

# A Managerial Framework for the Adoption of Cloud Computing in the Public Sector of Developing Countries

Shaher Y. Jabi, Ayham A.M. Jaaron

**Abstract**— Cloud Computing is considered as one of the most important topics in the information technology in recent years. It refers to computational resources available on demand via network as a service, where one of its main advantages is cost saving. Several researchers have presented its usefulness for developing countries as they do not have enough funds to establish their own information technology infrastructure and services. However, there seems to be scarcity in the current literature of empirical studies to explore effective cloud computing implementation in these countries. This paper is an attempt to develop a managerial framework for leveraging cloud computing successful implementation in the public sector of developing countries. An exploratory qualitative study was conducted in the Palestinian public sector organizations. Data were collected using semi-structured interviews, observations and the collection of related archival documents. The framework focuses attention on the achievement of twofold prerequisites for successful cloud computing realization; organizational readiness assessment and cloud-readiness assessment. The framework presented is important in that it identifies a set of determinants for the two prerequisites for cloud computing realization.

**Index Terms**—Cloud Computing, Public Sector, Developing Countries, Managerial Framework.

## I. INTRODUCTION

Cloud computing is a phenomenon that affects users, vendors and companies as a whole. It is considered as a strong and important force to change the way we manage and consume information services. The idea itself describes the computer as a service, and offers this service in the form of platforms, software and complete infrastructure, so cloud computing is not a particular technology, but a model where the most computation is beyond the organization's boundaries and uses internet shared computer resources on a pay per use basis [1]. Similarly, Cloud Computing provides computing services to users in a simple form and ignores lots of details and internal operations, so users do not need to know what happens inside the cloud; they only concern about the output services [2]. There are many simple definitions of cloud computing that emphasize on providing computing services via the Internet. The National Institute of Standards and Technology (NIST) defines Cloud as "Cloud Computing is a model for enabling convenient and on-demand network access to a shared pool of configurable computing resources:

(e.g. networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction." [3]. However, Gartner, a leading computer market analyst firm, considers that the impact of the cloud model will be "no less influential than e-business" [4]. For individual users, cloud computing means accessing e-mail, photo sharing and productivity of software; many of them are free. For organizations, switching to the cloud means having the ability to contract for computing services on-demand instead of investing to host all the necessary hardware, software and support staff necessary to provide a certain level of services.

For governments, cloud computing has special attractiveness because of the presence of both changes requirements for information technology (IT) and challenges economic situations [5]. In other words, cloud computing is a model where majority of computing operations are done outside the boundaries of the organization using the internet to access them. This technology avoids organizations the costs of establishing and running their own Information and Communications Technology (ICT) services, and enables organizations to focus on how to use *ICT* services rather than owning and managing ICT services [1]. In this sense, cloud computing is considered one of the most useful technologies for developing countries as it saves a lot of resources in the process of establishment of their own IT infrastructure and services. Despite of the availability of several studies describing cloud computing usefulness to developing countries, there seems to be scarcity in the current literature of efficient managerial models that can enhance successful implementation of cloud computing technologies in these countries. With this in mind, this paper aims at closing the aforementioned gap by offering a managerial framework that is capable of enhancing successfulness of cloud computing technologies implementation in developing countries.

This research inquiry uses a qualitative exploratory approach, in order to induce novel understandings of the relationship between determinants of cloud computing effective implementations. The exploratory study was conducted in the premises of IT departments of Palestinian public sector organizations. However, the research question sought to be answered in this paper is as follows.

RQ: what are determinates for successful adoption of cloud computing technologies in IT departments of public sector organizations in developing countries?

In the next section of this paper, the concepts of cloud computing, its characteristics, service models of cloud computing are further scrutinized based on a review of existing literature. In the third section, the research

**Manuscript received April 30, 2015.**

**Shaher Y. Jabi**, Engineering Management Division, Faculty of Graduate Studies, An-Najah National University, Nablus, Palestine

**Ayham A.M. Jaaron**, Industrial Engineering Department, Faculty of Engineering and Information Technology, An-Najah National University, Nablus, West Bank, Palestine

methodology is presented. Finally, results are shown and conclusions discussed.

### II. CHARACTERIZING CLOUD COMPUTING

Fundamentally, cloud computing is a wide range of services that can be hosted in a variety of manners. The basic idea behind cloud computing is that anything that can be done in computing, both on a single computer or in a data center, can be switched to the cloud. Cloud computing provides us with a new concept on how to communicate, collaborate and work. Therefore, as long as you can access the internet, you will be able to work when and where you wish. With a fast and reliable internet connection and computer power, it does not matter where the document, e-mail or data seen on the screen comes from, so the main idea of the cloud is that the end user is unaware of the geographical location and configuration of the cloud [6]. Forrest and Barthold [7] indicated that “clouds are hardware based services offering compute, network, and storage capacity where hardware management is highly abstracted from the buyer; buyers incur infrastructure costs as variable operational expenditures, and infrastructure capacity is highly elastic.” Furthermore, Cisco defines cloud computing as “a broad term, but in our view maps to methods that deliver infrastructure, services, and software via the network on demand, and at scale. Cloud is based on a foundation of virtualization in which pools of (virtualized) resources are dynamically organized for the benefit of software applications and services. This will change the way that applications are written and delivered.” [8].

The definitions presented above highlight some common trends in the usage of cloud computing. This usage is typified by payment at the rate of usage, flexibility and ability of operations, infinite resources that can be demanded by organizations and self-service interface that is extracted or virtualized efficiently. In this regard, Goscinski et al. [9] has explained that large organizations with a huge number of servers in its data centers do not usually operate at full capacity, and that cloud computing enables these organizations to get benefits by using these resources more efficiently. However, according to Mell and Grance [3], the term “Comprehensive Cloud Offering” should only be used for cases where a cloud has all these essential characteristics:

- On-demand self-service: the user can use or obtain cloud computing resources without the intervention of the service provider at any time.
- Broad network access: users can access to cloud computing resources through the network regardless of location or the type of device.
- Resource pooling: the providers of Cloud computing services offer their services or resources to multiple users at the same time.
- Rapid elasticity: Cloud computing resources can be acquired or released quickly by the user depending on his needs.
- Measured service: Cloud computing services must be measurable, such as duration of use and storage space.

There are many benefits of cloud computing, the most important benefits of these are to reduce infrastructure costs, and reduce dependence on local resources and technological

skills, in addition to the desired flexibility in the light of the rapid and continuous development in IT [8]. By using the Cloud computing the organizations can reduce capital expenditures and operating expenses of ICT so that companies pay only for the services they use by reducing or redeploying of their ICT staffs. One of the most desired features of the adoption of cloud computing is the availability, which means the ability to guarantee the continuity of the systems, the availability is considered one of the most important key features required for all systems, which increase in case of using cloud computing [8]. Despite these benefits, many studies have identified that several organizations are reluctant to implement and adopt cloud computing technologies [10], [11].

### III. SERVICE MODELS OF CLOUD COMPUTING

Service models refer to the types of services that can be available on the cloud. According to Mell & Grance [3], there are three main service models of cloud computing, these models are classified according to the level of the IT architecture that granted to the users [5]:

- Software as a Service (SaaS): In this model the user can access the cloud computing services through a web browser without the ability to control the underlying infrastructure that used to host these services. Using this model the user is not required to install and run the application on his computer, because all of these applications will be managed by the provider, SaaS services will replace the traditional software. Applications like Gmail, Google Docs and customer relationship management are some examples of SaaS [3], [12].

- Platform as a Service (PaaS): In this model the users can access the cloud computing services that give them the ability to develop their own applications without the ability to control the underlying infrastructure such as the servers or operating system. PaaS helps the companies by increase the productivity and decrease the time to launch the new applications. Examples of PaaS are Azure Services Platform (Microsoft cloud platform), and Google App Engine (Platform for developing and hosting web-applications) [3], [12].

- Infrastructure as a Service (IaaS): In this model the users can access the cloud computing services that give them the ability to deploy and run operating systems and applications through the control the underlying infrastructure such as the servers or operating system. Examples of IaaS are Amazon Web Services EC2 and S3 [3], [13].

The organization can combine two or three cloud service models in its operations. For example, the organization could use IaaS model for some applications from one provider, while using the SaaS model from another. The importance of Cloud service models is to define the relation between a cloud service provider and the organization.

Depending on the business objectives and the sensitivity of data, the company can decide what model is suitable for them; they can use one model or more [5]. Cloud computing can be classified depending on the deployment model [3], as follows:

- Private Cloud: this deployment model refers to the cloud that is only used by one organization which is managed by the same organization or by a third party.
- Community Cloud: this deployment model refers to the cloud that is used by several organizations for specific requirements which is managed by these organizations or by a third party.
- Public Cloud: this deployment model refers to the clouds that are offered to the public in general, for a fee, this cloud is managed by the cloud service provider.
- Hybrid Cloud: this deployment model refers to the clouds that are using two or more of cloud models.

Private clouds provide the highest level of security and control, but the company is required to purchase and maintain all programs and infrastructure, which negatively affects the cost savings. The Public clouds provide the highest level of efficiency. However, they are also more vulnerable to the risk than private clouds. But when using the hybrid cloud, the company will take all the benefits of the previous types, where each part of your business is placed in the most efficient environment, but here the company has to manage and track many various security platforms [14].

#### IV. CLOUD COMPUTING IN PUBLIC SECTOR

Cloud computing has a significant impact on the public sector, where the public sector is always looking for new solutions to increase efficiency within their low budgets [15]. Kundra [16] has introduced a number of cases where cloud computing has been adopted by government. For example, the United States government has allocated a large portion of the annual budget for ICT for the development of cloud computing, where the US government plans to reduce data centers from 2000 to 1200 in the coming years, in contrast to the increase in the number of data centers in previous years. Also, the Canadian Government announced in August 2011 that it will shut down more than 90% of its 300 data centers as part of a consolidation effort called Shared Services Canada [17]. The Europe Cyber Security Agency has confirmed that private and community clouds suit the needs of public sector, which plans to apply the governance policies. The Agency shows that cloud computing revenues expected to reach approximately € 35 billion in Europe by 2014 [18]. In the Asia Pacific region, a regional survey shows that 21% of respondents have adopted cloud computing in their business [19]. Furthermore, United Arab Emirates (UAE) began to launch the smart government cloud. The proposed model for this cloud is a community cloud, to include all existing services [20]. In Jordan, as a developing country, the e-government strategy (2014-2016) shows that the government is about to start building the Jordan infrastructure for cloud computing, this will be available to all government agencies in the coming few years [21]. Also, the Palestinian Authority is trying to push the information society through the development of future plans and strategies despite all the difficulties, and to take the necessary formal decisions to implement these plans and projects [22]. Nevertheless, public sectors in developing countries can benefit from cloud computing more than public sectors in developed countries [23]. This is due to the fact that cloud computing may enable

them to skip a whole generation of costly government computing [23], [24].

#### V. RESEARCH METHODOLOGY

As mentioned earlier, this research inquiry is using an exploratory qualitative approach by exploiting three different tools for data collection. The first tool is the observation of researcher who is an expert in the field of IT over a period of one year. The second tool is the collection of related documentary materials to better understand what has been done in this field. The third tool is the conduction of semi-structured interviews with Twenty Two key administrative and senior personnel at IT departments of selected public service organizations. Interviews are considered the most suitable tool for exploratory studies to generate thorough interpretations of the phenomena under investigation [25]. According to McCracken [26], at least eight successful interviews are required for saturated themes to be generated from thematic analysis of interviews data. The interviewees were experts in the IT area with long employment experience in the public services organizations. The interviewees composed of 4 general managers of government IT departments, 4 directors and 3 senior employees. Table I presents the demographics of interviewees.

Table I. Demographics of Interviewees

Job Role	Number
Director General of government IT departments	1
Directors of IT Departments	4
Director of Information Systems Units	3
Director of E-Services	1
Director of Programming	2
Systems Engineers in e-government	4
Systems administrators	3
Technical Support members	4

All interviews were conducted in the premises of interviewees' offices; the duration of each interview lasted about one hour. After completion of interviews, they have been tape-recorded and transcribed in preparation for analysis stage. Thematic analysis was used to analyze the data collected through interviews. It is flexible and simple technique used to create new ideas by identifying, analyzing and preparing patterns, these patterns or themes extracted from the data to make sense of the data [27]. The main stages of the thematic analysis followed in this research are as follows:

1. Reading the data several times to become familiar to the reader.
2. Generating initial codes by observing the occurrence of patterns.
3. Combining codes in themes that depict the data accurately.
4. Reviewing the themes to ensure that these themes support the study.
5. Defining and naming the themes.

6. Validating the chosen themes by building a valid argument.

**VI. RESEARCH RESULTS**

Thematic analysis, explained above, has been applied to analyze the data based on the guidelines of Braun and Clarke [27] noting that twenty two interviews are valid for thematic analysis in order to produce perceptive themes [26]; Table II provides a summary of all generated codes, issues and the final themes.

Table II. From codes to central themes

Codes	Issues discussed	Themes
<ul style="list-style-type: none"> <li>Hardware &amp; software</li> <li>Cloud models</li> <li>Providers</li> <li>Third Party</li> </ul>	Infrastructure Support	Infrastructure for Cloud Computing adoption
	Applications Integration	
	Staff Experience	
	Adequate budget	
	Choose appropriate Deployment Model	
	Choose appropriate provider	
<ul style="list-style-type: none"> <li>Opportunities</li> <li>Benefits</li> <li>Importance</li> </ul>	Cost-saving	Benefits of adopting Cloud Computing
	Easy Access	
	Information exchange	
	Disaster Recovery Plan	
	Capacity Plan	
<ul style="list-style-type: none"> <li>Challenges</li> <li>Concerns</li> <li>Obstacles</li> </ul>	Political instability	Potential challenges of the adoption of Cloud Computing
	Security and Privacy	
	Performance, Connection	
	Speed and Internet Connection	
	Who is the Leader? Data Control, Permissions and Authorities	
	Regulations	
<ul style="list-style-type: none"> <li>Solutions</li> <li>Requirements</li> </ul>	Electronic signature	Requirements for adoption of Cloud Computing
	Difference settings	
	Top management commitment	
	Administrative decisions	
	Increase the awareness	
	Analyze some case Studies	
	Policies	
	Training	
Plan to resolve resistance to change		
<ul style="list-style-type: none"> <li>Technology</li> <li>Problems</li> <li>Clients</li> </ul>	Framework	The current state of technology in the Public sector
	Virtualization	
	Web services	
	Software	
	Portal	
	X-Road Project	
	Emails Systems	
	Decentralization	
	High Expenses	
	High Licenses cost	
	Multiple databases	
No Backup Site		

The results from the semi-structured interviews were classified into five themes. The five themes emerged from the semi-structured interviews are presented below:

*1) Infrastructure for Cloud Computing adoption*

This theme is aimed at assessing the possibility of Cloud Computing adoption in the public sector where most interviewees agreed on the importance of Cloud Computing, but they believed that it is difficult to adopt Cloud Computing in the Palestinian public sector. This is due to the fact that most of them consider that the infrastructure of the ministries

does not support switching to cloud services despite of using modern technology and the availability of an annual budget that is dedicated for purchasing new hardware and software. This could be due to the lack of enough awareness about cloud computing and the lack of top management support. Also they clarified that there are still some old applications that are difficult to integrate in the cloud. Finally, interviewees pointed out that the staff needs to be trained on cloud computing and need a top management support to make cloud computing adoption possible.

*2) Benefits of adopting Cloud Computing*

This theme is aimed at identifying all potential opportunities or benefits for switching from existing computing arrangements to cloud computing; interviewees identified many benefits that can be gained by the Palestinian public sector from the adoption of cloud computing. Most interviewees considered that operational cost-saving is the most important opportunity from the adoption of cloud computing because they believed that the public sector can reduce their operating cost of ICT by paying only for the services they use. Another important opportunity from the adoption of cloud computing is capacity planning. They stated that the implementation of Cloud Computing makes the public sector not worried about adding additional hardware and software when the user loads increase, but it can instead add and subtract capacity according to new loads. In addition, some of interviewees stated that the public sector is suffering from a problem in the exchange of information between ministries, and they believed that cloud computing can solve this problem. Easy Access, disaster recovery plan and hardware utilization are other important opportunities that can be gained by the Palestinian public sector from the adoption of Cloud Computing according to the interviewees.

*3) Potential Challenges of the adoption of Cloud Computing in the public sector*

This theme is aimed at identifying all potential challenges or risks for switching from existing computing arrangements to cloud computing. All interviewees agreed that the political instability is the most important challenges facing the public sector when adopting cloud computing where government changes and security conditions remain unstable. Most interviewees believed that the data security and privacy is the second important challenge that can be faced by the Palestinian public sector; some interviewees believed that in the case of adoption of cloud computing, all data will be transferred to the outside of the ministries, and this is considered a threat, but this perception was found due to lack of awareness of cloud computing operation principles. Other important challenges from the adoption of cloud computing are performance and connection speed where interviewees explained that the situation of internet and data connections in Palestine is not very efficient, and would be a barrier to the adoption of cloud computing. Other important challenge for the adoption of cloud computing is “Who is the Leader?”; some of the interviewees showed a fear on their authority where there is a conflict on the permissions and authorities within the ministries, and it would be an obstacle to cloud computing adoption.

4) *Requirements for adoption of Cloud Computing*

This theme is aimed at identifying the requirements for adoption of cloud computing where most of interviewees considered that an important requirement is the top management commitment, and administrative decisions. Most of interviewees believed that it is impossible to adopt cloud computing without the support of top management where the support of top management will help in providing all the resources required for the adoption of cloud computing. Increasing the awareness, training, need for policies and plans to resolve resistance to change are other important requirements to adopt cloud computing in the Palestinian public sector according to the interviewees.

5) *The Current State of Technology in the public sector*

This theme is aimed at analyzing the current state of technology in the public sector. Most of the interviewees pointed out that the public sector uses the latest technologies such as virtualization and web services. They also pointed out that the public sector work on some projects that are shared between different ministries in the Public sector for exchanging data. They also clarified that the public sector has problems in emails systems; so many users are using external e-mails like Google or Yahoo in addition to problems such as multiple databases, no backup site, high licenses cost and decentralization. They also clarified that the public sector has problems in interruptions of provided services and slow in the network which affects the quality of provided services.

## VII. DISCUSSION AND CONCLUSIONS

Cloud computing is considered one of the most useful technologies for developing countries as it saves a lot of resources in the process of establishment of their own IT infrastructure and services. However, there seems to be scarcity in the current literature of efficient managerial models that can enhance successful implementation of cloud computing technologies in these countries. This paper aims at closing the aforementioned gap by offering a managerial framework that is capable of enhancing successfulness of cloud computing technologies implementation in developing countries.

From the previous results, it's clear that the interviewees at the public sector are dissatisfied with the level of top management support to adopt cloud computing technology. Interviewees pointed out that the top management support is important to make the adoption of cloud computing possible. This reveals that the level of top management's interest in cloud computing adoption is low. Thus, we can conclude that the top management is not aware of the benefits that can be gained by the public sector from the adoption of cloud computing technology; this is obvious by the absence of intention to adopt cloud computing in the government development plans. However, this is consistent with the findings of Lumsden and Anabel [28] research which concluded that the support of top management has a significant impact on the adoption of new innovations of IT such as cloud computing. According to Borgman et al. [29], the top management support can contribute to the adoption of Cloud Computing by providing a suitable environment and by

providing the necessary resources. Also, it was evident that allocation of financial resources is important to make the adoption of cloud computing possible; especially with their emphasis on that there is an annual budget dedicated for IT. This can be justified due by the existence of an annual budget dedicated for purchasing new hardware and software in addition to an annual budget dedicated for IT training in the Palestinian public sector. On the other hand, there is no adequate budget to adopt cloud computing in the Palestinian public sector. Thus, this allocation of funds needs a decision from the top management to allocate adequate budget for the adoption of cloud computing where the most important feature of cloud computing is costs saving. This was confirmed by the findings of Craig et al. [8] research which concluded that Cloud Computing can reduce capital expenditures and operating expenses of ICT so that companies pay only for the services they use by reducing or redeploying of their ICT staffs.

Generally speaking, the level of infrastructure's support and its integration with existing systems is vital for cloud computing adoption. Where interviewees pointed out that the infrastructure of the ministries does not support switching to cloud services, and they clarified that there are still some old applications that are difficult to be integrated in the cloud. Most of interviewees clarified that the public sector has problems in emails systems. This reveals that the possibility of moving existing applications and services provided by IT departments to the cloud is difficult because the current IT infrastructures in the Palestinian public sector do not support the adoption of cloud computing, and there are technical problems that may hinder the adoption of cloud computing in public sector organizations. This was supported by the findings of Lumsden and Anabel [28] who clarified that the technological infrastructure of an organization has an effect on the adoption of new IT innovations; the organizations who have the necessary infrastructure's support and integration are ready for the adoption of cloud computing.

The results also showed that there is a need to raise awareness as well as skills related to cloud computing operations. Interviewees pointed out that the staff needs to be trained on cloud computing. The need for training is one of the most important requirements for cloud computing adoption. This reveals that the training available to staff in the field of IT is not enough. Low et al. [30] found that the IT human resources have an effect on the adoption of cloud computing. The IT human resources provide the necessary skills, experience and knowledge base required to implement and integrate with a new cloud computing service. Furthermore, the results showed that cooperation between public sector organizations is of paramount importance to facilitate cloud computing implementation. This reveals that the Palestinian government encourages cooperation between all public sector agencies, and there are some projects shared between different ministries in the Palestinian public sector.

As far as the potential opportunities and challenges for switching from the existing computing arrangements to cloud services is concerned, the results indicated that operational cost-saving and hardware utilization are among the most important opportunities for switching from existing computing arrangements to cloud computing. In addition,

easy access, information exchange, disaster recovery plan and capacity plan were found to be of paramount importance to encourage switching to cloud services. Political stability was also viewed as an essential element to enhance cloud services adoption. However, to simplify the findings of the research, and present them in easy to understand form, a conceptual managerial framework for adopting cloud computing in the public sector in the developing countries was proposed. The conceptual managerial framework is shown in Fig.1.

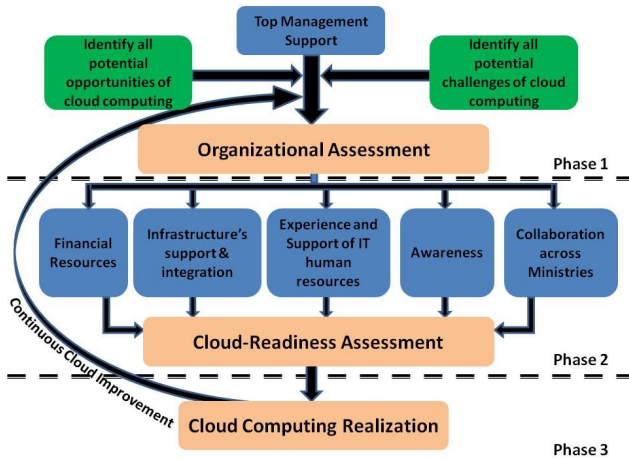


Fig.1 A conceptual Managerial framework for Cloud Computing adoption in developing countries

This conceptual framework divided into three phases. These phases are explained below:

- Phase 1- Organizational Assessment: The most important factor for the adoption of cloud computing is the top management support, so in case there is a commitment from top management, organizational assessment is initiated by conducting an assessment to identify all potential opportunities and challenges, and then conduct an assessment to identify the present IT needs, structure, and capacity utilization.

- Phase 2- Cloud-Readiness Assessment: after the organizational assessment finished, these factors “financial resources, infrastructure’s support and integration, experience and support of IT human resources, awareness and collaboration across ministries” must be examined to access the possibility of cloud computing adoption in the public sector. IT managers should then conduct an overall cloud readiness assessment to determine if their organization has data and applications that could readily move to a cloud environment and what is the cloud model that would be suitable for these purposes.

- Phase 3- Cloud Computing Realization: at this stage, it is time to begin using the cloud computing. In this stage the cloud becomes part of organizational operations. Then the process enters the final stage “continuous cloud improvement” – where the organization continues to transfer appropriate data and applications to the cloud and back from the cloud to internally hosted operations, based on a continuous assessment of the appropriate use of cloud technologies for the public sector.

REFERENCES

- [1] J. D., Prince, “Introduction to cloud computing,” *Journal of Electronic Resources in Medical Libraries*, vol. 8, 2011, PP. 449-458.
- [2] K.R., Jackson, “Introduction to Cloud Computing,” *Lawrence Berkeley National Lab, California, USA, 2011.*
- [3] P., Mell, and T., Grance, “The NIST definition of cloud computing,” *NIST special publication*, vol.800, 2011, pp. 7.
- [4] H., Stevens, and C., Pettey. (2008, June 26). Gartner says cloud computing will be as influential as e-business. Available: [www.gartner.com/newsroom/id/707508](http://www.gartner.com/newsroom/id/707508).
- [5] M., Armbrust, A., Fox, R., Griffith, A.D., Joseph, R., Katz, A., Konwinski, and I., Stoica, “A view of cloud computing,” *Communications of the ACM*, vol. 53, 2010, pp.50-58.
- [6] L., Ulanoff. (2009, February 4). Google's cloud: 8 key questions," Available: [www.pcmag.com/article2/0,2817,2340325,00.asp](http://www.pcmag.com/article2/0,2817,2340325,00.asp)
- [7] W., Forrest, and C., Barthold, "Clearing the air on cloud computing," *Discussion Document from McKinsey and Company*, 2009.
- [8] R., Craig, J., Frazier, N., Jacknis, S., Murphy, C., Purcell, P., Spencer, and j., Stanley. (2009, November). Cloud Computing in the Public Sector: Public Manager's Guide to Evaluating and Adopting Cloud Computing. Available: [http://www.cisco.com/web/about/ac79/docs/sp/Cloud\\_Computing.pdf](http://www.cisco.com/web/about/ac79/docs/sp/Cloud_Computing.pdf)
- [9] A.M., Goscinski, R., Buyya, and J., Broberg, *Cloud computing: Principles and paradigms, Hoboken, New Jersey: John Wiley & Sons, 2011.*
- [10] A., Fox, R., Griffith, A., Joseph, R., Katz, A., Konwinski, G., Lee, and I., Stoica, "Above the clouds: A Berkeley view of cloud computing," *Dept. Electrical Eng. and Comput. Sciences, University of California, Berkeley, Rep. UCB/EECS, 2009, 28.*
- [11] H., Takabi, J.B., Joshi, and G.J., Ahn, "Security and Privacy Challenges in Cloud Computing Environments," *IEEE Security & Privacy*, vol 8, 2010, pp. 24-31.
- [12] J., Parri, (2011, April 8). Introduction to Cloud Computing: *Embracing a Disruptive Force*. Available: [http://www.site.uottawa.ca/~mbolic/ceg4131/jparri\\_Directed\\_Study\\_2011.pdf](http://www.site.uottawa.ca/~mbolic/ceg4131/jparri_Directed_Study_2011.pdf)
- [13] R., Buyya, C.S., Yeo, S., Venugopal, J., Broberg, and I., Brandic, "Cloud computing and emerging IT platforms: Vision, hype, and reality for delivering computing as the 5th utility," *Future Generation Computer Systems*, vol.25, 2009, pp. 599-616.
- [14] D., Rountree, and I., Castrillo, "Introduction to the Cloud". In D. Rountree & I. Castrillo (Eds.), *The Basics of Cloud Computing* (pp. 1-17). Boston: Syngress, 2014.
- [15] D.C., Wyld, "Moving to the cloud: An introduction to cloud computing in government," *Management*, 2010, pp. 94-97.
- [16] V., Kundra, (2011, February 8). Federal cloud computing strategy. Available: <https://www.dhs.gov/sites/default/files/publications/digital-strategy/federal-cloud-computing-strategy.pdf>
- [17] N., Henderson (2011, August 5). Canadian Government Releases Data Center, Email Consolidation Plan. Available: <http://www.thewhir.com/web-hosting-news/canadian-government-releases-data-center-email-consolidation-plan>.
- [18] D., Catteddu, (2011, 17 January). Security and Resilience in Governmental Clouds. *enisa*. Available: <http://www.enisa.europa.eu/activities/risk-management/emerging-and-future-risk/deliverables/security-and-resilience-in-governmental-clouds>
- [19] A., Chandrasekaran, and M., Kapoor (2011, May 11). State of cloud computing in the public sector--A strategic analysis of the business case and overview of initiatives across Asia Pacific. *Frost & Sullivan*. Available: <http://www.frost.com/sublib/display-market-insight.do?id=232651031>.
- [20] I., Elbadawi, "Cloud computing for e-government in UAE: opportunities, challenges and service models," Paper presented at the Proceedings of the 5th International Conference on Theory and Practice of Electronic Governance, Tallinn, Estonia, September 26-28, 2011.
- [21] MolCT. (2013, April 15). *e-Government Strategy 2014-2016*. Jordan e-Government Program. Available: [www.jordan.gov.jo/wps](http://www.jordan.gov.jo/wps).
- [22] PCBS. (2007). Statistics in Information Technology in Palestinian territories *Reports series for status quo*: Palestinian Central Bureau of Statistics. Available: [http://www.pcbs.gov.ps/pcbs\\_2012/Publications.aspx](http://www.pcbs.gov.ps/pcbs_2012/Publications.aspx).

- [23] S., Greengard, "Cloud computing and developing nations," *Communications of the ACM*, vol.53, 2010, pp. 18-20.
- [24] N., Kshetri, "Cloud Computing in Developing Economies," *Computer*, vol.43, 2010, pp. 47-55.
- [25] J., Ritchie, J., Lewis, C.M., Nicholls, and R., Ormston, *Qualitative Research Practice: A guide for social science students and researchers*, London: Sage Publications, 2013
- [26] G., McCracken, *The Long Interview*, London: Sage Publications.
- [27] V., Braun, and V., Clarke, "Using thematic analysis in psychology," *Qualitative research in psychology*, vol. 3, 2006 , pp. 77-101.
- [28] J.R.I., Lumsden, and G., Anabel, "*Understanding the Determinanats of Cloud Computing Adoption within the UK*," Paper presented at the European, Mediterranean & Middle Eastern Conference on Information Systems, Windsor, United Kingdom, October 17-18. 2013.
- [29] H.P., Borgman, B., Bahli, H., Heier, and F., Schewski, "*Cloudrise: Exploring Cloud Computing Adoption and Governance with the TOE Framework*." Paper presented at the 46th Hawaii International Conference on System Sciences (HICSS), 2013.
- [30] C., Low, Y., Chen, and M., Wu, "Understanding the determinants of cloud computing adoption," *Industrial management & data systems*, vol.111, 2011, pp. 1006-1023.

**Shaher Y. Jabi** was a Master of Science student at the Engineering Management Division of the Faculty of Higher Studies, An-Najah National University in Palestine. He is former head of Networks and Technical Support Section at Palestine Exchange. Shaher Joined An-Najah National Univeristy in 2010 and he has recently completed his master degree.

**Ayham A.M. Jaaron** is currently the Director of Quality Assurance Unit at An-Najah National University, Nablus, Palestine. He is also Director of ABET Centre at the Faculty of Engineering and Information Technology, and assistant professor at the Industrial Engineering Department. He received his PhD degree (full time) in Manufacturing Engineering and Operations Management from the Wolfson School of Mechanical and Manufacturing Engineering, Loughborough University, England, UK in 2010. He was a full-time instructor at the Industrial Engineering Department of An-Najah National University, Nablus, Palestine from 2005–2007. Dr. Jaaron is recognized for his expertise and contributions to the quality of education in Palestine. He led the largest ABET Accreditation project in the region for seven engineering programs simultaneously at An-Najah National University, that resulted in a successful ABET Accreditation process. He is extensively involved in drawing and planning quality assurance policies for academic programs. His research activities have focused on service operations, service quality, resource utilization, organizational resilience, and human aspects of motivation in the manufacturing and service sectors. He was an Academic Visitor to the University of Strathclyde, Glasgow, UK in 2006. He is also academic visitor to the Wolfson School of Mechanical and Manufacturing Engineering of Loughborough University, England, UK.