P.D., Brewer, K.L.: Knowledge management, human resource management, and higher education: a theoretical model. J. Educ. Bus. **85**(6), 330–335 (2010)

21. Brinkley, I.: Defining the knowledge Economy. Knowledge economy programme report. The work foundation (2006)

22. Cheng, M., Ho, J.S., Lau, P.M.: Knowledge sharing in academic institutions: a study of multimedia university Malaysia. Electron. J. Knowl. Manag. **7**(3), 313–324 (2009)

23. Collina, L., Gerosa, G., Manciaracina, A., Mazzarello, M., Vergani, F.: New learning experiences. How the space planning and the technologies can be activators of innovative teaching methods. In: AROUND THE CAMPFIRE–Resilience and Intelligence. University of Lapland, pp. 391–403 (2019)

24. Chayjan, M.R., Bagheri, T., Kianian, A., Someh, N.G.: Using data mining for prediction of retail banking customer's churn behaviour. Int. J. Electron. Banking **2**(4), 303–320 (2020)

25. De Spiegelaere, S., Van Gyes, G., Van Hootegem, G.: Innovative work behaviour and performance-related pay: rewarding the individual or the collective? Int. J. Hum. Resour. Manag. **29**(12), 1900–1919 (2018)

26. Dzekashu, W.G., McCollum, W.R.: A quality approach to tacit knowledge capture: effective: practice to achieving operational excellence. Int. J. Appl. Manag. Technol. **13**(1), 52–63 (2014). https://doi.org/10.5590/IJAMT.2014.13.1.04

27. Elezi, E., Bamber, C.: Understanding the role of knowledge management in higher education partnerships through experts. In: 19th European Conference on Knowledge Management, 06–07 Sep, Padua, Italy (2018)

28. Fullwood, R., Rowley, J., Delbridge, R.: Knowledge sharing amongst academics in UK universities. J. Knowl. Manag. **17**(1), 123–136 (2013)

29. Fuller, D., Beynon, M., Pickernell, D.: Indexing third stream activities in UK Universities: exploring the entrepreneurial/enterprising university. Stud. High. Educ. **44**(1), 86–110 (2019). https://doi.org/10.1080/03075079.2017.1339029

30. Galán-Muros, V., van der Sijde, P., Groenewegen, P., Baaken, T.: Nurture over nature: How do European universities support their collaboration with business? J. Technol. Transfer **42**(1), 184–205 (2015). https://doi.org/10.1007/s10961-015-9451-6

31. Gertner, D., Roberts, J., Charles, D.: University-industry collaboration: a CoPs approach to KTPs. J. Knowl. Manag. **15**(4), 625–647 (2011)

32. Gloet, M., Terziovski, M.: Exploring the relationship between knowledge management practices and innovation performance. J. Manuf. Technol. Manag. **15**, 402–409 (2004)

33. Hamoud, M., Akour, M.A., Al-Salti, Z.: Developing the main knowledge management process via social media in the IT organisations: a conceptual perspective. Int. J. Bus. Adm. **7**(5), 49–64 (2016)

34. Hannoon, A., Al-Sartawi, A., Khalid, A.: Relationship between financial technology and financial performance. In: Musleh Al-Sartawi, A.M.A. (eds.) The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. Studies in Computational Intelligence, vol 974. Springer, Cham

35. Huang, M., Chen, D.: How can academic innovation performance in university–industry collaboration be improved? Technol. Forecast. Soc. Chang. **123**, 210–215 (2017)

36. Hung, R.Y., et al.: Knowledge as a facilitator for enhancing innovation performance through total quality management. Total Qual. Manag. **21**(4), 425–438 (2010). https://doi.org/10.1080/14783361003606795

37. Ichijo, K., Nonaka, I.: Knowledge Creation and Management: New Challenges for Managers. Oxford University Press, Oxford (2006)

38. Iyer, D.N., Sharp, B.M., Brush, T.H.: Knowledge creation and innovation performance: an exploration of competing perspectives on organizational systems. Univ. J. Manag. **5**(6), 261–270 (2017)

39. Jakovljevic, M.: Criteria for empowering innovation in higher education. Africa Educ. Rev. **16**(4), 53–71 (2019)

40. Azagra-Caro, J.M., et. al.: Dynamic interactions between university-industry knowledge transfer channels: A case study of the most highly cited academic patent. Res. Policy **46**, 463–474 (2017)

41. Karolak, M., Razzaque, A. Al-Sartawi, A.: E-services and M-services Using IoT: An Assessment of the Kingdom of Bahrain. In: Musleh Al-Sartawi A.M., Razzaque A., Kamal M.M. (eds) Artificial Intelligence Systems and the Internet of Things in the Digital Era. EAMMIS 2021. Lecture Notes in Networks and Systems, vol. 239. Springer, Cham (2021)

42. Kumar, D.M., Kumar, P.: Knowledge management and technology knowledge management model for the higher technology college of ministry of manpower, Oman". J. Bus. Adm. **1**(1), 24–40 (2010)

43. Lakemond, N., Bengtsson, L., Laursen, K., Tell, F.: Match and manage: the use of knowledge matching and project management to integrate knowledge in collaborative inbound open innovation. Ind. Corp. Change **25**(2), 333–352 (2016)

44. Lueddeke, G.R.: Toward a constructivist framework for guiding change and innovation in higher education. J. High. Educ. **70**(3), 235–260 (1999)

45. Madbouly, A., Reyad, S., Chinnasamy, G.: Analysis for the knowledge economy in GCC countries. In: Hamdan, A., et al. (eds.) The Fourth Industrial Revolution: Implementation of Artificial Intelligence for Growing Business Success, pp. 403–416. https://doi.org/10.1007/978-3-030-62796-6_24

46. Moen, Ø., Benum, J.D., Gjærum, I.: Exploring informal and formal learning activities as enablers of learning-by-exporting in small and medium sized firms. In: Leonidou, L.C., Katsikeas, C.S., Samiee, S., Aykol, B. (eds.) Advances in Global Marketing, pp. 127–146. Springer, Cham (2018). https://doi.org/10.1007/978-3-319-61385-7_6

47. Musleh Al-Sartawi, A.M., Razzaque, A., Kamal, M.M. (eds.) Artificial Intelligence Systems and the Internet of Things in the Digital Era. EAMMIS 2021. Lecture Notes in Networks and Systems, vol 239. Springer, Cham

48. Nelson, R., Rosenberg, N.: Science, technological advance and economic growth. In: Chandler, A.D., Hagstrom, P., Solvell, O. (eds.) The Dynamic Firm. Oxford University Press, Oxford (1998)

49. Nilsook, P., Sriwongkol, T.: The development of multi-weblog with knowledge management for Thailand's higher education. In: International Conference on Information and Multimedia Technology, 2009. ICIMT 2009, pp. 315–318. IEEE (2009)

50. Nonaka, I.: Dynamic theory knowledge of organizational creation. Organ. Sci. **5**(1), 14–37 (1994)

51. OECD. The knowledge-based economy (1996)

52. Paul, S., Roijakkers, N., Mortara, L.: How do human resource practices strengthen open innovation? An exploratory analysis. In: Open Innovation: Unveiling the Power of the Human Element, pp. 1–27 (2017)

53. Pinto, M.: Knowledge management in higher education institutions: a framework to improve collaboration. In: Information Systems and Technologies (CISTI), 9th Iberian Conference on IEEE, pp. 1–4 (2014)

54. Podsakoff, P.M., MacKenzie, S.B., Lee, J.Y., Podsakoff, N.P.: Common method biases in behavioral research: a critical review of the literature and recommended remedies. J. Appl. Psychol. **88**(5), 879 (2003)

55. Powell, W.W., Snellman, K.: The knowledge economy. Annu. Rev. Sociol. **30**, 199–220 (2004). https://doi.org/10.1146/annurev.soc.29.010202.100037

56. Ramjeawon, P.V., Rowley, J.: Knowledge management in higher education institutions in Mauritius. Int. J. Educ. Manag. **32**(7), 1319–1332 (2018). https://doi.org/10.1108/IJEM-05-2017-0129

57. Ramachandran, S.D., Chong, S.C., Ismail, H.: The practice of knowledge management processes: a comparative study of public and private higher education institutions in Malaysia. Vine **39**(3), 203–222 (2009)

58. Rossi, F., Rosli, A.: Indicators of university-industry knowledge transfer performance and their implication for universities: evidence from the United Kingdom. Stud. High. Educ. **40**(10), 1970–1991 (2015)

59. Rowley, J.: Is higher education ready for knowledge management? Int. J. Educ. Manag. **14**(7), 325–333 (2000)

60. Sanad, Z., Al-Sartawi, A.: Financial statements fraud and data mining: a review. In: Musleh Al-Sartawi, A.M., Razzaque, A., Kamal, M.M. (eds.) Artificial Intelligence Systems and the Internet of Things in the Digital Era. EAMMIS 2021. Lecture Notes in Networks and Systems, vol 239. Springer, Cham

61. Small, H., Garfield, E.: The geography of science: disciplinary and national mappings. J. Inf. Sci. **11**, 147–159 (1985)

62. Salunke, S., Weerawardena, J., McColl-Kennedy, J.R.: The central role of knowledge integration capability in service innovation-based competitive strategy. Ind. Mark. Manage. **76**, 144–156 (2019)
63. Saunders, M.L., Thornhill, A., Lewis, P.: Research methods for business students, 7th edn. Pearson, Italy (2016)
64. Senge, P., Cambron-McCabe, N., Lucas, T., Smith, B., Dutton, J., Kleiner, A.: Schools that Learn. Doubleday, New York (2000)
65. Serban, A.M., Luan, J.: (2002), "Overview of knowledge management." New Dir. Inst. Res. **113**, 5–16 (2002)
66. Siadat, S.A., Hoveida, R., Abbaszadeh, M., Moghtadaie, L.: Knowledge creation in universities and some related factors. J. Manag. Dev. **31**(8), 845–872 (2012)
67. Songsangyos, P.: The knowledge management in higher education in Chiang Mai: a comparative review. Procedia-Soc. Behav. Sci. **69**, 399–403 (2012)
68. Stanley, T.D., Doucouliagos, H.: Meta-regression analysis in economics and business, vol. 5. Routledge (2012)
69. Sullivan, R.: Business schools and the innovation conundrum. J. Manag. Dev. **30**(5), 492–498 (2011). https://doi.org/10.1108/02621711111133000
70. Tadros, M.E.: The Arab Gulf States and the Knowledge Economy: Challenges and Opportunities. The Arab Gulf States Institute in Washington (2015)
71. Tian, J., Nakamori, Y., Wierzbicki, A.P.: Knowledge management and knowledge creation in academia: a study based on surveys in a Japanese research university. J. Knowl. Manag. **13**(2), 76–92 (2009)
72. Tonidandel, S., LeBreton, J.M.: Relative importance analysis: a useful supplement to regression analysis. J. Bus. Psychol. **26**(1), 1–9 (2011)
73. Veer-Ramjeawon, P., Rowley, J.: Knowledge management in higher education institutions: enablers and barriers in Mauritius. Learn. Organ. **24**(5), 366–377 (2017). Doi: https://doi.org/10.1108/TLO-03-2017-0030
74. Wallace, D.P., Fleet, C.V., Downs, L.J.: The use of research methodologies in the knowledge management literature. Proc. Am. Soc. Inf. Sci. Technol. **47**(1), 1–7 (2010)
75. Wah, C.Y., Menkhoff, T., Loh, B., Evers, H.D.: Social capital and knowledge sharing in knowledge-based organizations: an empirical study. Int. J. Knowl. Manag. (IJKM) **3**(1), 29–48 (2007)
76. Wang, S., Noe, R.A., Wang, Z.M.: Motivating knowledge sharing in knowledge management systems: a quasi–field experiment. J. Manag. **40**(4), 978–1009 (2014)
77. Zhu, C.: Organisational culture and technology-enhanced innovation in higher education. Technol. Pedagogy Educ. **24**(1), 65–79 (2015)

The Role of Social Responsibility in the Digital Public Relations Age

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Abstract. The study aims to identify the role of social responsibility in the Digital Public Relations Age by reviewing this rules in many institutions all around the world, the results indicated that the use of digital public relations for social responsibility enables public relations practitioners to perform their task of creating trust between the service provider, product, idea, approach and the audience, and establishing credibility, accuracy and high professionalism as a major approach to public relations work.

Keywords: Social responsibility · Digital public relations · Organizations

1 Introduction

The philosophy of social responsibility emerged as an inevitable result of the development of ideas and movements concerned with protecting society and the consumer, as well as the concern for protecting the environment and natural resources that government and private institutions must adopt when dealing with the society [22]. Because it operates in a complex social and economic environment in which it is subjected to pressures from the owners of these institutions, and pressures to assume their responsibilities, whether these pressures are from the government, civil society or consumers [6]. Establishments are accustomed to conducting their business freely without ignoring the negative impacts resulting from their activities and their negative repercussions on society [16]. Interest in this topic increased in the second half of the twentieth century, especially in recent years, but the technological and scientific development witnessed by institutions, as well as the corruption scandals in institutions and the persistence of poor conditions that afflicted many developing countries [33]. It led to an evolution in the perception of the goals of the institution, and then the institutions became competitive with their inventions and discoveries, as modern goods and services working on the development and development of society [15]. Institutions in today's world do not have to relate only to social responsibility, but rather they must go deep into them and strive towards creativity in adopting them [40]. The success of the institution in carrying out its role in social responsibility depends mainly on adherence to three criteria: respect for the institution and its responsibility towards members of society [14], especially those working in the institution, community support, and environmental protection [16]. Whether in terms of commitment to the compatibility of the product provided by the institution to the community with the environment, or through the initiative to provide what serves the environment, improve

environmental conditions in society, and address various environmental problems [22]. Organizations of all kinds need to support the relationship between them and their internal and external audiences, as well as to promote a sincere and common understanding with that public [4]. Organizations at the present time have become one of their responsibility towards their audiences of workers and clients alike, increasing its prosperity and applying material and psychological gratification to it through business and all of this benefits the organization and supports the achievement of its goals [33].

Society needs to support this movement by introducing digital public relations programs using social networking sites and their role in social responsibility that can be adopted by public and private sector institutions and companies, highlighting their non-profit activities, and contributing to building public awareness among community members and enhancing loyalty to the facility [16]. And foreseeing and evaluating the needs of society, introducing new programs to parties interested in activities and seeking to motivate all parties to support these programs, on the other hand [33], it is necessary to develop and enact legislative laws that contribute to the manufacture of programs aimed at achieving the highest possible amount of social responsibility by offering a system of scientific programs It includes executives in companies and public bodies in various commercial, industrial, health, insurance and banking sectors. It is necessary for private sector institutions to adopt a project to establish a strategy that deals with social responsibility and pay attention to environmental and educational programs for social responsibility that will enhance this culture among members of society, which is reflected positively in strengthening and developing the role of institutions [6]. Therefore, private sector institutions and companies must also adopt the establishment of departments for social responsibility that follow the public relations that include their administrative structure and include them within its mission, vision, culture and principles, and consider social responsibility among the responsibilities of the executive management and these are important factors to achieve sustainable development rates as a long-term goal [37].

2   The Definition of Social Responsibility

The social responsibility of the organization is defined as many of the practical ideas that characterize the organization, regarding reaching its goals in a way that meets its interests and the interests of its audiences. That is, the so-called mutual interest with society [16]. Therefore, the rational top management does not deny the role of the Public Relations department nor does it deal with this department merely as a consultative department, but rather it makes it a link between it and all individuals who deal with the organization in order to win them in any case [41]. Accordingly, the work of public relations supports the organization, by directing it towards knowing its social obligations and fulfilling them, while informing the public of this in order to form a positive opinion about the organization and support it in achieving its goals [36].

The concept of social responsibility of the organization is a comprehensive social concept, and this concept does not express an administrative function that serves the interests of the organization alone, but rather expresses an organized cooperative activity between the organization and society that serves the interests of both parties

together and makes them partners in this interest [22]. The social responsibility of the organization is defined as many of the practical ideas that characterize the organization, regarding reaching its goals in a way that meets its interests and the interests of its audiences [40]. That is, the so-called mutual interest with society. Therefore, the rational top management does not deny the role of the Public Relations department nor does it deal with this department merely as a consultative department, but rather it makes it a link between it and all individuals who deal with the organization in order to win them in any case [9]. Accordingly, the work of public relations supports the organization, by directing it towards knowing its social obligations and fulfilling them, while informing the public of this in order to form a positive opinion about the organization and support it in achieving its goals [38]. The concept of social responsibility of the organization is a comprehensive social concept, and this concept does not express an administrative function that serves the interests of the organization alone, but rather expresses an organized cooperative activity between the organization and society that serves the interests of both parties together and makes them partners in this interest [1, 2].

The social responsibility of the organization in this nature rises above every activity and is not mixed with it and affects every activity and does not interfere with it. It is a human social framework that serves the reality of the organization and its audience [10]. For this reason, some have defined public relations as being a planned effort to influence public opinion through socially responsible and acceptable performance at the same time based on mutual contact that achieves the satisfaction of both parties [8]. Social responsibility is one of the most prominent forms of supporting the organization's relationship with society, which is considered one of the most important good public approaches to society [3, 14]. Business organizations should make an impression on their audience that they are trustworthy. Which could help the organization to achieve the maximum benefit from its work environment, as there is a total or partial lack of trust between the business organization and its audience [13].

3 Advantages of Corporate Social Responsibility

In light of the increasing interest in the concept of social responsibility in the world, the question arises about the reasons that encourage companies to apply social responsibility in light of the large financial burdens it entails [5].

Studies have shown that companies that offer initiatives and programs in social responsibility can attract the most efficient human elements, as the companies' commitment to their responsibility towards the society in which they work represents an element of attraction to distinguished competencies, it can also raise its capacity for innovation and creativity [5]. Companies can also build strong relationships with governments, which helps in solving problems or legal disputes that companies may encounter while exercising their activities in society [33]. The initiatives implemented by the companies demonstrated that the social role and ethical commitment are also tools of profitability and increasing sales for companies [31].

Therefore, major international companies are keen on adopting sustainable plans and programs to enhance social responsibility and include it within their long-term

strategies, because it is an investment that leads them to increase profit and production [10] and improve the performance of its employees and strengthens trust between the company and its employees and enhances their affiliation and loyalty to the company, and leads to reducing conflicts and differences between management on the one hand [35], employees and communities on the other hand. Studies that have been applied to a large number of private sector workers in a major American company have shown that nearly two-thirds of employees prefer to participate in some forms of charitable work or work to serve the community through the programs offered by the company [40]. As for consumers, nearly 90% of those surveyed prefer to buy products and services from companies that adopt the concept of social responsibility. Therefore, attention to social responsibility has become a prerequisite for improving the social and economic life of individuals and society, through the commitment of institutions to provide the appropriate environment for employees working in them to improve the performance of the company and production performance, and not to waste resources [7], and to carry out recruitment and training and raise human capabilities, and concern for women and raise their capabilities and skills in order to qualify them to participate In the process of sustainable development, and supporting the most needy groups [45]. Social responsibility programs and their compliance with them also help in good management of risks, which are represented in environmental compliance, respect for work laws and application of standards [5].

4 Corporate Social Responsibility in the Arab World

The current practices of the concept of corporate social responsibility in the Arab world are somewhat behind the Western countries, due to the ambiguity of the concept of social responsibility in many companies, and it still takes a form of charitable work, and is not in line with the actual needs of the region [5], This is due to the prevailing weakness in the knowledge of corporate social responsibility [1]. Therefore, Arab countries need to pay attention to holding conferences and workshops to discuss these initiatives and develop an organizational mental picture for them, and to have a legislative role that organizes these initiatives to have a deeper impact on society [34].

Developing Social Responsibility and Improving Corporate Performance
Some companies have gone beyond the ground of discussion about the importance of social practices and their importance to society as a whole, so they began to think about how to develop their social responsibility. It is not sufficient to adopt some voluntary or charitable practices or strategies, but rather that these practices must be sustainable [28]. Of course, there is a big fundamental difference between the development of social responsibility and its sustainability, as it is necessary to continuously adhere to social practices and play positive roles in society, and to ensure that these practices have a transitive benefit, benefiting the company and the institution alike [30]. However, in addition to the above, it must be noted that there is a correlative direct relationship between the development of social responsibility in a company and its success in performing the role assigned to it, and it is known that this role always has two dimensions: an economic dimension as the company seeks to achieve the largest

profit margin [39]. A social dimension: The company has to ensure that its work is not only harmful to society, but also has many benefits to it [43].

5 Methods for Developing Social Responsibility

5.1 Understand the Business Model

The first step on the road to the development of social responsibility is the long-term commitment of the company to it, the development of social responsibility is a real revolution in the performance of the company and trying to put things in the right perspective [32].

A Culture of Cooperation
Social work is very difficult and requires tremendous efforts, in addition to the development of social responsibility is a multi-track process in various ways, but it is important to realize that this cooperation has two tracks: one of them is internal cooperation between the members of the company and some of them, and the cooperation between the members is achievements, while the second track is external cooperation [19].

To Look for Opportunities
The goal of developing social responsibility is to make a real and positive difference in the surrounding society, and at the same time achieve some kind of profit, but achieving this bilateral goal is not easy, in addition to the cooperation that has been previously talked about, and the constant search for opportunities, whether they are opportunities that enable from community service [9].

The more you serve the community, the stronger the reputation of the institution, and therefore the greater the chance of profit [10]. The other direction is the search for opportunities that enable profit. Working in the social field is positive and sometimes even ethical, but it should also be profitable. In order to ensure the development of social responsibility, and the survival of companies in performing their social role assigned to them [17].

Models of the Reality of Corporate Social Responsibility
There is an observation that has become constant in recent years, which is that millennials want to deal with companies that play a positive social role and provide clear services to the community in which they operate. Perhaps this is the reason why the reality of corporate social responsibility is constantly improving, this on the one hand, and leads to the expectation is that this curve is also rising [23].

Corporate social responsibility has many dual benefits, not only for society, but also for companies. They help build trust, raise awareness, and encourage social change. The more socially responsible a company, the more supportive the community and consumers become [42]. Social responsibility takes many forms, such as: working to reduce carbon impacts, improving labor policies, participating in fair trade, volunteering in society, adopting environmentally friendly policies, and environmentally and socially conscious investments [18].

Johnson & Johnson

This pioneering brand has taken creativity and innovation as an excuse to implement social responsibility, and for decades, it has worked to reduce its negative impacts on the planet, and its initiatives range from harnessing wind energy to providing safe drinking water to communities around the world [5]. It is also working to reduce pollution while providing an economical, renewable alternative to electricity, and the company continues to research renewable energy options; With the aim of purchasing 35% of its energy needs from renewable energy sources [24].

Google

The giant Google company is not only famous for its many environmentally friendly initiatives, but also for taking a decisive stand against racial discrimination and other things, and Google also has the highest levels of corporate social responsibility in the RI in part, because its data center uses 50% less energy than others in the world. The company has allocated more than one billion dollars for renewable energy projects and enabling other companies to reduce their impact on the environment through its various services [25].

Ford Motor Company

Ford plans to reduce greenhouse gas emissions with the EcoBoost engine; To increase fuel efficiency, it also plans to introduce 40 electrified vehicles (electric and hybrid) by 2022, with an investment of $ 11 billion [27]. In addition, US Ford agencies rely on the use of wind and solar PV systems; To operate their sites, which greatly reduces their use of electricity [44].

Pfizer

Pfizer uses the term corporate citizenship; To formulate corporate social responsibility initiatives and believes that this work is an essential part of their mission [11]. Around the world, the company is leading initiatives that raise awareness of non-communicable diseases, in addition to providing health care to women and children who would not receive the care they need without such initiatives [11].

Starbucks

Starbucks is pursuing a slightly different endeavor; It is working to diversify its workforce, providing opportunities for some exemplary groups, and has pledged to employ 25,000 people with special needs or those in need of work by 2025 as part of their socially responsible efforts [12]. This employment initiative also seeks to recruit more younger people; With the aim of helping them start their career by giving them their first job [18]. Globally, the company has joined the United Nations High Commissioner for Refugees to increase the company's support and efforts to reach refugee candidates to employ 10,000 refugees by 2022 [20].

Social Responsibility Globally During the Corona Crisis

Social responsibility itself has become a test, and this is for the companies that decided to apply it before, that is, the Corona crisis was a test of the extent of these companies' ability to protect their employees, society and stakeholders during the crisis [26]. The Corona crisis is not the first, as there were crises that preceded it, and there are companies that also successfully dealt with these crises, some of them decided not to

lay off their employees, while others reduced salaries, and some pharmaceutical companies withdrew specific products from the market to protect the general health of society [29]. Then it is possible to take a look at social responsibility globally and note the extent of the change that has occurred in it itself, and the change in the performance of companies that have adopted this theory [14].

Social Commitment

Many companies, during this crisis, showed some practices, including allowing employees to work from home, launching some awareness campaigns, etc., but this is not enough, or, at least, this is what the current disaster tells us [7]. There is a large part of social responsibility related to anticipating risk before it occurs and thus developing the necessary plans and strategies to deal with it. It is true that this part is related to planning and managing risks, but it is also related to social responsibility [5]. And a sham social commitment to social responsibility is no longer viable now, especially as the world suffers from complex crises, such as global warming, climate change, and other social and economic risks [16]. Hence, the need for a real and clear commitment from companies to the societies in which they operate appears, and there are many companies that have apparently realized the importance of this type of commitment, and this is one of the positives of the Corona virus [40].

A Culture of Social Responsibility

Taking a look at corporate social responsibility in general leads us to conclude that: The institutions that established the values and principles of social responsibility before were the best able to overcome the crisis, or, at least, were able to overcome them easily [5]. In addition to engaging employees and other stakeholders, and creating a strong corporate culture is half the road to a company that is strongly socially committed, and fairness and fairness in salaries and trust-based management practices - all of which are requirements of a culture of social responsibility - are important pillars of getting everyone to the heart of a man. One, and it, too, helps make them more tolerant and resilient [13].

Flexibility is Essential

Flexibility is not a luxury but a necessity, in addition to the fact that social responsibility is a theory based on the idea of flexibility and finding a type of connection between the interest of society and the interest of the company, between profit and impact [18].

Upcoming Developments

If we are looking at social responsibility now from the perspective of the Corona crisis, then we should expect, as long as the crisis has not ended, that many developments will occur in the level of companies' performance of their social roles, so companies launch some awareness campaigns, donate some money or even allow flexible working hours or follow Telework policy is not all that can be done [11]. Many companies are now rearranging their papers and trying to find the best ways to deal with this crisis or similar ones, and therefore there are many developments that are expected to occur during the coming period [13].

6   Importance of Social Responsibility

Social responsibility has a great importance that can be accomplished in the following elements:

As for the institution: the most important of which are:
Improving the institution's image in instilling a positive appearance, especially among customers and workers in general [9]. Improving the work environment prevailing in the business organization and spreading cooperation and interdependence among the various parties [19]. Social stability as a result of providing a kind of social justice and the rule of the principle of equal opportunities, which is the essence of the social responsibility of business organizations [16]. External stakeholders continue to deal with the institution, in order to provide them with a sense of security, safety, and what achieves this is to provide them with correct and accurate information [38].

Social Responsibility Towards the Local Community
by making more public welfare, which includes contributing to support the infrastructure, building bridges and parks, contributing to reducing the unemployment problem, supporting some activities such as sports and recreational clubs, respecting customs and traditions, supporting civil society institutions, providing aid for people with special needs, continuous support for health and scientific centers, sponsoring charitable work [22]. Protecting the environment from damages resulting from the organization's activities, contributing to campaigns for environmental protection and preserving natural resources, adopting a rational environmental policy [32].

7   Dimensions of Social Responsibility

The First Dimension: The Economic Dimension: It does not refer to earning, as a matter of business, but rather refers to a commitment to ethical practice within institutions such as institutional government, preventing bribery and corruption, protecting consumer rights, and ethical investment [9].

The Second Dimension: The Social Dimension: It is the dimension that dictates that the institution must contribute to the well-being of the society in which it operates, and raise the level, care and support of its employees' affairs, in a way that will positively affect their productivity, develop their technical capabilities, provide job and professional security, and health care [5]. The social dimension represents both fair labor and employment practices, and participation in the local community [16].

The Third Dimension: The Environmental Dimension: The environmental dimension is the institution's duty to cover the environmental impacts of the organization's operations and products, eliminate emissions and waste, achieve maximum efficiency and productivity from available resources, and reduce practices that may negatively affect the countries and future generations' enjoyment of these resources [14].

8   Digital Public Relations and Social Responsibility

In the current era, public relations have become a necessity of modern society, and a modern science has reached maturity and completeness, which made it taught in universities, and it has been awarded with the highest specialized university degrees and scientific degrees [8], and it has become evident in many institutions that public relations in them are a mainstay of the pillars of modern management in the institution, because it links the institution with its social environment, so the required interaction takes place between them, where good public relations contribute to good appreciation and understanding of administrative problems [10], whether by workers who are aware of the reality of the situation and the conditions of the organization, or by the public that deals with The organization, its achievements and its problems, or by the local community in general, as it has the role that the organization plays in the national economy [41], and in raising the level of this society, and thus public relations achieve interdependence among its audiences of various groups, in order to ensure the achievement of the social objectives of public relations [33]. Where public relations aim to help citizens to adapt socially with the group and meet their basic and essential needs, especially as social institutions play functional and professional roles that satisfy the needs of the public to which they provide all kinds of care and social services [5]. Social responsibility comes another factor that clarifies the extent to which any contemporary organization needs a public relations apparatus that works to provide effective services and activities to achieve the development of the society in which it operates [16]. The advancement of social responsibility benefits the organization, which leads to the achievement of the goals the organization seeks [28].

9   Reasons for Adopting Digital Public Relations for Social Responsibility in Organizations

There are more different viewpoints in this field regarding whether or not the organization should bear its social responsibility. Most studies conclude that the arguments behind the organization's adoption of the concept of social responsibility [45] and its various variables reach the basic points as considered an appropriate field in the relationship between the organization and the community, in order to enable it to remain in the market [42]; Achieving the status of sales of needs, which means their contribution to achieving social profitability for the whole of society [9]; it works to improve and develop the organization's image in front of society [10]; It represents the best case for investors, by raising the value of shares in the long term, when they are acquired [40]; the organization has confidence in the community, and what it does to reduce the risks that may be caused to it in the future [23]; laws and legislation cannot accommodate all the details related to society [8]; responsibility in business, it will represent a social law [6]; If the organization does not fulfill its tasks in achieving social responsibility and helping the community to address and solve the problems it suffers from, it can lose much of their influential power in society [16]; preventing the problem

is better than treating it, so it is appropriate to leave the organization to work in the community and to avoid it [19] and problems before they get worse and difficult to treat [44].

10 Reasons for not Adopting Public Relations for Social Responsibility in Organizations

The response can be related to opinions opposing the organization's adoption of the concept of social responsibility are launched, since these tasks are inconsistent with some institutions, especially the economic ones, which the president aims to profit in [6]. Therefore, they are completely consistent with the ideas stemming from the old concept of social responsibility; Social responsibility is a complex and difficult issue, because decisions about it are in-depth and implicit [1]; many variables, which are often difficult to understand; social responsibility has high costs, which leads to an increase in the value and prices of products [35]. Limited experience and skill available to the organization in dealing with the social problems facing its work [17]; weaken the main objectives of the organization if they are carried out, because it drains great energy from the effort of the organization [16]; if the organization is solely spending the money on implementing social responsibility programs and excluding other competitors, this means that it bears additional costs that will be reflected in the increase in the prices it deals with, and thus negatively affect its position and its competitive strength in the market [26]; it does not have the force of law in mandatory implementation by other organizations, that is, it is a voluntary action they undertake [22] and sometimes the organization is not defined by law [15].

11 Conclusion

The results revealed that digital public relations are considered a social phenomenon in various social institutions. Indeed, it has become an inevitable necessity of social necessities in our contemporary society, especially after society has become intertwined in it and interests often collide, and digital public relations are human relations between human beings and organizations that Created it. The results revealed that the general goal of social responsibility and digital public relations is to achieve the social welfare of the community and its members and to bring about adaptation between the individual and his social environment and behavior with social environment and the second aspect is to bring about changes in the social environment of the individual and in the institutions existing in the environment (its policy - objectives - programs - services), so that these institutions are able to meet the needs of community members and overcome their problems. The study showed that public relations does not deviate from that as it aims to influence the attitudes and ideas of the masses through intentional programs, based on facts, and honesty, as it aims to bring about changes in these institutions so that they become appropriate to what the masses need in order to know their needs and trends, and analyze and measure public opinion.

References

1. Al-Zyoud, I.: Impact of corporate social responsibility implementation in Jordanian Public shareholding companies on sustainable development. Asian Soc. Sci. **13**, 94–106 (2017)
2. Al-Sartawi, A.: The effect of corporate governance on the performance of the listed companies in the gulf cooperation council countries. Jordan J. Bus. Adm. **11**(3), 705–725 (2015)
3. Al-Sartawi, A.: Institutional ownership, social responsibility, corporate governance and online financial disclosure. Int. J. Crit. Acc. **10**(3/4), 241–255 (2018)
4. Al-Sartawi, A.: Does it pay to be socially responsible? empirical evidence from the GCC countries. Int. J. Law Manag. **62**(5), 381–394 (2020)
5. Barrena-Martínez, J., López-Fernández, M., Romero-Fernandez, P.: Drivers and barriers in socially responsible human resource management. Sustainability **10**, 1532 (2018)
6. Barrena-Martínez, J., López-Fernández, M., Romero-Fernández, P.M.: Towards a configuration of socially responsible human resource management policies and practices: findings from an academic consensus. Int. J. Hum. Resour. Manag. **30**, 2544–2580 (2019)
7. Boadi, E.A., He, Z., Darko, D.F., Abrokwah, E.: Unlocking from Community Stakeholders, Corporate Social Responsibility (CSR) projects for effective Company-Community relationship. Labor Hist. **59**, 746–762 (2018)
8. Briones Peñalver, A.J., Bernal Conesa, J.A., de Nieves Nieto, C.: Analysis of corporate social responsibility in Spanish agribusiness and its influence on innovation and performance. Corp. Soc. Responsib. Environ. Manag. **25**, 182–193 (2018)
9. Tilt, C.A.: Corporate social responsibility research: the importance of context. Int. J. Corporate Soc. Responsib., 1–9 (2016)
10. Nazzaro, C., Stanco, M., Marotta, G.: The life cycle of corporate social responsibility in agri-food: value creation models. Sustainability **12**, 1–18 (2020)
11. Costanigro, M., Deselnicu, O., McFadden, D.T.: Product differentiation via corporate social responsibility: consumer priorities and the mediating role of food labels. Agric. Hum. Value **33**, 597–609 (2016)
12. Choi, D., Choi, P.M.S.: Joung Hwa Choi. Chune Young Chung, Corporate Governance and Corporate Social Responsibility: Evidence from the Role of the Largest Institutional Blockholders in the Korean Market, Sustainability **12**, 1–15 (2020)
13. Degie, B., Kebede, W.: Corporate social responsibility and its prospect for community development in Ethiopia. Int. Soc. Work **62**, 376–389 (2019)
14. Diaz-Carrion, R., López-Fernández, M., Romero-Fernandez, P.M.: Evidence of different models of socially responsible HRM in Europe. Bus. Ethics A Eur. Rev. **28**, 1–18 (2019)
15. Fordham, A.E., Robinson, G.M., Van Leeuwen, J.: Developing community based models of corporate social responsibility. Extr. Ind. Soc. **5**, 131–143 (2018)
16. Frederiksen, T.: Corporate social responsibility, risk and development in the mining industry. Resour. Policy **59**, 495–505 (2018)
17. Gallardo-Vázquez, D., Valdez-Juárez, L.E., Castuera-Díaz, Á.M.: Corporate social responsibility as an antecedent of innovation, reputation, performance, and competitive success: a multiple mediation analysis. Sustainability **11**, 5614 (2019)
18. Hayter, C.S., Cahoy, D.R.: Toward a strategic view of higher education social responsibilities: a dynamic capabilities approach. Strateg. Organ. **16**, 12–34 (2018)
19. Iacob, M., Gherghina, R., Cret,an, G.C.: "Comparative (Bio)Economic Systems" in Terms of Social Responsibility: The Natural Environment—Between Ideal Capitalism, Utopian Socialism and Real-World Interventionism. Amfiteatru Econ. **21**, 707–727 (2019)

20. Indarti, S., Efni, Y.: Comparative study: the role of corporate social responsibility towards the development of entrepreneurial attitude and small medium-sized enterprises income, Pekanbaru. Indonesia. Int. J. Law Manag. **60**, 311–324 (2018)

21. Kim, W.S., Park, K., Lee, S.H.: Corporate social responsibility, ownership structure, and firm value: Evidence from Korea. Sustainability **10**, 2497 (2018)

22. Lechuga, M.P., Martínez-Martínez, D., Larran, M., Herrera Madueño, J.: Understanding the link between socially responsible human resource management and competitive performance in SMEs. Pers. Rev. **47**, 1211–1243 (2018)

23. Lestari, I.B., Hamzah, N., Maelah, R.: Corporate social and environmental strategy and reporting in indonesian plantation industry. Indones. J. Sustain. Account. Manag. **3**, 84 (2019)

24. López-Fernández, M., Romero-Fernández, P.M., Aust, I.: Socially responsible human resource management and employee perception: the influence of manager and line managers. Sustainability **10**, 4614 (2018)

25. Lu, X., Zhu, W., Tsai, F.-S.: Social responsibility toward the employees and career development sustainability during manufacturing transformation in China. Sustainability **11**, 4778 (2019)

26. Luhmann, H., Theuvsen, L.: Corporate social responsibility in agribusiness: literature review and future research directions. J. Agric. Environ. Ethic **29**, 673–696 (2016)

27. Marotta, G., Nazzaro, C., Stanco, M.: How the social responsibility creates value: models of innovation in Italian pasta industry. Int. J. Glob. Small Bus. **9**, 144–167 (2017)

28. Mazzei, M.J., Gangloff, A.K., Shook, C.L.: Examining Multi-level effects on corporate social responsibility and irresponsibility. Manag. Mark. Chall. Knowl. Soc. **10**, 163–184 (2015)

29. McCarthy, S., Oliver, B., Song, S.: Corporate social responsibility and CEO confidence. J. Bank. Financ. **75**, 280–291 (2017)

30. McWilliams, A., Rupp, D.E., Siegel, D.S., Stahl, G.K., Waldman, D.A. (eds.): The Oxford Handbook of Corporate Social Responsibility: Psychological and Organizational Perspectives. Oxford University Press, Oxford (2019)

31. Naseem, M.A., Rehman, R.U., Ikram, A., Malik, F.: Impact of board characteristics on corporate social responsibility disclosure. J. Appl. Bus. Res. **33**, 799–808 (2017)

32. Jora, O.-D., Apăvăloaei, M.-A., Ros, V., Iacob, M.: "Mens Sana in Sound Corporations": a principled reconciliation Between Profitability and Responsibility. With a Focus on Environmental Issues. Sustainability **12**, 1–22 (2020)

33. Pasamehmetoğlu, A., Gokoglu, M.M.: Corporate social responsibility and sustainable development in the Mediterranean. Sustain. Tour. Pract. Mediterr. **11**, 99–112 (2019)

34. Park, K.-H., Byun, J., Choi, P.M.S.: Managerial overconfidence, corporate social responsibility, and financial constraints. Sustainability **12**, 1–15 (2020)

35. Pino, G., Amatulli, C., De Angelis, M., Peluso, A.M.: The influence of corporate social responsibility on consumers' attitudes and intentions toward genetically modified foods: Evidence from Italy. J. Clean. Prod. **112**, 2861–2869 (2016)

36. Radzi, N.A.M., Lee, K.E., Halim, S.A., Siwar, C.: An Empirical study of critical success factors and challenges in Corporate Social Responsibility (CSR) implementation: the case of selected corporate foundations in Malaysia. Int. J. Acad. Res. Bus. Soc. Sci. **8**, 70–90 (2018)

37. Rahmawati, P.I., Jiang, M., DeLacy, T.: Framework for stakeholder collaboration in harnessing corporate social responsibility implementation in tourist destination to build community adaptive capacity to climate change. Corp. Soc. Responsib. Environ. Manag. **26**, 1261–1271 (2019)

38. Shao, D., Zhou, E., Gao, P.: Influence of perceived socially responsible human resource management on task performance and social performance. Sustainability **11**, 3195 (2019)

39. Shao, D., Zhou, E., Gao, P., Long, L., Xiong, J.: Double-edged effects of socially responsible human resource management on employee task performance and organizational citizenship behavior: mediating by role ambiguity and moderating by prosocial motivation. Sustainability **11**, 2271 (2019)

40. Shen, J., Dumont, J., Deng, X.: Employees' Perceptions of Green HRM and Non-Green Employee work outcomes: the social identity and stakeholder perspectives. Group Organ. Manag. **43**, 594–622 (2018)

41. Shen, J., Zhang, H.: Socially responsible human resource management and employee support for external CSR: roles of organizational CSR climate and perceived CSR directed toward employees. J. Bus. Ethics **156**(3), 875–888 (2017). https://doi.org/10.1007/s10551-017-3544-0

42. Soetanto, R., Mullins, A., Achour, N.: The perceptions of social responsibility for community resilience to flooding: the impact of past experience, age, gender and ethnicity. Nat. Hazards **86**, 1105–1126 (2017)

43. Story, J.S.P., Castanheira, F.: Corporate social responsibility and employee performance: Mediation role of job satisfaction and affective commitment. Corp. Soc. Responsib. Environ. Manag. **26**, 1752 (2019)

44. Sanad, Z., Al-Sartawi, A.: Investigating the relationship between corporate governance and Internet Financial Reporting (IFR): evidence from Bahrain Bourse. Jordan J. Bus. Adm. **12**(1), 239–269 (2016)

45. Trendafiova, S., Ziakas, V., Sparvero, E.: Linking corporate social responsibility in sport with community development: An added source of community value. Sport Soc. **20**, 938–956 (2017)

E-learning: Is the End of Classic Education?

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Abstract. Until recently, saw the discussion of e-learning as inferior to classical education, where the university campus with all its holiness, and reverence, in addition to the university traditions, which represent the life of academic work, and the concern for the unique imprint, Distinguish this university from that until the Covid-fig9 pandemic came, to change the picture and turn the equation as global changes imposed resorting to the electronic platform as a rescue vessel for the critical situation experienced by universities in light of the policy of social distancing and isolation set by the epidemic. Thus, all universities hastened to mobilize efforts to prepare plans and practices that facilitate the work of distance education, which means relying on e-learning, with all the details that it is based on. Where the electronic platform and other technical accessories, including programs, devices, and electronic infrastructure. Simultaneously, the essential thing in all of this remains the communication method between the academic and administrative staff in universities and the students' response in communicating with the new experience, with the disclosure of the profit and loss account in all this.

Keywords: E-learning · Artificial intelligence · Blended learning

1 Introduction

Is confusion attend in the education process? Did educational performance decline? How did students receive the idea of distance education? Questions that increased heavily during the beginning of the experiment since March 2020, while questions continued to be repeated about survival and resilience, failure and success, and anxiety associated with this experience, given the direct comparison with the affairs of electronic universities [1, 2] which are viewed as the least significant in university life Even many academics view it as a deception, an untrustworthy experience. The matter here is not based on personal impression or the consent and rejection of this or that party. The whole process is based on the nature of the content's deliberation, perceiving reality, and working on diagnosing what is valuable and fruitful and what is harmful [3, 4].

The main goal in all of this is based on the form of looking at the educational process, with all its details related to the educational structure, in terms of the academic, the student and the administrative apparatus, [5, 6] and the official institutions responsible for drawing educational policy, and the relationship of international organizations that determine the path of the global approach. As a criterion for dealing with humanity's future, [7] it is the historical, cultural, and social responsibility to the educational process.

This highlights the importance of defining the scientific terminology associated with dealing with the concept of e-learning; it is a catalyst in the educational process or as a substitute for classical education [8]. Is it possible to accept the idea that e-learning has become a reality, and we have to announce directly the death of the classic education model, which all people know? Has the campus function, its annexes, an administrative apparatus, and an infrastructure ended, and is the trend towards pro-gramming everything and communicating through a digital system that organizes everything and anything.

Let's honestly say that these ideas are now resonating in the academic community. Instead, an increasing number of students call for the importance of e-learning, as it provides them with flexibility and ease in attending and communicating with the universities to which they belong. How easy it is to enter the lecture while you are at home, lying on the sleeping couch, or sitting in one of the sidewalk cafes in the center of the capital. The whole thing does not cost you except to press the login button and communicate with the lecture after you have provided a device with good specifications [9]. Internet service is available quickly and easily. Does it end with this simplified image? Before reading this scene, we have to pause at the main terms related to the topic, such as education on campus, distance learning, virtual learning, e-learning, distance learning. This is in terms of trying to follow the method of employing the direct period imposed by the conditions of the Covid 19 pandemic [10]. But the significant standards remain more closely related to more extensive and more profound concepts such as formal education, private education, public education, special edu-cation, lifelong learning, open education.

It is not possible to deal with the education sector based on the existing description, simplify terms, and promote concepts imposed by exceptional circumstances related to a pandemic, disaster, or emergency event. Education is a very fertile human field based on assumptions and theories that cannot be overlooked. They are the well-established cognitive relationships derived from behavioral values, social construction, [11] and subtle awareness. The matter is based on the primary standards agreed upon by the whole world and through a long experience of experiences, understandings, consensus, and international protocols. The leading standards in the field of education have been defined. Thus the distinction became between high-level universities, how students are received in specific disciplines, and the foundations and rules for the success of that educational institution and its uniqueness and recognition from the other.

2   Foundations of Communication

The issue is not just a matter of communicating with students. No, of course, as far as the orientation towards sobriety, distinction, the ability to prepare, investing in knowledge resources, follow-up, choosing a qualified academic staff capable of per-forming the task of teaching, [12] with its a supreme goal, and not just a job through which to communicate with a group of individuals who wish to obtain Just a testimonial.

Far from getting easy and trying to fish in murky waters, the separation between the two models remains clear. It is based on education on the university campus, where the

origin and the clear and constant standards characterize sober universities' work, and the other model is based on distance education as an undoubted aid [13]. But for distance education to be an alternative to the primary model, [14] this calls for further discontinuation. How many fake universities have tried to put them forward in the academic path by promoting distance education and accepting every application that reaches them once the money is paid? Recognized universities can invest in distance education in advancing the mechanism of blended learning [14]. And this is something that universities are investing in workshops, lectures, and courses. And it became promoted as a means to support the path of education and the desire to learn without burdening the academic community with the weight of claims for scientific legitimacy.

Separation and tradition are indispensable in academic life. Paradigm, in the words of [15] and the Scientific union, is the primary imperative for consolidating the bonds of work in a field of knowledge. Without this, it would only be a matter of manipulating and undermining the original content on which the academic activity is based. There is no doubt that digital education has accomplished essential steps in the field of communicating with those wishing to learn in various parts of the world, and in this, we can refer to the experience of MOOCs where the slogan is based on the promotion of the value of knowledge Enroll today and learn something new, this experience and Many others are emerging, and perform their valuable scientific function in providing mature knowledge services, [16, 17] at competitive prices, especially since the science courses are supervised by major universities such as Harvard, MIT, Princeton, Pennsylvania, etc.

It simply implies (recognition), in the sense of trying to identify the appropriate distinction between the academic and the intellectual. There is no harm in it. Let us add here the term learner. Do you think it is possible to herald the end of the professional academic era and advocate the conviction that the digital age has ended the period of monopolizing knowledge [18] Such saying is not without congestion and prejudices issued by the losers in riding recognized universities and trying to compensate by going towards obtaining educational courses offered by major universities as if they were the correct alternative. Nobody can monopolize knowledge; even in the age of paper culture, books are available to everyone, read and learn. No one will prevent you from exercising this right. But to make this knowledge equivalent to the right to climb the steps at the expense of the academic community, [19] this is a matter of more overlap, disorder, and poor construction. At the same time, the current reality remains based on the exploitation of the digital revolution products, [20] which had the merit of bridging distances, facilitating communication, and uncovering new methods that contribute to the development of the entire educational process. Thus, digital education's cultural, social, and economic impact has become evident in its clarity.

However, this effect remains within the limits of discerning the rights and duties that the academic community is committed to. Through the environment, the field, and the official educational field that has been recognized by the authorized institution, digital platforms have been dealt with, which are now attending with full force until they have become an essential means for broadcasting lectures and communicating with students with all transparency and flexibility [21]. Instead, the interaction has reached its extent until the academic community, with all its content (professor, student, and administrator), is looking towards the optimal, accurate, and firm investment.

The smartphone and the method of obtaining Internet service are no longer just a social function. One group is distinguished from the other, as much as it has become a primary method at the heart of the practical learning process. The matter here is based on monitoring the desired and desired results, far from the social impact. Instead, the cultural, intellectual, and educational effects have become the point of reference for these data's investment methods. And this is what emerges in the way students deal with this service, which can be abbreviated (e-learning) [22].

3   Substance and Appearance

The e-learning experience opened eyes to the vast geographical horizon in which it expands. Thus it became natural to face more prestigious universities with a high reputation in investing in this feature and relentlessly seeking to deal with this field through cooperation with institutions specialized in this area. Instead, communication did not stop at the limits of monopoly and dealing with one institution. Instead, flexibility reaches its extent, when you read the advertisement for courses for major universities, and you have topped the advertising scene on this or that site, but the invasion of personal e-mail has become Present with remarkable intensity, [23] it invites people to join and register while granting the registrant more advantages, which are not without an excessive simplification. Even some of these ancient universities, under the pressure of money, are gambling with their high reputation?! It has become common for everyone to obtain a certificate signed by the largest and most famous academic name, topped by the official logo's presence, for only one hundred dollars. And to draw some of the features of seriousness, the institution requires the associate to obtain an average score of 65% in the short examinations conducted during the six-week period, which represents the period of the study course. It reveals that the way to get the answers is through (copy and paste), whether through the site or by relying on google.

Humanity today stands at a crossroads regarding dealing with the basic concepts and perceptions entrenched in social life. And the products of artificial intelligence [23] and the Internet of things add to the mystery and confusion of the scene [24]. What was considered yesterday scientific fiction today becomes a present reality that does not amount to skepticism but is a firmly established certainty of itself. And what you learn from software skills and developments in computers and smartphones, in the blink of an eye, becomes a mere memory. Gasped and accelerated marathon products for the digital world. Who will destroy the entirety of the heritage and personal experiences and make them an object of scarcity and weakness. Instead, high-ranking academic names are becoming embarrassed by the worsening of the accelerating conditions in the production of programs that are difficult to catch up with and the work to implement them until they are finding help from their younger students. The latter is more adapted to this fast-flowing reality.

The direct educational reality has become a scandalous disclosure of the central and essential question about the future of education. Therefore it is logical and severe to discuss the question about philosophy, goals, visions, and perceptions of teaching and learning shortly, and not the open future? ! The situation that the academic is experiencing in the current reality is no more than, at best, the bitter and cruel (ordeal) about

what tomorrow holds of unpredictable surprises [25]. And if it was to adapt to the smartboard and communicate with students through the Moodle and Adreg program and the overall vocabulary of the educational package. The next step is at the heart of the educational scene, where the electronic platform, which puts the academic in an unprecedented confrontation, proves himself.

Challenges that are constantly being prepared, followed by other challenges that are more direct, the reality of education, teaching methods, method of communicating with students, desired behaviors, expected goals, and desired results. And the way of dealing with the traditional concepts that he grew up on, in relation to the university campus's idea, the sacredness on which the classroom is based, the method of direct interaction with students, and how to communicate with them. And a possible way to avoid unintended mistakes. And up to this moment, the most significant number of the academic community still views e-learning as an adjunct to classical education. It is nothing more than a means to solve the crisis imposed by the conditions of the Covid 19 pandemic.

On the other hand, this most significant number of academics continues to communicate via e-learning platforms to provide scientific lectures in various universities of the world, East and West, and participate in high-level scientific conferences through media that have increased and become known to the far and near. Instead, universities in the Middle East of modest financial means have achieved the dream of receiving global weight names in the academic lesson. Chomsky is the world's most famous linguistics philosopher, and Fukuyama is the author of the end-of-history theory. A dream came proper by sending free e- mail and a lecture that only cost the university to obtain a reasonable speed Internet service.

4 Why E-learning

Let us stop at the direct question, which relates to why nations and societies are keen to formulate unique strategies for education? Why does education occupy a central position in thinking? And have the largest share of the national budget? The answer is usually directly related to shaping the future. Here we find ourselves face-to-face with the main problem that we are talking about, which relates to the future consequences that have become dependent on the digital revolution [26]. And we will not be able to bury the heads in the sand and ignore what happened to fields and sectors that recently filled with the eye until they are today mere ruins. In this, we can read the conditions of the paper press that fell at the digital media's hands, and the giant media institutions ended. The one-person substitute appeared, who only needed a (smartphone) to reach the YouTube channel, which he ran to millions of viewers and followers. This is how the research centers' knowledge reports reveal the end of thousands of traditional jobs and new job solutions imposed by the digital revolution and its products [27]. The education sector is not different from all this and cannot hide or evade the effects of this crashing wave.

It is not possible to stop at the traditional educational inputs and outputs, and it is time to reconsider the way universities deal with reality [28]. It is no longer helpful to talk about establishing more master's and doctoral programs. This is a conversation

that may be circulating in museums, not reality. The issue is directly related to the needs of the labor market and nothing else. It is no longer helpful to talk about the supreme goal and that education is a sacred message whose aim is to build the human being. Whoever calls for this slogan should direct his family members to enroll in bachelor's programs that the labor market does not need. Rather, he who advocates these sayings does not hesitate to lament his bad luck, as he has been involved in a specialty that is not considered a priority in the labor market.

Consequently, employment opportunities will be scarce. Let us be directly faced with an undeniable stifling existential crisis. Otherwise, how can he live and communicate with reality without standing on an explicit guarantee of the permanence of the job and getting involved in the details of life? Education here is based on a realistic view, not engaging in romantic quotes. Education is an essential means of building and maintaining the state's momentum in performing its primary functions, and it is not an area of prestige and complimentary review. We can see, without exception, the serious structural problems that most countries in the world suffer from, as the number of unemployed graduates has increased. And the social, political, economic, and cultural implications thereof. Instead, discontent conditions reach their most dangerous extent when this graduate turns into a time bomb. Will direct consequences towards threatening security and social peace. Specializations are registered without economics, management, planning, and universities reproducing without a clear goal or vision. An increasing number of those with higher degrees do not have a direct impact on reality. It is a dream to obtain certification and thus to expect status and social preponderance [29]. It is a system of empty faces from its profound and original content. Simultaneously, the current reality requires more qualified trainees to obtain the current realistic and authentic labor market's jobs.

Whoever draws education strategies must consider the overall change of details related to resources, the movement of capital and markets, the way of dealing with the strengths and sovereignty imposed by the power of transnational companies, the effects of globalization, the environmental impact, and climate change:

- Global warming and desertification
- Poverty and least developed countries
- Ideas related to sustainable development

The reality is that I will not address this problem by writing a master's or doctoral thesis. The results and recommendations issued by them will only benefit from producing more paper files on libraries' shelves in universities. The matter here is related to a realistic way of dealing without precedents and ready-made ideas. All this is subject to how the concepts are formulated in the spirit of reconciliation with the future.

5 Conclusions

Realistic logic and the rapid changes taking place in the world make us about redefining the concept of education. Regarding the manner of; Decision-making, management, organization, vision, mission, goals. A logic based on discovering, monitoring, and diagnosing the learning structure's strengths and weaknesses and

analyzing the elements, with a vision based on openness and flexibility. All this coincides with the expansion of engagement with social and cultural perceptions, away from traditional slogans and banners. It is the formulation based on reformulating the production of meaning for the entire educational process, in line with the primary needs required by the reality of economic, social, political, and cultural relations. The main problem on which education is based is the intensity of the higher diploma's symbolic capital. The problem is not related to the countries of the East or the least developed countries. The advanced West, which claims top academics to be humble and ask students to call them by their abstract names, relies on the symbolic capital of diploma and degree a lot and very much. It is a means of social and class differentiation, status, power, and authority. The matter is very simply based on a direct comparison between a professor's standing at Harvard University and an employee at the same university.

The difference is apparent between a professor working at a prestigious university and another modest. All these ideas and repercussions will be just a memory in light of the growth of e-learning, which will undoubtedly overthrow the thrones and the differences that the current world lives in. Institutions and companies are exceeding the traditional standards of employment. It has even become biased toward the candidate who holds the applied educational training courses, vis-à-vis the theoretical degree recipient. Where comparison is based on the fact that these companies need a workforce that can catch up with the requirements and needs of the market, while the person who obtains the academic certificate constitutes a heavy burden on the operating institution, in addition to the psychological and cultural symptoms that distinguish both models. The employee with practical experiences quickly merges into the work. In contrast, the employee with theoretical experiences suffers from prestige and status. Still, matters sometimes reach hindrance to work due to theorizing, while reality requires more direct practical responses.

References

1. Kim, S., Song, S.M., Yoon, Y.I.: Smart learning services based on smart cloud computing. Sensors (Basel) **11**, 7835–7850 (2011)
2. Elareshi, M., Ziani, A.-K., Al Shami, A.: Deep learning analysis of social media content used by Bahraini women: WhatsApp in focus. Convergence **27**(2), 472–490 (2021). https://doi.org/10.1177/1354856520966914
3. Alur, P., Fatima, K., Joseph, R.: Medical teaching websites: do they reflect the learning paradigm? Med. Teach. **24**, 422–424 (2002)
4. Little, C.W., Clark, J.C., Tani, N.E., et al.: Improving writing skills through technology-based instruction: a meta-analysis. Rev. Educ. **6**(2), 183–201 (2018)
5. Li, Y., Wang, Q., Lei, J.: Modeling Chinese teachers' attitudes toward using technology for teaching with a SEM approach. Comput. Schools **36**(2), 122–141 (2019)
6. Mason, L.H., Kubina, R.M., Valasa, L.L., et al.: Evaluating effective writing instruction for adolescent students in and emotional and behavior support setting. Behav. Disord. **35**(2), 140–156 (2010)
7. Galvis, Á.H.: Supporting decision-making processes on blended learning in higher education: literature and good practices review. Int. J. Educ. Technol. High. Educ. **15**(1), 1–38 (2018). https://doi.org/10.1186/s41239-018-0106-1

8. Chiu, T.K.F., Churchill, D.: Adoption of mobile devices in teaching: changes in teacher beliefs, attitudes and anxiety. Interact. Learn. Environ. **24**(2), 317–327 (2016)

9. Worm, B.S.: Learning from simple ebooks, online cases or classroom teaching when acquiring complex knowledge: a randomized controlled trial in respiratory physiology and pulmonology. PloS One **8**(9), e73336 (2013). https://doi.org/10.1371/journal.pone.0073336

10. Hassan, A., Mseer, I.N., Omran, A.A.M., Al-Sartawi, A.M.A.M., Sarea, A.M.Y.: WhatsApp as a source of e-learning during corona virus pandemic. In: Hassanien, A.-E., Chang, K.-C., Mincong, T. (eds.) AMLTA 2021. AISC, vol. 1339, pp. 77–91. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-69717-4_8

11. Gillespie, A., Graham, S.: A meta-analysis of writing interventions for students with learning disabilities. Except. Child. **80**(4), 454–473 (2014)

12. Paver, J., Walker, D.A., Hung, W.-C.: Factors that predict the integration of technology for instruction by community college adjunct faculty. Community Coll. J. Res. Practice **38**(1), 68–85 (2014)

13. Lee, Y.-H., Hsieh, Y.-C., Chen, Y.-H.: An investigation of employees' use of e-learning systems: applying the technology acceptance model. Behav. Inf. Technol. **32**(2), 173–189 (2013)

14. Lee, R., Looi, K.H., Faulkner, M., Neale, L.: The moderating influence of environment factors in an extended community of inquiry model of e-learning. Asia Pacific J. Educ **41**(1), 1–15 (2021)

15. Littlejohn, A., Pegler, C.: Preparing for Blended E-learning, p. 27. Routledge, London (2007)

16. Anand, G., Larson, E.C., Mahoney, J.T.: Thomas Kuhn on Paradigms. Prod. Oper. Manag. **29**, 1650–1657 (2020). https://doi.org/10.1111/poms.13188

17. Bear, G.G., Minke, K.M., Manning, M.A.: Self-concept of students with learning disabilities: a meta-analysis. Sch. Psychol. Rev. **31**(3), 405–427 (2002)

18. Regan, K., Evmenova, A.S., Hughes, M.D., Rybicki-Newman, M.P., Gafurov, B., Mastropieri, M.A.: Technology-mediated writing: It's not how much, but the thought that counts. E-Learn. Digital Media (2021). https://doi.org/10.1177/2042753021996387

19. Behrend, T.S., Wiebe, E.N., London, J.E., Johnson, E.C.: Cloud computing adoption and usage in community colleges. Behav. Inf. Technol. **30**(2), 231–240 (2011)

20. Ma, W.W.K., Yuen, A.H.K.: News writing using wiki: impacts on learning experience of student journalists. Educ. Media Int. **45**(4), 295–309 (2008)

21. Ciullo, S., Reutebuch, C.: Computer-based graphic organizers for students with LD: A systematic review of the literature. Learn. Disabil. Res. Practice **28**(4), 196–210 (2013)

22. Cullen, J., Richards, S.B., Frank, C.L.: Using software to enhance the writing skills of students with special needs. J. Spec. Educ. Technol. **23**(2), 33–44 (2008)

23. Elareshi, M., Alsridi, H., Ziani, A.-K.: Perceptions of online academics' and Al-Jazeera.net's news coverage of the Egyptian political transformation 2013–2014. Jurnal Komunikasi Malaysian J. Commun. **36**(1), 124–146 (2020). ISSN 0128–1496

24. Mseer, I.N.: Etihics of artificial intelligencs and the spirit of humanities. In: Hamdan, A., Hassanien, A.E., Razzaque, A., Alareeni, B. (eds.) The Fourth Industrial Revolution: Implementation of Artificial Intelligence. Springer Nature, pp 327–340 (2021)

25. Darling-Hammond, L., Zielezinski, M.B., Goldman, S.: Using technology to support at-risk students' learning. Report. Available at: Stanford Center for Opportunity Policy in Education (SCOPE) and the Alliance for Excellent Education (2014). https://edpolicy.stanford.edu/sites/default/files/scope-pub-using-technology-report.pdf. Accessed 18 Dec 2020

26. Ziani, A.-K.: How GCC university students get local news and information. Stud. Media Commun. J. **2**(2) (2014)

27. Evmenova, A., et al.: Emphasizing planning for essay writing with a computer- based graphic organizer. Excep. Child. **82**(2), 144–169 (2016). https://doi.org/10.1177/0014402915585483

28. Musleh Al-Sartawi, A.M.A.: E-Learning Improves Accounting Education: Case of the Higher Education Sector of Bahrain. In: Themistocleous, M., Papadaki, M., Kamal, M.M. (eds.) Information Systems. EMCIS 2020. Lecture Notes in Business Information Processing, vol. 402. Springer, Cham (2020)

29. Ziani, A., Elareshi, M., Al-Jaber, K.: News media exposure and political communication among libyan elites at the time of war. Mediterranean J. Soc. Sci. **8**(1), 330 (2017). https://www.mcser.org/journal/index.php/mjss/article/view/9699

The Impact of Digitalization on Managerial Accounting Roles

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Abstract. This paper discusses the impact of digitalization on the role of managerial accounting and examines various factors that affect the accounting sector. These factors have led to many changes in the accounting process and decision-making in management accounting. The introduction of digitalization and the use of technological solutions have created some gaps when the new digital methods were adopted on the old management accounting methods. The accounting sectors should implement new business models and strategies to adapt to the new culture introduced by the companies and enter the digital age.

The research methodology will revolve around completing a literature review and evaluating previous research in similar fields and situations. As accounting methods begin to develop in a technology-led era, management accounting must also adapt, and the digital process is no exception. In this case, the organizations will need to learn to make certain changes to its company culture. Hence, this will also affect the way managerial accountants approach their employees in terms of daily work getting handled. The digitalization process will require the entire accounting process to be adapted, changed, and gradually transformed. Many people claim that digitalization will replace the outdated methods used by many companies. Following the right approach and practices may lead to the development of firms, the correct use of the advantages of digitalization in the field of management accounting, making it more sustainable in the long run.

Keywords: Digitalization · Managerial accounting · Decision-making · Big data · Cloud computing

1 Introduction

Managerial accounting is becoming a more important decision-making tool in businesses worldwide. Any corporation's value is determined by its capability to produce income while still addressing social problems in the community in which it operates [6]. The correct use of information can enable managers within the company to

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understand the situation and then make ideal decisions, thereby helping the organization to improve productivity, profitability, and performance. With the continuous advancement and development of technology, managers can use digital technology to increase revenue and achieve goals.

The process of using emerging technologies to transform business models to generate new sales and value creation opportunities is called digitalization, that is, the process of transforming the business into a digital enterprise [14].

Digitalization has led to changes in the main structure of many organizations. Its impact has been paid attention to in many key sectors, which has led to major changes in actual goods and their transformation into digital services. Digitalization has also optimised the digital platform, transformed regional services into international services, and converted traditional production methods into modern methods [21].

Digitalization has enabled many companies to implement innovative approaches and develop new goods and services. Digitalization has led to the automation of conventional practices, the initiation of business intelligence, and the use of information analysis. On the other hand, some challenges arise when determining the suitable drivers for applying digital methods and identifying the correct mix between humans and machines throughout the process. Combining human intelligence with digital intelligence is essential [3, 26].

The digitalization of the accounting process will have a long-term impact and change the way the accounting process is handled. Hence, the decision-making process in managerial accounting will develop as well. As a relatively new topic, there are still some gaps and unresolved problems in the introduction of digitalization into the accounting field. Recent research has developed and revealed some key factors that will influence the impact of digitalization on the role of management accounting.

This implies that academics should look at why businesses use digitalization to change the facets of their businesses, also the methods that should be used. The biggest problem with new businesses and practices is that they cannot simply digitise existing business styles [2].

Adopting the new forms of technology and applying them to unchanged current strategies and plans can pose many challenges. This transformation requires tremendous changes in the way companies operate and control their business. Companies should rediscover new opportunities, enhance all kinds of business activities and facilities, and re-evaluate their strategies to accomplish successful results and achieving a good controlling and governance [15, 28]. The digitalization process, will facilitate these changes and developments, allowing the companies to adapt and transform their current methods; shifting them into the new age of accounting processes that will be led by digitalization [16].

In this article, we will explore the impact of digitalization on managerial accounting roles, decisions, and practices. The analysis of other research papers discussing the impact of digitalization on enterprises with determining its advantages and disadvantages will allow us to understand its vital role and identify the best practices in which this revolutionary phenomenon can be used to enhance the performance of small and big companies, this topic was the goal of this research. The rest of the paper is organized as follows:

Literature review presented in Sect. 2, while conclusions is in Sect. 3.

2   Literature Review

Several factors influence all the sectors in many businesses in all kinds of fields. Digitalization is one of the most important aspects that change our lives and affect us every day. The development of technology and the introduction of digital solutions to enterprises have not bypassed management accounting. It changed the perspective of decision-making and business practices.

Managerial accountants should be concerned about the company's sustainability for the long run and be fully informed of its digital strategy since they are the firm's economic voice. This approach allows companies to benefit from emerging technologies, allowing executives to lead digital projects, track their success, and refocus their work when needed [29]. They do not only need to adapt to new technologies and standards, but managerial accountants also need to create new solutions to incorporate conventional methods with new digital business techniques. As new methods and technologies are introduced; the role of the managerial accountants is to fully ensure that these modern methods can run in parallel with the company's daily operations.

The main questions addressed in this paper are:

– What is the impact of digitalization on managerial accounting roles, decisions, and practices?
– What are the advantages and disadvantages of digitalization on managerial accounting roles and the accounting profession?
– What are the recommendations given to companies to introduce digitalization to the accounting profession?

During the past years, researchers suggested that the financial operations witnessed an important change due to digitalization [1, 30, 35]. [35, 38] discovered experimental proof that chief financial officers and managerial accountants believe that financial functions will change in their firms in Germany. [4, 32, 33] Made three surveys where the average expected significance of the best rated controlling trends in 2011 and the significance expected in 5 years was 0.39 points which increased in 2014 to 0.73 and 1 in 2017. They indicated that this growth was mainly pushed by trends related to digital technologies. Thus, further highlighting the development of digital technology; since the survey studies were completed in 2011, then again in 2014 and 2017; the trend clearly implies that this technological growth will only prosper and grow as time passes.

For a better assessment when considering digitizing the accounting process and procedures, there should be a clear distinction between the daily tasks that can be digitized easily and the non-daily tasks that are complicated to be done by a machine or any digital solution. Some tasks will be challenging to achieve digitalization as quickly as possible, especially those that require interpersonal interaction, critical thinking, innovation, and teaching [27]. Hence, it is clear to observe how digitizing the processes and procedures of accounting is anything but a simple task. However, the digitization process can be simplified when the clear and apparent line is drawn to distinguish visibly between the tasks of the accounting firms or departments. In this case, the daily repetitive and continuous accounting tasks are on one side of the line where they are

quite easy to be digitized. On the other side of the line are the afore mentioned accounting tasks which include interactive duties, critical thinking along with concepts such as teaching or innovation.

As digitalization has led to changes in the role of management accountants, [11, 18] have identified the possibility of making more specific roles for management accountants. This fact was also highlighted by [8, 23] who stated that behavioural patterns of managerial accountants change due to the influence of the linkage between digital technology and roles. Lastly, [7] have recommended after several studies that the relationship between digital technology and changes in the roles and jurisdiction of management accountants is complex and would require further studies in each sector to understand the impact of the same on the role, as for financial sectors following strategies by which to become data or analytics driven, the findings might hold some generalizability.

[19] conducted a case study and interviewed 146 chief financial officers, chief accountants, and employees to illustrate the development of digitalization and the role of accountants due to digitalization. Paperless accounting scored 83%, the highest among digital solutions, and is expected to be gradually introduced in the next two years. However, it has come to a disbelief to the author that could computing, big data tools have scored 56% agreement. Due to the impact of digitization on accounting, the ability to perform data quality/data consistency scored 74%, and the reporting speed score was 71%. The study also showed that in the companies surveyed by [19], the staffing costs of the accounting department have been reduced, and the agreement ratio was less than 35%.

The largest obstacle found in the study of [19] was applying digitalization to companies' procedures, which was not yet adequately optimised with a ratio of 51%. Another obstacle was the difficulty for employees to adapt and accept changes with a ratio of 48%. The survey implied that the digitalization of accounting was complex and would require incurring high expenses. Applying digitalization on the process was viewed to be the responsibility of the chief financial officer with the ratio of 28%, and others believed that it was within the scope of responsibilities of the chief accountant with a ratio of 50%. Only 40% of the companies surveyed by [19] followed a clear strategy towards the digitalization of the company's accounting system and some had clarity towards the digitalization of the system. It has been noted that 66% of companies were still in the intermediate stage of implementing digitalization on accounting systems, and only 15% were described as digital pioneers. The digitalization of the accounting system was believed to have a positive impact on auditors, as the result of digitalization with a ratio of 63%, which was expected to increase the efficiency of audit inspections and would result in lesser effort required by the auditors allowing them to charge lower fees [19].

Recent researchers have clearly pointed out the advantages of digitizing on the accounting process. Proving that not only will it be the more efficient way moving forward, but it would also allow businesses to have easier access to data, all the while making the data more reliable simply due to the fact that it is automated [39]. Correspondingly, the research also showed that due to the cloud storage process of accounting records, data will have better security, time efficiency, lower costs and enhance the company social responsibility [25]. As seen in this case, the modern era of

technology comes with its own threats in terms of cyber security, an issue that can arise in any kind of company involving technological advancements. On the accounting side however, this particular case proves to do quite the opposite [39, 41, 42]. As explained by previous researches it is quite clear that cloud storage involving accounting records will not only have better security measures but have higher levels of data protection along with lowering the costs of the entire process [27, 36]. Another key concept to look at is the time efficiency that comes along with the digitization of accounting procedures, as it will surely allow employees to perform a larger number of tasks than they previously would in each amount of time [43]. With technologies advancement such as Artificial Intelligence, Big Data, and Blockchain and Cloud are expected to speed up the transformations process, especially after Covid-19, as a result it is important to understand the way these tools' function. She has also mentioned that with technological transformations comes opportunities and risks that needs to be taken into consideration while implementing the change [23, 43].

Internet-related technologies are also to seen to have an impact on the way accountants work [24]. Technologies include artificial intelligence, big data, cloud and blockchain as they are seen to be used to provide an automated decision becoming a decision-making tool. Despite that, these technologies will raise issues regarding accountant's profession legitimacy and has been found through the paper that researchers have not given much attention to the effect of these on the accountants' scope of work, leading to conclude that further research is required to understand the correct accounting role required with the change in function due to digitalization [43].

The level of data security is an integral part of any accounting firm and managerial accountants would tend to be in favour of the decisions that would allow productivity to increase, while in turn lowering the company's costs as well. It was noted that even though few large firms have taken the step to completely digitize their process, it is merely a matter of time before many of these companies realize that the modern era will require a higher level of efficiency, accuracy, and security. As technology moves forward, accounting firms or departments will also realize the development that is required from their side [20, 22]. In retrospect, the digitalization process will require a high level of commitment from an organizational level as well as on an individual basis from the employees. As advancements take place, changes will be made and eventually managerial accountants will end up having a more accurate view of the company's performance, which will lead to key decision making becoming more fluid, hence having a positive impact on managerial accounting. Digitalization of the accounting process from recording to reporting will provide all that and more, and the shift will be gradual but inevitable [10, 17].

Digitalization is a process of the new age, and in certain sectors it is observed that the intensity of online data exchange is highest in the manufacturing and production industry, mainly in the production of computer equipment and electronic devices, where it is at 64%, but also at a relatively high intensity of 58% in the telecom industry [31, 44]. Digitalization process can begin to develop many cases. Nevertheless, it is important to point out that a simple development in the technological field and the way the electronic platforms are viewed does not necessarily relate purely to accounting processes [36, 37]. However, the development does take a step in the right direction and allow a stage for digitalization to grow in the future. As a result of this research, it

is believed that digitalization can provide technological solutions in the field of managerial accounting, and the process of technological development will trigger a revolution in the field of accounting, which will enable it to develop into an unprecedented new field. Hence, it is quite noticeable that accounting processes are still evolving under the newly developed digitalization processes. In many ways, the researchers perceive a shift in progress of digitalization which will lead to major changes in how accounting processes are handled, yet still positive changes that are required for the modern era in order to make the daily decision-making smoother and more efficient, this can work of course for the accounting department and all of its employees applying their daily duties, as well as the managerial accountants making their key decisions

[9] Had conducted a study proving that one-third of accountants spend over 50% of their time on repetitive tasks and 56% other accountants agreed on the need for automation/digitalization of their work to keep up with the workflow. She has also highlighted that the roles of the CFO, controller, accounting manager and staff accountant has changes drastically with technological changes [9]. Has renamed their known role names to reflect their actual new role by renaming the CFO to change agent where he no longer only focuses on the company's financial as he is now seen to be a strategic partner leading towards digitalization and analysis. Further, the controller has shifted from their focused on preventive controls to a more cross-functional role whereby they are expected to use technology to help automate manual processes to drive the company to a more efficient closed processes.

Also, [9] renamed the accounting manager to optimizer whereby they can make use of large data and identifying opportunities, trends, variances, and expectations. Lastly, the staff accountant is renamed to automation Wizard, resulting in a highly rewarded role whereby they would not spend time on repetitive data entries and focus on streamlining the process using digitalization to reconcile their entries. She concluded by saying that the new focus for all four roles is to add value.

Organizations should speed the process of adapting digitalization to their business and come up with new innovative processes and not only digitize their existing ones if they want to exceed their clients' expectations. They must follow less steps to accomplish their work, decrease the papers required throughout the process, use developed methods for decision making, develop new structural and managerial positions, conduct extensive training and improving skills, utilize improved information models to come up with enhanced decision making and track insights of performance and customers' perceptions. Digitalization can be more beneficial when the knowledge of an old employee is combined with the training and adopting new improved skills and sometimes coming up with new roles to specialize in tasks related to technological factors to enhance the business. There are great advantages for applying digitalization on processes where cost can be reduced by 90% and the time needed to complete organizational tasks can be improved. Also, adapting the new digital software can replace the lengthy paper and manual practices and help the decision makers to collect information faster to better identify the performance, expense drivers and risks resulting in better decision-making process and permitting managers to address issues before they get serious [5].

[12] reviewed the characteristics of the accounting practices that have been recorded over the years and then noticed the caused changes including the changes in

the field's activities due to the evolution of technology and digitalization. They highlighted the effect of IT on the accounting profession in the digitized economy with reconfiguring its activities and creating new accounting programs, allowing combining and collecting data efficiently to come up with better managerial decisions and offering prospects for diversification of goods and services. There were some challenges also highlighted in their article where they pointed out the fact of human behaviour natural response to change and the mentality towards accepting these new developments. Some of the explored challenges that are introduced to the accounting industry are the digital disturbance, virtual security and automation. However, these challenges can be treated as opportunities too particularly if they were supported by various organizations. By applying digitalization to the industry of accounting, it will be a vital factor for economic growth, competition, creativity, job creations and social development [13, 34].

Through the articles reviewed to assess the impact of digitalization, it was noticed that the managerial accounting role is expected to change with the digitization of systems and processes. The information generated through digital systems are seen to be more reliable and easier to access anytime. This means that managerial accountants will now have more time to spend on analysing the findings rather than conducting the decision-making models themselves as these models are expected to be in-built within the systems and would require minimal input to compute the result, which would lead to an improved method of decision making [39, 40]. Also, many challenges emerged with the introduction of digitalization which can be seen as opportunities to enhance the roles and results of any company.

3   Conclusion

In light of conclusion, it has been observed that adopting the new forms of technology and applying them to unchanged current strategies and plans can pose many challenges. As it would require tremendous changes in the way companies operate and control their business. These changes will certainly be presented with their own set of challenges, however it is clear that managerial accountants, as well as employees, must learn to adapt to them to fully embrace their advantages. It has been understood that the information generated through systems are seen to be more reliable and easier to access. That being said, the managerial accountant roles are expected to change with an improved decision-making tools used. Hence, the slightly modified roles of managerial accountants will continue to be altered in order to match the company's requirements along with the specifications set by the modified accounting processes that come with the growth of digitalization.

In many ways, this research proves that managerial accounting will always come down to key decision making. As challenges arise, managers must in turn learn to adapt and develop their skills in such a way that will match the current technologically advanced era that is leading the digitalization process. Adapting to change is anything but a simple process, and it is no different in the cases of managerial accountants. From an accounting perspective, the challenging phase of change and adaptation is a small price to pay for the higher level of efficiency and productivity that will be brought to the accounting processes in the long term. As the new age of technology develops, so

must outdated accounting processes that will potentially become obsolete in the years to come.

The digitalization of accounting processes is set to have a major impact on the way accounting methods are handled. This large-scale process of redesigning the known procedures and processes of accounting firms will require total parallel understanding from the managerial accountant along with all of the employees of the firm that are involved in any task to do with accounting. Long term benefits of digitization are inevitable, as technology is the forward-thinking way for the modern era, and of course, accounting processes or procedures are no different. Naturally, difficulties will be presented during the adaptation phase, as is the case with any major change being made across the board of a company, let alone one that will change how an entire group of processes and procedures are handled. So, difficulties are expected to rise in the beginning, however it is key to point out that the positives yielded in the near future will definitely ease the procedures and allow managerial accountants to make key decisions in a more professional manner, making the jobs of accountants more fluid and easier to handle in the long run.

It is also expected that the technological revolution will expand and spread among businesses as it was found to be handy during the pandemic and used as an important tool for recovery. As a result, it is important to know how to apply these digitalization tools to businesses to strengthen their position and explore new opportunities accompanied with this change.

References

1. Bhimani, A., Willcocks, L.: Digitisation, 'Big Data' and the transformation of accounting information. Account. Bus. Res. **44**(4), 469–490 (2014)
2. Kharba, F.F., Muqattash, R.: Accounting Information System Courses: Developing a Hybrid Syllabus in the Era of Digitization (2020)
3. Alvesson, M., Lee Ashcraft, K., Thomas, R.: Identity matters: reflections on the construction of identity scholarship in organization studies. Organization **15**(1), 5–28 (2008)
4. Schäffer, U., Weber, J.: Digitalisierung ante portas—Die Veränderung im Spiegel der dritten WHU-Zukunftsstudie. Controlling—Zeitschrift für erfolgsorientierte Unternehmenssteuerung **27**(1), 42–48 (2018a)
5. Markovitch, S., Willmott, P.: Accelerating the digitization of business processes. McKinsey-Corporate Finance Business Practise, pp. 1–4 (2014)
6. Ameen, A.M., Ahmed, M.F., Abd Hafez, M.A.: The impact of management accounting and how it can be implemented into the organizational culture. Dutch J. Financ. Manag. **2**(1), 02 (2018)
7. Andreassen, R.-I.: Digital technology and changing roles: a management accountant's dream or nightmare? J. Manag. Control **31**(3), 209–238 (2020). https://doi.org/10.1007/s00187-020-00303-2
8. Biddle, B.J.: Recent developments in role theory. Ann. Rev. Sociol. **12**(1), 67–92 (1986)
9. Williams, T.: How Digital Transformation Enables Modern Accounting (2020). https://www.blackline.com/blog/digital-transformation-enables-modern-accounting/

10. Sanad, Z., Al-Sartawi, A.: Investigating the Relationship between Corporate Governance and Internet Financial Reporting (IFR): evidence from Bahrain bourse. Jordan J. Bus. Adm. **12**(1), 239–269 (2016)

11. Burns, J., Baldvinsdottir, G.: An institutional perspective of accountants' new roles–the interplay of contradictions and praxis. Eur. Acc. Rev. **14**(4), 725–757 (2005)

12. Ciurea, M., Man, M.: The accounting profession from Romania in the digitized economy. In: 2nd International Scientific and Practical Conference "Modern Management Trends and the Digital Economy: from Regional Development to Global Economic Growth" (MTDE 2020), pp. 307–312. Atlantis Press, May 2020

13. Sanad, Z., Al-Sartawi, A.: Financial statements fraud and data mining: a review. In: Musleh Al-Sartawi, A.M., Razzaque, A., Kamal, M.M. (eds.) Artificial Intelligence Systems and the Internet of Things in the Digital Era. EAMMIS 2021. Lecture Notes in Networks and Systems, vol 239. Springer, Cham (2021). Doi: https://doi.org/10.1007/978-3-030-77246-8_38

14. Gartner: Definition of Digitalization - Gartner Information Technology Glossary (2020). https://www.gartner.com/en/information-technology/glossary/digitalization. Accessed 26 Mar 2021

15. Al-Sartawi, A.: The effect of corporate governance on the performance of the listed companies in the gulf cooperation council countries. Jordan J. Bus. Adm. **11**(3), 705–725 (2015)

16. Härting, R.C., Reichstein, C., Schad, M.: Potentials of digital business models-empirical investigation of data driven impacts in industry. Procedia Comput. Sci. **126**, 1495–1506 (2018)

17. Al-Sartawi, A.: Institutional ownership, social responsibility, corporate governance and online financial disclosure. Int. J. Crit. Acc. **10**(3/4), 241–255 (2018)

18. Järvenpää, M.: Making business partners: a case study on how management accounting culture was changed. Eur. opean Acc. Rev. **16**(1), 99–142 (2007)

19. Kpmg, A.G.: Wirtschaftsprufungsgesellschaft, Digitalisation in Accounting – Study of the Status Quo in German Companies (2020)

20. Al-Sartawi, A.: Assessing the relationship between information transparency through social media disclosure and firm value. Manag. Acc. Rev. **18**(2), 1–20 (2019)

21. Kumar, K.: Impact of digitalization in finance & accounting. J. Acc. Financ. Mark. Technol. **2**(2), 1–9 (2018)

22. Al-Sartawi, A.: Social media disclosure of intellectual capital and firm value. Int. J. Learn. Intellect. Capital **17**(4), 312–323 (2020)

23. Kumarasinghe, W.S.L., Haleem, A.: The impact of digitalization on business models with special reference to management accounting in small and medium enterprises in Colombo district (2020)

24. Moll, J., Yigitbasioglu, O.: The role of internet-related technologies in shaping the work of accountants: New directions for accounting research. British Acc. Rev. **51**(6), 100833 (2019)

25. Al-Sartawi, A.: Does it pay to be socially responsible? Empirical evidence from the GCC countries. Int. J. Law Manag. **62**(5), 381–394 (2020)

26. Möller, K., Schäffer, U., Verbeeten, F.: Digitalization in management accounting and Control: An editorial. J. Manag. Control **31**(1–2), 1–8 (2020)

27. Oschinski, M., Wyonch, R.: Future shock? The impact of automation on Canada's labour market. The Impact of Automation on Canada's Labour Market (March 16, 2017). CD Howe Institute Commentary (472) (2017)

28. Al-Sartawi, A., Sanad, Z.: Institutional ownership and corporate governance: evidence from Bahrain. Afro-Asian J. Financ. Acc. **9**(1), 101–115 (2019)

29. Ross, J.W., Beath, C.M., Sebastian, I.M.: How to develop a great digital strategy. MIT Sloan Manag. Rev. **58**(2), 7 (2017)
30. Schäffer, U.: Der Controller ist tot, es lebe das Controlling. Controller Mag. **3**, 52–53 (2017)
31. Alansari, Y., Al-Sartawi, A.: IT governance and E-banking in GCC listed banks. Procedia Comput. Sci. **183**, 844–848 (2021)
32. Schäffer, U., Weber, J.: Zukunftsthemen des Controllings. Controlling—Zeitschrift für erfolgsorientierte Unternehmenssteuerung **24**(2), 78–84 (2012)
33. Schäffer, U., Weber, J.: Controlling im Wandel—Die Veränderung eines Berufsbilds im Spiegel der zweiten WHU-Zukunftsstudie. Controlling—Zeitschrift für erfolgsorientierte Unternehmenssteuerung **27**(3), 185–191 (2015)
34. Musleh Al-Sartawi, A.M., Razzaque, A., Kamal, M.M. (eds.) Artificial Intelligence Systems and the Internet of Things in the Digital Era. EAMMIS 2021. Lecture Notes in Networks and Systems, vol. 239. Springer, Cham (2021)
35. Schäffer, U., Weber, J.: Die Digitalisierung wird das Controlling radikal verändern. Controlling Manag. Rev. **60**(6), 6–17 (2016). https://doi.org/10.1007/s12176-016-0093-9
36. Abdulrasool, F.E., Turnbull, S.I.: Exploring security, risk, and compliance driven IT governance model for universities: applied research based on the COBIT framework. Int. J. Electron. Banking **2**(3), 237–265 (2020)
37. Al-Sartawi, A.: Information technology governance and cybersecurity at the board level. Int. J. Crit. Infrastruct. **16**(2), 150–161 (2020)
38. Schäffer, U., Weber, J.: Der Controller verliert die Kontrolle. Frankfurter Allgemeine Zeitung, 16, March 26 (2018b)
39. Chauhan, N., Tekta, P.: Fraud detection and verification system for online transactions: a brief overview. Int. J. Electron. Banking **2**(4), 267–274 (2020)
40. Hannoon, A., Al-Sartawi, A., Khalid A.: Relationship between financial technology and financial performance. In: Musleh Al-Sartawi, A.M.A. (eds.) The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. Studies in Computational Intelligence, vol 974. Springer, Cham (2021). Doi: https://doi.org/10.1007/978-3-030-73057-4_26
41. Shihadeh, F.: Online payment services and individuals' behaviour: new evidence from the MENAP. Int. J. Electron. Banking **2**(4), 275–282 (2020)
42. Stefanovova, Z., Bartkova, H., Peterkova, J.: Evaluation of the effects of digitization in the process of accounting operations in a selected manufacturing company. In: SHS Web of Conferences, vol. 74, p. 02016. EDP Sciences. (2020)
43. Musleh Al-Sartawi, A.M.A. (ed.): The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. SCI, vol. 974. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-73057-4
44. Chayjan, M.R., Bagheri, T., Kianian, A., Someh, N.G.: Using data mining for prediction of retail banking customer's churn behaviour. Int. J. Electron. Banking **2**(4), 303–320 (2020)

Management Accounting in the Digital Era: Literature Review

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Abstract. The purpose of the paper is to provide a structure overview of literature for digitalization in the managerial accounting. This can serve as a basis for future research, and thus provide a framework for furthermore focused research questions. Papers published in prominent accounting journals during a 14-year period were scanned. These papers pertaining to the field of digitalization in the managerial accounting were categorized and analyzed in more detail and classified in accordance with selected dimensions. The review was focused on papers explicitly exploring the link between accounting and technology. This paper focused on the field of management accounting and its evolving nature in the fastmoving digital world. This literature review aims to shed light on the effects of digitalization on the well-established filed of management accounting.

Keywords: Digitalization · Managerial accounting · Enterprise resource planning · Big data

1 Introduction

Technological developments over the past 4 decades have impacted business processes drastically, leading to improved efficiencies in core processes such as production and marketing and supporting functions such as logistics and accounting. Within the accounting domain, management accounting has been a stable profession over the past few decades given the stability of information systems within organizations. However, the recent technological advances and increased competition have transformed business processes and information systems supporting organizational decision making. Among those affected processes are the managerial accounting processes. Traditional approaches for identifying, analyzing, interpreting, and communicating information to the various levels of management were established to help achieve business goals that have been disrupted by the availability of newer applications, which can process both internal and external information in fraction of time in comparison with traditional ways in which the accountants are used to produce their management reports, as in the past [18]. Competitive pressures mandate that management have access to current

operational and tactical comprehensive data along with analysis using technology to allow for quick remedial actions.

Digitalization in managerial accounting has gained attention in the early 2000, with the increased interest in technology in workplaces all over the world at that time, which has challenged and replaced the traditional approach to problem solving and decision-making techniques.

Management accounting has started in the early 19th century when businesses realized the need to be more efficient in their production system. Managerial accounting has been defined as "the practice of identifying, measuring, analyzing, interpreting, and communicating financial information to managers for the pursuit of an organization's goals" [8]. The main objective of managerial accounting is to help the managers to make better decisions on a daily basis. Along with changing operational processes satisfying a business needs, to make a shift in skills and talents possessed by the workforce. The shift should be from the manual paper-based analysis to the more technical, technology-based skills [4].

Digital transformation has led to improved organization performance through replacement of human workforce by more efficient technologies, which includes artificial intelligence machine-controlled processes for an example [27]. Nevertheless, this transformation has the potential to disrupt the management accounting domain [24]. As noted by [10], the digital transformation is forcing organizations to overhaul their processes to operate in a digital form to survive in highly competitive global economy. Digitalization is important for every sector and has been defined as "the use of digital technologies to change a business model and provide new revenue and value-producing opportunities; it is the process of moving to a digital business." These transformational changes have introduced opportunities to be capitalized on by businesses. Among these opportunities the availability of big data analytics that can support businesses in gathering external data for marketing and operational purposes [12]. These can be incorporated into business plans and be updated on regular basis. In addition, organizations can avail of latest applications including among others, Enterprise Resource Planning (ERP) [20].

In light of what has been mentioned above, it is necessary nowadays to evaluate the field of managerial accounting and its approaches within the era of digital transformation, and thereby suggest developing the intellectual capital needed to deal with it by training the human resources and conducting further research on the topic [33]. The purpose of the paper is to provide an evaluation through a structure overview of literature for digitalization in the managerial accounting. The literature review shall focus on several aspects in which digital era technologies and approaches effected management accounting starting from the education of management accounting.

The next sections will discuss the literature review in four aspects, first the education and the educational institutes views and initiatives in management accounting in the digital era, next it goes over the expectation reviewed in the literature regrading this field, then it will discuss the challenges mentioned in papers that were reviewed, after that, is an evaluation of the role of big data in management accounting in the digital era, and finally the conclusion were final reflections and further research suggestion are outlined.

2   Literature Review

2.1   Digital Management Accounting Academically

As with any field, the start of it evolves first from the educational institutions, by what they offer in terms of teaching and research, plus the ability of those institutions to keep up with the fast pace of change in the world. Several literature papers discussed the topic, all agreeing on the importance of incorporating digitization in managerial accounting. The weight of digitalization regarding management accounting research is growing as more realizations are met when it comes to information and data [2, 11, 21]. In such an investigation scene offering non-ending quantitative and qualitive research areas to be explored and investigated. Concerns discussed in the article highlights how first the interested parties will accept the transformation, which type of information will be included and who the organization will deal and analyze the huge amount of the data which will be generated from the digitalization process [45].

[1, 28] Reinforce the importance of a digitalized management accounting in educational institutions. It is vital that education institutions provide the knowledge and skills needed for the market demand, which means enriching the academic material and the training courses with digital technologies that aid accounting management. In this era, it is necessary not only to keep-up with tech applications in management accounting, but before hand to incorporate that in the education systems for future accountants. Moreover, Accounting & e-accounting education will benefit from the available technologies in many ways, one way is the electronic media, which makes it easier for the student and the teacher [28, 43].

It is apparent that improvement in this field has been accomplished, since older literature did not find the education systems consistent enough with up-to-date market requirements. For example, [7, 16, 32, 43] argues that accounting education is not compatible with the management accounting in practice, especially in the information technology the world is living. Therefore, the author focused on evaluating the statues of management accounting and discussed possibilities and actions to be taken in this era. The research was done using two methods. First. Analysis based on accounting and information technology literature. Second, an empirical study to provide a real-time evidence to back-up the literature, through conducting interviews with specialists and consultants in these field, plus a number of CFOs and CIOs. Findings state that in practice, there is not enough understanding for the need of technology development in management accounting, it might be because of managers do not fully comprehend or predict the future it represents in the year the paper was published back in 2007. The paper suggests that further research is required in the field of technology in managerial accounting. In addition, control in the organization cannot be separated from technology, as the author stated, because management would face less obstacles when facilitating technology in the organization.

2.2   Digital Management Accounting Expectations

The future predicts further advancement in all fields, and in an accelerating speed as well, has been seen during the fourth revolution and the digital era. Many papers were

published discussing the possibilities and the expectations of the future of management accounting. [15] Display the technologies influencing the present and forecasts of management accounting and auditing with the aim to represent the issues associated with technologies transforming these fields in areas of skill acquiring and future jobs. The necessity of technology and how already organizations are taking measures in preparing and implementing technology related aspects to the field are improve time management by limiting repetitive tasks, thus management accountant will have a better opportunity at preforming better, taking more of a consultant role which will enhance the social role played by the organization [14, 25].

Planning for digital transformation has an impact on governance system and its role in protecting the stockholders' interest [17, 19, 22]. Such planning must consider stakeholders' perception in a vertical structure, this includes stakeholders to have interests in the success or the failure of the organization, the top is shareholders and down at the bottom the average employee [27]. Mentioned that such mechanism is considered as applying the economic effects theories which is state that all would be replaced by automized machines gradually using Artificial intelligence. On the other hand, another form of expectation would be in the structure of businesses in all matters including how individuals interact within the organization. Another example is a paper examining accounting information quality in account agriculture process, where production was measured and components was identified in order to develop quality and sustainability in the organizational setting, this was done by analyzing the quality of account related decision-making and automized processes. The paper also aimed to construct an algorithm that would suit management accounting in agriculture organizations. These algorithms in the study were argued by the author to reduce a significant part of managerial work that will have a positive impact on the quality of managerial decisions [31].

Earlier papers seem to share similar expectations with more recent research as well, by overviewing previous literatures shed the light on the importance of technology and information in accounting and via e-accounting, that is to have a comprehensive accounting system that would benefit the decision maker. Findings concluded that Businesses has to either find ways to reduce costs nowadays to compete, or to use technologies of the digital era in their conduct and implementations. A published paper in 2012 stated that managerial accounting evolved together with the enterprises' development. Thus, it was necessary to reconsider permanently the existing information system so that it will include all the information that managers need in order to make economic decisions. Maintaining the traditional managerial accounting methods due to the changes imposed by the new manufacturing technologies in the current competitive environment, is inappropriate. Enterprises should adopt some improved methods in the digital economy that reflect the technology advances which is needed to sustain in future [2, 26, 34].

2.3   Digital Management Accounting Challenges

While the majority are optimistic about the digital era outcomes and the technology advancement in managerial accounting fields [9]. Nonetheless, experts also declare the existence of some challenges and they are present at the moment, and many papers

outlined these challenges and had given suggestions and ways to overcome them. In an editorial reviewing the advancement in management accounting by considering digitization and examining the role it plays in the conducting and controlling the accounting systems, the authors suggest that there is not sufficient research and published articles regarding the subject of digitization in finance and accounting fields [24]. The authors believe that a mix of human judgement and technology that is data driven is required to achieve business success, even more evidently during the Covid-19 pandemic, where the need for atomization is more of a necessity rather than luxury. The potential for digitization is transforming for field of management accounting and finance. However, some challenges remain in technology in management accounting processes and analytical skills are required. In addition, defining the digital incorporated systems in reporting, process, and structure. Finally, the downsizing in finance and accounting department, was viewed to be a challenge for some organizations as well, because organizations as were expected well have more work that will be carried out by machines and technology systems [24].

In the prospect of viewing the challenges developing from digitalization, a review of existing literature work in fields of management accounting and related topics was done to distinguish and provide the actual status of this field in a technology age. It was found that digitalized business conduct along with the state of the economy lead to a better realization of the importance on intangible assets and underlying system evaluation by including ratings given by the related organizations and the ranking were a business stand. The use of big Data and its technologies is to improve the management accounting systems, this is also true for IT expertise, where these two skills are said to be the partners by the author in relation to managerial accounting and finance professions [12, 13, 37, 40].

It is also perceived in a paper discussing technologies impact in management accounting. In which the authors provide an overview of organizations that choose to adopt a more of a technology-based approaches in management accounting versus those who remain with their traditional approaches, and what it takes to survive in this highly competitive field. It also aimed to display applications of modern information systems such as Enterprise Resource Planning technologies (EAR) and it influences on accounting. In addition to studying the relations between management accounting systems and the firms' productions and learnings. It was realized by digging for information and conducting some analysis of previous research done on this topic, that a number of challenges do arise from the transformation process. It can be summarized in few points. First, organizations in today's digital era are compelled to keep pace with the advances in technology to succussed. Secondly, in the realization that management alone is not sufficient in overviewing the organization environment, the paper then suggests some solutions to these challenges by developing a system to aid management in defining problems, identifying organization objectives, come up with possible solutions, execution, and finally evaluation and control [20, 32, 42].

To further examine the challenges that occur, and management accountant must face, it is the next paper that would shed some light on the topic by outlining some resemblances and variations in information regarding managerial accounting [29]. The Author interest in viewing all technology revolution through time and

examining the impacts of such fast-paced advancements in the form of sufficient information for the decision maker. It states that the relationship between digital transformation and managerial accounting is yet to be clarified, however, the effect is far from perfect or ideal. The author believes that one must consider the fact that digitalization is more difficult in practice and that to realize that much more efforts are needed to make technology tools and systems more of an aid to the decision maker, and only then the growth in management accounting would be achieved and recognized.

2.4 The Role of Big Data

Nowadays, the term "big data" is used frequently at any business dialogue, many believing it to be one of the most important factors in this digitized era. There are predictions that by 2021 information will be processed much faster and IP traffic would get to 3.2 ZB in a year, which means that number of devices contended will triple [30]. Management accounting is one field which was viewed to benefit from big data technologies in an enabled environment created by the digital era. Newer published research papers are now almost always mentioning "big data" or data science while discussing topics such as the advancement of managerial accounting the digital era [6]. This implied how big data and digitalization go hand in hand together.

The connection between management accounting and digital technologies (machine learning, information systems and big data) impacts the ways and methods followed by a management accountant in controlling and monitoring the different managerial process conducted by the management or any third parties [3, 5, 17, 38]. Digital technology does have a significant influence on shifting the role of a management accountant into a more of a competitive profession, by creating a specific specialized role for the management accountant [35, 41]. It also affects the expectations of a management accountant in an organization. It even plays a role of highlighting the identity of those in this position that can lead two different paths, where on the one hand, technologies save up time and energy and the management accountant is freer to take other roles of researching or innovating, on the other hand, some in these positions might take the role of doing repetitive tasks and actions still [3].

As with another paper findings that highlight the role of Big Data. The paper purpose was formed from the need for financial and accounting methods to transform parallelly with transformation in conduct of business due to cognitive and big data technologies. The author proposes a model that would evaluate the current set of skills of managerial accounting professionals. It also aims to fill the literature gap in three aspects which are future of management accounting in digitization, research of labor market, and the required skills of a management accountant model. Using a quantitative approach by analyzing labor market and taking into consideration differentiation in GDP, ICT incorporation and geography across five different Countries- USA, Canada, Poland, UK and Ukraine. It displayed in its findings the accelerating change due to technology advances and how it is changing demands in the labor professions including accountant professions. Moreover, it was discovered that different countries require different level of labor expertise. For example, developed countries such as USA require a more cognitive, while other countries such as Poland and Ukraine require less and more basic managerial accounting skills. Finally, the proposed model

was argued by the author to serve users in practice for enterprises and educational institutions, in addition to provide as road map for technology development for managerial accounting using big data analytics [28].

[12] insists on the importance of inquiring skilled professionals in big data, analytics of data, and IT knowledgeable personnel. This is because otherwise a knowledge of management accounting and finance is not enough in a firm to prosper and flourish in this technology-based era. Moreover, management accounting professionals require to relocate their focus on delivering information on costs with other relevant information, to focus on how to take actions, and to protect the data from any cyberattack, thus to support the decision makers of the business and further provide all needed information in a speedy manner, or else, the growth of the business will be in risky position, and what better way than technology and data science to achieve that goal [16, 39, 44]. It is claimed that to succeed in the digital era driven by the fourth revolution, all management accounting professions will require a level of mastery and skill acquisition, these new skills are to be more common among most fields and are forever evolving. Examples of these skills are big data, data science and data structure, data governance, information system analytics, machine learning, automized systems and Artificial intelligence. It would be more beneficial to combine these examples with the expertise in business, accounting, and finance to upscale the old traditional methods to a flourishing financial reporting [21, 23, 36].

The combination of these new era skills with traditional skills would be any forward thinker decision-maker dream. On the one hand an accounting and finance background would help fully understand the fundamentals and the concepts and is the final objective required. However, on the other hand, the latest technologies would serve as the tools to achieve these goals and objectives in the more efficient, optimized, and timely manner, that would ensure the business remains relevant. It is believed to be the future of management accounting as unitedly agreed upon in the literature.

3   Conclusion

In conclusion, we believe that digitalization advances have created an environmental upheaval for businesses with opportunities as well as some limitations to the well-being of organizations. Success of organizations depends on many factors and among these is availability of accurate and updated management accounting analysis. Given the demands mandated by the technological changes, organizations can only meet their objectives if they can adapt to the new paradigm of the digital world. Organizations must be versatile and forward thinking to maintain their position as a going concern in the future.

This study has discussed the main aspects of digital management accounting including the present stage of improvements in this field and the possibilities of the future of the management accounting. While many authors believe that sticking with the traditional approaches is no longer enough to survive this competitive field. It is also important to recognize that digitalization is actually more difficult in practice and needs more efforts to get the maximum benefit from the new digital tools. These tools

would achieve any firm's goals in the more efficient, optimized, and timely manner method. For that, many firms started inquiring skilled professionals in big data and data analytics and, preferably, with IT background as a result.

The current state of literature in this topic had no conflicts nor contradictions, many agree on the fact that the combination of these new era skills with traditional skills would be any managerial accounting dream to be a successful decision maker in the field. However, future research could be based on identifying the new scope of managerial accounting job. A qualitative research could be conducted to compare between the performance of digitalized accounting manager (who is equipped with the new era skills) and traditional accounting manager who work hand in hand with someone specialized in IT and data analytics. In addition, more research could be conducted to analyze the mindset of managers in the management accountant fields, and how does this align with their implementing's, by segregating managers from the different generations in the workforce (Baby boomers, X, Y, and Z generations). Such research would shed the light in the priority taken by organizations, a more status evaluations of firms in the region, and the importance of developing the professional skills or creating new roles to work together.

References

1. Güney, A.: Role of technology in accounting and e-accounting. Procedia-Soc. Behav. Sci. **152**, 852–855 (2014)
2. Bhimani, A.: Digital data and management accounting: why we need to rethink research methods. J. Manage. Control **31**(1–2), 9–23 (2020). https://doi.org/10.1007/s00187-020-00295-z
3. Andreassen, R.-I.: Digital technology and changing roles: a management accountant's dream or nightmare? J. Manage. Control **31**(3), 209–238 (2020). https://doi.org/10.1007/s00187-020-00303-2
4. Karolak, M., Razzaque, A., Al-Sartawi, A.: E-services and M-services using IoT: an assessment of the Kingdom of Bahrain. In: Musleh Al-Sartawi A.M., Razzaque A., Kamal M.M. (eds.) EAMMIS 2021. Lecture Notes in Networks and Systems, vol. 239, pp. 523–533. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-77246-8_48
5. Sanad, Z., Al-Sartawi, A.: Financial statements fraud and data mining: a review. In: Musleh Al-Sartawi, A.M., Razzaque, A., Kamal, M.M. (eds.) EAMMIS 2021. Lecture Notes in Networks and Systems, vol. 239, pp. 507–414. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-77246-8_38
6. Alansari, Y., Al-Sartawi, A.: IT governance and E-banking in GCC listed banks. Procedia Comput. Sci. **183**, 844–848 (2021)
7. Granlund, M.: On the interface between management accounting and modern information technology-A literature review and some empirical evidence. Available at SSRN 985074 (2007)
8. Atkinson, A.A., Kaplan, R.S., Matsumura, E.M., Young, S.M.: Management accounting: Information for decision-making and strategy execution, student value edition (2011)
9. Hannoon, A., Al-Sartawi, A., Khalid A.: Relationship between financial technology and financial performance. In: Musleh Al-Sartawi, A.M.A. (eds.) The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. SCI, vol. 974, pp. 337–344. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-73057-4_26

10. Gartner. Definition of Digitalization - Gartner Information Technology Glossary (2020). https://www.gartner.com/en/information-technology/glossary/digitalization. Accessed 20 Mar 2021

11. Musleh Al-Sartawi, A.M., Razzaque, A., Kamal, M.M. (eds.) Artificial Intelligence Systems and the Internet of Things in the Digital Era. EAMMIS 2021. Lecture Notes in Networks and Systems, vol. 239. Springer, Cham (2021)

12. Heinzelmann, R.: Digitalizing management accounting. In: Controlling–Aktuelle Entwicklungen und Herausforderungen, pp. 207–226. Springer Gabler, Wiesbaden (2019)

13. Gupta, M., Sikarwar, T.S.: Modelling credit risk management and bank's profitability. Int. J. Electron. Banking **2**(2), 170–183 (2020)

14. Al-Sartawi, A.: Does it pay to be socially responsible? empirical evidence from the GCC countries. Int. J. Law Manage. **62**(5), 381–394 (2020)

15. Kruskopf, S., Lobbas, C., Meinander, H., Söderling, K., Martikainen, M., Lehner, O.: Digital accounting and the human factor: theory and practice. ACRN J. Financ. Risk Perspect. **9**, 78–89 (2020)

16. Lawson, R., White, L.R.: Mmaintaining relevance in-the digital age: in the face of technological change, the management accounting profession needs to refocus on providing actionable cost information to support internal decision making–or risk becoming obsolete. Strateg. Financ. **99**(10), 26–32 (2018)

17. Al-Sartawi, A.: The effect of corporate governance on the performance of the listed companies in the gulf cooperation council countries. Jordan J. Bus. Adm. **11**(3), 705–725 (2015)

18. Manea, D.: The evolution of managerial accounting. Rev. General Manage. **16**(2), 226–231 (2012)

19. Al-Sartawi, A.: Corporate governance and intellectual capital: evidence from gulf cooperation council countries. Acad. Acc. Finan. Stud. J. **22**(1), 1–12 (2018)

20. Moghadam, S.K., Tayebtaher, E., Onsori, N.: Analysis of information new technologies effect in management accounting. Int. J. Sci. Manage. Dev. **5**(7), 297–303 (2017)

21. Musleh Al-Sartawi, A.M.A. (ed.): The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. SCI, vol. 974. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-73057-4

22. Abdulrasool, F.E., Turnbull, S.I.: Exploring security, risk, and compliance driven IT governance model for universities: applied research based on the COBIT framework. Int. J. Electron. Banking **2**(3), 237–265 (2020)

23. Sanad, Z., Al-Sartawi, A.: Investigating the relationship between corporate governance and internet financial reporting (IFR): evidence from Bahrain Bourse. Jordan J. Bus. Adm. **12**(1), 239–269 (2016)

24. Möller, K., Schäffer, U., Verbeeten, F.: Digitalization in management accounting and control: an editorial. J. Manage. Control **31**(1–2), 1–8 (2020). https://doi.org/10.1007/s00187-020-00300-5

25. Al-Sartawi, A.: Institutional ownership, social responsibility, corporate governance and online financial disclosure. Int. J. Crit. Acc. **10**(3/4), 241–255 (2018)

26. Al-Okaily, A., Abd Rahman, M.S., Al-Okaily, M., Ismail, W.N.S.W., Ali, A.: Measuring success of accounting information system: applying the DeLone and McLean model at the organizational level. J. Theor. Appl. Inf. Technol. **98**(14), 2697–2706 (2020)

27. Oncioiu, I., Bîlcan, F.R., Stoica, D.A., Stanciu, A.: Digital transformation of managerial accounting-trends in the new economic environment. EIRP Proc. **14**(1) (2019)

28. Pilipczuk, O.: Toward cognitive management accounting. Sustainability **12**(12), 5108 (2020)

29. Quattrone, P.: Management accounting goes digital: Will the move make it wiser? Manage. Acc. Res. **31**, 118–122 (2016)

30. Riddle, C.: The importance of big data and analytics in the era of digital transformation (2018)
31. Tomilova-Yaremchuk, N.O., Khomovyi, M.M., Khomovyi, S.M., Makarchuk, O.G.: The formation of effective accounting information for managerial decision-making in agricultural enterprises. Financ. Credit Act. Prob. Theory Pract. **4**(31), 230–238 (2019)
32. Al-Okaily, M., Alqudah, H., Matar, A., Lutfi, A., Taamneh, A.: Dataset on the acceptance of e-learning system among universities students' under the COVID-19 Pandemic Conditions. Data Brief **32**, 106176 (2020)
33. Al-Sartawi, A.: Social media disclosure of intellectual capital and firm value. Int. J. Learn. Intellect. Capital **17**(4), 312–323 (2020)
34. Shihadeh, F.: Online payment services and individuals' behaviour: new evidence from the MENAP. Int. J. Electron. Banking **2**(4), 275–282 (2020)
35. Chauhan, N., Tekta, P.: Fraud detection and verification system for online transactions: a brief overview. Int. J. Electron. Banking **2**(4), 267–274 (2020)
36. Al-Sartawi, A., Sanad, Z.: Institutional ownership and corporate governance: evidence from Bahrain. Afro-Asian J. Financ. Acc. **9**(1), 101–115 (2019)
37. Al-Okaily, A., Al-Okaily, M., Ai Ping, T., Al-Mawali, H., Zaidan, H.: An empirical investigation of enterprise system user satisfaction antecedents in Jordanian commercial banks. Cogent Bus. Manage. **8**(1), 1918847 (2021)
38. Chayjan, M.R., Bagheri, T., Kianian, A., Someh, N.G.: Using data mining for prediction of retail banking customer's churn behaviour. Int. J. Electron. Banking **2**(4), 303–320 (2020)
39. Al-Sartawi, A.: Information technology governance and cybersecurity at the board level. Int. J. Crit. Infrastruct. **16**(2), 150–161 (2020)
40. Memdani, L.: Demonetisation: a move towards cashless economy in India. Int. J. Electron. Banking **2**(3), 205–211 (2020)
41. Al-Sartawi, A.: Assessing the relationship between information transparency through social media disclosure and firm value. Manage. Acc. Rev. **18**(2), 1–20 (2019)
42. Al-Okaily, A., Al-Okaily, M., Shiyyab, F., Masadah, W.: Accounting information system effectiveness from an organizational perspective. Manage. Sci. Lett. **10**(16), 3991–4000 (2020)
43. Musleh Al-Sartawi, A.M.A.: E-Learning improves accounting education: case of the higher education sector of bahrain. In: Themistocleous, M., Papadaki, M., Kamal, M.M. (eds.) Information Systems. EMCIS 2020. Lecture Notes in Business Information Processing, vol. 402, pp. 301–315. Springer, Cham (2020). https://doi.org/10.1007/978-3-030-63396-7_20
44. Ameen, N., Tarhini, A., Shah, M.H., Madichie, N., Paul, J., Choudrie, J.: Keeping customers' data secure: a cross-cultural study of cybersecurity compliance among the Gen-Mobile workforce. Comput. Hum. Behav. **114**, 106531 (2020)
45. Venkatesh, V., Thong, J.Y., Xu, X.: Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology. MIS Q. **36**(1), 157–178 (2012)

Digital Entrepreneurship Roadmap: An Interview with a Serial Digital Entrepreneur

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Abstract. Digital-based enterprises have been growing tremendously throughout Malaysia but digital entrepreneurs struggle to maintain long-term sustainability. The purpose of this interview was to explore the experience of a serial digital entrepreneur in developing long-term sustainability strategies for his businesses. The narrative inquiry design will be used as a framework to learn about the serial digital entrepreneur's experience through storytelling in the Malaysia fintech industry. The interview sought to understand leading strategies to digital-based enterprises sustainability and provide a road map to help lead other digital entrepreneurs in the right direction of continued success.

Keywords: Digital entrepreneur · Sustainability strategies · Interview · Fintech startups

1 Introduction

Entrepreneurship is a long-established discipline. With the advent of information technology era, there are new terms created for entrepreneurship such as technopreneurs and digital entrepreneurs [9]. Both are used to describe individual whose business are relevant to digital technology and are always used interchangeably [16].

Research have shown that digital-based enterprises supply valuable contributions to local economies, and an increase in entrepreneurial activities is associated with quicker local economic expansion [9]. These enterprises create job opportunities, and open economic pathways for economically challenged communities. The value of digital-based enterprises appears to benefit communities within various avenues. Nevertheless, digital-based enterprises growth has sustainability struggles to strengthen [1]. Clearly, an understanding of the experience of digital entrepreneur and the development of strategies for long-term sustainability is very important to practitioners as well as academicians [5]. Moreover, this topic is a growing interest today among academicians and practitioners [13].

An interview with Mr. John Doe (pseudonym) is conducted to gain personal insight on the leading strategies to digital-based enterprises sustainability as well as seek his advice in providing a road map to help lead other digital entrepreneur in the right direction of continued success. Pseudonym is used to protect the privacy of the

interviewer. Mr. John Doe is a Malaysian Chinese. He is the co-founder of a public listed fintech company and is currently partners of a few fintech startups.

We began our interview by reflecting on his personal entrepreneurial experience. We have much to learn from his deep experience, and his insights into the field of digital entrepreneurship. Mr John Doe has a unique perspective, being a serial entrepreneur in fintech industry, and we were interested to know what are the success factors that built his empire in those early days. As more individuals attempt to join the digital entrepreneurial landscape and the academic field continues to grow, what can we learn from his experience? Mr John Doe has identified three factors to success: a good business model [18], relevant knowledge and skills [6], and strategic partnership [12]. This is consistent with the previous studies findings.

We then discussed the opportunities and challenges in establishing and maintaining a sustainable business model within the context of fintech industry. He is very optimistic and positive about the future of digital entrepreneurship within the Malaysian Fintech context. He goes on to identify two key challenges that are unique to digital entrepreneurs: managing talents [11] and managing customer expectation [12].

Finally, we concluded the interview by discussing the implications of the interview which may help novice entrepreneurs in the entrepreneurial journey. Mr. John Doe emphasized the importance of business model, collaboration and strategic partnership [5]. Novice entrepreneurs have to draw on each other's strength and cooperate to grow their business efficiently. The ability to leverage partner resources, subject matter expertise and innovation in vital in ensuring the sustainability of the business [4].

2 Entrepreneurial Experience

Wei Ying Chong (WYC): You've successfully co-founded a public listed company, and is currently running a few fintech startups. Would you like to share with me your experience on starting your own business?

John Doe (JD): In year 2000, I started a software business together with my 2 colleagues. All of us were software engineers back then. We identified a gap in the market and we were confident that we can make money from it. We discussed about it and formed our partnership in the hostel we stayed.

I was just a minority shareholder since I don't have much capital. I worked as the marketing representative and software engineer for the company. The business is mainly about integrating e-commerce securities trading solutions to local stock broking firms and banks. The business is doing well and is currently listed on Bursa Malaysia.

I had been running the business together with my partners for about 18 years, and we have had a lot of teething problems. Thus, I decided to sell my share and retired in my late 40s. Initially, the retirement is fun. However, after sometime I got bored. Another group of friends have invited me to be their business partners. They felt that it is such a waste for me to retire at such a young age. I can utilize my knowledge, skillsets and network to thrive the startups. My wife also encourages me to restart my entrepreneurial journey with my friends. I may live up to the 70s, and am too young to be retired in the 40s. That's how I ended up starting my current companies. I became a

major shareholder in these new companies, with the money I got from selling my shares of the previous company.

The fintech industry in Malaysia has grown significantly over the years [10]. With the funding and incentives from the government, the number of fintech companies have been expanding impressively. This has created lots of business opportunities for my companies.

I am running a few fintech startups concurrently with different business partners.

These businesses have synergy effects with each other. I have improvised my business model based on previous experience. I am actively streamlining the supply-side activities to maximize customer value and gain a competitive advantage in the marketplace. I am providing my clients a spectrum of services that cover every aspect of the capital market under one solution. Most of my clients are local stock broking firms and investment gurus.

Currently the market has only 3 software companies that are providing services which integrates e-commerce securities trading solutions into local stock broking firms and banks. My previous company was using 2000 technology while a competitor was using 1994 technology. My company is using 2015 technology which is more stable and user friendly.

3   Opportunities and Challenges

WYC: How would you describe digital-based business start-up opportunities for. Malaysians?

JD: I think timing [8] and business model [3] is important. Since 2000, the Malaysian Government has been actively promoting digital-based companies. Various funding and incentives are available to help digital startups to thrive. My first company was listed in Bursa merely after 5 years of establishments. We grew very fast not only because of the right timing – our innovative business model, different from conventional business, has played a role in our success too.

Technical knowledge and skillsets [2] are very important as well. There are many opportunities out there for grabs, for the entrepreneurs with the right skillsets and knowledge. We have had a smooth start since all of our partners are well versed in software and programming. I wouldn't say that it is impossible to start a digital business without technical knowledge and skillsets, but it is definitely a challenge for those without the relevant expertise. It is daunting to deal with the employees and relevant stakeholders if you have no relevant knowledge.

Usually, tech companies' founders in Malaysia are also the programmers for the system used. A constant update is required in order to stay competitive in the market. Newly recruited programmers can maintain the current system well but many of them lack of the passion and innovative spirit to improve the system. It is not easy to build an efficient team that is similar-minded to the founders.

WYC: How would you describe your status as a digital entrepreneur in business for the past 3 years?

JD: I would say we are doing very good for the past 3 years. The stock market is highly volatile and vibrant during the pandemic. My competitors' platforms cannot

cope with the market volume and speed. Their existing customers are complaining. My company's system and platform help them to solve the problems by providing a better solution. We have spent a lot of time to enhance our software, to provide affordable solutions to our customers. We provide integrated services to our customers, with solutions covering most of the complex aspects of the stock broking firms.

We provide a complete package of design, programming, hardware, and software. We also provide consultancy services and related activities, as well as management of investment properties and software for the customers. Our principle is that we will take care of everything, from A to Z, with payments from customers.

The current pandemic has speeded up the adoption of digital technologies [17]. Many stock-broking firms which used to allow their customers to fill in manual forms are now getting their customers to go digital. This has created numerous business transactions online, which is good for our business. Among all my companies, the top performer is the cyber security company. A lot of customers who used to have a wait and see approach are contacting us, to explore options and to seek advice from us, on how to protect their companies' cyber space and digital platform.

WYC: I am very curious as to your secret to success. Would you mind sharing with us?

JD: As a businessman, I believe that we must "Dài rén yǐ chéng" (sincerity in dealing with people). I always let my customers know that I will earn a fee with the solution provided. I will try my best to help them to maximize their operation's efficiency with a reasonable cost. Money does not fall from the sky for my customers. It is important to help them to minimise their cost while providing them the most effective solutions.

Customer relationship is the most important element in ensuring business success [4]. It is not just the technical knowledge you have or the efficacy of your software package – delivery is also important. You must always keep your promise. You need to deliver on the promises you made.

Let me share with you about a project I did with a client. When I bid the project, I was aware that I do not have the inhouse expert for the project. I got the bid. Rather than squeeze my own team and deliver a sub-standard project, I decided to outsource external experts. Although I made lesser profit, I earned the respect from customers and gained the knowledge and intellectual property of the particular software package. I can earn future revenue via selling the same software package to different customers. Up-to-date, I have managed to recruit 10 customers to use that particular software package. In a way, it has compensated what I didn't make in the first deal. Actually, I have earned more than I expected.

Also, there are always recurring business via modification of the original software. Reputation is very important in business. Is never about making money in the first deal. With a good word of mouth, customers will introduce customers. Recuring business is more important than one time off business deals. The most important thing in the business is the first deal. The comments and the rapport of the first deal will decided the survival of the business.

WYC: Did you experience any difficulties in the Malaysia business environment?

JD: Off course, I have. Financial resources [14] and recruitments [7] are always a problem. My capital is tight since I have to run a few companies concurrently. Thus, I

am partnering with a few investors in running the companies. Indeed, I have many keen investors want to invest into my businesses. I only chose those trusted partners. There are a lot "Dà è" (predators) out there. They might cannibalize my business. I have to be careful.

The pressing issue is actually talent acquisition [7]. It is not easy to get talented employees. I have headhunted some employees from other companied but they are not performed in my company. They have lack of self-discipline and I have to monitor them closely for work. For those who cannot perform, I have to asked them to leave.

It is very difficult to get passionate and committed talents [7]. My first companies started with only 5 people and make it to the Bursa within a 5 years period. It was all because we were passionate and committed. My current companies are yet to have many passionate and committed talents. The working hours in IT industry is very long. We normally work from 9 am till midnight. I still remember that I always camp in office with other founders in my early business days. The business environment was very competitive and still is.

When I first started my business 18 years ago, the time when I am still single, my then girlfriend now wife always cook for us in the office. We were all passionate and enthusiastic to growth the business.

The third challenges I encountered is from my customers [4]. Although I have only charge them a very reasonable fees, they are still kept on asking for more discounts. Nevertheless, this is not a big problem since I can always earn the revenue from recurring and subsequent sales.

WYC: Has there been moments when you feel discouraged in your business? Can you tell us the causes, and also how you overcame it?

JD: My previous partner has frustrated me when he decided to bring in his children who have neither relevant knowledge nor experience into the management team. I think it is bad to the company in the long run. There are a few big software companies in Malaysia such as MCSB, Fatimas, CSA and so on and so forth. Many of them are wipe out because of unprofessional management. The successors have neither the relevant technical background nor experience. They are unable to compete in the market and eventually wipe out from the market. Since I am unable to change his mind, I left and run my own business.

In current business, whenever I have problems, I will discuss with friends and wife. The main matter that frustrated me is mostly internal and employees related. It is always a challenge to manage employees and recruit talented employees [7].

4   The Business Sustainability Roadmap

WYC: Do you have any special strategies that you utilized to keep your business sustaining?

JD: The business must be run by talents not family members. A good example is Microsoft. Company must run and manage by talents and be performance oriented. We have to learnt from the experts and be open minded. Fintech industry is evolving and changing very fast. Is important to keep on learning.

Human plays a main factor in business sustaining [7]. It is very easy to recruit IT graduates and programmers but is not easy to recruit committed talents. Attitude is more important than academic achievement. I always get the interviewees to complete some hand on task during the interview sessions.

Business modal is important to ensure the business sustainability [3, 5]. We must differentiate ourself from the conventional business model. Rather than charge a one time off fees or annual maintenance fees, I am currently adopting a pay as per use model. The charges are based on usage. The bigger the volume the better the revenue.

I am also currently working with a few investment gurus in developing learning platform for their students. Each student has to pay us RM70 – RM80 per month for the terminal usage. One of the investment gurus has subscribed RM80 terminal for his students and he has 1000 students. Every month easily, we can have RM80000 income from just one customer.

WYC: What are some valuable insights you have gained from running your business, and would like to share with young people looking to start their own businesses?

JD: Collaboration and strategic partnership which allow each partner to draw on each other's strength is important for business growth [5]. Nevertheless, good partners don't come naturally. A significant amount of time, energy and resources have to be spent in the beginning of the collaboration to gain mindshare and commitment. If consensus and agreement are unable to achieve in the beginning stage of partnership, we should just be frank and change the strategy or the partner.

In today competitive business world, we must have strategic partners [4]. We cannot work in silo. The ability to leverage partner resources, subject matter expertise and innovation ensure the sustainability of the business. I strongly encourage young people to do networking and socializing in all sort of occasions. Meeting new people can always bring fresh perspectives to business.

Aside of strategic partnership, business model is also important. Business can only sustain with the right business model and committed partners. As entrepreneur, we must roll up our sleeves and get to work persistently and creatively.

5   Conclusion

As we think about this interview and its implications, an important starting point may be John's concern about the important of a good business model [18], relevant knowledge and skills [6], and strategic partnership [12] for digital startups. To John, digital entrepreneurial venture is neither a lone wolf venture nor an isolated phenomenon [4]. It is rather a catalyst moving all businesses in the direction of shared value and strategic planning [18].

In thinking about the challenges pose for digital entrepreneurs, we may take it as a point of departure from John's own experience in his serial entrepreneurial ventures, a few fintech startups. As he admits in the interview, there are many opportunities out there to grab for the entrepreneurs with the right skillsets and knowledge [10]. However, it takes years to harness the required technical skillsets and knowledge. Furthermore, it is neither easy to recruit nor trained a committed talents [11]. If we connect

these requirements to the educational idea that we may need a portfolio of courses or curriculums to deal with talent's problems in digital entrepreneurship landscape. As a result, we could begin the conversation by mapping out what kind of institutions we could include in this change. It showed that there is an opportunity to broaden business school management and curricula as well as the digital entrepreneurship research landscape [9].

As we reflect on this interview, we think that digital entrepreneurship can reshape Malaysia's SME sector from multiple and critical perspectives [10]. Digital entrepreneurship indeed has a crucial role to play in this age of 4th Industrial Revolution (IR4. 0). Digital entrepreneurship certainly gives us a platform to advance new conversations in the classroom and beyond about how the social can become more entrepreneurial and tech savvy [9].

The covid 19 has accelerated the rise of digital entrepreneurs [17]. While many conventional entrepreneurs feel limited in this pandemic era, many digital entrepreneurs with innovative delivery models will find more secure revenue streams [9]. As we move digital entrepreneurship forward, it seems that John's ideas give us a narrative of how business is experienced and lived every day. If the business plan is well founded and solidly built, it is time to bring the business plan off the page into practice. The startup process is certainly hefty and lengthy, but often necessary to deliver innovation to a wider market share [9]. While opportunities may abound for the digital entrepreneur, market will not see the quality benefits of digital innovation unless good plans are put into practice effectively. If you have a good plan, the time to dig in is now.

References

1. Ajagbe, A.M., Choi, S.L., Aslan, S.A., Ismail, K.: Investment in technology based small and medium sized firms in Malaysia: roles for commercial banks. IRACST – Int. J. Res. Manage. Technol. **2**(2), 147–153 (2012)
2. Antonizzi, J., Smuts, H.: The characteristics of digital entrepreneurship and digital transformation: a systematic literature review. In: Conference on E-Business, e-Services and e-Society (2020)
3. Bican, P.M., Brem, A.: Digital business model, digital transformation, digital entrepreneurship: is there a sustainable "digital"? Sustainability **12**(13), 5239 (2020)
4. Edwards, D.S.: The Digital Economy: A Look at the Integration of Strategic Entrepreneurship and Innovation in Digital Start Ups. Auckland University of Technology (2020)
5. Elia, G., Margherita, A., Passiante, G.: Digital entrepreneurship ecosystem: how digital technologies and collective intelligence are reshaping the entrepreneurial process. Technol. Forecast. Soc. Change **150**, 119791 (2020). https://doi.org/10.1016/j.techfore.2019.119791
6. Ladeira, M.J.M., Ferreira, F.A.F., Ferreira, J.J.M., Fang, W., Falcão, P.F., Rosa, Á.A.: Exploring the determinants of digital entrepreneurship using fuzzy cognitive maps. Int. Entrepreneur. Manage. J. **15**(4), 1077–1101 (2019). https://doi.org/10.1007/s11365-019-00574-9
7. Foung, W.-T.Y., Yeh, Y.-S., Jaw, B.-S. Talent management model in digital age: strategic internal entrepreneurial mechanism. In: 8th International Conference of Entrepreneurship and Business Management, Untar (2020)

8. Göcke, L., Meier, P.: Development and validation of platform businesses in digital entrepreneurship. In: Soltanifar, M., Hughes, M., Göcke, L. (eds.) Digital Entrepreneurship. FBF, pp. 87–102. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-53914-6_5
9. Hosu, I., Iancu, I.: Digital Entrepreneurship and Global Innovation. IGI Global (2016)
10. IMoney, E.: Raising Technopreneurs in Malaysia. IMoney Learning Centre. https://www.imoney.my/articles/raising-technopreneurs-in-malaysia (2014)
11. Jamil, N.N., Seman, J.A.: The impact of fintech on the sustainability of Islamic accounting and finance education in Malaysia. J. Islamic Soc. Econ. Dev. **4**(17), 74–88 (2018)
12. Lee, I., Yong, J.S.: Fintech: ecosystem, business models, investment decisions, and challenges. Bus. Horiz. **61**(1), 35–46 (2018)
13. Paramasivan, C., Selladurai, M.: Technopreneurship education: teach and train the youths. Asian J. Manage. **8**(4), 1173–1176 (2017)
14. Saldi, S.B.M.: The Funding Landscape Among Technopreneurs in Malaysia. Universiti Tun Abdul Razak (2015)
15. Masenya, T.M.: Technopreneurship development: digital strategy for youth self-employment in the digital economy. In: Handbook of Research on Management and Strategies for Digital Enterprise Transformation, pp. 443 (2021)
16. Venkatesh, K.A., Pushkala, N.: Digital entrepreneurship: the technology deployment in internationalization speed in the digital entrepreneurship era and opportunities – Tirumala Tirupati Devasathanam (TTD). Int. J. Recent Trends Bus. Tour. **2**(4), 39–42 (2018)
17. Zahra, S.A.: International entrepreneurship in the post Covid world. J. World Bus. **56**(1), 101143 (2021). https://doi.org/10.1016/j.jwb.2020.101143
18. Zarrouk, H., El Ghak, T., Bakhouche, A.: Exploring economic and technological determinants of FinTech startups' success and growth in the United Arab Emirates. J. Open Innov. Technol. Market Complex. **7** (2021)

The Role of Artificial Intelligence in Entrepreneurship

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Abstract. The study discusses the role of entrepreneurship and artificial intelligence (AI) in creating new products and their contribution to reshaping the future of economic growth, and identify also the administrative aspect to support and spread the culture of entrepreneurship, which contributed to the launch of a number of innovative projects, which led to the emergence of a number of innovations and the emergence of other projects that serve the orientation of countries to achieve economic development, and the results showed that both artificial intelligence and entrepreneurship have become a pillar of change that works to make a change. An ambition in the traditional and progressive business scene.

Keywords: Artificial intelligence · Entrepreneurship · Projects

1 Introduction

In the era of the fourth industrial revolution, modern technological advances in Artificial Intelligence have greatly changed entrepreneurship and economic growth [7].

The roots of this previous idea go back to the last century in the writings of the well-known economist Joseph Schumpeter, who emphasized the important role that entrepreneurship activities play in economic growth, as he called creative entrepreneurs "economic agents of creative destruction [19], Schumpeter explains that these "agents" are working to destroy existing markets by creating new markets with new products, services and technological innovations that provide higher added value than existing companies [29]. There are many realistic examples of this theory that you can see clearly in the development of the mobile phone industry and how a giant company like Nokia quickly collapsed in front of innovative products from Apple and Samsung [12]. Contrary to classical growth theories, Schumpeter concluded that creative destruction is the main source of economic growth [14].

Most of the stakeholders such as investors and policymakers have struggled in the selection process for aspiring entrepreneurs due to the limited time and research capabilities [7]. The decision-making process for selecting potentially successful entrepreneurial ventures often includes two steps. The first step is the eligibility criteria,

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whereby entrepreneurs must meet the minimum requirements to apply for the support program [31]. The second step is for eligible entrepreneurs to run another filtering process to determine who matches the expectations and criteria for joining the support program. If AI systems can narrow down desired candidates and provide effective forecasts to investors at an early stage, this will help increase investment in successful entrepreneurial ventures [13]. However, investors and other stakeholders should use their experience and knowledge regarding the support needed for various activities such as finance, technical or administrative support [10].

The qualitative and accelerating development brought about by the technological revolution, especially with the twentieth century in the field of information technologies, led to the emergence of new applications and programs characterized by diversity and continuous innovation [6], which increased the intensity of competition at the global market level. Smart in the world of management, money and business, as well as taking advantage of the ability of these smart systems to make decisions [13].

2   Definition of Artificial Intelligence

Artificial intelligence is defined as one of the branches of computer science, and it is that behavior and those characteristics on which different computer programs depend and are in line with human mental capabilities in various work, and the most important of these capabilities is the ability of the machine to teach and make correct decisions [25].

3   Artificial Intelligence Capabilities

Artificial intelligence acquires information through practical practices and is able to distinguish between multiple issues precisely [5].

One of the most important capabilities of artificial intelligence is its response to changes, and its flexibility and speed of reaction in all situations [23].

Artificial intelligence has its ability to perceive, and thus make decisions properly, based on studying all possibilities and mastering their results, and then choosing the best decisions that lead to the desired results [4].

It can be said that artificial intelligence began with the development of some different computer programs, chief among them the chess game programs, when the scientist Claude Shannon drew an algorithm that qualifies the computer to play chess and anticipates all the possibilities of the other player's movement [23].

4   Fields of Artificial Intelligence

– Artificial intelligence has entered all technical areas that require logical thinking, knowledge, planning and virtual perception based on applying theories and choosing the right solutions [27].

- One of the most prominent areas in which reality simulation programs and applications are distinguished [2].
- Industry through robots that are able to perform the tasks of the human race.
- Developing computer programs and applications in various fields, including medicine, engineering, trade and investment, among others [13].
- Developing cognitive simulations by testing theories, facial recognition, memory activation, and other functions [25].
- Development of engines with smart capabilities, such as driverless cars and drones [22].
- With each new day, AI knocks on a new door, especially the technology and computer industries [30].

5   Benefits of Artificial Intelligence

- One of the most important advantages of artificial intelligence is its ability to continuous effort and double production of work, and this is due to the ability of machines to work continuously without any interruption [1].
- Artificial intelligence provides many applications that save people a lot of time, such as maps [27].
- The machine was replaced instead of the human, so the work saving was much faster, and there were no errors [5].
- Artificial intelligence does the work that is difficult for humans to solve, which is why all the problems facing different areas of work are solved instantly [17].
- One of the most important characteristics of this intelligence is that this system does not control whims like a human being, as he may be betrayed by his conscience or his whims, but artificial intelligence is not controlled by these whims [24].

6   The Disadvantages of Artificial Intelligence

With the development of techniques to rely on artificial intelligence, and with researchers and developers taking broad steps to make the machine able to follow the approach with human cognitive, so that it can think, learn and manage to be able to make decisions, and with indications that with the continuing development processes, these will be machines are able to exceed human capabilities (with conclusions that disavow this) showing concerns about AI and dependence on it [18].

Certainly, relying on machines in scientific and medical fields or even in the simplest daily tasks that may be related to cooking, for example, as much as it carries great benefit and ability to improve the quality of life, it has negative [19] and other unpleasant aspects. which may include:

High unemployment rates in different countries around the world, after programs and applications have taken over the human being, especially in the tasks and repetitive work to do them more efficiently [12].

Artificial intelligence can make humans lazier and more dependent on machines and applications in most details of their daily lives. With the development of artificial intelligence technologies and the tendency to be more complex to match human capabilities, this could cause their costs to become greater over time [19].

The machine has the ability to make decisions, but it does not take multiple considerations into account [5].

It cannot anticipate the psychological and emotional impact, or perceive the rationality of a specific behavior, especially in areas that come into contact with humans [3].

It is possible for machines to have the ability to solve the problem, but it does so according to the information and data available to them, and therefore the solution will always come expected and known, but it will not be able to fully deal with new data and come up with ideas outside the box [22].

7   Definition of Entrepreneurship

The term entrepreneurship refers to the concept of developing and managing commercial projects in order to gain profits by taking risks and taking many risks. Simply, entrepreneurship can be defined as the desire to start a new business, and it is mentioned that entrepreneurship plays a fundamental and vital role in the economic development of the global market [22]. The title of entrepreneur or businessman is given to a person who creates a new business on his own and bears all the risks and consequences of this work, and is seen as an innovator, creator, and a source of renewable ideas, modern products and services, as he plays an important role in any economy by using skills Necessary and necessary to anticipate market needs and present good and renewable ideas [28].

8   Entrepreneurial Importance for Organizations

After the concept of entrepreneurship has been clarified, it must be noted that entrepreneurship in organizations means the existence of an organized process that results in qualitative developments by creating a set of ideas and applying them to the organizational reality so that the impact of these ideas is reflected in many of the actors in the organization [22], and the extent of application of the concept varies. Entrepreneurship in organizations according to the orientation of these organizations and the awareness of those in charge of them of the importance of activating the entrepreneurial role in them. The following are some aspects that demonstrate the importance of the concept of entrepreneurship in organizations [21]:

- Improving profitability in organizations and increasing the percentage of sales due to the presence of a number of new ideas that increase sales operations [15].
- Developing organizations' ability to enter the competitive market by developing the performance of produced goods and improving their quality, which results in opening new markets through which the organization can offer goods or services

and compete with their counterparts in the local or international markets [17], in addition to the role of entrepreneurship in the production of new goods or services did not exist before [25].

- Renewal of business strategies to suit the environment in organizations by activating the element of flexibility in normal operations and activities. Everything that is done in organizational entrepreneurship calls for renewal of blood in organizations in terms of current and future plans and work mechanisms [9].
- Raising the organization's ability to manage the risks and crises that faces it through new ideas that are put forward and applied in the reality of the organizations [22].
- Enhancing the concept of leadership in organizations by increasing the motivation of individuals and their passion for work, which is reflected in improving productivity, developing performance, and raising operational efficiency [3].
- Increasing the harmony of the departments with each other and achieving complementarity in performance, which contributes to reducing costs, in addition to reducing the time and effort consumed in implementing the daily tasks and operations in the various departments [25].
- Preventing job conflict by having a clear organizational structure through which responsibilities and powers are more defined [24].

9   The Importance of Specializing in the Field of Entrepreneurship

One of the most prominent benefits that accrue to a specialist in many fields of undergraduate studies or what follows from postgraduate studies is the acquisition of specialized knowledge in a specific field, and an attempt to integrate what he learns during university and post-university studies into the functional reality, so that academic knowledge is reflected into a professional reality [24]. It has an effective impact, and the entrepreneurship specialization is the functional heart beating in the business environment, and accordingly many modern trends are adopted in the environment of major economic projects [15], and the benefits of specialization in the field of entrepreneurship can be highlighted through the following:

The Development of the Psychological Aspect: where specialization in the field of entrepreneurship helps the owner to have an entrepreneurial spirit and influence the surrounding environment, and he has a greater ability to motivate himself in the first place, and to transfer this positive motivation to the surrounding professional environment [10, 15, 17].

- **Development of thinking skills:** One of the most prominent benefits of specializing in entrepreneurship is that it gives the individual the ability to develop creative thinking related to the field of business, thus becoming more able to find solutions to problems in the professional environment so that these solutions are appropriate to the current and expected economic changes and conditions [10].

- **Promoting the marketing aspect:** The concept of entrepreneurship is not limited to the administrative side only. Entrepreneurship is an integrated concept concerned with the marketing side, and how to improve the sales performance of the entire business process so that the increase in the monthly and annual sales operations leads to an increase in profit [30].
- **Enhancing research and development skills:** Entrepreneurship specialization is concerned with enhancing the ability of individuals to research causal relationships, reflecting effects on results, and researching and improving shared values based on well-thought-out action plans that take into account all departments and sectors in the project or the relevant organization [11].
- **Development of investment skills:** Entrepreneurs always seek to seize and monitor the opportunities that benefit the existing project, and entrepreneurs also target opportunities related to new projects that can have a good return on investment in the short or long term, and here comes the role of entrepreneurship specialization in promoting Investment skills and making comparisons between previous investment models in order to predict results in subsequent investment periods [5].
- **Development of commercial capabilities:** The development of skills related to the commercial aspect in projects is directly reflected in the existing or future projects, so that the entrepreneur has a greater ability to understand the progress of the business process in various sectors, in addition to knowing the most prominent commercial issues and the theories related to it [7]. Entrepreneurship is to increase knowledge of all of that, and to establish some commercial concepts in the entrepreneur's mind to have a link in commercial reality after completing university or post-university education in the field of entrepreneurship [20].

10   Types of Entrepreneurship

The definition of entrepreneurship has been classified into many types, and each type differs in its content from the other, and the most important of these types are:

- **Small business entrepreneurship:** It includes partnership between two or more people in small shops or companies with a job quorum of less than 500 employees, and it refers to companies with specific responsibilities [26].
- **Entrepreneurial home-based business:** it refers to projects that are managed from within homes, and in spite of that, it can enter into competition with companies [1].
- Business projects via the Internet: They are managed via the Internet. These projects include blogs or e-commerce companies [18].
- **Invention:** It is considered one of the most important types of entrepreneurship, as the inventor is seen as an entrepreneur, as he develops his idea into a product and markets that and turns it into a source of profit [9].
- **Lifestyle-based entrepreneurship:** It is one of the most popular types, and its popularity has increased through the development of Internet networks where the entrepreneur creates and develops his company in a field that suits his skills and interests [16].

11   How Companies Benefit From Artificial Intelligence?

1- Innovative services

Artificial intelligence technology developers provide innovative solutions to companies that help them establish their feet, such as integrating new services on websites to communicate with customers, as chatbots that provide 24-h interaction with customers [13].

2- Providing data on the market

The corporate research and development department is working to collect important information about the market, competitors and the public in order to develop competitive products and explore potential opportunities, which is provided by some artificial intelligence companies such as the company "Crayon" which works to provide market data for emerging companies [11].

3- Digital Marketing

There are smart platforms that provide important information about the market, this data is very important to reach the target customers quickly, accurately and at a lower cost [14].

The IBM Watson Personality Insights platform provides this service by conducting a comprehensive survey of emerging companies 'channels through social media sites and competitors' channels to create detailed profiles of target customers [6].

4- Investigating the competencies

Many startups do not have a human resources department that specializes in selecting the best competencies and talents that fit the company's requirements and financial capabilities, which is the task that artificial intelligence solutions can undertake [13].

Smart platforms evaluate job applicants based on the required tasks, as they determine the volume of productivity, experiences and interaction of job candidates, and then provide detailed reports to management to help them choose the work team [14].

5- Improving the level of corporate customer service

The startups put in the dilemma of opening direct communication channels all the time with customers to receive their inquiries and complaints.

With smart technologies, it is now easier and more efficient. Through chatbots, it is possible to respond instantly to customers with great accuracy and at a lower cost [5].

12   The Role of Artificial Intelligence and Entrepreneurship in Economic Growth

As mentioned earlier, creative entrepreneurs are "creative destructive agents." While inventors create new ideas, entrepreneurs work to turn these ideas into successful business ventures. Therefore, we usually see entrepreneurs performing several functions simultaneously, such as entering emerging markets, developing innovative business models, inventing new goods for customers or creating modern production technology [8].

While the Fourth Industrial Revolution is still in its infancy, entrepreneurs must keep pace with modern technology to ensure the company's continued profitability [7]. This is because the cost of technology is getting cheaper every day, and thus faster technological innovations will appear that destabilize the current industrial system. In line with previous technological shifts such as steam engines, electricity, and semiconductors, AI is the latest form of Automation that will cause major technological disruptions in the markets [21].

Recent studies indicate that the "artificial intelligence revolution" is the most important transformation in the field of entrepreneurship and economic productivity. In this regard, most companies want to use AI and robotics technologies to produce a massive number of innovative products that develop a higher lifestyle for societies [11].

Therefore, entrepreneurship and AI are likely to contribute to economic growth through two primary mechanisms. The first impact of AI will be to reduce the cost of products and services that rely on prediction, which is known as using the data needed to make better business decisions [22]. This is important, because a fall in the price of productive inputs such as forecasting will affect large industries such as agriculture, transportation, healthcare, retail and energy production. Artificial intelligence can lower the cost of knowledge needed for aspiring entrepreneurs by offering cheaper, faster, and more effective ways to identify, filter, acquire and process information [5]. Moreover, AI can reduce research and innovation costs by taking advantage of the interaction between Large datasets and Enhanced prediction algorithms.

Another potential aspect of AI is the way consumers interact with companies. AI applications may allow consumers to reduce the cost of searching and find more of the customized products and services they want. This will help more startups serve customers more efficiently [7].

The second mechanism in which enterprise and AI are expected to contribute to economic growth is the increased demand for human judgment. While AI can improve prediction for decision-making, it is not the only input into the decision-making process [9]; The other main input is judgment on decision making. The term judgment refers to "how the benefits and costs of different decisions are compared in different situations". The judgment process may involve prioritizing goals for the companies, keeping in mind the emotional, ethical, etc. dimensions [2].

13   The Effects of Artificial Intelligence Techniques and Modern Technologies on Companies and Industrial Institutions

1- Human employment and artificial intelligence technologies

If we conducted a comparison between the salaries of human labor, and the cost of equipment and machines that operate with artificial intelligence systems that some industrial companies and commercial institutions may resort to, we will notice that the salaries of human workers will be the highest in the cost index, although human labor may have weak and sometimes results not guaranteed, this matter will definitely make entrepreneurs and company owners resort to artificial intelligence equipment and machines and abandon employees and workers of the company; With the aim of reducing expenses and employing them in other essentials that the work may need [6].

Artificial intelligence, in the extent of its positivity and speed of completion of the required tasks and its high efficiency in productivity, will of course affect human labor directly, and indeed it began with a direct effect on the human resources department [15]. By building detailed training and development plans for each employee; These plans are based on analyzes of data related to employee practices [11].

As far as the impact, artificial intelligence techniques have proven their superior efficiency in the various companies and industries that work with these technologies; Especially with heavy equipment moving or handling high heat [1]; This is because these technologies are the most able to withstand difficult working conditions, in contrast to the human capacity that will certainly be incapable of carrying out some tasks and expose them to risks in the work environment [1].

2- Artificial intelligence enhances creativity and innovation

Undoubtedly, there are great concerns among human labor; As a result of the great development the world is witnessing in the field of technology, especially artificial intelligence, thinking that they will lose their work, but the growth of artificial intelligence techniques and modern technological means in the work environment will certainly enhance the process of innovation and creativity of human labor [4];

Where creativity and innovation are essential and required skills in the work environment, which artificial intelligence technologies and robots cannot complete [7].

So, artificial intelligence techniques, robots and modern technological means as much as they directly affect human employment, but they are among the positive means that entrepreneurs and owners of industrial companies can rely on [28],

Because, of course, it will contribute to the development of the process of creativity and innovation, which are considered essential and basics that create competitiveness and ensure continuity in achieving success [31].

3- Artificial intelligence technologies and new job opportunities

Experts expected that artificial intelligence techniques and modern technological means will help provide new job opportunities during the coming period in conjunction with the rapid growth of these technologies, in turn, some old job opportunities that still depend on old and traditional means will be eliminated [15]. Artificial intelligence

technologies may be more than the jobs it will provide, especially in the field of industry and agriculture,

This is because the human labor that works in these areas depends mainly on traditional means, and this matter will definitely reduce productivity [31]. Therefore, artificial intelligence techniques and modern technological means will be an alternative to routine work that certainly reduces productivity in the work of most companies and different industries [19],

But it will not affect the human functions that depend on innovation and creativity, because these means will not have the ability to do all the tasks that need the human mind and its interaction [4].

Some studies say that artificial intelligence machines and modern technological means provide the appropriate climate for the human mind to raise its creative and innovative capacity for development [5].

And achieving the goals of companies and industrial establishments; As artificial intelligence techniques succeed in routine tasks, and therefore human labor, which needs high training and skill to complete the tasks within companies, will not be affected [13].

Artificial intelligence and machine learning can be benefit in many areas such as collaboration, security, services, and network infrastructure. For example, an artificial intelligence platform has emerged that helps to conduct advanced chat conversations, making it easier to communicate and collaborate [26].

Artificial intelligence and machine learning can also be added to new information technology and security, in addition to infrastructure, to achieve balance in the work environment. In addition to traditional security measures, AI can be used to defend cybersecurity and protect systems from piracy [18].

Artificial intelligence constantly analyzes data and information to check normal traffic, protecting companies from any hacking attempt, and alerting them if anything abnormal happens. The advancement of artificial intelligence will have social and economic impacts [25],

It is expected that there will be more huge differences in income levels between individuals and the security, political and economic vibrations that may follow [3].

If this development will contribute to reducing product costs after reducing human resource costs, it will, in turn, lead to the collapse of sectors and companies that have been late in adopting this approach, even if they were large, due to the change of cost factors affecting to a large extent [12].

That there will be possibilities for the emergence of forms of clash and incompatibility in the future between these smart products and people, that the field of clash will be primarily economic [4], but will be followed by violent political and social effects, adding that some countries may temporarily resort to fighting and delaying this trend, but they will yield in the end [27].

"If human values are complex, then artificial intelligence will not be able to take care of everything that humans care about, and if it has too much influence [8],

This could lead in the long term to a future for a world contrary to the choice of humans, and this is a kind of problem that raises the concern of researchers in this field, which reached the point of concern about the possibility of human extinction [6].

14 Conclusion

The study revealed that Artificial intelligence is leading to a tremendous transformation in the field of entrepreneurship, as many companies and projects have turned to the acquisition of programs and tools that provide its services and have become dependent on the use of these technologies in the development, growth, marketing, improvement of the work environment and the production of large quantities of products, which leads to lower cost of production and increase in profits.

The study also revealed that Artificial intelligence has made work easier, faster, more productive and effective, and has reduced the rate of errors, as its tools are able to perform tasks accurately, and to succeed in routine and repetitive tasks, which provides time for project owners and employees to focus on project growth and increasing profits, as well as enables them to discover mistakes and avoid them its consequences, by quickly correcting them, ensures continuity in achieving successes.

The study showed that Innovation and creativity are among the basic and required skills in the world of entrepreneurship, which artificial intelligence and its technologies cannot do without programming and prior planning from the human element, by making use of it in carrying out most of the repetitive tasks, and providing a database of data, analyzing and dealing with it in a way that helps predict and raise Earnings.

The study recommended that the next wave of artificial intelligence technologies will open wide doors for individuals, especially project owners. These technologies have provided a lot of improvement and development advantages, so they must always be taken into account.

References

1. Agrawal, A., Gans, J., Goldfarb, A.: Economic policy for artificial intelligence. Innov. Policy Econ. **19**(1), 139–159 (2019)
2. Agrawal, A., Gans, J., Goldfarb, A.: Exploring the impact of artificial intelligence: prediction versus judgment. Inf. Econ. Policy **47**, 1–6 (2019)
3. Al-Sartawi, A.: The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. In: Kacprzyk, J. (ed.) Studies in Computational Intelligence, vol. 974. Springer International Publishing (2021)
4. Agrawal, A., McHale, J., Oettl, A.: Artificial intelligence, scientific discovery, and commercial innovation. Working Papero (2019)
5. Amabile, T.: GUIDEPOST: creativity, artificial intelligence, and a world of surprises guidepost letter for academy of management discoveries. Acad. Manage. Discov. (2019)
6. Amodei, D., et al.: Deep speech 2: end-to-end speech recognition in English and Mandarin. In: International Conference on Machine Learning, pp. 173–182 (2016)
7. Brock, J.K.-U., von Wangenheim, F.: Demystifying AI: what digital transformation leaders can teach you about realistic artificial intelligence. Calif. Manage. Rev. **61**(4), 110–134 (2019)
8. Burton, M.D., Colombo, M.G., Rossi-Lamastra, C., Wasserman, N.: The organizational design of entrepreneurial entrepreneurship theory and practice. Strateg. Entrep. J. **13**(3), 243–255 (2019)

9. Chayjan, M.R., Bagheri, T., Kianian, A., Someh, N.G.: Using data mining for prediction of retail banking customer's churn behaviour. Int. J. Electron. Bank. **2**(4), 303–320 (2020)
10. Cockburn, I.M., Henderson, R., Stern, S.: The Impact of Artificial Intelligence on Innovation. National Bureau of Economic Research (2018)
11. Cockburn, I.M., Henderson, R., Stern, S.: The impact of artificial intelligence on innovation. In: The Economics of Artificial Intelligence: An Agenda, pp. 115–152 (2019)
12. Davenport, T., Guha, A., Grewal, D., Bressgott, T.: How artificial intelligence will change the future of marketing. J. Acad. Mark. Sci. **48**(1), 24–42 (2019). https://doi.org/10.1007/s11747-019-00696-0
13. Ertel, W., Black, N.T.: Introduction to Artificial Intelligence. Springer International Publishing (2018)
14. Furman, J., Seamans, R.: AI and the economy. Innov. Policy Econ. **19**(1), 161–191 (2019)
15. Haenlein, M., Kaplan, A.: A brief history of artificial intelligence: on the past, present, and future of artificial intelligence. Calif. Manage. Rev. **61**(4), 5–14 (2019)
16. Huang, M.-H., Rust, R.T.: Artificial intelligence in service. J. Serv. Res. **21**(2), 155–172 (2018)
17. Hannoon, A., Al-Sartawi, A., Khalid, A.: Relationship between financial technology and financial performance. In: Musleh Al-Sartawi, A.M.A. (ed.) The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. SCI, vol. 974, pp. 337–344. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-73057-4_26
18. Karolak, M., Razzaque, A., Al-Sartawi, A.: E-services and M-services using IoT: an assessment of the Kingdom of Bahrain. In: Abdalmuttaleb, M.A., Al-Sartawi, M., Razzaque, A., Kamal, M.M. (eds.) Artificial Intelligence Systems and the Internet of Things in the Digital Era: Proceedings of EAMMIS 2021, pp. 523–533. Springer International Publishing, Cham (2021). https://doi.org/10.1007/978-3-030-77246-8_48
19. Kumar, V., Rajan, B., Venkatesan, R., Lecinski, J.: Understanding the role of artificial intelligence in personalized engagement marketing. Calif. Manage. Rev. **61**(4), 135–155 (2019)
20. Luo, X., Tong, S., Fang, Z., Qu, Z.: Frontiers: machines vs. humans: the impact of artificial intelligence Chatbot disclosure on customer purchases. Market. Sci. **38**(6) (2019)
21. Abdalmuttaleb, M.A., Al-Sartawi, M., Razzaque, A., Kamal, M.M. (eds.): Artificial Intelligence Systems and the Internet of Things in the Digital Era: Proceedings of EAMMIS 2021. Springer International Publishing, Cham (2021)
22. Nambisan, S., Wright, M., Feldman, M.: The digital transformation of innovation and entrepreneurship: progress, challenges and key themes. Res. Policy **48**(8), 103773 (2019)
23. Soni, N., Sharma, E.K., Singh, N., Kapoor, A.: Artificial intelligence in business: from research and innovation to market deployment. Procedia Comput. Sci. **167**, 2200–2210 (2020). https://doi.org/10.1016/j.procs.2020.03.272
24. Obschonka, M., Audretsch, D.B.: Artificial intelligence and big data in entrepreneurship: a new era has begun. Small Bus. Econ. **55**(3), 529–539 (2019). https://doi.org/10.1007/s11187-019-00202-4
25. Power, B.: How AI is streamlining marketing and sales. Harvard Bus. Rev. (2017)
26. Ransbotham, S., Kiron, D., Gerbert, P., Reeves, M.: Reshaping business with artificial intelligence: closing the gap between ambition and action. MIT Sloan Manage. Rev. **59**(1) (2017)
27. Strusani, D., Houngbonon, G.V.: The Role of Artificial Intelligence in Supporting Development in Emerging Markets. International Finance Corporation, Washington, DC (2019). https://doi.org/10.1596/32365
28. Townsend, D.M., Hunt, R.A.: Entrepreneurial action, creativity, & judgment in the age of artificial intelligence. J. Bus. Ventur. Insights **11**, e00126 (2019)

29. Wiklund, J., Wright, M., Zahra, S.A.: Conquering relevance: entrepreneurship research's grand challenge. Entrep. Theory Pract. **43**(3), 419–436 (2019)
30. Wilson, H.J., Daugherty, P., Bianzino, N.: The jobs that artificial intelligence will create. MIT Sloan Manag. Rev. **58**(4), 14 (2017)
31. Wirth, N.: Hello marketing, what can artificial intelligence help you with. Int. J. Mark. Res. **60**(5), 435–438 (2018)

Implication of Cyber Security in a Digital Economy: Learning from Corporate Sector with Special Reference to BFSI

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Abstract. The purpose of this current study is to understand the usage and implementation of Industry 4.0 (I 4.0) in Indian organizations with special reference to BFSI segment to improve their competitiveness, efficiency and productivity. Cyber Security has been one of the Key Pillars of I 4.0 in the BFSI Segment. The company has been assessed on this Pillar. Our study finds and conclude that few organizations studies have been conducted using industry 4.0 tools & techniques. The Maturity level as per the Questionnaire surveys has been medium to low. The maturity level has been assessed for 5 levels. With reference to implications, the results have been based on limited data and developed as Case Study. Nevertheless, this can form basis to understand the Usage of I 4.0 tools & techniques in organizations in the segment. Hence, utility of the study our study is that, this paper is one of the few studies conducted recently that provides insight into the usage and applicability of Industry 4.0.

Keywords: Industry 4.0 · Competitiveness · Maturity level · Digital transformation · Cyber security

1 Introduction

Digitalisation and business activities and processes are enabling the economy to move towards digital transformation of economy in order to have long term gain and cost optimisation. Many segments of an economy, especially the corporate sector is moving fast in the process of digitalisation to enable them to serve their customers in much better way. However, given the use of technology, the issues like cyber threats or cyber frauds are also increasing simultaneously and it is important for any organisations to handle such issues very carefully. Thus, implications and mechanism related to cyber security is a must.

Now, having looked at the BFSI segment of our economy, where the banking and other financial institutions have large consumer base, the possibility of cyber threat cannot be neglected. Thus, through digital transformation process in any digital economy through implementation of cyber security mechanism, the customers and organisations can be protected. Further, with reference to increase in competition in

market along with change in preference of consumers, i.e. given the complexity of products and supply mechanism, it is almost impossible to deny demand scenario and therefore firms should be more responsive towards customer demand and thus, the production system. Hence, with recent technological advancement in the form of Industry 4.0 is new normal with reference to high quality and low cost, Industry and Business model [4].

Moreover, in order to describe trends of inter-connectivity for business with reference to digital transformation, especially in manufacturing units along with other segments and economy, new industrial revolutions, namely Industry 4.0 was announced in Hannover in 2011 [11]. According to Vaidya et al. (2018), Industry 4.0 primarily based on 9 pillars (Given below in Fig. 1) which can help any organisations in becoming integrated, autonomous and to optimise the business operations, especially in case of SMEs with reference to implementations of new technologies, those 9 pillars are crucial in understanding technology requirement and become Industry 4.0 recognised as well as to implement new technologies. Hence, current study is undertaken to look at benefits of implementing Industry 4.0 process and implication of cyber security in a digital economy. Thus, BSFI segment is taken into consideration of conduct of the study [15]. The Nine pillars are defined below:
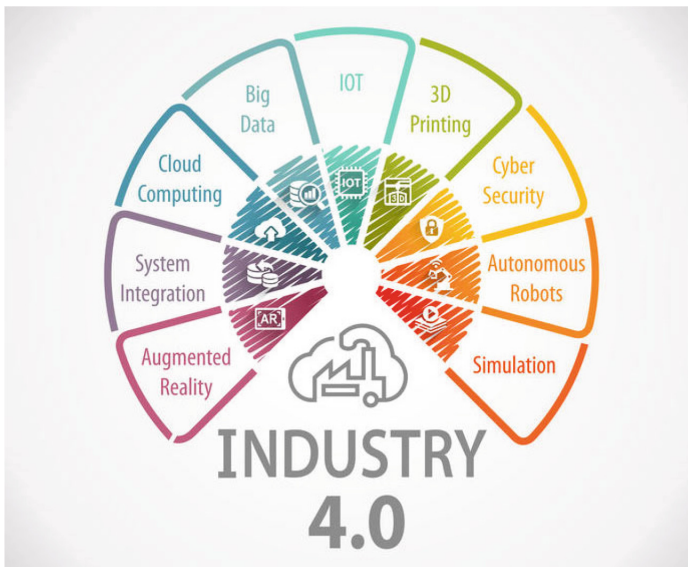
Fig. 1. Nine pillars of Industry 4.0. *Source*: Circuit Digest, 2021 [3].

1. Augmented reality

   • Coordination and communication between human and machine interface

2. System integration

- Integration throughout the value chain, horizontal & vertical for better coordination and seamless delivery

3. Cloud Computing

- Helps all stakeholders to share and access data in a reliable and 24x7 available platform, with minimal costs & most effective manner

4. Big data

- Getting data from various stakeholders and analysing them for improving performance of an organization

5. IoT (Internet of Things)

- Connected devices through wifi other means to transmit information on real time basis with standardised protocols

6. 3-D Printing

- Increased customisation and efficient design using less time and effort

7. Cyber Security

- Integration of various systems to predict and prevent unethical/ wrong practices and save customer/ organisational data

8. Autonomous Robots

- Work in areas where difficult for human resources to deployed and work on precision

9. Simulations

- Help in predicting and decision making process, with quick and large variability.

2   Literature Review

There are few studies conducted on Industry 4.0 and specially on its relevant application in the BFSI Segment. Akdil K.Y. et al. [1] studied about maturity and readiness model for Industry 4.0 strategy and asserted that in recent past years Industry 4.0 has gained huge attention from all segment of any economic system which includes industry leaders, policy makers, government officials, etc. but there is a lack of systematic literature to identify main dimensions for future reference in order to have maximum advantages of Industry 4.0 [1]. Vaidya S., et al. [15] studied about Industry 4.0 and found that digitalisation and implementation of intelligent system based technology in manufacturing process especially in the need for today's industry. The study tried to provide overview of Industry 4.0 with its application and identifying challenges with reference to implementation of Industry 4.0 [15].

Schumacher A, et al. [14] studied about manufacturing enterprises with reference to challenges faced with regard to disruptive concepts referred as Industry 4.0 and suggested model and its implication to assess the Industry 4.0 maturity and proved its applicability in real production environment [14]. Santosh R.C. and Martinho J.L. [13] also described a tool to assess maturity level in implementing Industry 4.0 using a framework with the help of relevant literature and proposed the maturity model considering 41 variables and 5 dimensions. The study asserted that model is useful in making an initial diagnosis and establishes a roadmap to proceed the implementation [13].

Salkin C. et al. [12] studies about Industry 4.0 with reference to managing digital transformation which is necessary for improvement in manufacturing and service systems because advancement in technology increases productivity both in service systems and manufacturing environment [12]. Camillo Mark [2] studied about cyber security with reference to management of risk for global banks and financial institutions and revealed that frequency as well as sophistication of cyber-attacks continues to increase against financial institutions and therefore, there is a need to embark on holistic risk management strategy to combat effectively the renewed threat [2].

Khakan N. et al. [7] asserted that why cyber security risk matters for FinTech firms and banks for their sustainability. The study revealed that given high demand for a tailored portfolio of financial products along with sophisticated communications required and transaction mechanism between financial institutions and banks in order to provide fine-tuned services to the customers and satisfy emerging market needs in new and evolving digital world, but cyber security threats have placed at constant risk [7]. Richard J. H. and James A. S. [9] looked at new policy world of cyber security at national level to protect electronically transmitted and stored information from intrusion. Thus, feasible policy framework to build future policy is needed since government agencies, private sector corporations, the military and many other economic activities are shifting towards digital transformation [9]. Nir K. [8] revealed that data is stored in cloud data centre and hence blockchain can provide cyber security and can protect privacy too. Hence, blockchain based solutions could possibly be superior to other available techniques/ mechanism [8].

Julian J. J. and Surya N. [6] studied about cyber-attack given the increase in use of internet and their interconnections. Those cyber-attacks can be prevented by developing innovative and effective malware defence mechanism. Thus, speculative observations on future research direction is required to avoid disastrous and grievous consequences via cyber-attack [6]. Jennifer C. and Jason J. [5] studied about necessity of cyber-security mechanism in financial sector. The study further revealed that given the increase in business activities of financial institutions especially related to remote banking, turn-around time and e-commerce, the financial institutions have no other choice but to adopt technological advancement, but this also increases the risk of cyber-threat and hence the cyber-security mechanism must be developed with the usage of available technology and digital transformation [5].

3   Objectives of the Study

- To examine issues related to Cyber-Security in Economic System.
- To explore implications of Cyber-Security in Digital Economy.

- To evaluate the benefits of Industry 4.0 via Digital Transformation in Digital Economy.
- To suggest policy guidelines on the basis of the study.

4   Methodology and Data Source

For the conduct of the current study a structured approach has been followed in order to get the things right in digital economy. Relevant literature has been reviewed to understand the domain so that the research gap can be found out to carry current study. Thus, the methodology primarily includes the primary source and secondary source too. Since, the current paper undertaken is based on BFSI segment of digital economy, and therefore, with reference to primary source the authors have administered questionnaire survey and firsthand information is collected from the top-most officials (around 25) of financial institutions i.e. Top Level employees of the BFSI segment. Further, questionnaire used for the study is consisting of 61 questions to get insights about the companies in cyber security area. An attempt has been made to understand about the threats to the organization and the ways they are implementing to keep the threats and other issues as low as possible. The study attempted to use Maturity model since this study is one of the few studies conducted recently that provides insight into the usage and applicability of Industry 4.0 and technological competitiveness. Thus, for the conduct of the study Royal Bank (RB) is taken as case.

5   Implications of Cyber Security in Digital Economy: BFSI Segment

Since, the study undertaken is focused on one of the pillars of Industry 4.0, i.e. Cyber Security, because in BFSI segment, cyber security is becoming more and more important, as most of the financial (& non- financial) transactions are going online. Thus, as mentioned earlier Royal Bank is taken as case to understand the implication of cyber security in digital economy with special reference to BFSI segment in the era of digital transformation. Moreover, with reference to banking segment, Banks in the country have been joining forces with FinTech companies to spur industry growth. Further, according to a report by PricewaterhouseCoopers (PwC) the big banks are responding to the opportunities and threats posed by FinTech companies. These companies have managed to enter the lending market by combining technology and online data to offer sought-after products and services such as business and personal loans to individuals and enterprises.

Now, with reference to an overview of Banks & FinTech Industry, it is learnt that FinTech companies are currently peripheral players, and this allows them some leeway to function without the same constraints that banks have. However, as these companies grow and expand, they will come under the purview of the regulatory authorities. FinTech companies are a boon to small business owners who may be unable to approach traditional lending institutions. With lenders like Lendified helping small

business owners get access to funds very quickly, entrepreneurship has received a major boost. However, entrepreneurs will also benefit from an MBA degree that will prepare them to address the challenges that come their way when they start their own ventures.

Further, as a case point with reference to Royal Bank (RB), RB is a multinational financial services company and one of the largest bank by market capitalization. The bank serves over 16 million clients and has 86,000+ employees worldwide. The bank was founded in late 19th century. Again, in case of Cyber security trends in cloud services, RB has been a player in BFSI Segment that has been mostly affected by Cyber Security threat. It becomes a Key and Critical Pillar for the company. A lot of new threat and technologies are emerging in the cyber security space especially when the whole world has shifted to a remote work model due to the pandemic. Insider threats are also a great concern for organisations. In 2019, a former Amazon Web Services (AWS) employee accessed the data of Capital One credit card applicants and customers and stole data from more than 30 companies. Around 106 million people's data was compromised across the United States and Canada. Firewall misconfiguration was the main reason for this stolen data. Cloud service providers like Google Cloud Platform, Microsoft Azure and AWS are continuing to expand their cyber security to protect the data.

6   Findings and Discussions

The RB service providers are considered to be the torchbearers in the financial service industry in the post-Covid world. They have the capacity to lead the industry as well as the economy to recover from this current crisis. However, cybercrimes and Cyber-attacks become a clear hindrance in the financial technology market. RB firms need to build a strong cyber resilience system inside and outside their organisations to evade the risks.

Ultimately, the onus rests on the individual entities. The economy is slowly trying to revive after the crisis unfolded by the pandemic. RB innovations are pivotal in this revival. Building a cyber-risk free ecosystem is a critical task for RB companies, which is the future of our financial system. Given below the major findings of the study undertaken:

- Complex Cyber Security vulnerabilities RB are completely dependent upon their installed Apps that can access the profile and critical data of users, more so during real-time transactions. Applications are more vulnerable to the assets towards security attacks, and once a cybercriminal makes an entry, it can successfully gain full access to RB existing infrastructure and the network used for services.
- Intricate System in Place to Render Services There are multiple third-party systems used by RB, and in the process, these systems at times are interconnected, creating an enhanced risk of cyber security. It is because of different systems being used that there is an emergence of compatibility issues and additional risks in cyber security, and it is touch to identify these issues due to the complexity involved.

- Migration to Newly used Cloud Services with the advent of Cloud systems, many banks are migrating their operations onto cloud services so as to get enabled to provide seamless and quality services at a diminished cost. In the process, banks are not able to secure the cloud operations completely, making it vulnerable like a traditional data centre is. Due to the complexity and load of data transactions in the cloud environment, it is difficult to provide security.
- Access gained by cybercriminals due to Human Error Phishing attacks are the other areas to gain access to data, and human error is the main reason for this breach and leeway to cybercriminals, the reason being phishing attacks or lost or stolen devices.
- Vulnerable Digital Identities Various services are accessed via mobile device authentication and authorization, and this is what a gateway is for malicious cybercriminals who may clone the identities.
- Privacy of Data There is a scenario of user consent for data sharing resulting in banks overcoming risks of the litigation (over misusing data) via legal ways.
- Compromising Security for Convenience bank provides convenience and ease of access to avail services; the challenge is to compromise on the key security aspects at times.
- Involvement of Third Parties Nowadays, banks are using solutions from other players as well in addition to providing services from their applications. It becomes easier for cybercriminals to hack banks without arousal of any suspicion when using third-party access, replicating a legitimate user.
- Not meeting Compliances There is a need for banks to adhere to compliance and regulatory requirements, which include appropriate licenses as well, the type includes Specialized Bank, Electronic Money Institution, Payment Institution, in addition to the need of GDPR & PSD2 compliance. Not meeting these and other important requirements is a serious breach resulting in greater risk.
- Increasing use of Electronic Gadgets & IoT devices for Transactions. The electronic space is growing, and there is an onset of more risks by this usage. There is an importance to be given to manage these vulnerabilities in addition to traditional & web-based security services.
- Consequent Data Security at banks, during digitization, it becomes challenging to maintain data universality and data security, right from the time of collecting the data to storing it.
- Malware Attacks Malware attacks are the most prominent types of security issues that are prevalent with banks in the global market. Society for Worldwide Interbank Financial Telecommunication (SWIFT) is more easily targeted.
- Money Laundering Risk, banks often use a crypto currency that is not formally regulated by any set of standards and global regulations, leading to illegal money laundering. Overcoming these challenges is critical to provide secure and smooth services by banks.

Further, according to RB [10], the maturity level based on Royal Bank's Business objectives the maturity level of the organization is concluded below in Fig. 2. Also, given the Maturity Level of RB in the Digital Economy on I 4.0 (Cyber security) with reference to Objectives (such as Strengthen Financial System Resilience, Enhance

Collaboration & Partnerships, Mature cyber security practices among FMI's, and Evolve cyber security Oversight) and Outcomes, the study undertaken found that the Maturity Level is ranging from 2–4, where evolving cyber security oversight is at highest level i.e. 4 and mature cyber security practices is at lowest level i.e. 2.

Fig. 2. Maturity level based on Royal Bank's business objectives. *Source*: RB Annual Report, 2021

Our study also evaluated that the RB's standing on Ten (10) Key parameters as given below in Table 1 is based on the interactions with the RB employees and examined by industry experts through focused group interactions, in BFSI segment.

Table 1. RB standing on various key parameters for BFSI segment

S. No	Key parameters	Royal Bank	Maturity level (qualitatively)
1	Cyber security implementation	Long back	Medium to high
2	Recovery period from cyber attack	Within 48 h	Medium
3	Negative impacts of security incidents in past 12 months	No	Medium to high
4	Will be compromised by a successful cyber-attack in next 12 months	Not at all likely	Medium
5	Cyber security programme	In-house	Medium to high
6	Insider attacks have become more frequent in past 12 months	Doubtful	Low to medium
7	Time to recover from an insider attack	Within few minutes	Medium to high
8	Difficulty to determine the actual damage of insider attack	Not at all difficult to determine	High
9	Firm's application was breached/attacked/compromised	More than 5 years ago	Medium to high
10	% of employees would benefit from security training & certification	100%	Medium to high

7   Limitations and Scope for Future Work

The study has been based on the inputs from senior management team of the organization by conducting focused group interviews. These employees are part of the IT have been working in the cyber security areas. However, the authors feel that there is scope for improvement if the study can be benchmark with similar organizations dwelling with same issues and challenges in the area of cyber security in BFSI Segment. Future work can be based doing similar studies with few organizations to understand the industry issues and challenges confronting the BFSI segment.

8   Conclusion

The study concludes that with the expansion of economic activities and evolvement of digitalization, the possibility of cyber threats/ cyber-attacks is even more since most of the firms especially in BFSI segment are under the process of digital transformation in Digital Economy with reference to Industry 4.0, this makes the necessity of strong cyber security system or mechanism to prevent cyber threats or frauds. The study also concludes that "Reducing risk and promoting resilience" is the Royal Bank's cyber security theme for the medium term to promote resilience in its own operations and contribute to stronger domestic and international financial systems. Thus, the study suggests that in order to achieve this, internal and external cyber efforts should be tightly integrated through collaboration with private and public-sector financial system partners and stakeholders. It is also learnt that given the vision, mission, goals and intended outcomes that are deliberately ambitious, given the critical nature of cyber security, our study suggest that RB should further build strong cyber security foundation, the strategy that may defines how the Bank will respond to the challenging threat environment ahead. These challenges will ensure there is minimum blind spots and losses to the company and customers. Further, the study undertaken also progressively suggest that a measurement framework must be developed to track and report progress, including cyber security testing and posture assessments to make future policies in this respect.

9   Suggestions for Future Work

Industry 4.0 is in nascent stage in many of the services and manufacturing industries across the world. Few nations like Germany are very advanced in Industry 4.0 in industries like Automobiles. Smart factories are in place in western and few Asian nations, however there is immense scope of Industry 4.0 applications across the world; this has been expedited by the COVID'19 pandemics. Cyber Security is more important these days than earlier in the world, as most of the activities across almost all industries are dependent on online services. Hence, the authors feel there is need for in-depth study in the value chains across different industries specially in the BFSI segment in coming future.

References

1. Akdil, K.Y., et al.: Maturity and readiness model for industry 4.0 strategy. In: Industry 4.0: Managing the Digital Transformation, pp. 61–94. Springer, Cham (2018). https://doi.org/10.1007/978-3-319-57870-5_4

2. Camillo, M.: Cybersecurity: risks and management of risks for global banks and financial institutions. J. Risk Manage. Financ. Inst. **10**(2), 196–200 (2017)

3. Circuit Digest. https://circuitdigest.com/article/what-is-industry-4-and-its-nine-technology-pillars (2021)

4. Hermann, M., et al.: Design principles for Industries 4.0 Scenarios. In: 49th Hawaii International Conference on System Sciences (HICSS), IEEE, pp. 3928–3937 (2016)

5. Jenifer, C., Jason, J.: Fintech, Regtech and the importance of cybersecurity. Issues Inf. Syst. **19**(3), 220–225 (2018)

6. Julian, J.J., Surya, N.: A survey of emerging threats in cybersecurity. J. Comput. Syst. Sci. **80**(5), 973–993 (2014)

7. Khakan, N., et al.: Fintech firms and banks sustainability: why cybersecurity risk matters? J. Financ. Eng. **1**(1) (2015). https://doi.org/10.1142/S2424786321500195

8. Nir, K.: Block chain's roles in strengthening cybersecurity and protecting privacy. Telecommun. Policy **41**(10), 1027–1038 (2017)

9. Richard, J.H., James, A.S.: The new policy world of cybersecurity. Public Admin. Rev. **71**(3), 455–460 (2011). https://doi.org/10.1111/j.1540-6210.2011.02366.x

10. RB: Annual Report, Royal Bank (2021)

11. Saad, S.M., Bahadori, R., Jafarnejad, H.: The smart SME technology readiness assessment methodology in the context of Industry 4.0. J. Manuf. Technol. Manage. **32**(5), 1037–1065 (2021). https://doi.org/10.1108/JMTM-07-2020-0267

12. Salkin, C., Oner, M., Ustundag, A., Cevikcan, E.: A conceptual framework for Industry 4.0. In: Ustundag, A., Cevikcan, E. (eds.) Industry 4.0: Managing the Digital Transformation, pp. 3–23. Springer International Publishing, Cham (2018). https://doi.org/10.1007/978-3-319-57870-5_1

13. Santosh, R.C., Martinho, J.L.: An Industry 4.0 maturity model proposal. J. Manuf. Technol. Manage. (2019). https://www.x-mol.com/paper/1285248942245330944

14. Schumacher, A., et al.: A maturity model for assessing Industry 4.0 readiness and maturity of manufacturing enterprises. Procedia CIRP **52**(1), 161–166 (2016). https://www.sciencedirect.com/science/article/pii/S2212827116307909

15. Vaidya, et al.: Industry 4.0 – a glimpse. Procedia Manuf. **20**, 233–238 (2018). https://www.sciencedirect.com/science/article/pii/S2351978918300672

Digital Innovation in the Fourth Industrial Revolution Era

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Abstract. At present, competition and competitiveness have become progressively imperative for all countries around the world. Competitiveness is vital to top management in government and private sectors and can found through plans, policies, approaches, measurement indicators, and statements. The study highlights the concept of innovation as a main pillar of knowledge-based economy in the renaissance and competitiveness. Therefore, the importance of this study is to explain how innovation contributes to the transformation into a knowledge-based economy, and how innovation is supporting the technology and boosting artificial intelligence. The study is a literature review in nature and indicates that training and education are the most proper way to enhance the level of investment in ICT.

Keywords: Knowledge-based economy · Innovation · ICT · Innovation capacity · Competitiveness

1 Introduction

The remarkable development in technology has reached a new stage called digital technology, in which the geographical dimension has diminished more and thus the individuals are closer to each other. Moreover, thanks to this technology development, especially in the world of communication, which plays an essential and important role in decision-making and policy building, it has boosted economic growth and helped to diversify outputs. Therefore, it has become necessary for developing countries to catch up and seize this technology to help them revive their economies by facilitate the process of importing knowledge from abroad and encouraging investment in the local economy [1].

Competition and competitiveness have become progressively imperative for all countries around the world. Competitiveness is vital to top management in government and private sectors and can found through plans, policies, approaches, measurement indicators, and statements. Furthermore, several nations, for example, the United States of America, reflect the rareness of country competitiveness as one of the rudiments that menace the security of the country. In one way, business competitiveness is a method

to continue and develop, and on the other way, it is also a method for nations to preserve their living standards, upsurge their ranks and contribute to universal growth [2].

Although the geographical location considered as one the core characteristics of competition, its effect has transformed dramatically. Countries which are wealthy in natural resources or with their exclusive geographical locations are still acquiring the profits from the same comparative advantage. Continually, competition becomes more aggressive and more important in lowering the cost for countries by letting them access comprehensive and universal supply tactics. Therefore, today, the competitive edge is built not only on natural resources but on finding innovative ways to deal with them [3].

Knowledge-based economy gives weight on the capability of a country to improve its innovative possibility, and hence competitive practice of an economy for a country relies on its intellectual capital and its ability to innovate. As a result, innovation-driven competitiveness is significant for a country's economic performance. Innovation indicators are commonly studied in about productivity and, competitiveness, as they seem powerfully unified. Even though they are intricate theories, they have extensively researched from various perceptions. For instance, technology and innovation can impact the economies of scale, the control of procedures and the starter of innovative systems, and accordingly influence the competitive advantage of businesses. Overall, innovative technology reflected as one of the primary drivers of competitiveness, which affect the cost or the uniqueness of a product [4].

Competitiveness and innovation connected in an expected and convoluted method, in another world, innovation forces competitive advantage in diverse manners. Due to the continuously changing environment and because of the hard competition, the essential prerequisite for success is competitiveness [5].

One of the greatest innovative productions is artificial intelligence, which is the basis of the fourth industrial revolution. Continuity of technological innovation and increased investment in it have achieved impressive results on the economies of countries [6, 7].

Within a country borders, the role of innovation is to encourage the competitiveness of the government and the local companies to push them success and help them to across the country borders and enter the global market, and hence knowledge transferred internationally. Competitiveness originates from the formation of the unique regional abilities required to tolerate growth in an internationally competitive environment. Such abilities produced through innovation, and because abilities are diverse and outstanding, and as the innovative knowledge practices for creating abilities are open-ended and normally permit for several possible roads to success, a series of different performers may advance their competitiveness together [8].

The whole world considers natural resources as a primary source of wealth. Numerous countries have depended on their natural resources to foster the economic wheel and to upsurge their competitiveness abilities. This was proven as previous experiences revealed that natural resources are essential and adequate for economic growth. The gains obtained are not only derived from the existence of natural resources but from how they innovatively used and developed.

However, with the current unstable economic environment, and with the increased influence of international threats, such as the drop in oil prices due to the coronavirus pandemic (covid-19), there is only one way to guarantee economic growth and competitiveness of nations with the requests of sustainable development, which is digital innovation [9].

Today, innovation performance is a critical indicator for transforming a country economy from the resource-based economy into a knowledge-based economy. Add to that; innovation is necessary to raise the competitiveness power of a country and foster the economic growth.

Non-oil resources must be taken care of to ensure economic growth and sustainable development, and to reduce the dependence on such resources as these natural resources are considered to be scarce resources. It is imperative for rentier countries to continue to diversify its resources and rationalize their consumption in line with the principle of sustainable development to use existing resources in a way that protect them and keep them available for future generations.

Given the importance of the knowledge-based economy in economic development and the increase in the country competitiveness abilities, there is a need for intensive scientific research in the pillars of the knowledge-based economy, where the innovative system is one of the most important factors that help in the transition to the knowledge-based economy.

2 Literature Review

2.1 Innovation the Driver of Knowledge Economy

Innovation is commonly studied in about efficiency and competitiveness, as these concepts are seemed to be powerfully unified. For instance, technology and innovation may affect economies of scale, the control of procedures and the starter of new approaches, and therefore mark the competitive advantage of companies. Innovative knowledge reflected as one of the major drivers of competition, where it enhances the cost or the differentiation of a product [4].

Moreover, innovation has begun since the last 40 years. For the 1950s, innovation was seen as an independent development resulting from studies by isolated researchers. Innovation defined as the novel ideas that entail of new products and services, the new practice of current products, new markets for current goods and new marketing means. Another definition of innovation by Evans (1991) is the capability to realize new ways of creating new things from current ideas, achieved by observing things from new viewpoints [10].

A different definition arose from Drucker (1985), he defined innovation as "an economic or social term, as changing the yield of resources and as changing the value and satisfaction obtained from resources by the consumer" [4]. However, Porter (1990) stated that and rendered to the declaration of Michael Porter; businesses attain competitive advantage via innovation. Nevertheless, the word "innovation" is vague and could be understood from different points of view. In the beginning, this word was noticed by Schumpeter (1934), as he appointed out that innovation is a discovery that

has been traded by businesspersons, meaning that it is the advance or finding, which has a plenty demand on the market. New goods and services, novel approaches production, new ways for market segmentations and new administrative structures, all present these findings. ensured that without applying innovation and implemented in the real, then innovation fails its sense [3].

Knowledge is an economic engine and resource in today's economy; it has become an important asset that can be packaged and traded. Knowledge transformed the way businesses compete, moreover knowledge became the foundation of comparative advantages between nations. This development has been reinforced by the development of ICTs that have cutter-off the cost of knowledge collection and dissemination. The contribution of knowledge to innovation has been realized in the decreasing transaction costs between business partners and involvers, particularly in areas such as the search and acquisition of information. A knowledge-based economy is known as the economy which rely on the creation, spreading and on the use of knowledge, where knowledge is extensively used in all forms of economic activities. Knowledge has always been a crucial power in economic performance. However, in recent progressively knowledge-based world, most of the countries are relying on knowledge and innovation for economic growth and global competitiveness. Recently, some countries have now advanced from a knowledge-based economy to a knowledge-driven economy, assuring that the current influence of knowledge is largely the dynamism of their economy. A knowledge-driven economy passes new business opportunities. Local markets are becoming international markets where there are more competitors and more clients' demands, and thus technology became more complex [11, 12].

Touches nearly all domains of community, such as the economics, politics, ideology, social sphere, culture, ecology, and lifestyle. Globalization turned out to be an essential part of the current contemporary universe, one of the greatest dominant powers that define the progress route of the earth. The fundamental truth donated to the formation of the major transnational corporations (TNCs), forming a cohesive product, employing economies of scale and worldwide sourcing, and accessing global markets to sell products all worldwide. Globalization delivered huge enhancements in productivity, quality, and speed of international networks of communication and transport, and as a result, the transaction expenditures reduced. Additionally, increasing markets homogenization in many nations has significantly simplified the business process for the whole world. Globalization also supported the growth of small and medium-sized companies, by allowing them to access universal markets, and the current market situations have shaped a more functional international economic domain, equalizing the competitive advantage of the scale of huge vertically joined multinationals. Add to that; globalization asserts that worldwide sustainable competitive advantage can only attain by the existence of exclusive assets and capabilities. Consequently, small and medium-sized companies with limited resources, but provide innovative products and services, can compete with the big businesses in the market, by delivering added-value products to meet their customers [3].

Innovation is supported by the constantly updating and refining of the regulatory and the official agenda where the innovative act involved. Therefore, alterations are required to make public policy, and regulatory environment more inspiring to innovation in a domain of policy spreads from the general industry and services

environment to global business, financial investment markets, labor markets and education. Policy cooperation is necessary, a general and extensive policy to raise and reinforce innovation will help in achieving social and environmental objectives and thus will form a long-term basis for future economic growth and competitiveness.

Government policies towards innovation are important as innovation frequently needs support from many governmental organizations. While governments have a further and straight role in promoting innovation, where public investment can play a major role in emerging technology and as a result innovation is then enabled. The government role raises the importance of reorganizing management and financing of public investments in research and scientific studies, for both of public and private sectors. Several emerged-technology accomplishments and major innovations with in-depth and optimistic social influences came from government funding. Well-known innovations, for example, the World Wide Web and the Web browser, founded not because of competitive environment only, but from public funding for institutions such as universities and laboratories [13].

2.2   The Contribution of Innovation in ICT

Today, innovation is considered as a critical cause of successful competition, of economic growth and of society revolution. The implementation of improvements in technology, in aggregation with entrepreneurship and innovative activities to the formation and distribution of products and services, which interprets scientific and technological developments into more useful economic movement. This outcome in economic development occurs only if the market environment permits the additional productive methods to occur [14, 15]. Unquestionably, the ability to innovate and to carry innovation efficaciously to market will be a critical element of the international competitiveness of countries over the future. There is increasing consciousness among officials that innovative action is the key driver of economic growth.

Certainly, economic growth is associated with the development and transmission of innovation. The practice of ICT thoroughly related to the capability of organizations to innovate, specifically producing innovative goods, services, methods, and applications. Furthermore, ICT has enabled the innovation practice, by fostering scientific studies, improving networking which in turn developed a new way for distance learning and meetings between partnerships, along with outsourcing. Forming proper regulation is a significant factor to confirm fair competition and innovation in new emerging markets and in markets where scientific studies and technologies convergence needs adjustments in the regulatory framework. These kind of development of innovation in ICT will not materialize without focusing on education and training, so it depends deeply on the formation of knowledge, where high-quality schooling system enables the implementation and dispersal of innovation. Investments in education mainly in knowledge gaining and investments in human capital especially in skilled human resources will foster innovation and all lead to economic development. Generating, emerging and spreading of new goods and services needs solid knowledge and technology abilities in addition to soft abilities, for example, risk-taking skill, communications abilities, and flexibility, which all fosters innovation. Therefore, effective education is now more concerned with skills learning in the perspective of real-world intricacies, for example,

expert thinking, complex communication, and self-concept. For a high-level productivity, people need to learn and trained for the right skills. Competitive countries take their people across the country borders to educate and trained them [13].

With the contemporary insecure economic settings and with the increased influence of global threats, innovation is a technique to guarantee economic development and competitiveness of countries with the necessities of sustainable development. The regression analysis outcomes, the innovation schemes and governance are exposed to be of real significance for economic development [16].

Equally, considerable of the development attained by the leading businesses in an industry imitates the broader development of that industry. The competitive battle among companies motivates innovation, and hence innovation drops expenses and enhances goods quality in the industry, and all results in rising market demand. Several republics have implemented domestic planned roadmaps to raise innovation and improve its economic influence [17]. Even nations that have normally desisted from effective trade policy in latest years, currently pursue new behaviors to develop the environment for innovation to boost efficiency and development. Growth in living standards is because of innovation, nowadays, the innovative realization is a critical element in defining competitiveness and country development. Furthermore, innovation is significant to help report global threats, for instance, environmental change and sustainable development. In recent times, the significance of innovation has been strengthened by globalization and by quick developments in emerging technologies, particularly ICTs, which have allowed original practices of competition and released new markets for the formation and transfer of innovative goods and services [8, 13].

3   Conclusion

Competitiveness in the fourth industrial revolution is not the same as it was in the previous revolutions. Therefore, governments and companies need to increase their investments to boost digital innovation to help them stand and preserve their position in the global market.

Moreover and due to the current global situation and with increasing challenges threatening the economic security of many countries, even for those that are considered as great nations such as China and the United States of America, it has become very necessary to find radical solutions to stand and address these threats to guarantee sustainable development. The key to achieving this is digital innovation and facilitating the path towards it.

It is advised for developing countries to accelerate the adaptation of digital innovation, which in turn will bring knowledge from different countries of the world. The digital economy saves many costs related to producing knowledge, creating infrastructure and increasing human capital and as a result, this will contribute to the revival of the local economy and development. Activating digital innovation has many advantages, the most important of which is diversifying sources of economic income. In addition, this technology supports and guides decision-makers towards making constructive and purposeful decisions that depend on providing knowledge in innovative ways [1].

Essential characteristic of innovation is the creation of new efficient methods to help in managing crises and to ensure the continuity of life for humanity. Consequently, the importance of innovation obviously shows, which is considered as an important indicator of the country's global progress in many aspects, including increasing the income and the purchasing power of individuals, attracting more international traders and knowledge, and contributing to increase innovation which is reflected as one of the major drivers of competition. Add to that, in a world of knowledge and the transition of most countries to the knowledge-based economy, researchers stated that innovation is one of the most important pillars of the knowledge economy. Policy modifications are required for both public and private sectors to reinforce and support innovation. Also, refining the business environment for innovation is significant because business and entrepreneurship are the key drivers of innovation. Further innovation welcoming regulations, united with lesser barriers to trade and foreign direct investments would boost competition and would promote the stream of know-how and knowledge across borders.

References

1. Al-Roubaier, A., Hamdan, A., Sarea, A.M.: Economic diversification in a digital economy. In: Hassanien, A.E., Azar, A.T., Gaber, T., Oliva, D., Tolba, F.M. (eds.) Proceedings of the International Conference on Artificial Intelligence and Computer Vision (AICV2020), pp. 665–671. Springer International Publishing, Cham (2020). https://doi.org/10.1007/978-3-030-44289-7_62
2. Al-Ghazali, I.M.: Competitiveness and measurement. Periodic Series Dealing With Development Issues in Arab Countries (2003)
3. Struzhanov, M.: The role of national innovation system in increasing competitiveness of small innovative enterprises in Russia (2016)
4. Carayannis, E., Grigoroudis, E.: Linking innovation, productivity, and competitiveness: implications for policy and practice. J. Technol. Transf. **39**(2), 199–218 (2012). https://doi.org/10.1007/s10961-012-9295-2
5. Drumea, C.: Competitiveness through innovation for the Romanian economy. IP activity and its effect on competitiveness. Bulletin of the Transilvania University of Brasov. Econ. Sci. Ser. V **8**(2), 391 (2015)
6. Lee, M., et al.: How to respond to the fourth industrial revolution, or the second information technology revolution? Dynamic new combinations between technology, market, and society through open innovation. J. Open Innov. Technol. Market Complex. **4**(3), 21 (2018)
7. Gibson, D.V., Naquin, H.: Investing in innovation to enable global competitiveness: the case of Portugal. Technol. Forecast. Soc. Change **78**(8), 1299–1309 (2011)
8. Cantwell, J.: Innovation and competitiveness. The Oxford Handbook of Innovation, pp. 543–567 (2005)
9. Fernandes, N.: Economic effects of coronavirus outbreak (COVID-19) on the world economy (2020). Available at: SSRN 3557504
10. Popa, I.L., Preda, G., Boldea, M.: A theoretical approach of the concept of innovation. Manager. Challenges Contemp. Soc. **1**, 151–156 (2010)
11. Hidalgo, A., Tiscar, J.: Innovation Management and the Knowledge-Driven Economy. European Commission, Brussels-Luxembourg (2004)

12. Global Innovation Index Report (2016). Retrieved https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2016.pdf
13. O.E.C.D.: Growth: Rationale for an Innovation Strategy. Statistical Office of the European Communities, Luxembourg (2007)
14. Martinez-Fernandez, C., Toner, P.: Innovation and the Knowledge Economy: Implications for Penrith. AEGIS, University of Western Sydney, Sydney (2003)
15. Chen, Y., Tang, G., Jin, J., Xie, Q., Li, J.: CEO s' transformational leadership and product innovation performance: the roles of corporate entrepreneurship and technology orientation. J. Prod. Innov. Manage. **31**, 2–17 (2014)
16. Taranenko, I.: Strategic analysis of innovation-based competitiveness in the global economy. Montenegrin J. Econ. **9**(1), 127 (2013)
17. Musleh Al-Sartawi, A.M.A. (ed.): The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. SCI, vol. 974. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-73057-4

Innovation and Economic Diversification – Which Has Impact on Another? The Case of Oman

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Abstract. The aim of this research is to investigate the relationship between innovation and economic diversification in the Sultanate of Oman. Quantitative research method has been implemented using secondary data. Granger causality test used to assess the impact of each variable on the other one for the Omani economy from 2011 to 2019. The study found a significant impact of economic diversification on innovation while there is no significant impact of innovation on economic diversification in Omani economy. The outcomes of this research will be very helpful to the Omani policy makers as it may sheds the light on policies needed to be taken by them to achieve the sustainable development in the Sultanate.

Keywords: Innovation · Economic diversification · Causality test · Sultanate of Oman

1 Introduction

1.1 Background

The Omani economy was dominated for long time by the production and export of hydrochronic products, which may have caused to made the economy more volatile resulted from fluctuations of oil prices. Hence, the Omani government started to diversify the economy by implementing the Tanfeedh program, which is aims at increase the Omani Gross Domestic Product (GDP) and reduce the dependency on the hydro carbonic sector [13]. On another hand, many initiatives taken to promote the innovation in the country, such as the establishment of the innovation park and The Research Council (TRC) which came under the umbrella of Ministry of Higher Education, Research and Innovation (MOHERI) in 2020.

1.2 Research Problem

Although both economic diversification and innovation have an impact on the GDP and the sustainable development, each of them has impact on the other variable. The innovation will lead to have new Intellectual Properties (IPs) and, in turn, Patents

which will motivate inventors to start businesses to produce products utilizing these patents. This will, definitely, lead to more diversification in the economy. In addition, innovation is seen as critical in resolving pressing social challenges such as pollution, health issues, and unemployment. On another hand, economic diversification means give higher priority to produce goods and services which will motivate to have higher level of innovation to initiate more goods and services to be produced.

Hence, the main problem of this research is the ambiguity about the relationship between the innovation and economic diversification in the Sultanate of Oman. as there is no clarity about the impact of innovation initiatives taken in Oman to diversify the Omani economy. Also, there is no clarity about the impact of the economic diversification initiatives in the Sultanate on promoting the innovation. In another words, the research problem can be formed in the following two questions: i) Does the innovation has a significant impact on economic diversification in the Sultanate of Oman? and, ii) Does the economic diversification has a significant impact on innovation in the country?

2   Literature Review

2.1   Innovation

Innovation can be defined, simply, as the process of translating a new idea or solution into a product which can meet the needs of the consumers and adds value [3, 5, 14]. Innovation can be in products, processes, services, technology, and the level of innovation is measured in sectors or organizations according to this benchmark [4].

Innovation is considered the engine of economic growth even in developed or developing countries, as it leads to long-term market sustainability [18] which could be due to innovation. Innovation creates new opportunities which lead to higher rate of employment [6], investment, more empowerment and social adjustment, achieve high flexibility and creative capabilities which leads to achieve significant economic growth at the end [7, 10, 12, 17].

Research institutes and centers in several countries around the world have been established to promote and foster innovation and inventions. This leads to having a better business environment which stimulates businesses to look for new opportunities to produce more products and to enhance their way of providing symmetric information to enhance the decision-making process and to attract more investments [2, 9]. Economists and policymakers have focused on technological product advancement based on R&D, mostly produced in-house and mostly in the manufacturing industry. This form of innovation has been carried out by a highly skilled labor force in R&D intensive enterprises [11].

The level of innovation in any country can be measured using the Global Innovation Index (GII) which assesses the full innovation ecosystem where factors of creativity are constantly evaluated. The GII has been used to assess the level of innovation for 140 countries in which they are ranked according to their scores. It recognizes innovation's crucial position as a driver of economic development and prosperity. It recognizes the importance of a broad horizontal vision of innovation that

includes metrics that go beyond traditional innovation measures. The GII consists of two sub-indexes, the Innovation Input Sub-Index and the Innovation Output Sub-Index. The former captures the country's economy's innovative elements. It consists of five input pillars, which are: i) institutions; ii) infrastructure; iii) human capital and research; iv) consumer sophistication and v) business sophistication. The later sub-index captures the innovation output related pillars which are: i) information and technology outputs and ii) imaginative outputs. The weighted average of Input and Output Sub-Indices is the total GII score [19].

2.2   Economic Diversification

Economic diversification implies adopting policies that minimize the dependency on a single/a few sector(s) in the contribution of the GDP. Diversification is a difficult process as it requires structural economic changes. Economic diversification is accomplished through the country's policies encouraging entrepreneurship, privatization, globalization, and industrialization. Diversification leads to have flexible and stronger economy able to sustain and adjust with the different global shocks.

For oil producing countries, and Sultanate of Oman as well, having strong non-hydrocarbon sectors such as manufacturing, services, logistics, entrepreneurship and agriculture could be considered the way to diversify the economy which leads to have more stable economies in the long run. Diversification strategies provide comfort and realistic alternatives in markets in order to compensate any drop in the in international oil prices and thus their reduced oil export revenues [13].

Majority of indices which measure economic diversification are related to the level of contribution of each sector in the economy's employment, exports or GDP. economic diversification indices can be divided into two groups: first group measures the absolute specialization of a country (e.g. ogive index, entropy index, Herfindahl-Hirschman index, Gini index, diversification index); and the second measures the economic structure of a country from a reference group of industries (e.g. Theil index, relative Gini index, productive sector disparity). The following sub-sections demonstrate three of most well-known indices used to assess the economic diversification in countries using depending on the absolute specialization, which are Ogive Index, Herfindahl Hirschman index and Entropy index

2.2.1   Ogive Index

The Ogive index is one of the most widely used economic diversification indices. It has been initiated by [1]. to quantify deviation from a uniform distribution of jobs across all sectors of an economy. When a household's economic activities are more evenly distributed among the different economic sectors, this reflects more diversity economy and vice versa. The value of Ogive index ranges between 0 and 1. If the value equals 0, this means an equal distribution of labour on the economic sectors which reflects high diversified economy. A higher value of the index means that the distribution of labour is more unequal which reflects less level of diversification in that economy. The measurement is, however, susceptible to the degree of sectoral aggregation.

The Ogive index is measured according to the following formula:

$$Ogiven\ Index = \sum_{i=1}^{N} \frac{(S_i - 1/N)^2}{1/N}$$

Where:
N = The number of sectors
S_i = The revenue share of the sector in the GDP

The greater the diversity in economy, the more distribution of the financial activities are the different sectors in the economy which lead to have less value of the index.

2.2.2 Herfindahl Hirschman Index

The Herfindahl Hirschman index is a commonly used measure of income/ livelihood concentration. It determines the level of concentration of the GDP generation from the different sectors. The index is the sum of the square of the proportion of sectoral income in the economy over the duration of a year [8].

$$Helfindahl\ Index = \sum_{i=1}^{n} S_i^2$$

Where:
n = the number of economic activities
Si = the share of each activity in the GDP

The index varies from 0 (perfect diversification) to 1 (perfect concentration). Thus, a lower index signifies higher diversification.

2.2.3 Entropy Index

This index is inversely related to the concentration and has a positive relationship with diversification. When the economy is fully specialized, it hits zero, and when there is perfect diversification, it reaches its optimum value. If all income in the GDP is concentrated in only one group or sector, the Entropy index will be zero. If income is distributed evenly among the "N" sectors in the GDP, the Entropy index will be maximum, implying perfect diversity. [16]. The formula is as follows:

$$Entropy\ Index = \sum_{i=1}^{N} S_i\ ln \left(\frac{1}{S_i} \right) = - \sum_{i=1}^{n} S_i\ ln\ (S_i)$$

Where:
N = The number of sectors
Si = The revenue share of the sector in the GDP

The index's upper limit is determined by the logarithm's base and the number of generated income from the sector. Greater relative diversification is indicated by higher entropy index values, while greater relative concentration is indicated by lower entropy index values. The drawback of this index is that it does not have a standard scale for evaluating the degree of diversification [15].

2.3 The Research Gap and Theoritical Framework

As there is no study investigated the relationship between innovation and economic diversification, there is a need to have a study try to spot the light on this relationship which is totally novel and will add considered an addition to the body of the knowledge in this area. The theoretical framework is simply demonstrated in Fig. 1.

Fig. 1. The theoretical framework of the research. *Source:* Designed by the authors.

3 Research Methodology

Quantitative research method has been implement in this research depending on secondary data published in many international reports, books, academic articles and journals. The data related to innovation was collected from the global innovation index which contains the pillars and sub pillars of innovation for 131 countries. The time series of the data collected in regards to the global innovation index from the year 2011 to 2019. The data regarding economic diversification of Oman was first collected by obtaining data regarding GDP revenue of each sector in Oman between the years 2011 and 2019. The calculation of economic diversification variable has been done using different indices. To test the relationship between innovation and economic diversification in Oman, the Causal Analysis for Bivariate has been be implemented.

For a bivariate system, y_t, x_t defined by

$$\begin{bmatrix} y_t \\ x_t \end{bmatrix} = \begin{bmatrix} A_{11}(B) & A_{12}(B) \\ A_{21}(B) & A_{22}(B) \end{bmatrix} \begin{bmatrix} y_{t-1} \\ x_{t-1} \end{bmatrix} + \begin{bmatrix} u_{yt} \\ u_{xt} \end{bmatrix}$$

$$= \begin{bmatrix} \Phi_{11}(B) & \Phi_{12}(B) \\ \Phi_{21}(B) & \Phi_{22}(B) \end{bmatrix} \begin{bmatrix} u_{yt-1} \\ u_{xt-1} \end{bmatrix} + \begin{bmatrix} u_{yt} \\ u_{xt} \end{bmatrix}$$

Where:

Y = Innovation

X = The economic diversification

4   Analysis

4.1   Innovation

Global Innovation Index (GII) has been used to assess the level of innovation in the Sultanate of Oman. The index consists of five input pillars (institutions, Human capital & research, Infrastructure, Market sophistication and Business sophistication) and two output pillars (Knowledge & technology outputs and Creative outputs). Table 1 and Fig. 2 demonstrates the evolution of the index and its' pillars from 2011 to 2019.

Table 1.   Global innovation index for Oman (2011–2019)

GII and the it's pillars	2011	2012	2013	2014	2015	2016	2017	2018	2019
GII	35.5	39.5	33.3	33.9	35.0	32.2	31.8	32.8	31.0
Pillar 1 - Institutions	78.7	71.9	71.6	70.8	70.9	71.0	71.8	62.1	61.5
Pillar 2 - Human Capital and Research	45.9	48.1	33.8	28.3	29.1	33.9	35.8	40.3	43.3
Pillar 3 - Infrastructure	26.7	38.3	35.9	39.8	45.4	47.5	48.4	48.3	51.3
Pillar 4 - Market sophistication	35.1	32.6	44.1	48.1	40.7	39.0	44.2	44.9	45.5
Pillar 5 - : Business sophistication	44.7	43.8	31.1	27.2	35.0	19.1	17.0	21.5	23.8
Pillar 6 - Knowledge & technology outputs	22.3	26.8	20.1	21.2	23.9	18.5	15.6	16.3	12.3
Pillar 7 - Creative outputs	27.2	37.3	26.4	28.6	32.5	26.2	24.8	28.1	21.5

Source: Global Innovation Index report. Various issues.
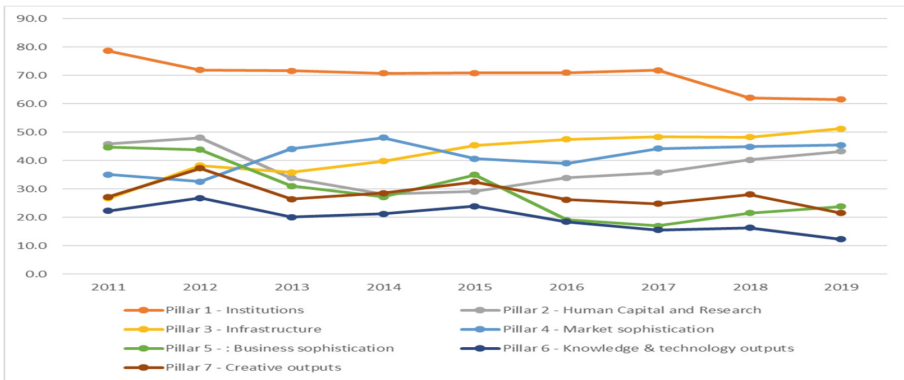
Fig. 2.   Global Innovation index Pillars for Oman (2011–2019)

The GII score fluctuated between 31.0 and 39.0 for the given period. It reached the maximum in 2019 while the following years show decreased value of the index. Infrastructure and market sophistication showed increase in their score between 2011 and 2019. On another hand, the value of all other sub-pillars decreased between 2011 and 2019.

4.2   Economic Diversification

The ogive index has been used in this research to assess the level of economic diversity in the Omani economy. Table 2 demonstrates the evolution of the score of ogive index for Oman from 2011 to 2019.

Table 2. The ogive index for the Oman economy (2011–2019)

Year	Sectors				Total
	Petroleum Activities	Agriculture & Fishing	Industry Activities	Services Activities	
2011	0.22475	0.02243	0.05658	0.10125	0.40501
2012	0.22575	0.01975	0.06898	0.10483	0.41931
2013	0.22563	0.01931	0.07782	0.10758	0.43033
2014	0.22408	0.0214	0.10445	0.11665	0.46658
2015	0.22126	0.01894	0.10018	0.11346	0.45383
2016	0.21635	0.01816	0.09809	0.11087	0.44346
2017	0.21381	0.01746	0.11411	0.11512	0.4605
2018	0.2052	0.01765	0.1059	0.10957	0.4383
2019	0.20388	0.01407	0.09334	0.10376	0.41505

Source: Calculated by the researchers

The above table demonstrates the Ogive Index for Omani economy from 2011 to 2019. Detailed calculation of the index for each year is shown in Appendix I. As clarified in the research methodology section, less value of Ogive index reflects more diversity in the economy and vice versa. It can be observed that there is a drastic drop of the value of ogive index starting from 2016 which indicates that the Sultanate started to move towards having more a diversified economy.

4.3   Granger Causality Test

4.3.1   The Impact of Economic Diversification on Innovation in Oman

The results of Table 3 demonstrates a significant impact of economic diversification on innovation in Oman as the value of calculated F (1.209) is greater than the P-value (0.321).

Table 3. The outcome of the causality test for the impact of economic diversification on innovation in Oman

Granger Causality Test: Y = f(X)				
Model	Res.DF	Diff. DF	F	p-value
Complete model	5			
Reduced model	6	-1	1.209233	0.321589

4.3.2   The Impact of Innovation on the Economic Diversification in Oman

The results of Table 4 reflects that there is no significant impact of economic diversification on innovation in Oman as the value of calculated F (0.089) is smaller than the P-value (0.777).

Table 4. The causality test for the impact of innovation on the economic diversification in Oman

Granger Causality Test: X = f(Y)				
Model	Res.DF	Diff. DF	F	p-value
Complete model	5			
Reduced model	6	-1	0.089383	0.776990

5   Discussion and Conclusion

Oman has started many initiatives to promote the innovation as an attempt to shift its economy away from reliance on oil towards a non-petroleum focused economy. The contribution of industry value added to the Omani GDP is increasing which reflects significant improvement in the level of economic diversification. The strategies such as Tanfeedh and other government programs for diversification has been reflected on the economic indicators of the Sultanate. The indicators show that the Sultanate of Oman is

making good strides in economic diversification and innovation by sticking to national-level policies, as evidenced by various indicators. The innovation in Oman is measured by the Global innovation index of Oman. The index' score has been decreased from (35.1) in year 2011 to (31.0) in year 2019. The index score has been fluctuated during the same period of time. This fluctuation reflects although there is improvement in the score of many pillars, there is deterioration in some certain pillars. The improvement has been shown in innovation inputs than innovation outputs pillars. This fluctuation is due to many factors. Institutions exhibits strengths in the indicator "Ease of starting a business" (Business environment sub pillar), this can be seen that the score of the sub pillar has been fluctuating and improving this is due to the investment incentive laws, such as the Commercial Companies Law, the Foreign Capital Investment Law, the Bankruptcy Law, the Public-Private Partnership Law and the Privatization Law.

Human Capital & Research shows strengths in the sub-pillars "Education" and "Tertiary education". Oman has improved their score and accelerated investment in human capital through stimulating current government strategies to improve health and education outcomes. This can be shown that Oman ranked 1st in 2020 in Graduates in science & engineering. However, Oman shows weakness in research which reflects the need to increase the expenditure on R&D. The big Omani factories do not have in-house R&D. So, there is a need to establish such units in the Omani factories, this might be developed via having joint ventures with foreign partners or utilize the current governmental support provided by the innovation complex and such supportive institutions.

"Creative outputs" sub-pillar shows strength. The trademark sub pillar has increased, this may due to the new Public Private Partnership (PPP) law introduced in 2019. However, Oman has revealed weaknesses in the Industrial designs by origin indicator, as the industrial design in Oman grant is protected for only 5 years. According to the Law on Industrial Property Rights, a trademark must be registered with the Ministry of Commerce and Industry's Registry of Trademarks and Trade Names. Trademarks are covered for ten years and can be extended.

The reduction in the overall innovation index of Oman may be resulted that the efforts towards foster the innovation are still new and the impact of these efforts will be shown in the long run. Hence, although there is a reduction in the value of the innovation index in Oman decreased between 2011 and 2019, it's expected that the fruits of the taken effort to foster the innovation will be shown in the near future.

The economic diversification in Oman has been measured using Ogive index. The evidenced that Omani economy became more diversified between 2011 to 2019. This increase in the economic diversification may be resulted mainly from the significant effort done by the government in this regard due to government programs such as having operational free zones like "Sohar free zone" which is still in the early stages of growth. The zone is planned to be 4,500 ha on the Sohar Port with a wide range of

companies work in trade and logistics, oil and gas, petroleum products, minerals and assembly of products, ceramics, and food warehousing & Storage. In addition, the Sohar free zone is planned to have a one-stop shop where customers can get all their requirements to start and run their businesses effectively and efficiently. Another government program is Tanfeedh, which is also the title given to the Royal Court's National Program for Enhancing Economic Diversification This program started in 2016 as a result of the sudden drop in oil prices below $30. This huge reduction affected the country's revenues which forced the government to implement reform steps such as eliminating fuel subsidies, raising taxes, and reducing annual increments for government employees. This sudden drop in oil prices sounded the alarm that there is a need to accelerate the economic diversification. Tanfeedh came as a result of that. The Royal Decree (1/2016) determined the targeted sectors, which are: manufacturing; tourism; logistics; and banking.

The granger causality test showed a significant impact of economic diversification on innovation in Oman while there is no significant impact of innovation on economic diversification in the Sultanate. This result may highlight that more economic diversification might lead to more innovation in the Omani economy. Hence, it's expected that more implementation of economic diversification programs will lead the Omani economy not only for sustainable development but also towards having innovative economy.

The findings of this study have a wide range of consequences and are useful to decision-makers. Recognizing the critical position of innovation as a driver of economic growth, the study highlighted the need to assess the outcomes of innovation initiatives on the economy. They would need innovation measures in addition to conventional input metrics, such as the percentage of R&D expenditure on the GDP. There is a need to initiate and implement policies lead to improve the market and the business environment in the Sultanate which is essential for having diversified economy and attract more foreign direct investment.

The main limitations of this research is the difficulty of collecting data for long time series about all innovation sub-pillar. This forced researchers to run the analysis for 9 years only. This research investigated the relationship between the innovation and economic diversification in Oman. This is considered a new add to this area of knowledge. In this regard, it's suggested to conduct similar studies to investigated the relationship between the innovation and economic diversification in other countries. This study has been done for the period from 2011 to 2019. It's suggested to collect longer time series and measure the relationship between the innovation and economic diversification.

Appendix I

Ogive Index for Oman (2011–2019)

Ogive Index for Oman economy (2011)

2011	Si	1/N	Si - 1/N	(Si - 1/N)2	[(Si - 1/N)2] / [1/N]
Sector	0.442987	0.25	0.192987	0.037244153	0.149
Total Petroleum Activities	0.012963	0.25	-0.237037	0.056186762	0.225
Agriculture & Fishing	0.175117	0.25	-0.074883	0.005607395	0.022
Industry Activities (Mining , Manufacturing , Construction etc..)	0.368933	0.25	0.118933	0.014144955	0.057
Services Activities (Retail , Transportation , Tourism , Education etc ..)					0.113
	1	1	0.00	0.113183266	
$\sum_{i=1}^{N} \frac{(S_i - 1/N)^2}{1/N}$					0.40501

Ogive Index for Oman economy (2016)

2016	Si	1/N	Si - 1/N	(Si - 1/N)2	[(Si - 1/N)2] / [1/N]
Sector	0.393356	0.25	0.143356	0.020550817	0.082
Total Petroleum Activities	0.017434	0.25	-0.232566	0.054086925	0.216
Agriculture & Fishing	0.182616	0.25	-0.067384	0.004540645	0.018
Industry Activities (Mining , Manufacturing , Construction etc..)	0.406595	0.25	0.156595	0.0245219	0.098
Services Activities (Retail , Transportation , Tourism , Education etc ..)					0.104
	1	1	0	0.103700287	
$\sum_{i=1}^{N} \frac{(S_i - 1/N)^2}{1/N}$					0.519

Ogive Index for Oman economy (2012)

2012	Si	1/N	Si - 1/N	(Si - 1/N)2	[(Si - 1/N)2] / [1/N]
Sector	0.426512	0.25	0.176512	0.031156395	0.125
Total Petroleum Activities	0.012436	0.25	-0.237564	0.056436514	0.226
Agriculture & Fishing	0.179728	0.25	-0.070272	0.004938113	0.020
Industry Activities (Mining , Manufacturing , Construction etc..)	0.381324	0.25	0.131324	0.017245907	0.069
Services Activities (Retail , Transportation , Tourism , Education etc ..)					0.110
	1	1	0	0.109776928	
$\sum_{i=1}^{N} \frac{(S_i - 1/N)^2}{1/N}$					0.549

Ogive Index for Oman economy (2017)

2017	Si	1/N	Si - 1/N	(Si - 1/N)2	[(Si - 1/N)2] / [1/N]
Sector	0.378369	0.25	0.128369	0.016478485	0.066
Total Petroleum Activities	0.018804	0.25	-0.231196	0.053451513	0.214
Agriculture & Fishing	0.183929	0.25	-0.066071	0.00436538	0.017
Industry Activities (Mining , Manufacturing , Construction etc..)	0.418898	0.25	0.168898	0.028526637	0.114
Services Activities (Retail , Transportation , Tourism , Education etc ..)					0.103
	1	1	0	0.102822015	
$\sum_{i=1}^{N} \frac{(S_i - 1/N)^2}{1/N}$					0.514

Ogive Index for Oman economy (2014)

2014	Si	1/N	Si - 1/N	(Si - 1/N)2	[(Si - 1/N)2] / [1/N]
Sector	0.398237	0.25	0.148237	0.021974089	0.088
Total Petroleum Activities	0.013313	0.25	-0.236687	0.056020533	0.224
Agriculture & Fishing	0.176853	0.25	-0.073147	0.005350441	0.021
Industry Activities (Mining , Manufacturing , Construction etc..)	0.411597	0.25	0.161597	0.026113486	0.104
Services Activities (Retail , Transportation , Tourism , Education etc ..)					0.109
	1	1	0	0.109458549	
$\sum_{i=1}^{N} \frac{(S_i - 1/N)^2}{1/N}$					0.547

Ogive Index for Oman economy (2018)

2018	Si	1/N	Si - 1/N	(Si - 1/N)2	[(Si - 1/N)2] / [1/N]
Sector	0.380197	0.25	0.130197	0.01695121	0.068
Total Petroleum Activities	0.023521	0.25	-0.226479	0.051292681	0.205
Agriculture & Fishing	0.183571	0.25	-0.066429	0.004412845	0.018
Industry Activities (Mining , Manufacturing , Construction etc..)	0.412711	0.25	0.162711	0.02647497	0.106
Services Activities (Retail , Transportation , Tourism , Education etc ..)					0.099
	1	1	0	0.099131706	
$\sum_{i=1}^{N} \frac{(S_i - 1/N)^2}{1/N}$					0.496

Ogive Index for Oman economy (2015)

2015	Si	1/N	Si - 1/N	(Si - 1/N)2	[(Si - 1/N)2] / [1/N]
Sector	0.395739	0.25	0.145739	0.021239771	0.085
Total Petroleum Activities	0.014811	0.25	-0.235189	0.055313844	0.221
Agriculture & Fishing	0.181195	0.25	-0.068805	0.004734073	0.019
Industry Activities (Mining , Manufacturing , Construction etc..)	0.408255	0.25	0.158255	0.025044596	0.100
Services Activities (Retail , Transportation , Tourism , Education etc ..)					0.106
	1	1	0	0.106332284	
$\sum_{i=1}^{N} \frac{(S_i - 1/N)^2}{1/N}$					0.532

Ogive Index for Oman economy (2019)

2019	Si	1/N	Si - 1/N	(Si - 1/N)2	[(Si - 1/N)2] / [1/N]
Sector	0.382311	0.25	0.132311	0.017506322	0.070
Total Petroleum Activities	0.024233	0.25	-0.225767	0.050970885	0.204
Agriculture & Fishing	0.190698	0.25	-0.059302	0.003516681	0.014
Industry Activities (Mining , Manufacturing , Construction etc..)	0.402757	0.25	0.152757	0.023334847	0.093
Services Activities (Retail , Transportation , Tourism , Education etc ..)					0.095
	1	1	0	0.095328736	
$\sum_{i=1}^{N} \frac{(S_i - 1/N)^2}{1/N}$					0.477

References

1. Attaran, M., Zwick, M.: Entropy and other measures of industrial diversification. Q. J. Bus. Econ. **26**(4), 17–34 (1987)
2. Al-Sartawi, A., Reyad, S., Madbouly, A.: Shariah, presentation and content dimensions of Web 2.0 applications and the firm value of Islamic financial institutions in the GCC countries. J. Islamic Mark. (2021)

3. Musleh Al-Sartawi, A.M.A. (ed.): The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. SCI, vol. 974. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-73057-4

4. Balka, K., Raasch, C., Herstatt, C.: The effect of selective openness on value creation in user innovation communities. J. Prod. Innov. Manag. **31**(2), 392–407 (2014)

5. Bossink, B.A., Vrijhoef, R.: Innovation management in the construction supply chain, Construction Supply Chain Management Handbook, pp. 1–14. CRC Press, Boca Raton (2009)

6. Cui, A.S., Wu, F.: Customer involvement in innovation: a review of literature and future research directions. Innov. Strategy (Rev. Mark. Res. **15**, 63–98 (2018). https://doi.org/10.1108/S1548-643520180000015005

7. Chayjan, M.R., Bagheri, T., Kianian, A., Someh, N.G.: Using data mining for prediction of retail banking customer's churn behaviour. Int. J. Electron. Bank. **2**(4), 303–320 (2020)

8. Department of Business, Economic Development and Tourism, State of Hawaii. "Measuring economic diversification in Hawaii", Research and Economic Analysis Division (2008)

9. Drucker, P.F.: Innovation and Entrepreneurship: Practice and Principles. Harper & Row, New York (2007)

10. Hannoon, A., Musleh, A., Al-Sartawi, A.: Relationship between financial technology and financial performance. In: Musleh, Abdalmuttaleb M A., Al-Sartawi, (eds.) The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. SCI, vol. 974, pp. 337–344. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-73057-4_26

11. INSEAD. The Global Innovation Index 2011: Accelerating Growth and Development. Fontainebleau (2011)

12. Mansour, A.: Planning for Economic diversification in Oman. In: Conference on Sustainable and Equitable Growth between Planning and Reality, Muscat, Oman (2013)

13. Mishrif, A.: Introduction to economic diversification in the GCC region. In: Mishrif, Ashraf, Balushi, Yousuf Al (eds.) Economic Diversification in the Gulf Region, Volume I, pp. 1–26. Springer Singapore, Singapore (2018). https://doi.org/10.1007/978-981-10-5783-0_1

14. Abdalmuttaleb, M.A., Al-Sartawi, Musleh, Razzaque, Anjum, Kamal, Muhammad Mustafa (eds.): Artificial Intelligence Systems and the Internet of Things in the Digital Era: Proceedings of EAMMIS 2021. Springer International Publishing, Cham (2021)

15. Pandit, A., et al.: Fishers' livelihood diversification in Bhagirathi-Hooghly stretch of Ganga River in India. Central Inland Fisheries Res. Inst., India (2019)

16. Shiyani, R.L., Pandyaj, H.R.: Diversification of agriculture in gujarat: a spatio-temporal analysis. Ind. J. Agric. Econ. **53**(4) (1998)

17. Shihadeh, F.: Online payment services and individuals' behaviour: new evidence from the MENAP. Int. J. Electron. Bank. **2**(4), 275–282 (2020)

18. Visnjic, I., Wiengarten, F., Neely, A.: Only the brave: product innovation, service business model innovation, and their impact on performance: only the brave. J. Prod. Innov. Manag. **33**(1), 36–52 (2016). https://doi.org/10.1111/jpim.12254

19. Wunsch-Vincent, S., Lanvin, B., Dutta, S.: The Global Innovation Index 2015: effective innovation policies for development, no. id: 7491 (2015)

Computing the Effect of Brand Passion
on Consumer Behaviour

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Abstract. Most challenging task for any enterprise especially in ever changing market scenario is to accurately predict consumer behaviour. Although, data and relevant statistics with appropriate literature whenever being used for estimation purposes, provides some tentative forecasting but cannot guarantee the same result. In this scenario the only game changer or the game winner for any organization is Brand Attachment or Brand Passion. However, it is again a big challenge to create good brand image in market especially in the eyes of the consumers. Moreover, it has been observed that once brand passion is developed amongst consumers based on certain aspects, the journey for firm would be smooth in many respects.

Thus, in this paper an attempt is being made to analyse brand passion impacts on the consumer's choice about particular product and also analyze how a consumer who is passionate about particular product can promote various other factors of brand. Hence, for current study we have chosen particularly APPLE because consumers connect highly with APPLE as a lifestyle statement.

Keywords: Brand · Consumer choice · APPLE · Marketing · Business

1 Introduction

Researchers in the past have brought in different theories of brand like brand attachment [38, 44], brand love, brand passion [4, 11] in order to examine as well as discover the part of customer and brand relationship in terms of consumer attitude and behavior of purchase. Several new theories and variables of brand have been proposed to understand the attitudes and evaluation pattern of consumers about a particular brand. In recent times, Brand passion has attracted a lot of attention from marketing practitioners and academicians. Passion is very often said as a part of love [12, 49]. With passion comes the power of idealization and also adoration for the cherished. The very passionate component of the commitment is responsible for the strength of emotions that comes in with love but it does not really reflect the intensity of love.

Passion is often cited as a component of love [12, 49]. Along with passion comes idealization and adoration of the beloved. The passionate component of devotion is responsible for the intensity of emotionality that comes with love however it does not

reflect the intensity of love as such. Passion rather circumscribes the desire and (physical) attraction that is evoked by the object of love.

The main aim of this study is to understand the concept of Brand Passion and how being passionate about something can change a user's perception about the Brand. In this research study we propose to investigate the impact of Brand passion on various other factors which include, brand advocacy, social media support, alternative deval- uation, brand community engagement, price insensitivity and purchase loyalty for Apple users in particular. The passionate brand is not a brand that consumers purchase purely out of any habit but it is a brand consumers are very emotionally connected with and they want to be noticed by their social group. Refer below in Fig. 1 the conceptual framework develops for the study undertaken.

The brand selected for this study is Apple considering how smartphones are an integral part of a consumer's lifestyle and many consumers exhibit a high degree of attachment with their personal phones.

2   Statement of the Problem

How brand passion affects the perception of users about a particular brand. Here we try and understand how brand passion affects various factors such as brand advocacy, brand alternatives, price insensitivity, social media support, purchase loyalty, brand community engagement which affects the consumer's perception of a particular brand.
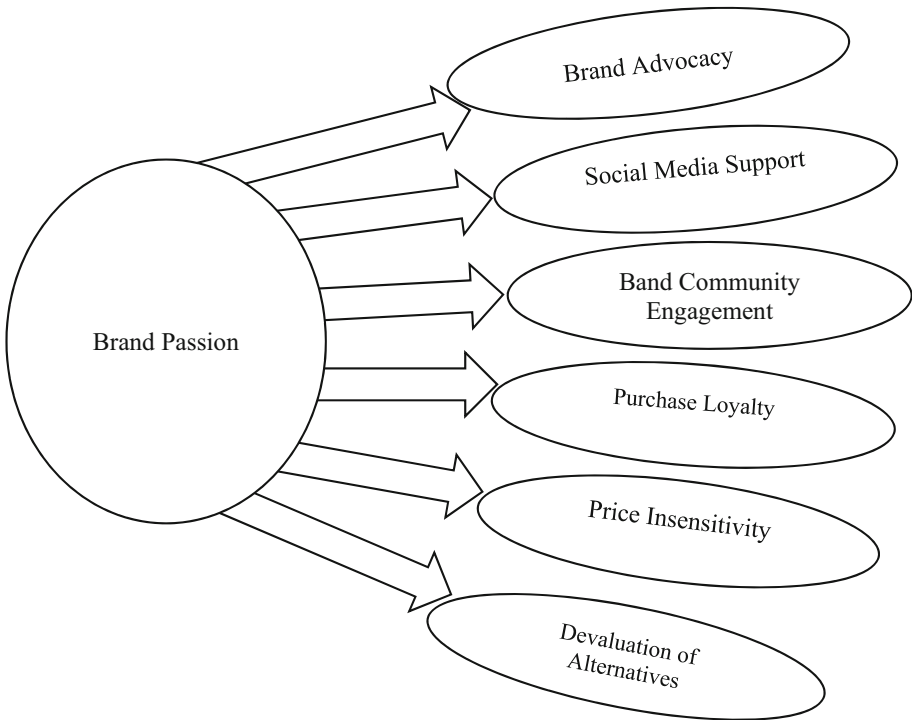
Fig. 1. Conceptual framework of brand passion (Source: Our study)

3   Literature Review

The amount of emotional connect that an individual customer has towards a brand can force them to cross certain barriers like price, online support, devaluating other alternatives and so on, which on other cases will not be possible. One such way of measuring this connect that a customer has towards a brand can be estimated by determining how they are passionate towards the brand. Passion plays a very important role in ensuring a commitment towards a particular entity in this case a brand. Passion is what drives attachment and the willingness to do that extra for experiencing that feeling.

Very recently brand passion is defined as a psychological construct which comprises of excitation, infatuation, and obsession for a particular brand and also a type of feeling which fewer consumers embrace [1]. In theory of marketing, it is discussed within the framework by Sternberg's triangular love theory [48]. The triangular theory of love says that love has three major components: passion, decision/commitment and intimacy. Sternberg also defines passion as "the dries that leads to romance, physical attraction, sexual consummation, and the related phenomena in the loving relationships [49]. Furthermore, the strong wish and urge for indulging with the partner is one aspect of passion [34]. A few other consumer brand concepts like brand commitment [25], brand identification [22] and brand trust have dominated the studies, but this new proposed concept of brand passion is developing a domination in understanding the customer's relation with the brand. The word passion is defined in terms of an activity that an individual finds very important, is concerned about liking or even to an extent of love and also dedicates the require energy and time into the activity [54]. This is very similar to the past research that depicts the value of activity [19] expenditure on energy and time [21], and likeness towards a task [17] and hence they are related with activities which requires high amount of engagement. [54] also proposed that they are passionate towards an activity only when it defines or relates with some characteristics of the person's identity.

In application context brand passion defines the optimistic behavior of individuals towards a particular brand [11]. Application experiences are multidimensional and include hedonic dimensions, such as feelings, fantasies, and fun [16]. Passion is considered the fundamental of a healthy customer–brand relationships [23]. Emotionally attached consumers do not just spread positive word of mouth but they try to involve in convincing others to select a particular brand [45]. All these strong emotional connections are made due to the long connection feeling with a particular brand, in both social and inside context [13]. These consumers act as advocators of the brands which are due to the connection, they feel both emotionally as well as physically. Generally, passion is put forward in two broad categories, a harmonious passion and as well as obsessive passion which reflects the active and passive forms of passion [46]. There was a hypothesis that the two passions occur by the way a particular work is undertaken by a consumer or an individual [54]. In accordance with self-determination theory, it is said that the activity is completed in a very controlled manner [20]. The brand values and strong emotional connect defines the customer's **willingness to pay** premium price for that brand [11]. A customer who is emotionally connected and has a

sense of prestige attached, will not hesitate in spending that extra towards the particular brand.

If we look into broader aspects of customers-brand relationships, consumers tend to resist other alternatives based out of trust and commitment which they have developed in themselves over time towards a brand [24, 53]. Also, consumers who feel passionately towards a certain brand are less likely to depend on alternatives and are more loyal even if other brands fulfill their requirements [40]. In order to develop a bond with brands, it eventually leads to strong associations with brand which results in consumes becoming ambassadors or followers of a brand [31, 32, 37, 50]. Such customers follow these brands on their **social media** platforms to stay updated about the newer enhancements and also, they will maintain the image of these brands by giving out positive reviews and engaging with other enthusiastic people. They will be very cautious in protecting the social image of the brand as they are physically and emotionally attached with the brand [15]. There are a few evidences of acts where in consumers have a deep feeling for the people associated with the brand and some examples are: passionate owners of VW Beetle giving personal names to their cars and Mac passionate users who promote campaigns against Bill Gates (the founder of Microsoft) or tattoo apple logo on their chest next to their hearts.

Academics [7, 38], have created the impact of brand communities as a group of individuals who have the ability to affect the perception of members of purchase behavior and brand in a way to effectively circulate information amongst the members and then have a collaboration [8]. Studies depict that the consumer willingness to back up the communities is majorly correlated with the empowerment of the consumer and emotional attachment [14, 27]. Other studies have also depicted that emotional attachment of consumers with a particular brand led to a higher probability of buying the same brand frequently or purchase the brand on a regular interval [5, 9, 25, 57]. Thus, joyful and affectionate brands create a feeling of greater purchasing loyalty [16]. The consumers constantly get involved in many unique forms of brand relationships and if looked deeply we also find a feeling of love [24]. Such kind of relationships require the ability to idealize a particular object, which may be an antecedent for desire. Hence, the objects of love are taken in a way which is unclear or distorted. Further, if something needs to be loved or desired, the object must fulfill the 'personification qualification' criterion [24]. The literature of Consumer behaviour supports with numerous evidences of enthusiastic and highly passionate types of consumers oriented with object relationships in the form of different activities. In order to enchant their lives, consumers get engaged in riding a motorcycle [36, 47], worshipping the Apple Newton Brand and in trying to communicate with other fans who are passionate as told by [45]. It is also concluded that materialistic objects have an important role in the lives of consumers. The objects have the capability of becoming their 'favorite things' and serve as an important psychological function in our lives. People living in today's almost demystified world of consumption are increasingly looking out for new opportunities to fill their lives with meaning. Consumers often satisfy this deeply rooted desire through the consumption of material products or the possession of beloved objects [10].

In earlier ages the people of industrialized markets like USA, UK and Japan largely consumed smartphones. But his state has dramatically shifted to embryonic markets

like BRIC (Brazil, Russia, India and China) [43]. The developing economy of India has now extended consumer groups in the smartphones sector, which now also includes people from middle class, where consumers prioritize social influence, brand image and brand awareness in their ways [51]. Brand passion is directly related to many factors some of which include **Brand advocacy**, promotion of **brand community** events, improved **social media** support, increased **purchase loyalty** towards a brand, willingness to **pay a premium** for their desired brand and disregarding the **alternatives** even if they fulfill the customers need [38].

4 Objectives of the Study

If we take relational context then according to [23], affection is more closely linked with trust as compared to passion, the direct correlation of brand trust on passion has not yet been identified. Further, as also suggested and noticed by many authors in recent past such as [4, 16], that trust for a brand has both affective and cognitive dimensions in similar lines with brand passion. With this background and on the basis of learning from relevant literature our study is being undertaken with following objectives:

- To examine social behavioral effects of brand passion with reference to brand advocacy, social media support and brand community engagement.
- To examine individual behavioral effects brand passion with reference to purchase loyalty, price insensitivity and devaluation of alternatives.
- To recommend policy guidelines on the basis of the study.

5 Methodology and Data Source

- **Description of Research Design and Procedures Used**
  This study examined the behavioural responses of Apple consumers in a view to understand the relation between brand factors with Brand Passion. The data collected is within India. In order to do the analysis and assess all the concepts, a questionnaire was created and designed to collect data from our sample consumers. The items were taken from the past studies in the similar lines of customer brand relationship and brand passion. Having studied the literature review, we feel that it will be important for the brand to understand its customers on what factors are they agreeing to go that extra for continuing to experience the pleasure they get on using their brand.
  A survey was conducted with respondents on a sample size of 250 respondents who are current users of Apple brand. The respondents indicated the usage of Apple products and were asked to respond to the questionnaire about that brand (measured using a five-point Likert-type scale, ranging from 'strongly disagree' to 'strongly agree'). All the variables in the conceptual framework above were examined in relation to Apple as a brand. The questionnaire created presented the previous research used to develop such relating questions, the constructs and the survey

items. In the research framework, our sample was among the Age Group 18–65, the data was collected through an online form circulated on various digital platforms. In order to format the data, query the data and analyse the data we will be using tools such as Google sheets and R Studio.

Thus, finally based on relevant literature review, objectives set for the study and methodological procedure being used, we constructed following hypothesis for the purpose of the study:

- **With Reference to Social Behavioral Effects:**
  Brand Advocacy: Studies show that developing a connection with brand will lead to strong associations with brand, resulting in the consumers becoming advocates or followers of the brand [29, 31, 32, 50]. It is proving that an emotional relationship towards a brand or a service positively affects the willingness to act as an advocate on behalf of the brand in different sectors such as telecommunications, banking or retail work [25, 42]. Same evidences are also shown in the context of social media [55]. Based on the previous studies we also feel that the brand advocacy plays a major factor for a smartphone brand and hence we propose the following hypothesis:
  H1: **Brand Passion does not influence Brand Advocacy**.
  Social Media Support: Very regular consumers are generally very active on online social communities participating in many activities towards a brand [39]. Based on the nature of connection with a brand, consumers are tending to engage on social media (via 'liking', 'following', commenting and so on) in a way to show their feelings online [55]. Therefore, we propose the following hypothesis:
  H2: **Brand passion does not influence social media support**.
  Brand Community Engagement: Researchers have made the idea of brand communities as group of persons who are able to affect the perception of the members of a brand and purchase behavior to spread information effectively among the members and to have a team with a loyal set of consumers [2, 3, 8]. Past studies clearly depict the bond between strong consumer-brand connections and their willingness to back the communities, showing that association with communities of brand significantly has a correlation with consumer empowerment and emotional closeness. Thus, we propose the following hypotheses:
  H3: **Brand passion positively influences brand community engagement**.
- **With Reference to Individual Behavioral Effects:**

Purchase Loyalty: Various literatures show that consumers' who are emotionally connected with a brand leads to a higher possibility of constantly buying the same brand regularly [6, 25, 34, 57] Thus, 'joyful' and 'affectionate' brands add up to greater purchase loyalty [16]. We suggest that those consumers who are loyal towards a brand and would like to continue the relationship with the brand. Hence, the following hypothesis is proposed:

H4: **Brand passion does not influence purchase loyalty.**

Price Insensitivity: The previous research shows that the value consumers provide to a brand can lead to a strong consumer-brand relationship [52]. It is also said that the values that create a connect emotionally for the consumers with the brand, defines the

willingness of consumers to pay high or premium price for that brand [11]. Thus, the following hypothesis is proposed:

   H5: **Brand passion positively influences price insensitivity.**

   Devaluation of Alternatives: In a deeper aspect of brands-customer's relationship, customers tend to be away from various substitutes because of trust and commitment that they have built towards the brand over a certain period of time [24, 53]. Hence, consumers who feel very passionately about a brand are less likely to pay attention to substitutes, even if they have the same characteristics with a cheaper price [44]. Consequently, we propose the following hypothesis:

   H6: **Brand passion does not influence devaluation.**

6   Findings and Discussions

Given the analysis result in Table 1 we can state the following:

Table 1. The relationship between Brand Passion with various Social and Individual Behavioral effects:

Coefficients	Standard co-efficient	t-Stat	P-value
Brand Passion → Brand Advocacy	0.40381	6.189	2.46E−09
Brand Passion → Social Media Support	0.10648	2.561	0.011012
Brand Passion → Brand Community Engagement	−0.03944	−0.944	0.346249
Brand Passion → Purchase Loyalty	0.24231	3.741	0.000227
Brand Passion → Devaluation of alternatives	0.21936	3.307	0.00108
Brand Passion → Price Insensitivity	−0.0429	−0.9	0.368864

Source: Our study.

1. Brand Advocacy – The results show that value of R^2 (Preparation of variances in the dependent variable that can be explained by the independent variable) is 0.63, P value as 2.46E−09 and thus we reject the null hypothesis.
2. Social Media Support – The results show that value of R^2 (Preparation of variances in the dependent variable that can be explained by the independent variable) is 0.63, P value as 0.011012 and thus we reject the null hypothesis.
3. Brand Community Engagement – The results show that value of R^2 (Preparation of variances in the dependent variable that can be explained by the independent variable) is 0.63, P value as 0.346249 and thus we fail to reject the hypothesis.
4. Purchase Loyalty – The results show that value of R^2 (Preparation of variances in the dependent variable that can be explained by the independent variable) is 0.63, P value as 0.000227 and thus we reject null hypothesis.
5. Devaluation of alternatives – The results show that value of R^2 (Preparation of variances in the dependent variable that can be explained by the independent variable) is 0.63, P value as 0.00118 and thus we reject null hypothesis.

6. Price Insensitivity – The results show that value of R^2 (Preparation of variances in the dependent variable that can be explained by the independent variable) is 0.63, P value as 0.368864 and thus we fail to reject null hypothesis.

7   Limitations of the Study

The sample size for the study was limited may not be a correct representation of to the entire population. The study has examined Brand passion for Apple brand only and similar researches can be undertaken on other brands to further understand the nuances of its various dimensions. Brand passion is based on emotions, which are never stable for a particular customer and can change over time. Hence, this study conducted at a future date with the same set of consumers may give a different result.

8   Scope of the Study

Although the study has some limitations, it does provide some useful insights, which can help the organization in their brand building exercises. Brand passion improves recognition of the brand and their offerings among their customers and additionally creates a product differentiation in the minds of the customers. Branding supports advertising and word of mouth which helps in gaining customer trust towards the brand. Branding builds financial value and it inspires and increase the productivity.

9   Conclusion

On completion of the entire study, we can conclude that passion does play a major role in determining the extent to which a customer can reach to attain certain brand experiences. It can be concluded that brand passion positively favors brand advocacy, social media support, purchase loyalty, devaluation of alternatives and does negatively favors brand community engagement, price insensitivity. This result shows that building a strong passionate connection with a brand would lead to positive purchase-related behavioral response. The study depicts the emotional as well as behavioral effects the consumers demonstrate towards the brand Apple as a result of their very passionate relationship with their most favorite brand. This study also expands the current awareness about the consumers who are very passionately involved towards a particular brand also explains the various factors and emotions which led to such brand passion. This also gives a very valuable insight about how building brand passion is very important and how it aids to more good will among the consumers of that brand and because of this the marketers must also dedicate extra time towards building the brand passion among their consumers. The outcomes and results of our study also depicts that the passionate consumers spread the good word and are also involved in actively engaging Apple's online presence. Thus, in turn promoting and making a vibrant and dynamic social media presence which could be a very effective use of the enthusiasm and positive attitudes towards a brand. The future studies could also

investigate further about the behavioral consequences of brand passion pertaining to the brand, customer and characteristics of company. Digital marketing and 'like clicking' behavior on social media can be viewed as a friend-bonding exercise between the brand and the consumer. In the current digital age, companies such as Apple must effectively use a sound digital marketing strategy to create personal bonds and attachment with passionate customers to trigger superior brand performance.

India is a price-sensitive market and although Apple enjoys considerable emotional attachment with passionate consumers, they may shift to competitive brands in the wake of price increases. Furthermore, the awareness of Apple's community engagement programs is low in India. Apple can hence consider launching a mid-range of smartphones and strengthen its social and community engagement programs to strengthen the brand and attract further consumer interest.

References

1. Albert, N., Merunka, D., Valette-Florence, P.: Brand passion: antecedents and consequences. J. Bus. Res. **66**(7), 904–909 (2013)
2. Albert, N., Merunka, D., Valette-Florence, P.: When consumers love their brands: exploring the concept and its dimensions. J. Bus. Res. **61**(10), 1062–1075 (2008). https://doi.org/10.1016/j.jbusres.2007.09.014
3. Albert, N., Merunka, D., Valette-Florence, P.: The feeling of love toward a brand: concept and measurement. Adv. Consumer Res. (2009)
4. Albert, N., Merunka, D., Valette-Florence, P.: Brand passion: antecedents and consequences. J. Bus. Res. **66**(7), 904–909 (2013)
5. Albrecht, C.M., Neumann, M.M., Haber, T.E., Bauer, H.H.: The relevance of irrelevance in brand communication. Psychol. Mark. **28**(1), 1–28 (2011)
6. Albrecht, C.M., Neumann, M.M., Haber, T.E., Bauer, H.H.: The relevance of irrelevance in brand communication. Psychol. Market. **28**(1), 1–28 (2011)
7. Algesheimer, R., Dholakia, U.M., Herrmann, A.: The social influence of brand community: evidence from European car clubs. J. Mark. **69**(3), 19–34 (2005)
8. Algesheimer, R., Dholakia, U.M., Herrmann, A.: The social influence of brand community: evidence from European car clubs. J. Market. **69**(3), 19–34 (2005). https://doi.org/10.1509/jmkg.69.3.19.66363
9. Musleh Al-Sartawi, A.M.A. (ed.): The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. SCI, vol. 974. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-73057-4
10. Batra, R., Ahuvia, A., Bagozzi, R.P.: Brand love. J. Market. **76**(2), 1–16 (2012)
11. Bauer, H.H., Heinrich, D., Martin, I.: How to create high emotional consumer-brand relationships? The causalities of brand passion. In: Paper Presented at the 2007 Australian & New Zealand Marketing Academy Conference Proceedings (2007)
12. Belk, R.W., Ger, G., Askegaard, S.: The fire of desire: a multisited inquiry into consumer passion. J. Consumer Res. **30**(3), 326–351 (2003). https://doi.org/10.1086/378613
13. Nagarkoti, B.: Factors Influencing Consumer Behavior of Smartphone Users, Degree Thesis. International Business (BBA) (2009)
14. Brodie, R.J., Hollebeek, L.D., Jurić, B., Ilić, A.: Customer engagement conceptual domain, fundamental propositions, and implications for research. J. Serv. Res. **14**(3), 252–271 (2011)

15. Brown, T.J.: Spreading the word: Investigating antecedents of consumers' positive word-of-mouth intentions and behaviors in a retailing context. J. Acad. Market. Sci. **33**(2), 123–138 (2005). https://doi.org/10.1177/0092070304268417

16. Chaudhuri, A., Holbrook, M.B.: The chain of effects from brand trust and brand affect to brand performance: the role of brand loyalty. J. Market. **65**(2), 81–93 (2001)

17. Csikszentmihalyi, M., Rathunde, K., Whalen, S.: Talented Teenagers: The Roots of Success and Failure. Cambridge University Press, New York (1993)

18. Christine, D.: Brand passion and its implication on consumer behaviour. Int. J. Bus. Forecast. Market. Intell. (2018)

19. Deci, E.L., Eghrari, H., Patrick, B.C., Leone, D.R.: Facilitating internalization: the self-determination theory perspective. J. Pers. **62**(1), 119–142 (1994)

20. Deci, E.L., Ryan, R.M.: The 'what' and 'why' of goal pursuits: human needs and the self-determination of behavior. Psychol. Inq. **11**(4), 227–268 (2000)

21. Emmons, R.A.: Religion in the psychology of personality: an introduction. J. Pers. **67**(6), 874–888 (1999)

22. Escalas, J.E., Bettman, J.R.: You are what they eat: the influence of reference groups on consumers' connections to brands. J. Consumer Psychol. **13**(3), 339–348 (2003). https://doi.org/10.1207/S15327663JCP1303_14

23. Fehr, B.: Prototype analysis of the concepts of love and commitment. J. Pers. Soc. Psychol. **55**(4), 557 (1988)

24. Fournier, S.: Consumers and their brands: developing relationship theory in consumer research. J. Consumer Res. **24**(4), 343–353 (1998)

25. Füller, J., Matzler, K., Hoppe, M.: Brand community members as a source of innovation. J. Prod. Innov. Manage. **25**(6), 608–619 (2008)

26. Fullerton, G.: How commitment both enables and undermines marketing relationships. Eur. J. Market. **39**(11–12) (2005)

27. Grönroos, C.: Creating a relationship dialogue: communication, interaction and value. Market. Rev. **1**(1), 5–14 (2000)

28. Johnson, D.J., Rusbult, C.E.: Resisting temptation: devaluation of alternative partners as a means of maintaining commitment in close relationships. J. Pers. Soc. Psychol. **57**(6), 967–980 (1989)

29. Hannoon, A., Abdalla, Y.A., Musleh, A.M.A., Al-Sartawi, A.A., Khalid, A.: Board of directors composition and social media financial disclosure: the case of the United Arab Emirates. In: Musleh Al-Sartawi, A.M.A. (ed.) The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. SCI, vol. 974, pp. 229–241. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-73057-4_18

30. Keller, K.L.: Building, measuring, and managing brand equity. New Jersey: Pearson measures. J. Serv. Market. **15**(7) (2003)

31. Kemp, E., Childers, C.Y., Williams, K.H.: Place branding: creating self-brand connections and brand advocacy. J. Prod. Brand Manage. **21**(7), 508–515 (2012)

32. Kemp, E., Jillapalli, R., Becerra, E.: Health care branding: developing emotionally based consumer brand relationships. J. Serv. Market. **28**(2), 126–137 (2014)

33. Kim, C.K., Lavack, A.M., Smith, M.: Consumer evaluation of vertical brand extensions and core brands. Journal of Business Research **52**(3), 211–222 (2001)

34. Karolak, M., Razzaque, A., Al-Sartawi, A.: E-services and M-services using IoT: an assessment of the Kingdom of Bahrain. In: Abdalmuttaleb, M.A., Al-Sartawi, M., Razzaque, A., Kamal, M Mustafa (eds.) Artificial Intelligence Systems and the Internet of Things in the Digital Era: Proceedings of EAMMIS 2021, pp. 523–533. Springer International Publishing, Cham (2021). https://doi.org/10.1007/978-3-030-77246-8_48

35. Matzler, K., Pichler, E.A., Hemetsberger, A.: Who is spreading the word? The positive influence of extraversion on consumer passion and brand evangelism. Market. Theory Appl. **18**(1) (2007)
36. McAlexander, J.H., Schouten, J.W., Koenig, H.F.: Building brand community. J. Market. **66**(1), 38–54 (2002)
37. Abdalmuttaleb, M.A., Al-Sartawi, M., Razzaque, A., Kamal, M.M. (eds.): Artificial Intelligence Systems and the Internet of Things in the Digital Era: Proceedings of EAMMIS 2021. Springer International Publishing, Cham (2021)
38. Pourazad, N., Saniee, A., Pare, V.: Brand Passion: What Would Customers Do for their Favourite Brands. In: Melbourne International Business and Social Sciences Research Conference (MIBSRC) (2015)
39. Pourazad, N., Pare, V.: Conceptualising the behavioural effects of brand passion among fast fashion young customers. In: Sydney International Business Research Conference 2015, Sydney, NSW, Australia (2015)
40. Netemeyer, R.G., et al.: Developing and validating measures of facets of customer-based brand equity. J. Bus. Res. **57**(2), 209–224 (2004)
41. Oliver, R.L., Rust, R.T., Varki, S.: Customer delight: foundations, findings and managerial insight. J. Retail. **73**(3), 311–336 (1997)
42. Kotler, P., Armstrong, G.: Principles of Marketing, 14th edn. Pearson Prentice Hall, Boston (2012)
43. Shukla, P.: Status consumption in cross-national context: socio-psychological, brand and situational antecedents. International Marketing Review **27**(1), 108–129 (2010)
44. Park, C.W., MacInnis, D.J., Priester, J., Eisingerich, A.B., Iacobucci, D.: Brand attachment and brand attitude strength: conceptual and empirical differentiation of two critical brand equity drivers. J. Market. **74**(6), 1–17 (2010)
45. Pimentel, R.W., Reynolds, K.E.: A model for consumer devotion: affective commitment with proactive sustaining behaviors. Acad. Market. Sci. Rev. (2004)
46. Rony, J.-A.: Les passions [The Passions] Presses. Universitaires de France, Paris (1990)
47. Chakraborty, S.: An Explanatory study on Indian Young Consumers' Luxury Consumption (2016)
48. Sternberg, R.J.: The Triangle of Love. Basic Books, New York (1988)
49. Sternberg, R.J.: Construct validation of a triangular love scale. Eur. J. Soc. Psychol. **27**(3), 313–335 (1997)
50. Stokburger-Sauer, N., Ratneshwar, S., Sen, S.: Drivers of consumer–brand identification. Int. J. Res. Market. **29**(4), 406–418 (2012)
51. Eng, T., Bogaert, J.: Psychological and cultural insights into consumption of luxury Western brands in India. J. Customer Behav. **9**(1), 55–75 (2010)
52. Thomson, M., MacInnis, D.J., Park, C.W.: The ties that bind: measuring the strength of consumers' emotional attachments to brands. J. Consum. Psychol. **15**(1), 77–91 (2005)
53. Tsai, S.-P.: Fostering international brand loyalty through committed and attached relationships. Int. Bus. Rev. **20**(5), 521–534 (2011)
54. Vallerand, R.J., et al.: Les passions de l'ame: on obsessive and harmonious passion. J. Pers. Soc. Psychol. **85**(4), 756 (2003)
55. Wallace, E., Buil, I., de Chernatony, L.: Facebook 'friendship' and brand advocacy. J. Brand Manage. **20**(2), 128–146 (2012). https://doi.org/10.1057/bm.2012.45
56. Wallace, E., Buil, I., de Chernatony, L.: Consumer engagement with self-expressive brands: brand love and WOM outcomes. J. Prod. Brand Manage. **23**(1), 33–42 (2014)
57. Yim, C.K., Tse, D.K., Chan, K.W.: Strengthening customer loyalty through intimacy and passion: roles of customer-firm affection and customer-staff relationships in services. J. Market. Res. **45**(6), 741–756 (2008)

An Overview of Key Sustainability Theories, Regulations and S ERP for Business Education, Business Research and Digital Business Practitioners

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Abstract. As a response to recent European Union (EU) regulatory sustainability requirements, business education, research, organizations, Sustainable Enterprise Resource Planning (S ERP) system providers are racing to integrate more of sustainability throughout their activities. The aim of this paper is to provide an overview on key sustainability concepts, such as, Environmental, Social and Governance (ESG) framework, Sustainability Developments Goals (SDGs), the recent regulatory requirements and S ERP. To do this, the paper provides the overview through three perspectives: theoretical, regulatory and digital. This overview is a first step to elucidate the sustainability key concepts when professors communicate with business students, when business practitioners communicate with their clients and when business researchers seek for relevant sustainability theories, regulations and S ERP related knowledge for their future business research. The novelty of this paper is seamlessly presenting fundamental sustainability concepts going from theory to practical digital implementation for businesses.

Keywords: Corporate Sustainability Reporting Directive (CSRD) · Environmental · Social and Governance (ESG) · Sustainability Developments Goals (SDGs) · Sustainable Enterprise Resource Planning (S ERP)

1 Introduction

Sustainability is a concept and process of improving environmental, economic, and social aspects to preserve life on our planet for our and future generations [1]. Businesses around the globe have an increased interest in assessing the three sustainable aspects to increase their organizations' sustainability and to report on sustainability. Still, many organizations, business educators and students, and practitioners struggle to connect the major sustainability concepts, such as Sustainability Developments Goals (SDGs), Environmental, Social and Governance (ESG), current regulations and the implementation of such concepts digitally in businesses. One cause behind the struggle is the rapid increase in interest in sustainability concepts in the last 2 to 3 years due to a plethora of sustainability guidance, and European Union (EU) directives. My overview

of the main concepts (and their acronyms) on sustainability may enable educators, researchers and the business community to better grasp the fundamental concepts of sustainability.

To do this, the paper defines the main sustainability concepts (as depicted in Fig. 1) under the umbrella of three perspectives: theoretical, regulatory and digital perspectives. The theoretical perspective clarifies the main theoretical concepts such as CSR and ESG. The regulatory perspective provides an overview of the recent EU directives within sustainability reporting. The third perspective provides an overview on recent research and efforts regarding ERP systems to facilitate digital sustainability reporting in businesses.
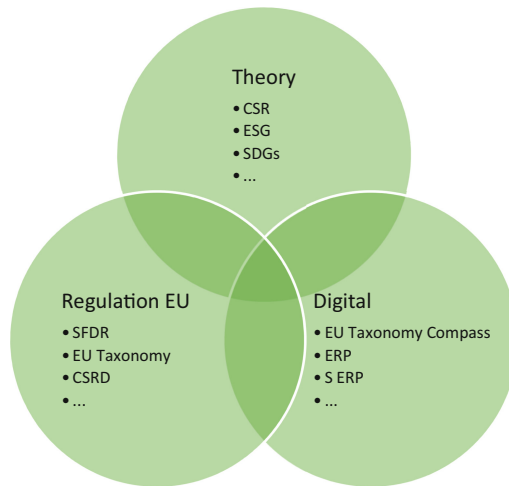
Fig. 1. Perspectives on key sustainability concepts for business

The rest of the paper will proceed as follows. First, the paper presents a theoretical overview of main concepts within the topic of sustainability. Second, I summarize the latest EU regulations and initiatives. Third, I present an overview on how information systems within organizations may implement sustainability enabling them to improve and report on sustainability. Finally, the paper presents concluding remarks.

2   Theoretical Sustainability Concepts for Business

Research on sustainability related concepts is vast. There are several concepts related to sustainability arising over the last decades. Below and in Fig. 2 identify the main concepts related to sustainability to enhance our understanding of these theoretical concepts.
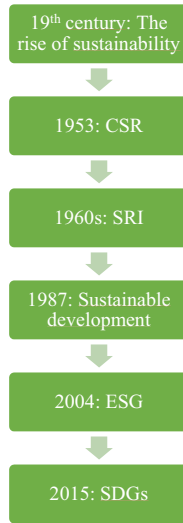
Fig. 2. Major theoretical sustainability concepts

Roselle [2] traces the rise of sustainability since the 19th century with the early faith-based charity organizations. He provides the example of the *Quaker Friends Fiduciary Corporation*. In 1898, the organization adopted a nonviolence investment policy excluding investment in weapons, alcohol or tobacco. This policy offered a first example of a sustainability mindset. Since then, the nonprofit organization is providing socially responsible investment management services to *Friends* meetings, churches, schools and organizations[1].

In modern times, one of the first emerging concepts related to sustainability that is broadly used in organizations, is Corporate Social Responsibility (CSR). Howard R. Bowen [3] describes in his book CSR as the fundamental responsibility of organizations to behave ethically toward stakeholders. In more current versions of his book, he and other coauthors discuss topics such as the businessman economic goals, social responsibilities and laissez-faire, and social aspects of business decisions in present-day capitalism. In 1994, Elkington discussed corporate environmental reporting as an important element of a sustainable organisation [4]. Elkington [5] introduced the "triple bottom line" in the end of the 90s which included financial, environmental and social factors in companies' value calculation.

In the 1960s, the interest in nonfinancial information reflecting socially responsible investment (SRI) is rising [6], especially, as charities needed to invest responsibly under the Apartheid times in South Africa. This resulted in EIRIS foundation in the 1980s that provided research to help charities invest ethically[2]. As such, CSR and SRI

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[1] For more information about the quaker organization, please visit: https://quaker.org/friends-fiduciary-corporation/.

[2] For more information about EIRIS Foundation, please consult the website of EIRIS: https://eirisfoundation.org/history/.

seem to have a longer history than the sustainability concept that emerged with "our common future" report [1] and the Environmental, Social and Governance (ESG) concept that emerged with the "UN Global Compact" report in 2004.

The UNs report recommended companies around the world to better incorporate ESG aspects in research, investment, and reporting [7]. Since this time, many companies have begun to report on ESG factors. Since, the definition on sustainability as providing for the current generation without sacrificing the needs of future generations [1], is unclear [8], the UN issued the 17 Sustainability Developments Goals (SDGs) [9] to provide precise goals on sustainability to companies. Regulators and standard setters [10] around the world responded to these UN initiatives and issued directives and standards on how to report on ESG factors.

3   Regulatory Sustainability in EU for Business

To provide concise guidance on sustainability requirements upon organizations, the European Union (EU) has initiated several guidelines and directives on sustainability to enable organizations' reporting on ESG factors. The recent three European Union's directives (2019, 2020 and 2021) guide large organizations across Europe in their efforts to provide sustainability reports. Figure 3 provides a chronological overview of major recent EU regulations and one proposal. The focus here is on regulations within on EU's Sustainable Finance Action Plan that provided regulations informing business investors about different kinds of sustainable investing.

European Green Deal

EU's Sustainable Finance Action Plan

SFDR

EU Taxonomy

Climate Benchmarks Regulation

CSRD

Fig. 3. Recent Regulations in EUs sustainable finance action plan

Behind EU regulations and initiatives is the adoption of United Nations' (UN) new global sustainable development framework, [11] and The Paris Agreement adopted under the UN in 2016. The regulation aim is to reduce the risks and the impacts of climate change and to stop the increase in the global average temperature to below 2 °C above pre-industrial levels and try to limit the temperature increase to 1,5 °C above pre-industrial levels.

In 2019, the EU recognized that the climate change and environmental degradation are an existential threat to Europe and the EU responded by issuing the European Green Deal[3] to pursue efforts to overcome these climate and environmental threats. The European Green Deal laid out eight Action Plans: Climate; Energy; Agriculture; Industry; Environment and oceans; Transport; Finance and regional development; and Research and Innovation. Within EU's Sustainable Finance Action Plan is the Sustainability Regulation Disclosure in the financial services sector from 2019.

The Sustainable Finance Disclosure Regulation (SFDR) was dedicated to the financial sector. The objective of the SFDR was to pursue more consistent disclosures of sustainability risks. In addition, the SFDR aimed to reduce information asymmetries in agent-principal relationships between financial market participants and advisers in their consideration of sustainability risks in their investment decisions and advice. According to SFDR article 14, a sustainability risk is defined as an environmental, social or governance event or condition that, if it occurs, could have a negative material impact on the value of an investment.

The SFDR became effective from 10 March 2021 and apply to financial market participants and advisers. More precisely, it required the integration and consideration of sustainability risks and adverse sustainability impacts in the financial participants' and advisers' decision making or investment advice processes; and the disclosure of sustainability related information related to financial products[4]. Following the SFDR, the new flagship of the Finance Action Plan was the EU Taxonomy [12] of which requirements expended to companies' reporting on financial products.

On the 22 June 2020, the EU Taxonomy[5] was published by the EU and it was effective from July 12th, 2020. The EU taxonomy is a classification system that provided companies, investors and policymakers a list of environmentally sustainable activities. As such the EU Taxonomy was placed upon wider group of companies than did the SFDR. The Taxonomy laid out six environmental targets: climate change mitigation; climate change adaptation; water and marine resources; circular economy; pollution prevention and control; and biodiversity and ecosystems. The objective of this classification system [13] was to protect investors from greenwashing and to help companies meet environmental targets.

Further on, the Climate Benchmarks Regulation[6] has applied since 23 December 2020 to ease the comparison of different financial products. The Climate Benchmark Regulation harmonized low-carbon indices used as benchmarks for low-carbon

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[3] For more details regarding the European Green Deal, please consult: https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en.

[4] The Disclosure Regulation is EU regulation from 2019 on sustainability-related disclosures in the financial services sector or REGULATION (EU) 2019/2088. For details on this EU regulation, please consult: https://eur-lex.europa.eu/eli/reg/2019/2088/oj.

[5] The EU Taxonomy is EU taxonomy for sustainable activities from 2020 - Regulation (EU) 2020/852. For details on this EU regulation, please consult: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32020R0852.

[6] The whole regulation text of EU Climate Transition Benchmarks, EU Paris-aligned Benchmarks and sustainability-related disclosures for benchmarks is available on: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32019R2089.

investment portfolios. As such, this regulation targeted transparency of the disclosure of sustainability information. To offer guidance on such benchmarks, the EU Technical Group on Sustainable Finance (TEG) [14] was established to provide guidance on two types of climate benchmarks, the "EU Climate Transition" and "EU Paris-aligned" benchmarks. Key TEG recommendations in such benchmarks are climate benchmarks must qualify as an EU Climate Transition Benchmark (EU CTB) or an EU Paris Aligned Benchmark (EU PAB); Benchmarks on ESG and Climate-related considerations can be integrated in the valuation of assets by asset class; and transparency when measuring the alignment of an investment portfolio with a temperature scenario. The TEG recommendations targeted meeting the requirement to disclose an assessment of 'Paris alignment' for each benchmark.

In March 2021, the EU commission adopted a proposal for a Corporate Sustainability Reporting Directive[7] (CSRD) [15]. The CSRD is a review of the Non-Financial Reporting Directive[8] (NFRD) that was in force since 2018. The new Corporate Sustainability Reporting Directive will ensure transparency and that companies provide consistent and comparable sustainability information that investors and other stakeholders need. The CSRD extended the sustainability disclosure requirements to apply to all large companies and all listed companies, except listed micro-enterprises. Consequently, nearly 50,000 companies in the EU will follow detailed EU sustainability reporting standards, compared to 11,000 companies subject to the current requirements [15]. The CSRD represents a new milestone in disclosing comparable sustainability information across large and listed companies in all sectors. Together with the SFDR and the EU Taxonomy, the CSRD regulation enhanced the importance of integrating sustainability data with companies' business process data to report on companies' activities and products impact on sustainability.

To help in the measurement and reporting of sustainability related requirements, the EU provided IT tools to facilitate digital integration of sustainability data into companies' databases and Enterprise Resource Planning (ERP) systems. For instance, a visual representation of the Taxonomy called the EU Taxonomy Compass starting with Delegated Act on the climate objectives on 2021 was published [16]. The users of the EU Taxonomy compass can check which activities are included in the EU Taxonomy. Users can also check which environmental objectives their sectors substantially contribute to and what criteria they have to meet. The EU Taxonomy Compass also provided IT tools to integrate the criteria into databases and other IT systems[9] such and ERP systems.

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[7] The text of the proposal is available on: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52021PC0189.

[8] The Non-Financial Reporting Directive (NFRD) – Directive 2014/95/EU provides the rules on disclosure of non-financial and diversity information by certain large companies. The 2014 directive is available on: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32014L0095.

[9] EU Taxonomy Compass in MS excel (xlsx) or JSON format can be downloaded here: https://ec.europa.eu/sustainable-finance-taxonomy/

4 Digital Sustainability for Business

Clearly regulators are increasingly placing sustainability reporting requirements upon organizations that need to embed the requirements into core organizations business processes and functions. Organizations' ERP systems integrates IT programs supporting core organizational functions including manufacturing and logistics, finance and accounting, sales and marketing, and human resources. Today, ERP systems are crucial in facilitating organizational sharing of data and producing external reports [17–20]. Data integration included a central database [21] either on premise and increasingly in the cloud is a cornerstone in supporting seamless reporting either financial reporting or non-financial sustainability reporting.

Organizations (large, medium, and small enterprises) deploy ERP systems (e.g. Microsoft Dynamics and SAP) to generate sustainability reports according to the new regulatory requirements [22]. Consequently, ERP system providers (such as SAP) are developing solutions to provide sustainability metrics, dashboard and reports. Research on ERP systems [e.g. 23, 24–26] have pursued integration of sustainability data into modular ERP systems.

Research have called such ERP systems Sustainable ERP (S ERP) systems. Chofreh, Goni, Shaharoun, Ismail, & Klemeš [27] described S ERP as a holistic solution to support sustainability initiatives. The sustainability dimension in the ERP system adds an additional level of new data types, new sources of data, and new stakeholders [28]. To do this, managers in organizations establish a master plan that provides a stepwise plan of action the implementation of S ERP specifying a roadmap, a framework, and guidelines.

Based on project management methodology [29], Chofreh et al. [28] specify the roadmap as the process groups, the framework indicates knowledge areas and the guidelines include management processes. In a project management perspective, a roadmap will include five process groups: initiating, planning, executing, monitoring/controlling, and closing. Then, the framework indicates ten knowledge areas defining integration, scope, time, cost, quality, human resource, communications, risk, procurement, and stakeholder. Finally, the guidelines refer to the stepwise description of action for the completion of S ERP system implementation. As such, such a master plan based on project management provides a way to implement S ERP systems in organizations.

Using similar project management methodology, ERP system providers offer ERP modules that help organizations measure, account, and act upon sustainability goals. For instance, SAP[10] [30] is developing several modules within "SAP Emission Management"[11]. One of their offered ERP modules is "SAP Product Footprint Management" module that is a cloud enabled application. The module can collect data on product footprint on several footprint categories: carbon, water, and energy/land use.

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[10] SAP 30. SAP, *SAP Sustainability Summit - Virtual Live Experience over two days*. 2021, SAP. announced that it is developing 2 sustainability related modules: SAP Product Footprint Management module and SAP Environment, Health and Safety Management module.

[11] For more details on SAP products, please consult: https://www.sap.com/products/sustainability.html.

With respect to the carbon category, the module may calculate CO^2 Emissions and track CO^2 emissions by plant location to comply to the European and American trading acts on CO^2. In addition, the module calculates CO^2 footprint on product line level and product wise CO^2 footprint because customers may solicit such detailed information.

5   Conclusion

Through three perspectives (theoretical, regulatory and digital) on key sustainability concepts for business, major sustainability concepts are clarified. This overview provides a first step toward providing the sustainability story from theory all the way to the digital implementation of sustainability in businesses. The overview is relevant to educators, businesses and research seeking to know how theory, regulation and digitalization work together to support sustainable organizations.

References

1. Brundtland, G.H.: Our Common Future: Report of the World Commission on Environment and Development. United Nations (UN), Geneva (1987)
2. Roselle, P.: The evolution of integrating ESG analysis into wealth management decisions. J. Appl. Corp. Financ. **28**(2), 75–79 (2016)
3. Bowen, H.R., Social Responsibilities of the Businessman. 1953: University of Iowa Press
4. Elkington, J.: Towards the sustainable corporation: win-win-win business strategies for sustainable development. Calif. Manage. Rev. **36**(2), 90–100 (1994)
5. Jeurissen, R., Elkington, J.: Cannibals With forks: the triple bottom line of 21st century business. J. Bus. Ethics **23**(2), 229–231 (2000)
6. Eccles, R.G., et al.: The social origins of ESG: an analysis of Innovest and KLD. Organ. Environ. **33**(4), 575–596 (2020)
7. UN and FDFA: The Global Compact - Who Cares Wins: Connecting Financial Markets to a Changing World, in United Nations (UN) and Swiss Federal Department of Foreign Affairs (FDFA), UN, Editor (2004)
8. Çalıyurt, K.T., Said, R.: Sustainability and Social Responsibility of Accountability Reporting Systems: A Global Approach. Springer, Singapore (2018). https://doi.org/10.1007/978-981-10-3212-7
9. United Nations: United Nations Sustainable Development Summit 2015. United Nations (UN), New York (2015)
10. Truant, E., Corazza, L., Scagnelli, S.D.: Sustainability and risk disclosure: an exploratory study on sustainability reports. Sustainability **9**(4), 636 (2017)
11. Transforming our world: the 2030 Agenda for Sustainable Development, in A/RES/70/1, U. G. Assembly, Editor. UN General Assembly (2015)
12. Morningstar, EU Sustainability Disclosures, in Policy Research. Morningstar, London (2021)
13. EU Taxonomy of Sustainable Activities. Morningstar, London (2020)
14. TEG, Technical Expert Group on sustainable finance (TEG) - Final Report on Climate Benchmarks and Benchmarks' ESG Disclosures. European Union (2019)
15. EU, E.U.: EU sustainable finance - April package. European Union (2021)

16. European Commission: E. EU Taxonomy Compass (2021). https://ec.europa.eu/sustainable-finance-taxonomy/
17. Aladwani, A.M.: Change management strategies for successful ERP implementation. Bus. Process. Manag. J. **7**(3), 266–275 (2001)
18. Dechow, N., Mouritsen, J.: Enterprise resource planning systems, management control and the quest for integration. Acc. Organ. Soc. **30**(7), 691–733 (2005)
19. Osnes, K.B., et al.: ERP systems in multinational enterprises: a literature review of post-implementation challenges. Proc. Comput. Sci. **138**, 541–548 (2018)
20. Olsen, C.: A Brief review on blockchain integrated Enterprise Resource Planning (ERP) in accounting: what, why and how? In: Proceedings of 16th International Conference on Enterprise, Systems, Accounting, Logistics & Management (ICESALM), Chania, Greece (2019)
21. Davenport, T.H.: Putting the enterprise into the enterprise system. Harvard Bus. Rev. **76**, 121–131 (1998)
22. Blount, Y., et al.: Integrating enterprise resource planning (SAP) in the accounting curriculum: a systematic literature review and case study. Acc. Educ. **25**(2), 1–18 (2016)
23. Patalas-Maliszewska, J., Kłos, S.: The methodology of the S-ERP system employment for small and medium manufacturing companies. IFAC-PapersOnLine **52**(10), 85–90 (2019)
24. Chofreh, A.G., et al.: Development of guidelines for the implementation of sustainable enterprise resource planning systems. J. Clean. Prod. **244**, 118655 (2020)
25. Zeplin Jiwa Husada, T., et al., Impact of enhanced Enterprise Resource Planning (ERP) on firm performance through green supply chain management. Sustainability (Basel, Switzerland) **13**(4358), 4358 (2021)
26. Ferrari, A.M., et al.: Dynamic life cycle assessment (LCA) integrating life cycle inventory (LCI) and Enterprise Resource Planning (ERP) in an industry 4.0 environment. J. Clean. Prod. **286 (**2021)
27. Chofreh, A.G., et al.: Sustainable enterprise resource planning: imperatives and research directions. J. Clean. Prod. **71**, 139–147 (2014)
28. Chofreh, A., et al.: A master plan for the implementation of sustainable enterprise resource planning systems (part I): concept and methodology. J. Clean. Prod. **136**, 176–182 (2016)
29. PMI: Guide to the Project Management Body of Knowledge. Project Management Institution, Pennsylvania, USA (2013)
30. SAP: SAP Sustainability Summit - Virtual Live Experience over two days. SAP (2021)

Determinants of the Cashless Payment Systems Acceptance in Developing Countries: Evidence from Jordanian Public Sector Employees

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Abstract. Cashless payment systems (CPS), known as mobile payment systems is one of the most promising systems that has emerged in recent times and could prove to have important value to promote digital financial inclusion targets. Even though the huge advantages of these systems, their acceptance by users' is still limited and insufficient in some developing countries as Jordan. Therefore, this study has examined the variables that determine acceptance of cashless payment systems in the Jordanian context. This study proposes a research model based on Technology Acceptance Model (TAM). The result has confirmed the proposed hypotheses that behavioural intention to use the cashless payment system is significantly and positively influenced by perceived usefulness. Meanwhile, the effect of perceived ease of use was not supported. Finally, the research has some practical implications for banks via services offered to their customers to manage their daily activities and make payment transactions easily without any physical interaction with banks staff.

Keywords: Sustainable technology · Financial inclusion · Financial services · Cashless payment systems · Public sector · Jordan

1 Introduction

Mobile payment system, which is seen as Jordan Mobile Payment (JoMoPay) in Jordan, is a new method of payment that arose from the requirement of the Central Bank of Jordan to supply satisfactory financial services to people who live in rural districts and do not have a bank accounts at the lowest costs and the best services [1–5], the definition of JoMoPay system is "a method of payment using electronic money whether by the customer's using his account at a bank or by opening an electronic wallet account in the company" correspondingly, JoMoPay system indicates to the payment

method through mobile technology by creating an m-wallet account, or to be synchronized with bank accounts. Accordingly, the Central Bank of Jordan has recently issued the JoMoPay as a new payment method system as a way to enhance financial inclusion in the Jordanian context.

Unluckily, the aspect of financial inclusion in including the systems of mobile payment was worst than anticipated compared to the cultural level of the Jordanian society and the evolution level of banking and financial services, and thus this situation was not satisfactory to the Central Bank of Jordan [6]. In spite of those advances in technology above mentioned and the existence of good infrastructure to utilize the system of JoMoPay, it still bears a low acceptance rate in the Jordanian environment [7–9]. Recently, the survey results that carried out by [10] to discover the status of the JoMoPay system in Jordan present that only a few of Jordanian people have utilized the JoMoPay system [4, 10, 11], indicating a low acceptance of the JoMoPay system in Jordanian environment. Yet, very few studies have examined JoMoPay acceptance from the perspective of users [10, 11]. As such, it is pertinent to utilize the related theory(s) to examine the factors that drive JoMoPay system acceptance from the perspective of Jordanian users.

This paper covers seven sections as follows: It starts with an introduction about the systems of mobile payment in Jordan. Section 2 reviews the theoretical framework and then presents the research hypotheses. Section 3 introduces the research methodology and Sect. 4 provides research results and discussion. Section 5 provides research contributions. Section 6 provides research limitations and recommendation for future research. Finally, Sect. 7 presents the conclusion of the study.

2 Theoretical Framework

Technology Acceptance Model (TAM) was primarily provided by [12] in the context of information technology (IT) acceptance. It has been proposed as one of the most important theories of acceptance of IT in the world [13]. Furthermore, the TAM has been choosing by prior studies to study the acceptance of IT, which was approved to be an indicator of the acceptance and use of IT [14]. Thus, IT usage success relies on user acceptance [15]. Recently several studies have been investigated the TAM validity in the mobile internet context [16]. The aforementioned study's results have recommended that TAM is a solid model that can clarify the acceptance of the mobile internet. As an extension to the theoretical model of TAM as highly recommended by [12]. The theoretical framework used in the current study included the TAM factors predicting the intention of the Jordanian citizen to use cashless payment systems as shown in Fig. 1.
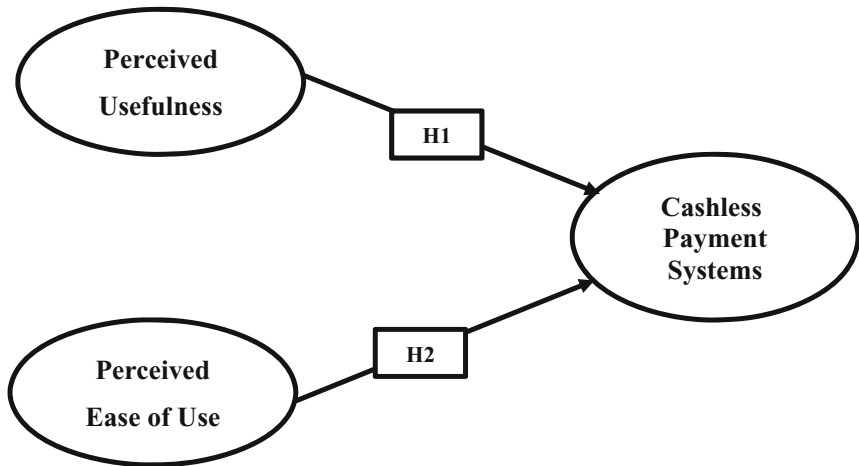
Fig. 1. Theoretical framework

2.1 Perceived Usefulness

Perceived usefulness (PU) is defined by [12] "the degree to which a person believes that using a particular system would enhance his or her job performance". PU is same to performance expectancy in the Unified Theory of Acceptance and Use of Technology (UTAUT) model [17]. Theoretically, cashless payment systems are anticipated to afford users with the constant access to complete routine digital financial services. Empirically, PU was verified to be statistically significant in the information technology acceptance context [9, 16, 18–26]. Therefore, we suggest the following hypothesis:

H1. Behavioural Intention to use Cashless Payment Systems Positively Influenced by PU

2.2 Perceived Ease of Use

Perceived ease of use (PEU) can be well-defined as the "extent to which users believe that applying a specific system would be free of efforts" [12]. PEU is same to effort expectancy represent the perception of users in ease of use of technology [17], positively influencing the behavioural intention to use related technology. Based on a review of prior studies, PEU was determined to be a vital factor in the intention to use digital payment systems [24, 27–29]. Consequently, this drives to the subsequent hypothesis:

H2. Behavioural Intention to use Cashless Payment Systems Positively Influenced by PEU

3   Research Methodology

In the current study, a quantitative research method was adopted to examine the theoretical framework proposed in the present study. In light of this, there are several ways to do the data collection e.g., mail, self-administrated, internet and phone survey. In the current study, the approach of self-administered is more popular in many contexts to reach a high response rate [21, 25, 29]. Due to some limitations in the selection of probability sampling such as random samples of citizens. For instance, with disability to get all citizens' list addresses and names, the citizens sepreeds across the country, and certain groups or classes of citizens are difficult to reach. Therefore, the researchers have autlized a non-probability sampling with the purposive sampling technique, since purposive sampling technique is knon as fast and easy, where citizens can be chosen because of their accessibility and reachable by the researchers.

Hence, in the present study, a total of 404 questionnaires has distributed to the employees of the public sector who are working in the main centres of the Jordanian ministries, whereas the sample was limited to all 24 Jordanian ministries except for the ministry of foreign affair. To calculate the number of respondents from each ministry, the researcher followed the following equation:

$$\frac{Number\ of\ employees\ in\ ministry}{Total\ number\ of\ employees\ in\ all\ ministries} \times sampling\ size.$$

Where the number of employees in ministry (population of ministry) is divided by total the number of employees in all ministries (population of study) and multiplied by sample size (sample of study). However, this study found that due to the small capacity of employees in some ministries, it was impossible to obtain the minimum sample, therefore 5 samples were allocated for such ministries. For instance, the ministry of political and parliamentary affairs with a unit population size of 132, in which it is impossible to determine the sample size for such ministry based on the total population size of 222,672. Then, any ministry was having less than 3100-unit population, should be allocated 5 population sample size and distributed to each ministry of them.

Furthermore, the research measurements were assessed by a seven-point scale with anchors ranging from "1 = strongly disagree" to "7 = strongly agree". To avoid language differences, the translation of the survey instrument from English into Arabic was carried out based on the guidelines that Brislin suggested. In this regard, the researchers engaged with the teams mentioned above in the translation process to ensure that the translation of the questionnaire from English to Arabic is accurate and free from bias. In addition, to ensure the validity of content and in relation to the content and wording of the questions as well as to ensure that all respondents understood the questions and avoid ambiguity. Hence, the result of this process produced the translated version of the questionnaire that equally performed in the same way as the original one. While the main focuses in this process are on conceptual and cross-cultural equivalence rather than on literal/linguistic equivalence. Finally, three questions were devoted to demographic information as gender, age, and education level. Table 1 summarizes the demographic characteristics of the respondents.

Table 1. Demographic characteristics.

Category	Coding	Fre	Per
Gender	Male	143	53.0%
	Female	127	47.0%
	Total	**270**	**100%**
Age	Less than 30 years	54	20.0%
	30–40 years	138	51.1%
	41–50 years	61	22.6%
	More than 50 years	17	6.3%
	Total	**270**	**100%**
Education level	Bachelor's	155	57.4%
	Master's	42	15.6%
	Ph.D	11	4.1%
	Others	62	23.0%
	Total	**270**	**100%**

4 Results Discussion

This section will discuss the study results of the direct and indirect relationships as presented proposed research model. Using the bootstrapping method in the assessment of path coefficients entails the least bootstrap sample of 5000 and the number of cases should be equal to the number of observations in the original sample. Along with this vein, critical values for a two-tailed test are 1.65 (significance level = 10%), 1.96 (significance level = 5%), and 2.57 (significance level = 1%) which should usually consider path coefficients with a 5% or less probability of error as significant. As a result, there are two hypotheses declared to examine those relationships as illustrated in Table 2, while contains the results regarding the hypotheses testing (T-value), where the hypothesized relationships have been assessed.

Table 2. Hypotheses results

No.	Relationship		Beta	Error	T-value	P-value	Sig	Decision
	IV	DV						
H1	PU → CPS		0.217	0.066	3.273	0.001	Sig.+	Supported
H2	PEU → CPS		0.020	0.042	0.473	0.641	N.S	Not supported

In this regard, this research was tried to understand the situation acceptance of cashless payment systems in Jordan based on TAM. Specifically, the research investigates the factors impact cashless payment systems behavioural intention to use. Hence, the current section describes the discussed findings in line with earlier studies and tested hypotheses. The following sub-sections are outlined to discuss the empirical results.

4.1   The Effect of Perceived Usefulness

The result in the present study reveals a positive and significant relationship between PU and behavioural intention to use the cashless payment system. This means that citizens in Jordan are more likely to use CPS if they understand that such systems are useful. Thus, citizens were affected mostly by their thoughts about the advantages expectancy of using such systems. In this respect, this study agreed with the TAM proposed by [12]. Furthermore, the result concurred with past research in the context of information systems acceptance (e.g., [9, 16, 18, 19]). wich state that rising PU, lead to an enhanced behavioural intention.

4.2   The Effect of Perceived Ease of Use

For hypothesis 2, which proposes an association between PEU and behavioural intention, the empirical result does not support the presumed influence of this relationship, and as such, is not in accordance with TAM prediction. However, notwithstanding behavioural intention is determined by PEU as presented in the work of [12] utilizing the TAM, while the PEU does not support in the current study. This means that citizens do not give any value to CPS, although high diffusion rate of smartphones usage. Therefore, the above discussion indicates that CPS is relatively new in the Jordanian context and the citizens play a less significant of using such systems [9].

To sum up, Table 3 below presents a summary of the direct relationships between hypothesis 1; PU as the independent variable and behavioural intention to use cashless payment systems as the dependent variable, hypothesis, and hypothesis 2; PEU as the independent variable and behavioural intention to use cashless payment systems.

Table 3. Summary of hypotheses testing

No.	Hypotheses for direct relationships	Decision
H1	Intention to use CPS will be positively influenced by PU	Supported
H2	Intention to use CPS will be positively influenced by PEU	Not supported

5   Contributions

In terms of contributions, the current study has successfully examed the TAM in the digital financial inclusion context in general and in to use cashless payment systems context in particular. However, the original TAM consists of many constructs as determinants of behavioural intention. This study does not consider all of them and the decision was taken to drop them from the theoretical proposed model. Moreover, it is worth mentioning that such study has not been conducted before in the context of Jordan. Accordingly, the theoretical implication of this research is hence identified and is critical for the advancement of information systems acceptance in different contexts.

6   Limitations and Recommendation

Like any other research, where no research exists without limitations, this research has some limitations that should be considered in future research. For example, this study is only limited to one particular use of cashless payment systems. In order to reach more generalizability on the applicability of TAM in the technology use context, future studies should focus on replicating and employing the same theoretical framework used in this study with other mobile applications in different contexts (e.g., m-wallet, m-learning, m-health, m-shopping, and m-government). Thus, further investigations are clearly required in the context of information technology acceptance to confirm the efficacy and applicability of the current research model by implementing it in several contexts as required.

7   Conclusion

Cashless payment systems service has emerged as a new method of making payments transaction digitally in Jordan, which can lead to disrupting users' traditional payment habits in the long term. Nonetheless, the acceptance rate of these payment systems is still quite limited in the Jordanian context, as well as only a few earlier studies have examined the associated issues with it. Notwithstanding the weakness of using CPS among Jordanian citizens, the important goal to enhance the spread and of online payment systems acceptance is still within the Jordanian government priorities. Since this research achieves the critical factors determining the Jordanian citizens' behavioural intention to use CPS. This study estimated that two main predictors will discover the using CPS among Jordanian citizens namely perceived ease of use and usefulness. Consequently, there are two relationships formulated based on the TAM model to examine the CPS acceptance in the Jordanian context.

References

1. Central bank of Jordan: Jordan Financial Stability Report-2017 (2017). http://www.cbj.gov.jo/Pages/viewpage.aspx?pageID=45
2. Groupe Speciale Mobile Association: The long road to interoperability in Jordan Lessons for the wider industry (2016). https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2016/12/GSMA-case-study_Jordan_2016.pdf
3. Central bank of Jordan: Jordan Financial Stability Report-2016 (2016). http://www.cbj.gov.jo/EchoBusV3.0/SystemAssets/PDFs/EN/FINANCIAL%20STABILITY%20REPORT%202016.pdf
4. Central bank of Jordan: Jordan Financial Stability Report-2015 (2015). http://www.cbj.gov.jo/EchoBusV3.0/SystemAssets/PDFs/EN/FINANCIAL%20STABILITY%20REPORT%202015.pdf
5. Central bank of Jordan: Mobile Payment Service Instructions (2013a). https://procurementadmin.fhi360.org/Files/jomopay_instruction_635586593682135070.pdf

6. Sehwail, L., Bahou, M.: Interview with The Jordanian Official Television - program money and business - financial inclusion [Video file], 24 April 2017. https://www.youtube.com/watch?v=5ouJVc7nBqU

7. Al-Okaily, M., Lutfi, A., Alsaad, A., Taamneh, A., Alsyouf, A.: The determinants of digital payment systems' acceptance under cultural orientation differences: the case of uncertainty avoidance. Technol. Soc. **63**, 101367 (2020)

8. Gharaibeh, M.K., Arshad, M.R.M.: Determinants of intention to use mobile banking in the North of Jordan: extending UTAUT2 with mass media and trust. J. Eng. Appl. Sci. **13**(8), 2023–2033 (2018)

9. Qasim, H., Abu-Shanab, E.: Drivers of mobile payment acceptance: the impact of network externalities. Inf. Syst. Front. **18**(5), 1021–1034 (2016)

10. Al Shawwa, M.: The 2nd Electronic and Mobile payments in the Arab world conference - Presentation on the Jordan Retail Banking Survey and findings of the E & M Banking services [Video file], 7 May 2016. https://www.youtube.com/watch?v=WLeikg3AFA4

11. Ghazal, M.: Mobile payment transactions reach 13,498 since start of year. Published by Jordan Times, 13 June 2017. http://www.jordantimes.com/news/local/mobile-payment-transactions-reach-13498-start-year. Accessed 21 Aug 2018

12. Davis, F.: Perceived usefulness, perceived ease of use and user acceptance of information technology. MIS Q. **13**(3), 319–340 (1989). https://doi.org/10.2307/249008

13. Shankar, A., Datta, B.: Factors affecting mobile payment adoption intention: An Indian perspective. Global Bus. Rev. **19**(3_suppl), S72–S89 (2018). https://doi.org/10.1177/0972150918757870

14. Venkatesh, V., Davis, F.: A theoretical extension of the technology acceptance model: four longitudinal field studies. Manag. Sci. **46**(2), 186–204 (2000). https://doi.org/10.1287/mnsc.46.2.186.11926

15. Raid, M.: An evaluation of information systems success: a user perspective - the case of Jordan Telecom (2009)

16. Alalwan, A.A., Baabdullah, A.M., Rana, N.P., Tamilmani, K., Dwivedi, Y.K.: Examining adoption of mobile internet in Saudi Arabia: extending TAM with perceived enjoyment, innovativeness and trust. Technol. Soc. **55**, 100–110 (2018)

17. Venkatesh, V., Morris, M.G., Davis, G.B., Davis, F.D.: User acceptance of information technology: toward a unified view. MIS Q. **27**(3), 425–478 (2003)

18. Musleh Al-Sartawi, A.M.A. (ed.): The big data-driven digital economy: artificial and computational intelligence. SCI, vol. 974. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-73057-4

19. Hannoon, A., Al-Sartawi, A.M.A.M., Khalid, A.A.: Relationship between financial technology and financial performance. In: Musleh Al-Sartawi, A.M.A. (ed.) The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. SCI, vol. 974, pp. 337–344. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-73057-4_26

20. Ameen, N., Tarhini, A., Shah, M.H., Madichie, N., Paul, J., Choudrie, J.: Keeping customers' data secure: a cross-cultural study of cybersecurity compliance a mong the Gen-Mobile workforce. Comput. Hum. Behav. **114**, 106531 (2020)

21. Al-Okaily, A., Abd Rahman, M.S., Al-Okaily, M., Ismail, W.N.S.W., Ali, A.: Measuring success of accounting information system: applying the DeLone and McLean model at the organizational level. J. Theor. Appl. Inf. Technol. **98**(14), 2697–2706 (2020)

22. Venkatesh, V., Thong, J.Y., Xu, X.: Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology. MIS Q. **36**(1), 157–178 (2012)

23. Al-Sartawi, A.: Information technology governance and cybersecurity at the board level. Int. J. Crit. Infrastruct. **16**(2), 150–161 (2020)

24. Merhi, M., Hone, K., Tarhini, A., Ameen, N.: An empirical examination of the moderating role of age and gender in consumer mobile banking use: a cross-national, quantitative study. J. Enterp. Inf. Manag. **34**, 1144–1168 (2020)
25. Al-Okaily, A., Al-Okaily, M., Shiyyab, F., Masadah, W.: Accounting information system effectiveness from an organizational perspective. Manag. Sci. Lett. **10**(16), 3991–4000 (2020)
26. Al-Okaily, A., Al-Okaily, M., Ai Ping, T., Al-Mawali, H., Zaidan, H.: An empirical investigation of enterprise system user satisfaction antecedents in Jordanian commercial banks. Cogent Bus. Manag. **8**(1), 1918847 (2021)
27. Al-Okaily, M., Alqudah, H., Matar, A., Lutfi, A., Taamneh, A.: Dataset on the acceptance of e-learning system among universities students' under the COVID-19 pandemic conditions. Data Brief **32**, 106176 (2020)
28. Al-Qudah, A. A., Al-Okaily, M., Alqudah, H.: The relationship between social entrepreneurship and sustainable development from economic growth perspective: 15 'RCEP'countries. J. Sustain. Finance Invest. 1–18 (2021)
29. Memdani, L.: Demonetisation: a move towards cashless economy in India. Int. J. Electron. Bank. **2**(3), 205–211 (2020)

The Digital Economy: Challenges and Opportunities for Economic Conversion in the Gulf Countries

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Abstract. Digital technologies increase the ability of the economy to absorb and adapt the existing knowledge elsewhere for building indigenous capacity for development. Not only external markets enable countries to improve entrepreneurial capabilities and increase production linkages, but also facilitate inflows of foreign direct investment and encourage local firms to participate in the global value chains. Narrowing the digital divide becomes essential for joining the digital economy and benefiting from the new opportunities offered by the Fourth Industrial Revolution. Human capabilities contribute to decision making by providing more choices to select among alternative development projects. Digital technologies are enablers for rapid technological change and economic conversion.

Keywords: Digital technologies · Fourth Industrial Revolution · Digital economy · Human capital · GCC

1 Introduction

For several decades, economic development in the gulf countries has been shaped by public expenditures reflecting the role that governments paly in regional development. Heavy government control over the economy has limited the contribution of private enterprises to the national development. Low industrial productivity and growth in non-energy sectors hindered economic diversification and weakened the ability of the economy to build capacity for manufacturing production. In developed countries, the private sector has been instrumental in knowledge creation and innovation diffusion leading to productivity growth and rapid improvement in human development. Furthermore, heavy reliance of government expenditures on revenues from oil production and export has made the economy vulnerable to changes in prices and demand in external markets. Little efforts were made to restructure the productive system and diversify output so that to reduce the risk of external shocks and restore financial stability.

In the new economy, building digital capabilities are crucial for economic conversion and reducing dependence on international trade. Governments in the region need to encourage investment in human capabilities to build capacity for development and strengthen participation in the digital economy. The new technologies, driven by

the Fourth Industrial Revolution, are disrupting markets by causing structural unemployment and increasing labor market inflexibility to adapt to technological change and participate in the digital economy, i.e. workers must acquire certain skills and training to adapt to changes in technology and sustain employment. Not only capabilities empower people with the required skills to participate in the new digital economy, but also to enhance creativity and promote innovation. The ability of the economy to produce sophisticated products and knowledge-based goods will depend on the creativity of the human mind to generate new ideas and create new products.

In the digital economy, public-private partnership expands the scope of development by providing new opportunities for people across the national divides to participate in market activities and contribute to development. The inclusive nature of digital technologies increases the ability of the economy to harness the creative and innovative minds of citizens aiming at enhancing human capabilities and supporting rapid economic conversion.

This paper aims to provide a brief theoretical discussion about digital services and their impact on development with reference to GCC countries. The paper argues that participation in the digital economy enhances entrepreneurial capabilities and increases production linkages across sectors of the economy. Digital technologies have the potential to exploit tacit knowledge and encourage sharing ideas that strengthen the fundamentals for building indigenous capacity. Digital services enable access to a wide range of information, which can be used to increase confidence in the economy and encourage collaboration with foreign firms. Widening the digital divides are likely to have negative impact on developing countries by leaving them behind. The challenge facing many developing countries including, the GCC countries, is to formulate an effective digital strategy that enhances digitization and deepen integration in the digital economy.

2   The Digital Economy

The digital economy has been widely discussed in recent literature on development studies reflecting the importance of digital services in building capabilities for development [1, 5, 11–16]. The 21st century technologies are driven by digital devices including mobile telephones, the internet, and computer applications that represent key components of the Fourth Industrial Revolution. Digital technologies empower individuals, organizations and institutions to gain access to knowledge, skills, technologies and information that are important determinants for building capacity for digital economy. Developing countries, in particular, can improve capabilities and strengthen production linkages by investing in ICT infrastructure and providing internet services that enable local actors communicate, acquire and adapt knowledge and technologies for building indigenous capacity for development. Human capabilities are among the most transformational forces of the 21st century impacting wide range of human activities from the workplace to the battlefield [16]. They represent the new technologies and interventions that boost human activities and foster economic growth.

Connectivity in the digital economy offers new opportunities for various actors to share information and exchange ideas that are essential for enhancing human

capabilities and building capacity for development. In the digital age, countries with low level of capabilities can increase access to global markets and obtain knowledge and technology to enhance domestic entrepreneurial capabilities and support rapid structural transformation. Digital technologies are enablers provide users with inclusive coverage that cultivate the creativity and innovative potential of citizens without exclusion. Developing countries need to invest in digital technologies not only to enhance digital capabilities and join the digital economy, but also to participate in the Fourth Industrial Revolution and reap the benefit of the new society. Overcoming the challenges will require radical institutional reforms aiming at building ICT infrastructure, promoting innovation, providing access to knowledge and increasing the stock of human capital [9]. Digital technologies are unleashing new economic and social dynamics that will need to be managed if the digital transformation of industries and societies are to deliver long-term and broad-based gains [6].

Arab countries should seize upon the new opportunities offered by 21st digital technologies and participate in the new economy to facilitate knowledge transfer and innovation diffusion. Investment in human capital, ICT technologies and e-services will allow these countries to increase participation in global value chains and improve market competition. Not only global integration increases entrepreneurial capabilities to utilize domestic resources efficiently, but also expand the ability of the economy to absorb, adopt and use knowledge and information available elsewhere. However, "Capturing the full potential of digital and analytics will require organizations, to commit to a journey of reinvention: from the capabilities they hire and develop, to the ways they think and work, to the investments they commit to." [7].

For several decades, economic development in the GCC region has been shaped by revenues from production and export of oil and gas resources with little or no efforts made to diversify output in non-energy sectors. Recent crisis brought by COVID-19 pandemic has shown that rental economies are not sustainable to reduce the risk of global shocks and maintain financial stability. The negative impact of the pandemic on the economies of the region underscores the weakness of the productive capacity and low level of capabilities to minimize the risk of external shocks and sustain growth. Responding to these challenges, oil-producing countries must construct strategies that enable their economies to participate in the Fourth Industrial Revolution.

Digital technologies are key determinate of capacity building for digital economy and therefore, focusing on productive strategies to improve digital capabilities will increase the potential for leapfrogging and catching-up with the rest of the industrialized world. Closing the gap in the availability of affordable digital infrastructure services could diversify output, increase growth, and boost inclusion. To realize the benefit of digital technologies, countries must implement structural reform to allow various actors participate in market activities and gain access to global competition. However, the overall knowledge economy readiness in the Arab world remains low to overcome some of the challenges facing the region in its drive toward economic conversion. More efforts are needed to restructure the productive system and alleviate development in the region to a parallel level like that in industrialized countries [3].

There are several names used to describe the digital economy including the new economy, the information economy, the internet economy, and web economy. There is no unified agreement among students of economic about the meaning of the digital

economy. Several definitions are presented in the literature to highlight the meaning and scope of the digital economy. Oxford Dictionary, for example, defines the digital economy as "an economy which functions primarily by means of digital technology, especially electronic transactions made using the internet." The European Union describes the digital economy as "the single most important driver of innovation, competitiveness and growth in the world." [15] states that the "digital economy plays a significant role in accelerating global economic development, enhancing productivity of existing industries, cultivating new markets and industries, and achieving inclusive, sustainable growth. At the same time, the digital economy is becoming a powerful catalyst and a driver of inclusiveness, by linking communities to each other in a sort of "global village", sharing information, ideas, and products, and allowing countries to rise up the value chain." [15].

The digital economy presents inclusive services that spread across both public and private activities and services. It has the benefit of linking people in different localities to exchange ideas, share knowledge, discuss common problems, propose solutions and promote social capital. In the Gulf countries, digital technologies increase factor mobility and improve regional investment among various sectors of the regional economy. Also, they empower people capabilities to boost investment, acquire knowledge and create new job opportunities and growth. Statistical evidence shows that enterprises adapting digital technologies are 26% more profitable compared to those with no digital services [15].

In recent years, e-businesses have made substantial growth creating immense opportunities for newcomers and local entrepreneurs to access to global markets and increase competitiveness. In countries with low level of capabilities, digital technologies allow people to obtain knowledge and information about markets worldwide in order to create new job opportunities and lift large number of people out of poverty. Similarly, e-government services can reach people in different locations providing information they need to make decisions and improve capabilities. Although several Middle Eastern countries have made efforts to harness the benefit of digitization, however, studies show that economies in the region have adopted digital technologies unevenly with wide variations among countries [8] The digital economy in the Middle East still small compared to other regions accounting for 4.1% of the region total output.

In the digital economy, the role of the government is instrumental in building infrastructure and making digital services available to all. An affordable internet services is critical not only for improving capabilities and encouraging entrepreneurship, but also to enable the economy to create new opportunities and integrate in the global economy. Access to global markets increases the economy capacity to produce more goods and services as well as to reduce the impact of external shocks on the economy. "National policies play a vital role in preparing countries for value creation and capture in the digital era [11–14] The impact of digital technology on economic growth is facilitated through three mechanisms – inclusion, efficiency and innovation. [15] Not only these mechanisms allow the integration into the global economy, but also help firms to make better utilization of capital resources and diffuse innovation.

3   Human Capital Capabilities

The disruptive characteristics of the new technologies require high labor market flexibility to adapt to market changes and technological advancement. The new technologies such as robotics, artificial intelligence and automation are changing the market demand for inputs, especially labor. Not only digital workers are required special skills, but also, they need continues learning and training to upgrade their skills and adapt to the changes in the marketplace. The digital economy requires the creation of "liquid workforces" highly adaptable to technological change. Liquidity of the workforce is associated with human capital capabilities and influenced by the ability of the educational system to graduate students with adequate skills that meet market demand for labor. Human capital improves labor productivity, promotes technological innovation and fosters economic growth. In other words, human capital increases "ability and efficiency of people to transform raw materials and capital into goods and services, and the consensus is that these skills can be learned through the educational system [10].

Human capital can be explained by the knowledge and skills embodied in people and obtained through training and experience provided by the educational system. These skills and knowledge are among the most valuable resources that enable the economy to produce new products, develop new technologies, create new knowledge and promote innovation. Theoretically, the knowledge and skills embodied in people generate positive externalities leading to adaptation new technologies, absorption new knowledge, and creation new job opportunities. Digital technologies increase human capabilities to achieve these strategic objectives and harness the economic potential of the new economy [4].

Worldwide, the educational system has been under pressure to provide highly skilled knowledge workers not only to improve labor market flexibility, but also to support leapfrogging, improve technological learning, and foster global competitiveness. It is not the number of graduates important, rather the capabilities of the students in innovative and productive ways is crucial [10]. There is a need to build human capital capabilities to support research and development and encourage creativity and innovation in the marketplace. Human capital capabilities increase student's prospect for employability, especially those with imaginative, creative and collaborative skills.

GCC countries can also rely on diaspora members to supply skilled and experienced workers to substitute for shortages of knowledge workers in the home country and increase local human capital capabilities. For example, large number of Arab migrants are currently working in countries worldwide possessing valuable skills and knowledge that can be transferred to their native countries. In recent years, countries such as China and India have benefited a lot from 'brain gain' of their nationals working in Western countries. Many of these highly skilled workers returned to their native countries and employed in various sectors of the economy. These migrants possess valuable talents and knowledge which can utilized in building indigenous capacity for digital services and making use of their capabilities to promote innovation and support growth. [2, 11–14] On their part, governments should make extra efforts and provide incentives for returnees to engage in productive activates harness their knowledge and expertise for development. In short, human capital will determine the

choices available for nations to move forward and catch-up with the rest of the developed world. Digital technologies can increase productivity by providing opportunities for workers, including non-skilled, to engage in commercial activities and participate in global trade. Even at the time of crisis, as in the case of COVID-19 pandemic, digital technologies could have substantial impact on people health and reduce the risk of illness.

4   ICT Capabilities

Information and Communication technologies (ICT) are among the core determinants of the digital economy and therefore, building sound ICT infrastructure is an essential element for transforming the economy into a digital-based services. The digital economy provides individuals, businesses and institutions in different geographical locations the opportunity to exchange ideas and discuss business plans. Enterprises with more divers contacts are expected to become more productive and more competitive through participation in international trade and foreign investment. This enables local firms to access to information about production, consumption and marketing at lower operational and transaction costs. Countries with high degree of dependence on export trade, will be able to increase the value of their exports by searching for new markets and negotiating for better prices. ICT could help the government sector to deliver services more efficiently to people at different locations. Sharing information with the public empowers capabilities to increase participation in production and trade. On their parts, governments can save money by reducing the cost of delivery, especially to poor regions, offering new opportunities for private sector to participate in market activities.

Multinational Corporations depend on certain skills available in developing countries to allocate part of their works and create job opportunities in these countries. Not only governments should incorporate these opportunities in their strategic policies, but also to provide incentives for small and medium enterprises to expand access to new technologies and information needed for improving entrepreneurial capabilities and harnessing the potential benefits of the digital economy. Digital technologies make it easier for businesses to engage in trade and get goods and services to the market. Obtaining such facilities could improve the efficiency of internal operations of local enterprises by enhancing their technical, managerial and marketing capabilities. Building on these capabilities will enable individuals and firms to innovate and develop new technologies fostering in the process production linkages and knowledge creation. Thus, affordable digital technologies can create significant economic possibilities including job creation, poverty alleviation, knowledge absorption, and capabilities enhancement. Rapid use of the internet in recent years has increased human contacts providing individuals, organizations and institutions new channels for exchanging ideas, discussing issues, and finding solutions to some of the urgent problems [15].

Countries with low productive capacity can increase incentives to encourage local entrepreneurship acquires access to global talent and information for use in strengthening the indigenous capacity. Governments should contribute to the creation of an appropriate business environment to make it attractive for both local and foreign firms

to invest in the economy. Providing incentives by the government could be in several forms including investment in education and human capital resources, provide financial support for small and medium enterprise, and build adequate physical and ICT infrastructure. Government contribution enhances entrepreneurial capabilities and create attractive environment for FDI to invest in the domestic economy.

Digital technologies also address the gender gap by providing equal opportunity for women to participate in the digital economy. Greater access to ICT technologies will empower women and girls to participate in the digital economy and benefits from the opportunities offered by the Fourth Industrial Revolution. The gender gap is likely to shrink because of digitization and the use of the internet by women to improve capabilities and participate in the new economy. Muhammad Yunus of Bangladesh has been successful in using mobile technology to support people, especially women, start business and help their families. His microfinance project helped millions of women across rural Bangladesh to get out of poverty and create new job opportunities. To this end, digital services increase the society capabilities by encouraging a large number of people, including the poor and women, to contribute to the economy. It is the tacit knowledge and other indigenous socio-cultural features that endorse rapid transformation and speed up the process of building productive capacity.

Data in Table 1 presents global indicators that rank different economies according to their positions in the new economy. The productive capacity index measures the limitations that hinder effort to build productive capacity for development. The United States have the greatest potential for capacity building scoring 50.51. The Table illustrates that the productive capacity of most listed Arab countries remains low to enable the economy generating production linkages and fostering economic growth. [14] The economic complexity index measures the contents of knowledge and skills that are required in the production and export of goods and services. Almost all Arab countries are producing ubiquities goods with little or no knowledge to compete in the global markets. Next, the competitive industrial index shows that the production of manufactured goods in the Arab world is below the world average of 0.067 reflecting the low level of economic diversification and weak capabilities to participate in the new economy.

The human capital index shows more satisfactory results for most counties listed in the table representing positive steps on the path for integration in the digital economy and benefiting from the 21st century technologies. Finally, the global innovation index measures the performance of innovation in different countries worldwide. This index illustrates that Arab countries are yet to strengthen the capabilities for endorsing innovation and stimulating production linkages. To improve capabilities and strengthen knowledge indicators, Arab countries need to construct an effective digital strategy that enables the region responding to the challenges of the digital age and benefiting from the opportunities offered by the 21st technologies.

Table 1. Economic Performance Indicators for Selected Countries, 2020

Country	Productive capacity index	Economic complexity index	Human capital index	Global innovation index	Competitive industrial index
USA	50.51	1.55	0.70	61.7	0.345
Japan	45.39	2.43	0.80		0.344
Algeria	27.76	−0.31	0.53	24.0	0.014
Bahrain	39.03	0.30	0.65	31.1	0.058
Egypt	29.39	−0.06	0.49	27.5	0.037
Jordan	31.01	0.17	0.55	29.6	0.028
Kuwait	33.98	−0.70	0.56	36.5	0.052
Lebanon	33.68	0.35	0.52	28.5	0.016
Morocco	30.51	−0.56	0.50	31.6	0.041
Oman	34.60	−0.48	0.61	31.0	0.067
Qatar	40.81	−0.31	0.64	33.9	0.063
Saudi Arabia	34.73	0.67	0.58	32.9	0.084
Tunisia	33.24	0.34	0.52		0.035
UAE	42.30	−0.13	0.67	36.9	0.089

Sources [11–16]

5   Conclusion

In recent years, digitization has been widely employed in organizational strategies and national policies as enablers for inclusion and rapid socio-economic transformation. Countries with low levels of development capabilities can benefit from digital technologies to build productive capacity and foster innovation. The digital economy provides new opportunities for nations to gain access to international markets and acquire knowledge and information for development. Harnessing the benefit of the digital economy, therefore, will require closing the digital divide by investing in human capital resources, ICT infrastructure, conducive business environment and integration in the global economy.

Digital technologies increase the ability of the economy to absorb and adapt the existing knowledge elsewhere for building indigenous capacity for development. Not only external markets enable countries to improve entrepreneurial capabilities and increase production linkages, but also facilitate inflows of foreign direct investment and encourage local firms to participate in the global value chains. Narrowing the digital divide becomes essential for joining the digital economy and benefiting from the new opportunities offered by the Fourth Industrial Revolution.

Most countries in the Gulf region have made adequate success in promoting digital services. Governments in the region are recognizing the need for economic conversion to reduce dependency on oil revenues and minimize the risk of financial volatility. So far, these countries can achieve high ranking in all digital global indicators paving the way for deepening integration into the digital society. The new economy highlights the

importance of human ideas and creativity to generate linkages and accelerate the process of transformation. Human capabilities contribute to decision making by providing more choices to select among alternative development projects. Digital technologies are enablers for rapid technological change and economic conversion.

References

1. Al-Roubaier, A., Hamdan, A., Sarea, A.M.: Economic diversification in a digital economy. In: Joint European-US Workshop on Applications of Invariance in Computer Vision, pp. 665–671. Springer, Cham, April 2020
2. Al-Roubaie, A.: Labor movement in the middle east: a regional perspective. In: Akira, U., Bajunid, O., Tomoko, Y. (eds.) Population Movement Beyond the Middle East: Migration, Diaspora, and Network, (Osaka, The Japan Center for Area Studies), pp. 53–88 (2005)
3. Al-Roubaie, A.: Building indigenous knowledge capacity for development. World J. Sci. Technol. Sustain. Dev. **7**(2), 113–128 (2010)
4. Al-Roubaie, A.: Building knowledge capacity for development in the Arab world. Int. J. Innov. Knowl. Manag. Middle East North Afr. **2**(1), 7–20 (2013)
5. Musleh Al-Sartawi, A.M.A. (ed.): The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. SCI, vol. 974. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-73057-4
6. Baller, S., Dutta, S., Lanvin, B.: Global Information Technology Report 2016. Ouranos, Geneva (2016)
7. Blackburn, S., Gartner, D.: Digital Australia: seizing the opportunity from the Fourth Industrial Revolution (2017)
8. Mckinsey: (2016) Digital Middle East: Transforming the Region into a Leading Digital Economy (2016). https://www.mckinsey.com/~/media/mckinsey/featured%20insights/middle%20east%20and%20africa/digital%20middle%20east%20transforming%20the%20region%20into%20a%20leading%20digital%20economy/digital-middle-east-final-updated.ashx
9. Musleh Al-Sartawi, A.M.A., Razzaque, A., Kamal, M.M. (eds.): EAMMIS 2021. LNNS, vol. 239. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-77246-8
10. Son, H.H.: Human capital development. Asian Development Bank Economics Working Paper Series (225) (2010)
11. UNCTAD: The Least Developed Countries Report 2006: Developing Productive Capacities. United Nations, New York (2006)
12. UNCTAD: (2012) The Least Developed Countries Report 2012. (Chapter 4) Mobilizing the Diaspora from Brain Drain to Brain Gain (2012)
13. UNCTAD: Digital Economy Report 2019, Geneva (2019). https://unctad.org/webflyer/digital-economy-report-2019
14. UNCTAD (2): The least Developed Countries Report 2020 (Geneva, United Nations) (2020). https://unctad.org/webflyer/least-developed-countries-report-2020
15. World Bank Group: Digital Economy Concept, Trends and Visions: Towards a Future-Proof Strategy (2016). https://pubdocs.worldbank.org/en/513361482271099284/Digital-Economy-Russia-Discussion-paper-2016-12-20-eng.pdf
16. World Economic Forum: The Digital Arab World: Understanding and Embracing Regional Changes in the Fourth Industrial Revolution (2018). http://www3.weforum.org/docs/WEF_Digital_Arab_World_White_Paper_2018.pdf

Information Technology Governance
and Online Banking in Bahrain

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Abstract. The aim of current study is to investigate the impact of information technology governance on the online banking used by Bharani banks during 2020. The results indicates that the total level of applying online banking was 87% and the information technology was 82% and there is a significant and positive relationship between both. The study recommended that the banks must incorporate more online services and use the financial technology which can be considered as an advanced model of online banking.

Keywords: IT governance · Online banking · Financial technology · Banks · Bahrain

1 Introduction

IT governance is a procedure used for monitoring and controlling the main decisions related to information technology to make sure those investments that are done in IT should be aligned with organizations' strategies [2, 4–7]. IT governance is applied as a response to stakeholders' requirements [11, 27, 30]. Usually, the organizations are requested to assure the different stakeholders that the data and the information are accurate, available, and protected with clear procedures and regulations [9, 15, 20–22]. Accordingly, IT Governance is guaranteed the consequences of business and the administration works required to protect and control the data and the information [37]. Moreover, IT Governance is related to IT choices that affect the value of the business [10, 13].

IT governance has been adopted by the GCC banks to control their online banking, reporting, and the decisions related to the use of financial technology in their transactions [30]. Furthermore, IT governance can mitigate the future risks joints the digitalization by providing a system that can be used to equally, fairly, and effectively delivering value to their customers [28–30].

Banking Industry becoming totally dependent on Information Technology to enhance efficiency, performance, revenue, image, and value [1, 45]. One of the information technology outcomes is the online banking which is need huge investment

in the information technology infrastructure such as equipment, tools, machinery, and human capital [23, 26].

Although, the usage of online banking enhanced the quality of the banking services but it at the same time increasing the percentage of cybercrime which needs a more mature IT governance system to deal with [43, 44].

IT Governance system will help the banks in selecting the best online system which they can use to reduce the potential risks that relate to information technology by hiring a team of experts responsible for the data, information, analyzing data, maintaining infrastructure, and measuring the performance [8].

2   Literature Review

Information Technology governance includes five main areas IT standards; Information technology design; Information technology framework; IT capacity and IT management support in the company and the board [30, 41, 43].

Online banking can be described as using the information technology and the digitalization to complete and provide financial services by banks and individuals [5, 46]. Services provided through online banking are helping customers to get access to their accounts every time the need without caring about carrying cash or not [14, 17–19]. Accordingly, online banking is replacing and changing the traditional banking concepts in terms of offering the services and in terms of the physical authentication and signatures needed to complete any banking transaction. The customers can easily print reports, information, forms, and others through the online banking which will increase the customers satisfaction. On the other side, the banks will operate with less complications and they will use few employees to run the operation which will reduce the cost and enhance the performance [38, 42].

Many factors can impact the level of using and accepting online banking by customers and banks. Culture is an important factor that impacts the acceptance of online banking. Accordingly, it is the responsibility of the banking sector to educate society about the benefits of using online banking and encourage them. Another factor that can impact online banking is the inherent risks with online banking and whether the customers are risk-takers or risk-averse because many online banking includes risks of not getting the expected products and the time of receiving the products sometimes is not accurate. The prevailing culture in a society determines whether users tend to make use of e-banking services. It is important that the baking sector in any country investigate the requirements of the users as well as their needs. Such needs and requirement are greatly impacted by culture. Thus, it is important to explore the role of national culture as one of the most important determinants which directly impact the acceptance or resistance of electronic banking services [12, 24, 25, 32].

The implementation of IT governance in e-banking services and products include factors as security, privacy, and other risk issues. When banks apply IT governance practices, it will enhance online banking from the point of view of the customers. Accordingly, IT governance can enhance banks' competitive advantages and it will help the banks to attract more customers to their online banking services [16, 29, 39].

In the Kingdom of Bahrain, the banking sector is supporting all other sectors in terms of providing up to date financial solutions. The banking sector in general has been growing together with the increasing competition especially with the growth of the multinational banking sector in the kingdom. Significance of the banking sector in Bahrain arises from the fact that this sector constitutes the largest single employer in Bahrain. The sector contributes to Bahrain's (GDP) Gross Domestic by 17.2%. This shows that the financial sector in the kingdom of Bahrain is a dynamic sector that plays beneficial roles in growth and development of the kingdom finance. The banking industry in Bahrain consists of Islamic banks and conventional banks [34, 40]. Banks in Bahrain did start making use of the online services for their banking operations and continue to seek providing their customers with the latest online banking services. It is assumed that there is no considerable divergence between the level of expectations of customers and the status of the online banking services. However, there are problems that are encountered by bank customers encountered when executing online banking tractions [31, 33, 35, 36].

Furthermore, using online banking enhanced the way of disclosing information in the banking sector by achieving the symmetry principle in sharing and using the information [34].

3 Research Methodology

The data was collected from 12 banks working in Bahrain depending on the availability of the information needed to conduct the research. The online banking level was calculated depending on a dummy variables checklist which is developed by the researchers based on literature review and filed depending on the information available banks websites. Where the item will assign one (1) if it is achieved by the bank and (0) zero otherwise, then the average of the total items achieved by the banks was calculated to indicate the level. The research model was developed taking into consideration online banking as a dependent variable and IT governance level as independent variable along with some control variables that are firm size, age, and financial leverage. All the financial variables were taken from Bloomberg database for the selected banks for the year 2020.

$$OB_j = \beta_0 + \beta_1 ITG_i + \beta_2 BSi_i + \beta_3 BA_i + \beta_4 BFl_i + \varepsilon_j$$

Where:

OBi is Online Banking (i), ITGi is IT governance for bank (i), BSii is the bank size (i), BAi is the bank age (i), and BFli is the bank financial leverage (i).

4 Data Analysis

The descriptive statistics, Table 1, shows that overall average of the dependent variable, OB was 87.2% in 2020. The level indicates that the Bahraini banks provide a good level of online banking during 2020. One of the possible justifications for this

good level could be because of COVID-19 where most customers and banks are preferring to use online banking to avoid the spread of the virus. On the other, the results show that the ITG level by the banks was 82.36%, which is considered as a good level of IT governance applied by Bharani banks. According to the control variables, the total assets of the banks which were used as an indicator of bank size, shows that the mean size was 2.33E6 million, with a minimum of 54,110 million and a maximum 770,240 million. However, as the normality distributions of total assets are generally skewed, natural logarithm was used in the regression analysis to reduce skewness and bring the distribution of the variables nearer to normality. Moreover, the mean leverage for the banks was approximately 50.25% with a minimum 4.56%, indicating banks with somewhat high debts and a maximum of 93.21%, signifying very high debts. With regards to the age, it was ranged from 8 to 54 with a mean of 21.33 years old, which might lead to that Bharani banks had good experience and flexibility in applying online banking and IT governance which is interpretating the good level of online banking and IT governance achieved as mentioned above.

Table 1. Descriptive statistics for the variables

Variable	Min	Max	Mean	S. D
ITG	. 2046	. 9053	.8236	.1471
OB	. 4231	. 9521	.8720	.1135
Leverage	.0356	.9321	.5025	.2712
Age	8	54	21.33	13.211
Size*	54,110	770,240	2.33E6	1.238E5

*Millions

4.1   Validity and Reliability

To assess validity, several tests were conducted. The study checks for multicollinearity, as seen in Table 2, by conducting the variance inflation factor (VIF) indicating that no score exceeded 10 for any variable in the model. Similarly, the tolerance test, which is the inverse of the VIF, suggested that no score was below 0.2. It was, therefore, concluded that no problems were found with regards to collinearity in the model.

Table 2. Normal distribution and collinearity statistics tests

Model	VIF	Skewness	Kurtosis	Shapiro-Wilk Test	
ITG	2.151	2.419	2.745	.577	.0271
Lev	2.327	.976	.482	.707	.0863
Age	2.571	.755	2.268	.871	.0983
Size	2.726	3.334	2.311	.952	.0016

Additionally, Table 2 reports the normality test, where the skewness test and the kurtosis test suggest that all the predictive variables are normally distributed except for

firm size. Furthermore, the Shapiro-Wilk test was used to test the normality of the collected data for the variables. Table 2 reported a significance level of more than 0.05 for all the variables except for size; thus, it can be assumed that the data are normally distributed. Regarding the firm size, the study has considered the natural logarithm to transform the data to better fit the normal distribution before conducting the regression analysis. It should be noted that an autocorrelation test was not conducted in this research as the data used are cross-sectional.

4.2 Regression Analysis

Table 3 reports the empirical results of the regression analysis of the study model. It also shows the coefficients of determination, where the value of the F- statistic for the model was more than the F- scheduled at confidence level 95% which is 3.751, with a p-value less than 0.05, deeming the model as significant.

Table 3. Regression analysis results

Variables		Beta	t	Sig.
ITG		.972	2.751	.002**
Lev		.178	1.893	.066
Age		.682	2.921	.032*
Size		.623	3.193	.021*
R	R2	Ad. R2	F-Stat	Prob. (F)
.897	.577	.493	3.751	0.034

*P < 0.05 level
**P < 0.1 level

With regards to testing the hypothesis, the model reported a positive and significant relationship between the ITG and OB. This is in line with prior research which indicates that good IT governance can enhance and control the OB [30, 38]. Moreover, the regression analysis shows a positive and significant relationship between size, age and OB. Which means that older and larger firms have higher flexibility, and they are investing more in OB tools.

5 Conclusion and Recommendations

The aim of this study is to examine the impact of ITG on OB of Bahraini Banks. The current study collected data using a checklist developed by the researchers and filled depending on the available information on the banks' websites. The filled-out checklist was examined against the 2020 financial performance reports of the sample banks taken from the Bloomberg database. The results concluded that there is a significant relationship between ITG, and online banking applied by Bahraini-listed banks.

The recommended that the banks must incorporate more online services and use the financial technology which can be considered as an advanced model of online banking,

and Bahraini banks must maintain the level of ITG used by acquiring more advanced technology and by activating the role of this technology in controlling and preventing cybercrimes. Also, future studies can add more control variables to be tested on the impact of ITG and OB such as analyzing the impact of ITG on FinTech adapting and practice.

References

1. Chiemeke, S.: Consumer acceptance of online banking: an extension of the technology acceptance model. Internet Res. **14**(3), 224–235 (2014)
2. Musleh Al-Sartawi, A.M., Razzaque, A., Kamal, M.M. (eds.): Artificial Intelligence Systems and the Internet of Things in the Digital Era. EAMMIS 2021. Lecture Notes in Networks and Systems, vol. 239. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-77246-8
3. Van De Haes, S., Grembergen, W.: An exploratory study into IT governance implementations and its impact on business/IT alignment. Inf. Syst. Manag. **26**(2), 123–137 (2009)
4. Al-Sartawi, A.: Does it pay to be socially responsible? Empirical evidence from the GCC countries. Int. J. Law Manag. **62**(5), 381–394 (2020)
5. Fakhoury, R., Aubert, B.: Citizenship, trust, and behavioural intentions to use public e-services: the case of Lebanon. Int. J. Inf. Manag. **23**, 346–351 (2015)
6. Al-Sartawi, A., Sanad, Z.: Institutional ownership and corporate governance: evidence from Bahrain. Afro-Asian J. Finance Account. **9**(1), 101–115 (2019)
7. Al-Sartawi, A.: The effect of the electronic financial reporting on the market value added of the Islamic banks in gulf cooperation council countries. In: 8th Global Islamic Marketing Conference, 4–6 May. International Islamic Marketing Association, Turkey (2017)
8. Dhar, V., Stein, R.M.: FinTech platforms and strategy. Commun. ACM **60**(10), 32–35 (2017)
9. Garner, J.: Corporate governance. Manag. Financ. **43**(10), 1054–1055 (2017)
10. Ali, W., Muthaly, S., Dada, M.: Adoption of Shariah Compliant Peer-To-Business Financing Platforms by SMEs: A Conceptual Strategic Framework for FinTech in Bahrain (2018). https://pdfs.semanticscholar.org/0c16/cfe3da4583db360eb546d3a63fa597aa6856.pdf
11. Al-Sartawi, A.: Information technology governance and cybersecurity at the board level. Int. J. Crit. Infrastruct. **16**(2), 150–161 (2020)
12. Karolak, M., Razzaque, A., Al-Sartawi, A.: E-services and M-services using IoT: an assessment of the kingdom of Bahrain. In: Musleh Al-Sartawi, A.M., Razzaque, A., Kamal, M.M. (eds.) Artificial Intelligence Systems and the Internet of Things in the Digital Era. EAMMIS 2021. Lecture Notes in Networks and Systems, vol. 239. Springer, Cham (2021)
13. Al-Sartawi, A.: Assessing the relationship between information transparency through social media disclosure and firm value. Manag. Account. Rev. **18**(2), 1–20 (2019)
14. Puschmann, T.: Fintech. Bus. Inf. Syst. Eng. **59**(1), 69–76 (2017)
15. Al-Sartawi, A.: The effect of corporate governance on the performance of the listed companies in the gulf cooperation council countries. Jordan J. Bus. Adm. **11**(3), 705–725 (2015)
16. Al-Sartawi, A.: Social media disclosure of intellectual capital and firm value. Int. J. Learn. Intellect. Cap. **17**(4), 312–323 (2020)
17. Qasim, H., Abu-Shanab, E.: Drivers of mobile payment acceptance: the impact of network externalities. Inf. Syst. Front. **18**(5), 1021–1034 (2016)

18. Al Shawwa, M.: The 2nd Electronic and Mobile payments in the Arab world conference - Presentation on the Jordan Retail Banking Survey and findings of the E & M Banking services [Video file], 7 May 2016. https://www.youtube.com/watch?v=WLeikg3AFA4

19. Al-Okaily, A., Abd Rahman, M.S., Al-Okaily, M., Ismail, W.N.S.W., Ali, A.: Measuring success of accounting information system: applying the DeLone and McLean model at the organizational level. J. Theoret. Appl. Inf. (2020)

20. Al-Sartawi, A.: Measuring the level of online financial disclosure in the Gulf Cooperation Council Countries. Corp. Ownersh. Control **14**(1), 547–558 (2016)

21. Al-Okaily, A., Al-Okaily, M., Shiyyab, F., Masadah, W.: Accounting information system effectiveness from an organizational perspective. Manag. Sci. Lett. **10**(16), 3991–4000 (2020)

22. Al-Sartawi, A.: Ownership structure and intellectual capital: evidence from the GCC countries. Int. J. Learn. Intellect. Cap. **15**(3), 277–291 (2018)

23. Schweitzer, M.E., Barkley, B.: Is' Fintech' Good for Small Business Borrowers? Impacts on Firm Growth and Customer Satisfaction (2017). https://ideas.repec.org/p/fip/fedcwp/1701.html

24. Al-Okaily, A., Al-Okaily, M., Ai Ping, T., Al-Mawali, H., Zaidan, H.: An empirical investigation of enterprise system user satisfaction antecedents in Jordanian commercial banks. Cogent Bus. Manag. **8**(1), 1918847 (2021)

25. Al-Okaily, M., Alqudah, H., Matar, A., Lutfi, A., Taamneh, A.: Dataset on the acceptance of e-learning system among universities students' under the COVID-19 pandemic conditions. Data Brief **32**, 106176 (2020)

26. Al-Sartawi, A.: Institutional ownership, social responsibility, corporate governance and online financial disclosure. Int. J. Crit. Account. **10**(3/4), 241–255 (2018)

27. Sanad, Z., Al-Sartawi, A.: Investigating the relationship between corporate governance and Internet Financial Reporting (IFR): evidence from Bahrain bourse. Jordan J. Bus. Adm. **12**(1), 239–269 (2016)

28. Al-Sartawi, A.: Corporate governance and intellectual capital: evidence from Gulf cooperation council countries. Acad. Account. Financ. Stud. J. **22**(1), 1–12 (2018)

29. Sanad, Z., Al-Sartawi, A.: Financial statements fraud and data mining: a review. In: Musleh Al-Sartawi, A.M., Razzaque, A., Kamal, M.M. (eds.) Artificial Intelligence Systems and the Internet of Things in the Digital Era. EAMMIS 2021. Lecture Notes in Networks and Systems, vol. 239. Springer, Cham (2021)

30. Alansari, Y., Al-Sartawi, A.: IT governance and E-banking in GCC listed banks. Proc. Comput. Sci. **183**, 844–848 (2021)

31. Hannoon, A., Abdalla, Y., Al-Sartawi A., Khalid, A.: Board of directors composition and social media financial disclosure: the case of the United Arab Emirates. In: Musleh Al-Sartawi, A.M.A. (eds.) The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. Studies in Computational Intelligence, vol. 974. Springer, Cham (2021)

32. Musleh Al-Sartawi, A.M.A.: E-learning improves accounting education: case of the higher education sector of Bahrain. In: Themistocleous, M., Papadaki, M., Kamal, M.M. (eds.) Information Systems. EMCIS 2020. Lecture Notes in Business Information Processing, vol. 402. Springer, Cham (2020)

33. Al-Okaily, M., Lutfi, A., Alsaad, A., Taamneh, A., Alsyouf, A.: The determinants of digital payment systems' acceptance under cultural orientation differences: the case of uncertainty avoidance. Technol. Soc. **63**, 101367 (2020)

34. Al-Sartawi, A.: Shariah disclosure and the performance of Islamic financial institutions. Asian J. Bus. Account. **13**(1), 133–160 (2020)

35. Gupta, M., Sikarwar, T.S.: Modelling credit risk management and bank's profitability. Int. J. Electron. Bank. **2**(2), 170–183 (2020)

36. Gupta, N.: Influence of demographic variables on synchronisation between customer satisfaction and retail banking channels for customers of public sector banks of India. Int. J. Electron. Bank. **1**(3), 206–219 (2019)
37. Abdulrasool, F.E., Turnbull, S.I.: Exploring security, risk, and compliance driven IT governance model for universities: applied research based on the COBIT framework. Int. J. Electron. Bank. **2**(3), 237–265 (2020)
38. Hannoon, A., Al-Sartawi, A., Khalid, A.: Relationship between financial technology and financial performance. In: Musleh Al-Sartawi, A.M.A. (eds.) The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. Studies in Computational Intelligence, vol. 974. Springer, Cham (2021)
39. Chauhan, N., Tekta, P.: Fraud detection and verification system for online transactions: a brief overview. Int. J. Electron. Bank. **2**(4), 267–274 (2020)
40. Al-Sartawi, A.: Performance of Islamic banks do the frequency of Shari'ah supervisory board meetings and independence matter? ISRA Int. J. Islamic Finance **11**(2), 303–321 (2019)
41. Shihadeh, F.: Online payment services and individuals' behaviour: new evidence from the MENAP. Int. J. Electron. Bank. **2**(4), 275–282 (2020)
42. Al-Sartawi, A., Reyad, S., Madbouly, A.: Shariah, presentation and content dimensions of Web 2.0 applications and the firm value of Islamic financial institutions in the GCC countries. J. Islamic Mark. (2021, Accepted article)
43. Chayjan, M.R., Bagheri, T., Kianian, A., Someh, N.G.: Using data mining for prediction of retail banking customer's churn behaviour. Int. J. Electron. Bank. **2**(4), 303–320 (2020)
44. Musleh Al-Sartawi, A.M.A. (ed.): The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. SCI, vol. 974. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-73057-4
45. Memdani, L.: Demonetisation: a move towards cashless economy in India. Int. J. Electron. Bank. **2**(3), 205–211 (2020)
46. Al-Qudah, A.A., Al-Okaily, M., Alqudah, H.: The relationship between social entrepreneurship and sustainable development from economic growth perspective: 15 'RCEP' countries. J. Sustain. Finance Invest. 1–18 (2021)

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