Challenges of Cloud Computing Adoption From the TOE Framework Perspective

4 authors:

Omar Al Hujran
United Arab Emirates University

51 PUBLICATIONS   **1,024** CITATIONS

Enas Al-Lozi
Al-Zaytoonah University of Jordan

17 PUBLICATIONS   **736** CITATIONS

Mutaz M. Al-Debei
Oracle Corporation

74 PUBLICATIONS   **3,470** CITATIONS

Mahmoud Maqableh
University of Jordan

76 PUBLICATIONS   **2,512** CITATIONS

Some of the authors of this publication are also working on these related projects:

Websites Quality View project

Information Security and Chaotic View project

Table of Contents

Research Articles

Challenges of Cloud Computing Adoption From the TOE Framework Perspective

Omar Al-Hujran, Princess Sumaya University for Technology, Amman, Jordan

Enas M. Al-Lozi, Al-Zaytoonah University of Jordan, Amman, Jordan

Mutaz M. Al-Debei, The University of Jordan, Amman, Jordan

Mahmoud Maqableh, The University of Jordan, Amman, Jordan

ABSTRACT

Cloud computing can be classified as a third-generation computing platform which refers to on-demand delivery of computing infrastructure and services via a network, usually the Internet. Cloud computing promises to provide several advantages to its adopters such as: cost advantage, availability, scalability, flexibility, reduced time to market and dynamic access to computational resources. Notwithstanding the numerous advantages of cloud computing, its implementation and adoption in developing countries is still limited and surrounded by variety of issues. Hence, the main objective of this article is to identify the main challenges facing the utilization of these services in developing countries, particularly Jordan. To achieve the above-mentioned objective, six in-depth interviews with ICT officials and experts in the domain of cloud computing were used as the main data collection method. The challenges of cloud computing adoption emerged in this study are classified into technological, organizational and environmental factors.

1. INTRODUCTION

The highly dynamic business environment and the increasingly competition pressures urge organizations to adopt various state-of-the-art information systems/information technologies (IS/IT) in order to improve their business operations and performance (Sultan, 2010; Pan and Jang, 2008), to advance there IS/IT innovativeness and to sustain themselves in the competitive marketplace (Wu et al., 2013). One of the recent and advanced innovative technologies is cloud computing, which is increasingly being considered as a technology that has the potential of changing how business can be conducted and how information systems are presently operated and used within organizations. According to the National Institute of Standards and Technology (NIST), cloud computing is defined as "…a model for enabling convenient, 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…" (Mell and

Grance, 2011). Cloud computing service models are classified based on the computing requirements of the end-users into three different layers including: software as a service (SaaS), infrastructure as a service (IaaS), and platform as a service (PaaS) (Alshamaila et al., 2013). However, the deployment models of cloud computing are usually classified as: public cloud, private cloud, hybrid cloud, and community cloud.

The emergence of the cloud computing as a disruptive technology has the potential of changing how business operations can be conducted and how computing services are developed, deployed, operated, maintained, and paid for (Gangwar et al., 2015). Recently, we are witnessing a big movement toward adopting innovative technologies, such as cloud computing, so as to gain competitive advantages that would help organizations in vanquishing the high levels of competition in many industries. Indeed, each organization has its own unique drivers to adopt cloud computing, but they generally fall into some general categories: cost savings, availability, scalability, flexibility, time-to-market, and others (EMC, 2011). Moreover, cloud computing has the potential to bring substantial benefits to organizations especially for small and medium-sized enterprises (SMEs) which usually cannot afford high investment in ICT infrastructure.

Without a doubt, the rapid emergence, prevalence and potential impact of cloud computing has sparkled a significant amount of interest amongst Information Systems/Information Technology (IS/IT) industry and research. However, and despite the rapid emergence of cloud computing, empirical research on cloud computing adoption is still quite limited (Alharbi, et al., 2016; Gupta et al., 2013; Morgan and Conboy, 2013). In addition, there has been less focus on adoption at the organizational level compared to the excessive one at the individual level (Marston et al., 2011). Further, despite the numerous advantages of cloud computing, its implementation and adoption in developing economies is still limited and surrounded by a variety of risks and challenges. These include: security, reliability, performance and integration issues (Gangwar et al., 2015). Moreover, the cultural differences between developed and developing countries are acknowledged. Many organizations in developing countries have deeply entrenched cultural diversities and norms compared to those in developed countries. These societal culture-based differences influence the diffusion of innovation and transfer of technology across nations (Sabi et al., 2017). Therefore, the main objective of this research is to explore the technological, organizational, and environmental factors that hinder the adoption of cloud computing technology by organizations in a culturally different part of the world, particularly Jordan.

The rest of this paper is organized as follows. Section 2 provides a theoretical background. Section 3 describes the research design and methodology applied in this study. In Section 4, we present the results of the study and offers justified interpretations and discussions in regard to the results. Section 5 provides theoretical and practical implications. Finally, the paper concludes in Section 6.

2. THEORETICAL BACKGROUND

2.1. Technology-Organization-Environment (TOE) Framework

The technology-organization-environment (TOE) is an organisation-level theory and multi-perspective framework that was developed by Tornatzky and Fleischer (Tornatzky and Fleischer, 1990). Based on this framework, the adoption process of a technology innovation is influenced by technological, organizational and environmental dimensions of an organization's context (Alharbi, et al., 2016; Alshamaila et al., 2013). The inclusion of technological, organizational and environmental factors has made TOE advantageous over other adoption models in studying technology adoption, use and value creation from technology (Gangwar et al., 2015). In addition, TOE framework is free from industry and firm-size restrictions (Wen and Chen, 2010). Moreover, TOE framework has been widely tested in IT/IS adoption studies and has reported consistent empirical support (Oliveira et al., 2014). The framework is also comprehensive and thus allows examining the adoption phenomenon and its

impact on value chain activities from a holistic picture (Gangwar et al., 2015). As summarized in Zhu et al. (2006), the current literature validated the usefulness of the TOE framework for understanding the diffusion of a complex IS/IT innovation. Therefore, this framework.is adopted as a theoretical background in this study.

2.2. Cloud Computing Adoption: Technology Context

The technology context describes the characteristics of both internal and external technologies related to an organization. Internal technologies represent technologies that are currently in use by the organization while external technologies represent technologies that are available in the marketplace but not currently in use by the organization. Several technological factors that affect an organization's decision to adopt cloud technology have been identified in the literature. Frequently used constructs include: *security* (Aleem and Sprott, 2013; Gupta et al., 2013; Lian et al., 2014), *relative advantage* (Oliveira et al., 2014; Alshamaila et al., 2013; Borgman et al., 2013; Morgan and Conboy, 2013; Low et al., 2011), uncertainty (Alshamaila et al., 201), compatibility (Oliveira et al., 2014; Lian et al., 2014; Borgman et al., 2013; Morgan and Conboy, 2013; Low et al., 2011), complexity (Oliveira et al., 2014; Lian et al., 2014; Alshamaila et al., 2013; Borgman et al., 2013; Morgan and Conboy, 2013; Low et al., 2011), and trialability (Alshamaila et al., 2013; Morgan and Conboy, 2013).

2.3. Cloud Computing Adoption: Organization Context

The organization context refers to the characteristics and resources of an organization that impact the adoption and implementation decisions of an innovation (Oliveira et al., 2014), where in this case the innovation is represented by cloud computing technology. Common organization characteristics affecting the adoption decision of cloud computing including firm size, top management support, organization structure, organization culture, and the availability of human and slack resources (Oliveira et al., 2014; Alshamaila et al., 2013; Low et al., 2011). For example, top management support plays an essential role in cloud computing adoption because its implementation may involve integration, allocation of resources and reengineering of business processes (Low et al., 2011). Therefore, support from top management is critical in cloud computing adoption as they have the ability to make the change and influence the organization's members to implement this change (Oliveira et al., 2014). The size of the organization is another critical determinant of cloud computing adoption. Organization's size is usually determined by its capital, the number of its employees, the amount of investment involved, the annual revenue and the target market. It is often argued that large firms tend to adopt more innovations, largely because they have more resources, skills, experience and their ability to take risk (Alshamaila et al., 2013; Low et al., 2011).

2.4. Cloud Computing Adoption: Environment Context

The environment context refers to the settings in which an organization conducts its business; it can be related to surrounding conditions of the organization such as industry nature, competitors, regulations, geographical locations, and interactions with the government (Lian et al., 2014; Oliveira et al., 2014). Competitive pressures, for example, may encourage organizations to adopt new and innovative IS/IT systems to provide better services, gain competitive advantages (Lian et al., 2014), or at least to ensure survival. Regularity support is another important environmental factor that might influence cloud computing adoption by organizations. Indeed, government regulations can positively or negatively impact cloud computing adoption (Borgman et al., 2013). On the one hand, the government can support cloud computing adoption by providing tax advantages such as introducing regulation that force firms to comply with certain technology standards (Borgman et al., 2013). On the other hand, the non-compliance and violation of regulations may result in extra transactions cost on organizations and may involve strict liability (Delmas, 2002).

2.5. Challenges of Cloud Computing

Cloud computing represents a major shift in IS/IT and promises to bring substantial benefits to how organizations conduct their business. Cloud computing promises to dramatically reduce upfront and operating costs of ICT services (Marston et al., 2011; Venters and Whitley, 2012). Cloud computing also promises to deliver scalability (Aleem and Sprott, 2013), availability (EMC, 2011), agility (Armbrust et al., 2010), flexibility and other benefits to business enterprises so as to allow enterprises to focus on core business processes, while leaving the IT activities to the cloud provider (Salleh et al., 2012). However, despite the numerous benefits of cloud computing, there are several challenges that need to be resolved before it can be recognized as a viable ICT choice for organizations and especially in developing countries. Previous research indicated that loss of physical control of the data that is put on the cloud, security issues, privacy concerns, reliability of the internet connection, lack of standards and regulations represents the major concerns that are highly anticipated by potential cloud computing adopters (Mather et al., 2009; Aleem and Sprott, 2013). Based on the conducted review of literature, the main challenges of cloud computing are summarized in Table 1.

2.6. Cloud Computing Adoption

Unsurprisingly, there is a noticeable gap in terms of investments in advanced technologies as well as the adoption of such innovative technologies between developed and developing countries. The low levels of investments and adoption in developing countries can be attributed to the continuous socio-economic and political challenges in addition to the unique characteristics of developing countries' cultures (Sabi et al., 2017; Fong, 2009). Thus, we believe that introducing a technology to a new context successfully requires proper considerations of important cultural, socio-economic, and political differences (Al-Hujran et al., 2015).

Table 1. Cloud Computing Challenges

Challenge	Brief Description	References
Lack of Regulations	Regulations regarding cloud computing are till now not clear enough for cloud customers to know their legal status and the jurisdiction.	Aleem and Sprott (2013); EMC (2011); Marston et al. (2011)
Lack of Standards	There is a lack of open standards between cloud computing providers. Switching from one cloud provider to another gets to be truly confounded.	EMC (2011); Shimba (2010); Marston et al. (2011); Nuseibeh (2011).
Lock-in	Customer will be locked into a specific service that is rendered by the provider.	Armbrust et al (2010); Salleh et al. (2012); Prince (2011)
Loss of Control	Organizations adopting cloud computing may face risk of losing a level of control over their companies, instead of controlling the IT environment directly they manage it through relationships with CSPs (cloud service providers) and SLA (service level agreement). Freedom of customers becomes limited because as they will be more reliant on the service provider.	Armbrust et al. (2010); Marston et al. (2011); Salleh et al. (2012); Prince (2011)
Privacy Concerns	Privacy is not a barrier but it must be taken into consideration. For example, customers need to know if their data is going to be disclosed by the cloud operator and subsequently used by third parties.	Office of the Privacy Commissioner of Canada (2007); Marston et al. (2011); Svantesson and Clarke (2010); Prince (2011)
Reliability	Cloud computing services are usually delivered via the Internet. Issues related to Internet connections such as bottlenecks (e.g. response time, latency and packet-loss) remain a big concern of cloud customers toward procuring cloud services.	Armbrust et al. (2010); Aleem and Sprott (2013); EMC (2011); Kim et al. (2009); Marston et al. (2011); Prince (2011); Qian et al. (2009)
Security Concerns	While companies prefer to keep their data within private corporate network under their control and security mechanisms, usage of cloud computing force companies to communicate their data over public internet, this in turn increase data vulnerability. In addition to the fact that CSP have to deal with huge amount of data, work load management issue becomes difficult among geographically dispersed machines which makes it ambiguous for the customer to know where the data is located and how is protected.	Armbrust et al (2010); Aleem and Sprott (2013); EMC (2011); Marston et al. (2011); Mujinga and Chipangura, (2011); Office of the Privacy Commissioner of Canada, (2007); Kim et al. (2009); Prince (2011); Qian et al. (2009); Zhang et al., (2010)

Cloud computing innovation is widely seen as a solution to the digital divide between developed and developing countries and also to the innovation adoption problems faced by developing countries (Purkayastha and Braa, 2013; Sabi et al., 2017). This is because cloud computing innovation offers organizations in developing countries the accessibility and usage opportunities of advanced technologies which are available to organizations operating in the developed countries. By doing so, organizations operating in developing countries become more globally competitive than ever before (Kshetri, 2011). Indeed, the adoption and usage of cloud computing technology would help in bridging the digital divide, and in providing a cost-effective platform for organizations operating in developing countries to access global markets (Sabi et al., 2017).

On the basis of Technology-Organization-Environment (TOE) framework and the Diffusion of Innovation (DOI) theory, Oliveira et al. (2014) investigated the adoption of cloud computing by manufacturing and services organizations in Portugal and concluded that complexity, relative advantage, technological readiness, firm size and top management support have a direct effect on the adoption of cloud computing. In another study and by utilizing TOE framework and Human-Organization-Technology fit theory, Lian et al. (2014) indicated that the five most critical factors affecting the decision to adopt cloud computing technology were cost, security, perceived technical competence, top manager support, and complexity. Similarly, Low et al. (2011) used the TOE framework and DOI to examine the adoption of cloud computing in the Taiwanese high-tech industry. Findings of their study discovered that top management support, relative advantage, firm size, competitive pressure, and trading partner pressure characteristics have a noteworthy impact on the adoption of cloud computing technologies. By adopting the TOE framework as a theoretical base, Alshamaila et al. (2013) conducted semi-structured interviews among 15 key decision makers from different small and medium enterprises (SMEs) and service providers in the north east of United Kingdom. Their qualitative assessment indicated that compatibility, relative advantage, firm size, uncertainty, geo-restriction, trial-ability, top management support, innovativeness, prior experience, industry, supplier efforts, market scope, and external computing support were main determinants of SME adoption of cloud-based solutions. Gupta et al. (2013) presented five factors affecting the usage of cloud computing by SMEs in Singapore. These factors were: ease of use, convenience, security, privacy and cost reduction. Trigueros-Preciado et al. (2013) identified the main barriers to cloud adoption in Spain. They found that the knowledge about cloud computing is limited among the surveyed organizations, and that ignorance of the technology amongst these organisations was the major obstacle to adopt cloud computing technologies. Mohammed (2011) discussed the most key drivers and constraints for secure cloud computing from a societal and technological perspective. In his paper, he highlighted the most important societal issues such as: trust, privacy, and user behavior and how security affects these factors. In addition, the paper discussed the key technological issue such as: scalability, reliability, encryption, data rights, and transparency.

In the e-government context, Lian (2015) developed an integrated model which is based on the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) to identify the main factors that influence cloud-based e-invoicing service in Taiwan. The paper has examined seven factors: performance expectation, effort expectation, social influence, facilitating conditions, trust in e-government, security concerns and perceived risk. Relevant hypotheses were developed in this study. To empirically test these hypotheses, the paper utilized a questionnaire-based survey to collect. Findings from 251 valid responses of this study revealed that effort expectation, social influence, trust in e-government, and perceived risk have a significant effect on the adoption of the e-invoicing service. In addition, the results indicated that perceived risk and trust in e-government mediates the relationship between security concerns and behavioral intention to adopt the e-invoicing service. However, surprisingly findings of this study found that performance expectation and facilitating conditions were not significant factors. In another context, Sabi et al. (2017) investigated the factors that impact diffusion, adoption, and usage of cloud computing at educational institutions in sub-Saharan Africa. Results of this study found that socio-cultural factors, usefulness, results demonstrability

and data security significantly impact ICT experts and decision makers' propensity to recommend adoption of cloud computing in the universities.

3. RESEARCH DESIGN AND METHODOLOGY

This research aims at investigating the determinants prohibiting Jordanian organizations from moving to the cloud. Cloud computing paradigm is still quite new to the most of Jordanian organizations. In addition, there is lack of research in this area and this is more evident in developing countries. Due to the insufficient empirical work in the cloud computing field and a notably need to get rich data, this study was considered exploratory in nature, so that a qualitative approach mainly using semi-structured interviews was adopted as the main data collection tool for this research. The use of qualitative methods, such as interviews, has been suggested for exploratory research when little is known about the phenomenon of interest and when there is a need to identify unanticipated or new issues in regard to the area of study (Sekaran and Bougie, 2010). In this research, therefore, six full-length interviews were conducted with key ICT officials and experts within the Jordanian landscape of cloud computing were conducted. Open-ended questions were chosen to put the interviewee at ease giving them the ability to respond in their own words using their own structure. Data also came from secondary sources that included published work in peer reviewed academic journals, high impact journals and reviews, media releases and websites, in addition to documents obtained from the sample's officials.

An interview protocol was prepared to guide the interviewing process. Data collection took place between November 2015 and February 2016. As mentioned earlier, six direct face-to-face full-length semi-structured interviews were conducted with ICT officials and cloud computing experts of a set of firms operating in different industries in the Jordanian market in an attempt to meet the main objectives of this research. Every target out of the whole six firms has a different field of business than the other; this is demonstrated in Table 2, and all the targets are located in Amman, the capital city of Jordan as a matter of determining the geographical coordinates of the target. The interviews have been performed at each firm's location. The interviews lasted between 40 and 60 minutes. All interviews were audio recorded but only after all participants approved the recording. Data was then transcribed, proof-read, and then analyzed using content analysis techniques as described by (Miles and Huberman, 1994; Al-Debei and Avison, 2010).

Having all interviews in hands, the transcribed data of the six interviews went through preparation and editing processes to make it ready for the analysis. The resulted textual data was then aggregated with the hand notes of the researchers and the joined content was qualitatively analyzed. The analysis procedure has been performed using NVIVO 10.0 software. It has been widely advised to use different computer-aided examination for qualitative data interpretation and analysis as supported by Charmaz (2000). This route of data analysis has been selected due to the proven efficacy, accuracy

Table 2. List of Interviewees

ID	Interviewee's position	Industry	Interview date	Duration
1	ICT Consultant	Telecommunications	Nov 25, 2015	40 min
2	Executive Director	Consultancy	Nov 30, 2015	50 min
3	Director of ICT	ICT	Dec 3, 2015	60 min
4	Business Development Manager	ICT	Dec 30, 2015	60 min
5	IT Manager	Banking	Jan 20, 2016	45 min
6	CIO	Aviation	Feb 2, 2016	60 min

and minimum amounts of systemic errors of the resulting outcomes when compared to conventional old-fashioned analysis approaches.

NVIVO is a computer assisted qualitative data analysis package, settled by QSR International (Bazeley and Richards, 2000). This software offers a set of functions that support the coding and recovery of text. Another remarkable privilege is that it assists researches to write down memos during the analysis process (Gibbs, 2002). In an attempt to conquer reliable and informative data out of the interviews, each single interview has skillfully created a transcript that was saved in a distinct word processor document. This has enabled sustaining fertility of the interviews data. Afterwards, all documents were imported in NVIVO for reading, analysis and coding. The main objective of the analysis was to transform data into insights and findings so as to make a sense out of it. During the analysis, as list of ideas emerge, ideas were grouped based on significant headings to form the concepts. Next, related concepts were aggregated in categories to form the themes that constitute the results of this research. The emerging themes were then examined based on their intensity, depth, and specificity with the research questions, with additional emphasis given to comments that were frequently repeated or refuted by the interviewees (Marshall and Rossman, 1999; Al-Debei and Avison, 2010). The results are then presented in a narrative form granting detailed insights into the main factors hindering cloud computing adoption by organizations in Jordan.

4. RESULTS AND DISCUSSION

4.1. Technological Factors

The main factors hindering the adoption of cloud computing in Jordan was found to be related to security, privacy, trust, and compatibility & integration requirements. Security risks can be described as risks associated with remote data hosting, virtualized and shared resources, and data transfer over the Internet (Subashini and Kavitha, 2011). Our analysis revealed that there are huge concerns about data confidentiality and security risks when it comes to cloud computing adoption by organizations in Jordan. Consistent with previous studies (e.g. Lian et al., 2014; Aleem and Sprott, 2013; Gupta et al., 2013; Kshetri, 2013), our analysis revealed that security risks present key challenges for widespread adoption of cloud in Jordan. For example, interviewee 1 explained that, "Security and privacy are considered as the most important barriers to adopt cloud computing. The level of security and privacy must be listed in the Service Level Agreement (SLA), usually the authentication mechanism implies high level of security, providers must enhance security over the rendered applications in different ways such as username and passwords, biometrics and card plus password, as otherwise data will be easy to be unofficially disclosed or hacked". Interviewee 6 also explained that "One of the reasons of dealing with global service provider is that we must follow specific security standards, and the global provider commit and achieve that", interviewee 4 comported with interviewee 6 by saying "I think that global provider such as Amazon will invest much more on security aspects than our organization regarding our data". While interviewee 5 opposed with the two previous interviewees and connected security with trust when he said, "Our provider is local because this gives us higher trust and security…" Indeed, security concerns have been highlighted as a main technological issue in cloud adoption literature (Lian et al., 2014; Aleem & Sprott, 2013; Gupta et al., 2013; Kshetri, 2013; Marston et al., 2013; Morgan & Conboy, 2013; Mohammed, 2011; Sultan, 2011; Zhang et al., 2010). Security remains a major obstacle for many enterprises to migrate to the cloud. A recent survey conducted by the International Data Corporation reviled that security was the main cloud computing adoption concern and about 75% of respondents reported that they had significant concerns about security (Sultan, 2011). Cloud computing security risk incident has happened when Google, a major cloud computing provider had its systems attacked and hacked (Markoff and Barboza, 2010). Therefore, securing both data and communication is really important for both cloud service providers and consumers.

Privacy is also still an area of concern to organizations in Jordan when it comes to cloud computing. In public cloud model, service providers manage the physical location(s) of the data that are being stored. Therefore, consumers have real concerns about privacy, data security, data ownership and audit, especially if these providers are located in another country (Kshetri, 2013; Marston et al., 2013). Data privacy and protection barriers are keeping down wide scale of cloud adoption by organizations in general. Our analysis also revealed that there are many issues related to the concept of trust in service providers. This can be referred to as Institution-based trust which can be described as the degree to which the organization believes that effective third-party guarantees are in place to assure the fulfillment of the client's expectations (Gefen et al., 2006). One of trust related issues that was highlighted in our study is the nature of cloud service provider based on its location; whether it is local or global provider. Findings regarding this issue were conflicting. For example, when interviewee 2 was asked if they trust local provider more than global provider, he replied: "I had an experience with global service provider and also with a local service provider and the global one was more reliable from my own perspective" then he noted: "the principles of cloud are not tied to a specific geographic area". However when interviewees 1 and 5 were asked the same question, answers were different from the previous one and they agreed that local provider can be more trusted; interviewee 1 said: "Despite the fact that global provider can provide you with better prices and service, you will feel more safe to deal with local provider also some problems could be solved easily due to personal relationships". Interviewee 5 said: "Our provider is local because this gives us higher levels of trust and security". Then he pointed out to a problem they have faced and that it was solved easily because their provider is local. Another issue is that the decision of adopting cloud might be related to the concept of trust; Interviewee 6 stated: "Adoption of cloud computing is based on two main factors: risk and trust. Perceived value can be also added as a third factors…" Our analysis also revealed that the concept of trust can be related to other concepts such as, reliability, availability and security. For example, regarding the relation with availability and reliability, interviewee 6 said: "We are dealing with a trusted and reliable provider such as Microsoft to guarantee service availability and avoid time down cases". Interviewee 2 agreed with him when he said: "One of the risks is to lose service then you do not know where to go after this so we need trusted providers". Regarding relation with security interviewee 2 also said: "Risks of security and trust will rise because of the distributed nature of cloud". Trust can be considered as a determinant or a challenge to adopt cloud when it comes to Supply Chain Management (SCM) and Customer Relationship Management (CRM) systems, interviewee 1 stated: "It is very difficult for cloud to support SCM, because within SCM you do not have your information only but your suppliers' information as well so you need their approval to put this information on the cloud". The same idea is for CRM, organizations need to get the approval of their customers to put their data over cloud thus they can maintain trust-based relationship.

Compatibility and Integration requirements was also identified as one of the factors hindering the adoption of cloud computing in Jordan. Compatibility is the extent to which an innovation or new technology is recognized as harmonious with current values, past experience and the requirements of potential adopters (Rogers, 1995, p. 240). Compatibility can be considered as an essential factor in the decision of adopting an innovation (Rogers, 1995; Ching and Ellis, 2004). When enterprises think about adopting cloud, compatibility with existing applications would be a noticeable concern (Dargha, 2012; Heinle and Strebel, 2010). This concern stems from the little control that cloud customers have over the rendered computing platforms by the provider, this in turn force providers to assure flexibility, nevertheless, providers can change the rendered platforms whenever they want without having the customer approval (Leavitt, 2009). From the developer side, there is a growing attention toward compatibility, which is centered on achieving a high level of integration for the new technology (Kamal, 2006). Organizations need to integrate applications and data for variety of reasons such as adopting diverse separate service providers. Thus integration might become an important issue. This is what our analysis has revealed as interviewee 1 stated that "If cloud service provider renders certain services, then companies will be forced to go for different service provider.

It is the same for websites and so on; this point has a positive aspect in which customer can distribute risk between all providers which in turn will decrease the risk. On the other hand, when taking all services from one provider, the risk will be higher because the customer will be highly dependent on the provider. On the other hand, dealing with one provider only makes it easier to integrate, coordinate and manage. If data will move from one system to another, many questions could be raised such as: how will the integration be done? Who will be in charge for the integration process? Is it possible that it will be an integrator cloud service provider which it's role to integrate between two different services? If we take two different services from two different providers and they are not compatible in term of technology, who will be responsible for that? Is there a need for integrator? All of these questions will be explicated in the future". Interviewee 6 noted about integration "When we deal with a big company like Microsoft, they commit to the SLA, integration is not big issue and small problems might occur but not major problems such as service down". The finding of this study is in line with previous studies such as (Alshamaila et al., 2013; Safari et al., 2015). However, this result in inconsistent with some of previous studies as well. For example, Low et al. (2011) found that compatibility has no significant effect on the adoption of cloud computing in Taiwan. One possible justification for this inconsistency is that the industries are different as the previous study focused on high-tech industry while the current study focused on ICT industry.

4.2. Organizational Factors

The main factors identified in this study as barriers for cloud computing adoption in Jordan from an organizational standpoint are: organizational culture in addition to top management support and the characteristics of CEOs. This study finds that organizational culture is one of the main significant organizational factors in adoption and implementation of cloud computing. This is consistent with previous studies which indicated that culture is one of the critical success factors for implementing IS/IT systems (Al-Hujran et al., 2015; Morgan and Conboy, 2013; Rosenberg, 2001). The deployment of a cloud computing service leads to drastic changes in the way IS/IT services are invented, developed, deployed, scaled, maintained and delivered. As a result, resistance to change from business users and more specifically the IT officials always emerges as one of the most noticeable barriers facing the successful utilization of cloud computing services (Marston et al., 2013; Morgan and Conboy, 2013). In this research, one of the points that have emerged from our analysis is IT officials' resistance to change their traditional IT environment because of their fear of losing control on ICT environment or losing their jobs. Interviewee 1 confirmed this point by stating: "IT officials are the people who usually recommend the implementation of new IT/IS systems. However, I believe that they would not recommend something that conflict with their interest. Also, people usually do not like to lose their knowledge power and to start learning new systems". On the same level of importance, IT officials assume that cloud computing would replace them and therefore would increase the possibility of losing their jobs. Interviewee 1 contemplated, "IT officials might think that they will lose their jobs and therefore they will not recommend cloud systems for their companies".

Other organizational factors that impact cloud computing adoption are top management support and the characteristics of CEOs. The results of this study is in line with previous studies such as (Oliveira et al., 2014; Alshamaila et al., 2013; Low et al., 2011). For example, Low et al. (2011) found that top management support has a significant effect on the adoption of cloud computing. Implementing cloud computing may involve business process reengineering and resources integration, therefore, top management support is necessary to boost commitment and to create a positive environment toward this innovation (Low et al., 2011). In this research, most of the interviewees indicate that a decision to adopt IS/IT system including cloud computing service is usually made by top management. This means that the adoption of cloud computing is heavily dependent on the top management knowledge and attitude toward this technology, whether as inhibitors or facilitators. Interviewee 1 stressed the importance of top management support and senior managers' characteristics by stating: "I worked in the IT industry for long time and I know that most of decision makers in different public and

private organization here in Jordan do not see the value of implementing new technologies on their businesses. I believe that, the mentality of mangers in eastern part of the world is different than that of managers in the western part. Many of senior managers in this part of the world perceive that investment in technology is wasting of resources as they do not see the potential value of technology for businesses". He continued, "I strongly believe that this factor will be a strong barrier in front of cloud computing adoption, especially for large enterprises".

4.3. Environmental Factors

The main environmental factors negatively affecting the adoption of cloud computing technology in Jordan are regulatory frameworks and SLAs as contractual agreements between the cloud services provider and the company getting the service. Our result that suggest regulatory framework as one of the main impediments of cloud computing in Jordan is consistent with previous studies such as (Marston et al., 2013; Morgan and Conboy, 2013). However, this result in inconsistent with some of previous studies as well. For example, Oliveira et al. (2014) found that regulatory framework has no significant effect on the adoption of cloud computing in Portugal. A plausible justification for this inconsistency in the importance of regulatory framework in cloud computing adoption could be related to the fact that Jordan represents late adopters' context for cloud computing technology as opposed to early adopters' context of European counterparts.

As an environmental factor, regulations can be considered as a main issue when adopting cloud computing (Morgan and Conboy, 2013). For instance, central bank of Jordan does not allow Jordanian banks to store their critical data (core banking) on the cloud. In addition, Delmas (2002) remarked that organizational non-compliance with surrounded regulations may transform extra transaction expenses and potential legitimate conclusions coming about because of these activities. Here in Jordan we do not have specific regulations or regulatory framework that deal with cloud computing aspects, which may limit many customers from adopting the cloud. According to our interviewees, interviewee 3 stated "Cloud in Jordan is still in its infancy stage, we still have many barriers related to laws and regulations, and customers may wonder who can take backup for my data? Who will be accountable in the case of my data loss? How can I guarantee that my data will not be disclosed to a third-party or being sold to my competitors? There must be regulations and laws to organize all of that". When he was asked if there is a tendency from Jordanian government toward stating a regulatory framework for the cloud, he replied "There is a tendency, but we in general are slow in taking actions, we still need the regulators to be more aware of the cloud computing technology. I think it will take a long time to develop regulatory framework regarding cloud computing in Jordan". He added "Regulations play a critical role in public cloud because in this case, there are two separate parties that need regulations and laws to govern their relationship, while in the private cloud, instructions will be enough because it is internally". Interviewee 6 noted "Regulations limit us from hosting our core banking on the cloud". When he was asked if the bank will be more relaxed in case of regulations existence, he replied "maybe yes, because the bank will be more safe if its data is stored and managed internally, the reason of that that I have storage for my data in addition to a maintenance contract with our hardware supplier and insurance in the case of any danger, there will be a company that will compensate us, but when giving our data to local provider what will be the insurance and guarantee?". Interviewee 4 stated "Regulations can be considered as a benefit and a threat at the same time". He added "I know about six banks in Jordan using virtualization because at the end of the day it is economically much more cost effective. They are just not ready to give piece of their core banking out to the public cloud, because of security perspective, things like that and regulations as well, like for example I was working with a bank in Jordan that have branches in Palestine so I told them why do you have two separate data centers: one for the branches in Jordan and another for the branches in Palestine. The answer was very much about regulations as the regulations in Palestine monetary authority does not allow them to store and manage their data outside the country. Interviewee 2 agreed interviewee 4 by

saying "Regulations considered as double edge; sometimes regulations become bottleneck. However, being just completely free and acting without any regulations is a problem".

Our research also revealed that SLAs are vital aspects that need to be carefully considered before moving to the cloud. Based on our qualitative research, we found out that SLAs are considered to be a hindering factor affecting the adoption of cloud computing in Jordan. SLAs are contractual arrangements between the cloud services provider and the customer that specifies many terms such as availability, serviceability, quality of service (QoS), penalties in case of violation terms, and are considered as a support for the pay-per-consumption. However, SLAs constitute a big impediment in front of cloud customers toward procuring cloud services (Mujinga and Chipangura, 2011). Sometimes it is difficult to enforce and monitor SLAs (Keller and Ludwig, 2003). In addition, each cloud provider has its own terminologies and concepts that maybe misleading and misunderstood by the customer. In addition, cloud providers may manipulate the terms to favor their desired selling points. For example, Aleem and Sprott (2013) reported that 65.7 percent of respondents agree that SLAs are viewed as being unsatisfactory forms of protection that weigh heavily in favor of the cloud provider. This in turn makes it challenging for customers to identify the right provider that will perfectly suite their needs and help them in achieving their desired business goals. SLA varies from one provider to another according to the rendered services provided by those providers. As such, it is challenging to make all providers agree on a standardized framework for modelling SLAs (i.e. writing the same terms and concepts). In this context, interviewee 3 highlighted the significances and the need for a clear and formal methodology to handle cloud computing SLAs, he stated: "SLA is very important when it comes to cloud computing. This contract will be the main reference for both; consumers and service providers. Therefore, to avoid disputes, cloud customers need to manage this document properly. Before signing, IT department has to check technical and quality of service issues, legal department has to check legal issues carefully, and senior management has to review business aspects". Interviewee 4 also commented about the importance of SLA by stating: "SLAs are very important, I am using something outside my organization, so I need to have a contract which states what can I expect, and for example, I am working with cloud service provider and services are down for a day, then I am out of business for a day. Accordingly, we must have a really good agreement on what you can expect from each other with of course penalties…" Accordingly, we believe that cloud computing SLA vetting process is very critical as potential clients need to be thoroughly aware of the terms and conditions and perhaps legal council should be involved at this stage (Aleem and Sprott, 2013).

5. IMPLICATIONS

5.1. Theoretical Implications

Organizations in developing countries lag behind their Western counterparts due to lack of cutting edge technology required for running their businesses (Sabi et al., 2017). However, while the current literature (refer to Section 2.6) provides a better understanding of cloud computing technologies usage in Western countries and countries in the Asian-Pacific region, empirical research that rigorously explore the proposed factors that might influence the adoption of cloud computing in other parts of the world such as the Arabian Peninsula is needed. This gap is significant given cultural and social characteristics of Arab nations differ significantly from those of the Western nations (Baker et al, 2010). Our literature review also revealed that there is a limited number of studies have evaluated the adoption of cloud computing on the organizational level. Although cloud computing has different service and deployment model, the literature has not focused on identifying the adoption of different models. In addition, prior research on cloud computing adoption has largely focused on the operational and technological aspects of cloud computing and their impact on cloud computing adoption (Schneider and Sunyaev, 2016). While the current literature provides a fundamental understanding of cloud computing, empirical studies that comprehensively explain the diffusion and adoption of cloud computing in organizations from socio-technical perspectives are still required (Alharbi, et al.,

2016; Marston et al., 2011; Low et al., 2011; Lin and Chen, 2012; Hsu et al., 2014; Oliveira et al., 2014). Moreover, and based on our extensive literature review, we found out that most of previous studies explored cloud computing adoption from the viewpoint of the individual user (e.g. Arpaci, 2017; Sharma et al., 2016), but very little attention has been given to investigate cloud computing adoption from an organizational perspective.

5.2. Practical Implications

Our study results suggest that security, privacy, trust, in addition to compatibility and integration requirements are the main technological impediments for cloud computing adoption in Jordan. As security is a major concern for organization in Jordan, service providers should come up with new approaches that tackles these concerns. This might include partnerships to be established with local governmental agencies such as the ministry of information and communication technologies. In this case, cloud computing services will be offered by the service provider but through the local governmental agency which will be responsible for governance. This solution might help in significantly reducing consumers' security risks and concerns and in building trust in such services. Moreover, workshops and seminars can be held on a continuous basis by service providers to announce new developments and innovations related to security on the cloud. This would be also beneficial in raising the awareness of customers in this particular domain. As for data privacy, we believe that service providers need to highlight their approaches and strategies to handle data privacy in a very clear way to customers. Moreover, they might come up with innovative approaches to handle this. One idea is to allow customers to host data within their data center but to host or use their applications on the cloud. Another idea is that to have key management system or the encryption system hosted at the customer side and before data is transferred to the cloud it gets encrypted using the locally hosted key management system and then in its way back to the customer side where it gets decrypted.

The third identified challenge to cloud computing adoption in Jordan is trust. It was revealed in our study that some organizations in Jordan would have higher trust in service providers if the service providers host their data and applications on local cloud computing data centers. This implies that major service providers such as Amazon, Oracle, and Microsoft need to seriously think about expanding their cloud computing data centers' territories to include Middle East in general and the Arab world in particular for higher adoption rate of cloud computing technology. The fourth technological impediments that was identified in our study is related to compatibility and information requirements. This implies that organizations in Jordan need to adjust their organizations along with their processes to become compatible with cloud computing systems. Organizations need to effectively address their management style, culture of the organization, structure and integration of the processes to successfully utilize cloud computing solutions. This is essential as cloud computing should be compatible with the organization's policy, technology development environment, and business needs (Lin and Chen, 2012). Managers need also to work on changing existing business processes to be fully aligned with cloud computing solutions. It is also very critical that organizations work on establishing transparent information flow for better utilization of cloud computing.

Our study results also suggest that organizational culture, top management support, and characteristics of CEOs are the main organizational impediments for cloud computing adoption in Jordan. Indeed, the choice to deploy a cloud computing solution would lead to significant changes in the way technological services and products are designed, developed, deployed, scaled, maintained and delivered. Therefore, such a decision is usually confronted with significant resistance to change coming from technological resources within the organization as they might fear from losing their jobs. This implies that management need to manage the transition to cloud very carefully by allowing their IT personnel to adjust their skills and capabilities to suit the cloud computing landscape. Regular meetings with IT personnel in which management illustrates their cloud computing strategy and keeps IT personnel in their future plans would help in moving to the cloud more smoothly. Further, our study revealed that top management support and the characteristics of CEOs is critical to cloud

computing adoption. Indeed, the adoption of cloud computing is heavily dependent on the top management knowledge and attitude toward this technology. This implies that cloud service providers need to focus on highlighting cloud computing technology along with its benefits and value to top managements within organizations in Jordan. One idea is to frequently design roundtable events with C-level personnel within organizations in Jordan to make sure that they have enough knowledge about this innovative platform and positive attitudes towards cloud computing technology. This would help in making top management within Jordanian organizations perceive cloud computing as an asset of high strategic importance and value which is helpful to them in enabling their organizations to sustain their competitive advantages. This is significant as otherwise top management within Jordanian organization might delay their investments in cloud computing until they learn more about it.

Finally, our study results revealed that regulatory framework and SLA are two key environmental impediments of cloud computing adoption in Jordan. Regulatory framework is very critical to cloud computing adoption and especially in developing countries. This implies that Jordan should develop its legislations in the domain of cloud computing so to support and at the same time protect the use of cloud computing. The existence of such legislations and regulatory framework would facilitate the adoption of cloud computing solutions by Jordanian organizations. Another important environmental factor that significantly and negatively affects the adoption of cloud computing in Jordan is related to SLAs. This implies that cloud service providers need to write their SLA in a more clear form and to reduce Jargon and complex terminologies. SLAs need also to be fair and to include articles for the benefits of both; the provider and the customer to achieve a win-win situation. We also recommend that cloud service providers to include warranties for customers to encourage them to confidently move into the cloud landscape.

6. CONCLUSION AND LIMITATIONS

This study aimed at identifying the factors hindering cloud computing adoption by organizations in Jordan. Findings of this study revealed that cloud computing utilizations by Jordanian companies still at its early stages. Indeed, it was clear that there is a low-level of cloud computing adoption by Jordanian companies. According to interviewees, both service providers and consumers still immature enough to adopt cloud computing. Some of organizations in Jordan implement virtualization as the first level of cloud computing. Other organizations adopt mail and hosting services. On the other hand, service providers in Jordan are also still immature in the area of cloud computing and offer only limited cloud computing services. Major players in the Jordanian IT industry such as IT providers and telecommunication companies are offering the basic levels of cloud computing such as data center visualization, servers, virtual firewall and websites hosting. Only few of them offer advance cloud services such as SaaS. This issue has been explicitly expressed as Interviewee 1 stated: "In the area of cloud computing we have many IT companies who provide visualization and hosting services while very few offer software and application as a service which we really need". Interviewee 3 confirmed this point by saying: "Many companies and IT professionals in Jordan talk about cloud computing, but few of them know exactly what they want and need from cloud computing. Although our institution is considered as a high-tech institution in Jordan and therefore should be one of the early adopters of technological innovations, only mail hosting service is implemented".

Interestingly and despite the lack of adoption of cloud computing technology in Jordan, it was found out that cloud computing is perceived useful by Jordanian companies. Consistent with previous literature (e.g. Alshamaila et al., 2013; Gupta et al., 2013; Sultan, 2011), our findings have shown that cloud computing is economically feasible solution for SME's because they have limited resources and financial capabilities to invest in IT. According to interviewees, most of the start-ups use global cloud computing providers where they host their applications, website or cloud service. Cost savings is the first perceived advantage of cloud computing, and thus cloud computing may seem very attractive to SME's, as interviewee 1 stated "SME's do not have the financial capability to buy

software applications and the needed infrastructure, thus cloud computing gives them a competitive advantage in which it lowers the cost of applications and the needed infrastructure, need for less manpower (people) to manage, maintain applications. Moreover, with cloud computing, SMEs do not have to buy licenses for the software itself, all of this will be the responsibility of the provider". He added that "SMEs usually have a small number of employees so if they will not use the cloud, the utilization of applications will be decreased, in this case cost of the application will outweigh the benefit of the application, but when using the cloud, it will be more feasible and the benefit will outweigh the cost". Interviewee 3 claimed "let us assume I want to initiate a company and I want to decide which will be more efficient solution to be considered, adopting the cloud or having the service within my company, I will find out that cloud computing option is less costly and as a start-up will go for it". All interviewees also agreed that in the near future SMEs will be the early adopters of cloud computing as it is a cost-effective option for them. as interviewee 4 stated "if you examine SMEs, you can easily find out that the majority do not have the budget for the IT infrastructure needed so as to run the business smoothly". He added "I think when people start using cloud computing services then they can start perceiving the associated benefits. interviewee 1 confirmed that by saying "I think that SMEs will be the pioneers in adopting cloud computing in Jordan; not the large enterprises because they are modest in terms of economics (financial capabilities), that means that they sometimes take risk because they have no other choices, they will go to cloud over building needed infrastructure for their applications".

To summarize, results revealed that cloud computing makes eminent sense for SMEs; however, there are significant technical, organizational and environmental issues which need to be tackled before cloud computing services are effectively used by organizations in Jordan. Based on applying TOE framework, findings of this study were classified into several technological, organizational and environmental factors that adversely impact cloud computing adoption. The identified technological factors were security, privacy concerns, trust, and compatibility. On the other hand, the main identified organizational factors were culture, top management support, and characteristics of CEOs. Finally, the main identified factors that are hindering cloud computing adoption by organizations in Jordan from environmental standpoint were the need for regulatory framework and SLAs contractual agreements.

As with all studies, this study is not free of limitations. The major limitation is derived from the sample size and the geographical location of the sample which is limited to only six full-length interviews that were conducted with ICT officials and cloud computing experts of a set of firms operating located in Jordan. Although these findings are believed to be applicable to other organizations in Arab countries that share demographic characteristics with Jordan, our limited-number of interviews may not be representative of the entire country or the Arab region. Further study in other countries would most likely strengthen and validate the findings of this study. Second, this study investigated the determents of cloud computing adoption in general and did not specify a cloud computing service model. However, determinant factors may diverge according to the cloud service model. In other words, the determinant factors of decisions to adopt SaaS model may considerably differ from the determinant factors of decisions to adopt IaaS or PaaS service models (Schneider and Sunyaev, 2016). Therefore, this paper calls for further research on the adoption of a specific cloud service model as well as a comparative research on the adoption of different cloud computing service models.

REFERENCES

Al-Debei, M. M., & Avison, D. (2010). Developing a unified framework of the business model concept. *European Journal of Information Systems*, *19*(3), 359–376. doi:10.1057/ejis.2010.21

Al-Hujran, O., Chatfield, A., Migdadi, M., & Al-Debei, M. (2015). Strategic Imperative of Influencing Citizen Attitude in Increasing E-government Adoption and Use: An Empirical Study. *Computers in Human Behavior*, *53*, 189–203. doi:10.1016/j.chb.2015.06.025

Aleem, A., & Sprott, C. R. (2013). Let me in the cloud: Analysis of the benefit and risk assessment of cloud platform. *Journal of Financial Crime*, *20*(1), 6–24. doi:10.1108/13590791311287337

Alharbi, F., Atkins, A., & Stanier, C. (2016). Understanding the determinants of Cloud Computing adoption in Saudi healthcare organisations. *Complex & Intelligent Systems*, *2*(3), 155–171. doi:10.1007/s40747-016-0021-9

Alshamaila, Y., Papagiannidis, S., & Li, F. (2013). Cloud computing adoption by SMEs in the north east of England: A multi-perspective framework. *Journal of Enterprise Information Management*, *26*(3), 250–275. doi:10.1108/17410391311325225

Armbrust, M., Fox, A., Griffith, R., Joseph, A. D., Katz, R., Konwinski, A., & Zaharia, M. (2010). A view of cloud computing. *Communications of the ACM*, *53*(4), 50–58. doi:10.1145/1721654.1721672

Arpaci, I. (2017). Antecedents and consequences of cloud computing adoption in education to achieve knowledge management. *Computers in Human Behavior*, *70*, 382–390. doi:10.1016/j.chb.2017.01.024

Baker, E., Al-Gahtani, S., & Hubona, G. (2010). Cultural impacts on acceptance and adoption of information technology in a developing country. *Journal of Global Information Management*, *18*(3), 35–58. doi:10.4018/jgim.2010070102

Bazeley, P., & Richards, L. (2000). *The Nvivo Qualitative Project Book*. London: Sage Publications. doi:10.4135/9780857020079

Borgman, H. P., Bahli, B., Heier, H., & Schewski, F. (2013, January). Cloudrise: Exploring cloud computing adoption and governance with the TOE framework. In *46th Hawaii International Conference on System Sciences* (pp. 4425–4435). Washington, DC: IEEE. doi:10.1109/HICSS.2013.132

Charmaz, K. (2000). Grounded theory: objectivist and constructivist methods. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of Qualitative Research* (2nd ed., pp. 509–535). Thousand Oaks, CA: Sage.

Ching, H. L., & Ellis, P. (2004). Marketing in cyberspace: What factors drive e-commerce adoption? *Journal of Marketing Management*, *20*(3-4), 409–429. doi:10.1362/026725704323080470

Dargha, R. (2012). Cloud computing: from hype to reality: fast tracking cloud adoption. In *Proceedings of the International Conference on Advances in Computing, Communications and Informatics* (pp. 440-445). ACM. doi:10.1145/2345396.2345469

Delmas, M. A. (2002). The diffusion of environmental management standards in Europe and in the United States: An institutional perspective. *Policy Sciences*, *35*(1), 91–119. doi:10.1023/A:1016108804453

EMC. (2011). *Cloud Infrastructure and Services Student Guide*. EMC Education Services.

Fong, M. W. (2009). Technology leapfrogging for developing countries. In *Encyclopedia of Information Science and Technology* (2nd ed., pp. 3707–3713). IGI Global. doi:10.4018/978-1-60566-026-4.ch591

Gangwar, H., Date, H., & Ramaswamy, R. (2015). Understanding determinants of cloud computing adoption using an integrated TAM-TOE model. *Journal of Enterprise Information Management*, *28*(1), 107–130. doi:10.1108/JEIM-08-2013-0065

Gibbs, G. (2002). *Qualitative Data Analysis: Explorations with Nvivo*. London: Open University Press.

Gupta, P., Seetharaman, A., & Raj, J. R. (2013). The usage and adoption of cloud computing by small and medium businesses. *International Journal of Information Management*, *33*(5), 861–874. doi:10.1016/j.ijinfomgt.2013.07.001

Heinle, C., & Strebel, J. (2010). IaaS adoption determinants in enterprises. In Economics of Grids, Clouds, Systems, and Services (pp. 93-104). Springer Berlin Heidelberg. doi:10.1007/978-3-642-15681-6_7

Hsu, P. F., Ray, S., & Li-Hsieh, Y. Y. (2014). Examining cloud computing adoption intention, pricing mechanism, and deployment model. *International Journal of Information Management*, *34*(4), 474–488. doi:10.1016/j.ijinfomgt.2014.04.006

Kamal, M. M. (2006). IT innovation adoption in the government sector: Identifying the critical success factors. *Journal of Enterprise Information Management*, *19*(2), 192–222. doi:10.1108/17410390610645085

Keller, A., & Ludwig, H. (2003). The WSLA framework: Specifying and monitoring service level agreements for web services. *Journal of Network and Systems Management*, *11*(1), 57–81. doi:10.1023/A:1022445108617

Kim, W., Kim, S. D., Lee, E., & Lee, S. (2009). Adoption issues for cloud computing. In *Proceedings of the 7th International Conference on Advances in Mobile Computing and Multimedia* (pp. 2–5). New York, NY: ACM.

Kshetri, N. (2013). Privacy and security issues in cloud computing: The role of institutions and institutional evolution. *Telecommunications Policy*, *37*(4), 372–386. doi:10.1016/j.telpol.2012.04.011

Leavitt, N. (2009). Is cloud computing really ready for prime time? *Computer*, (1): 15–20.

Lee, J. (2004). Discriminant analysis of technology adoption behavior: A case of Internet technologies in small businesses. *Journal of Computer Information Systems*, *44*(4), 57.

Lian, J. W. (2015). Critical factors for cloud based e-invoice service adoption in Taiwan: An empirical study. *International Journal of Information Management*, *35*(1), 98–109. doi:10.1016/j.ijinfomgt.2014.10.005

Lian, J. W., Yen, D. C., & Wang, Y. T. (2014). An exploratory study to understand the critical factors affecting the decision to adopt cloud computing in Taiwan hospital. *International Journal of Information Management*, *34*(1), 28–36. doi:10.1016/j.ijinfomgt.2013.09.004

Lin, A., & Chen, N. C. (2012). Cloud computing as an innovation: Perception, attitude, and adoption. *International Journal of Information Management*, *32*(6), 533–540. doi:10.1016/j.ijinfomgt.2012.04.001

Low, C., Chen, Y., & Wu, M. (2011). Understanding the determinants of cloud computing adoption. *Industrial Management & Data Systems*, *111*(7), 1006–1023. doi:10.1108/02635571111161262

Markoff, J., & Barboza, D. (2010). Researchers Trace Data Theft to Intruders in China. *The New York Times*.

Marshall, C., & Rossman, G. (1999). *Designing Qualitative Research*. London: Sage.

Marston, S., Li, Z., Bandyopadhyay, S., Zhang, J., & Ghalsasi, A. (2011). Cloud computing—The business perspective. *Decision Support Systems*, *51*(1), 176–189. doi:10.1016/j.dss.2010.12.006

Mather, T., Kumaraswamy, S., & Latif, S. (2009). *Cloud security and privacy: An enterprise perspective on risks and compliance*. Sebastopol, CA: O'Reilly Media.

Mell, P., & Grance, T. (2011). The NIST Definition of Cloud Computing. *Communications of the ACM*, *53*(6), 50.

Miles, M., & Huberman, A. (1994). *Qualitative Data Analysis: An Expanded Sourcebook*. California: Sage Publications.

Mohammed, D. (2011). Security in cloud computing: an analysis of key drivers and constraints. *Information Security Journal: A Global Perspective, 20*(3), 123-127.

Morgan, L., & Conboy, K. (2013). Key factors impacting cloud computing adoption. *Computer*, *46*(10), 97–99. doi:10.1109/MC.2013.362

Mujinga, M., & Chipangura, B. (2011). Cloud computing concerns in developing economies.

Nuseibeh, H. (2011). Adoption of cloud computing in organizations. In *AMCIS Proceedings*.

Office of the Privacy Commissioner of Canada. (2007). *Fact sheet: Privacy impact assessments*. Retrieved from http://www.privcom.gc.ca/

Oliveira, T., Thomas, M., & Espadanal, M. (2014). Assessing the determinants of cloud computing adoption: An analysis of the manufacturing and services sectors. *Information & Management*, *51*(5), 497–510. doi:10.1016/j.im.2014.03.006

Pan, M.-J., & Jang, W. (2008). Determinants of the adoption of enterprise resource planning within the technology-organization-environment framework: Taiwan's communications. *Journal of Computer Information Systems*, *48*(3), 94–102.

Prince, J. D. (2011). Introduction to cloud computing. *Journal of Electronic Resources in Medical Libraries*, *8*(4), 449–458. doi:10.1080/15424065.2011.626360

Purkayastha, S., & Braa, J. (2013). Big data analytics for developing countries–using the cloud for operational BI in health. *The Electronic Journal on Information Systems in Developing Countries*, 59.

Rogers, E. M. (1995). *Diffusion of innovations* (4th ed.). New York, NY: Free Press.

Rosenberg, M. J. (2001). *E-learning: Strategies for delivering knowledge in the digital age* (Vol. 3). New York: McGraw-Hill.

Sabi, H. M., Uzoka, F. M. E., Langmia, K., Njeh, F. N., & Tsuma, C. K. (2017). A cross-country model of contextual factors impacting cloud computing adoption at universities in sub-Saharan Africa. *Information Systems Frontiers*.

Safari, F., Safari, N., & Hasanzadeh, A. (2015). The adoption of software-as-a-service (SaaS): Ranking the determinants. *Journal of Enterprise Information Management*, *28*(3), 400–422. doi:10.1108/JEIM-02-2014-0017

Salleh, S. M., Teoh, S. Y., & Chan, C. (2012). Cloud enterprise systems: A review of literature and its adoption. In PACIS (p. 76). Association for Information Systems. AIS Electronic Library (AISeL).

Schneider, S., & Sunyaev, A. (2016). Determinant factors of cloud-sourcing decisions: Reflecting on the IT outsourcing literature in the era of cloud computing. *Journal of Information Technology*, *31*(1), 1–31. doi:10.1057/jit.2014.25

Sekaran, U., & Bougie, R. (2010). *Research Methods for Business: A Skill Building Approach*. UK: John Wiley and Sons.

Sharma, S. K., Al-Badi, A. H., Govindaluri, S. M., & Al-Kharusi, M. H. (2016). Predicting motivators of cloud computing adoption: A developing country perspective. *Computers in Human Behavior*, *62*, 61–69. doi:10.1016/j.chb.2016.03.073

Shimba, F. (2010). *Cloud computing: Strategies for cloud computing adoption.* Unpublished master's thesis, Dublin Institute of Technology, Dublin.

Sultan, N. (2010). Cloud computing for education: A new dawn? *International Journal of Information Management*, *30*(2), 109–116. doi:10.1016/j.ijinfomgt.2009.09.004

Sultan, N. A. (2011). Reaching for the "cloud": How SMEs can manage. *International Journal of Information Management*, *31*(3), 272–278. doi:10.1016/j.ijinfomgt.2010.08.001

Svantesson, D., & Clarke, R. (2010). Privacy and consumer risks in cloud computing. *Computer Law & Security Review*, *26*(4), 391–397. doi:10.1016/j.clsr.2010.05.005

Tornatzky, L. G., & Fleischer, M. (1990). *The processes of technological innovation*. Lexington, MA: Lexington Books.

Trigueros-Preciado, S., Pérez-González, D., & Solana-González, P. (2013). Cloud computing in industrial SMEs: Identification of the barriers to its adoption and effects of its application. *Electronic Markets*, *23*(2), 105–114. doi:10.1007/s12525-012-0120-4

Venters, W., & Whitley, E. A. (2012). A critical review of cloud computing: Researching desires and realities. *Journal of Information Technology*, *27*(3), 179–197. doi:10.1057/jit.2012.17

Wen, K. W., & Chen, Y. (2010). E-business value creation in Small and Medium Enterprises: A US study using the TOE framework. *International Journal of Electronic Business*, *8*(1), 80–100. doi:10.1504/IJEB.2010.030717

Wu, W. W., Lan, L. W., & Lee, Y. T. (2013). Factors hindering acceptance of using cloud services in university: A case study. *The Electronic Library*, *31*(1), 84–98. doi:10.1108/02640471311299155

Zhang, Q., Cheng, L., & Boutaba, R. (2010). Cloud computing: State-of-the-art and research challenges. *Journal of Internet Services and Applications*, *1*(1), 7–18. doi:10.1007/s13174-010-0007-6

Zhu, K., Dong, S., Xu, S. X., & Kraemer, K. L. (2006). Innovation diffusion in global contexts: Determinants of post-adoption digital transformation of European companies. *European Journal of Information Systems*, *15*(6), 601–616. doi:10.1057/palgrave.ejis.3000650

Omar Al-Hujran is an associate professor in the Department of Business Information Technology at Princess Sumaya University for Technology (PSUT). He got his bachelor's degree in computer science from Muâtah University, Jordan, Master of Science in computing from University of Technology/Sydney, and PhD degree in Information Systems from Wollongong University, Australia. His work has been presented in several international Journals such as Information Technology for Development Journal, Computers in Human Behavior, Internet Research, Journal of Enterprise Information Management and Electronic Journal of E-Government. His research interests include e-government, e-government adoption in developing countries, e-business and cloud computing.

Enas M. Al-Lozi is an Associate Professor of Information Systems at Al-Zaytoonah University of Jordan. She accomplished her PhD degree in Information Systems and Computing at Brunel University London, UK. Her research interests focus on the adoption, evaluation, and continuance usage of social networking sites from a behavioural and social standpoint. Within this research arena, Al-Lozi has published research papers in learned Journals such as Decision Support Systems, Computers in Human Behavior, IEEE Technology and Society, and Business Process Management Journal. In addition, she performed as an associate editor for the European Conference on Information Systems (ECIS). Al-Lozi also participated in an EU-funded project titled "Trust and Value Exchange in the Digital Economy" and helped in designing and managing workshops, conducting ethnographic and scoping studies at Access Space in Sheffield and with Bebo in Belfast, plus she undertook an ethnographic study of online users of Bebo's BeWell forum. Her background is in information systems (Bsc) and business management (MBA) from the University of Jordan.

Mutaz M. Al-Debei is currently a Principal Cloud Platform Consultant – Big Data and Advanced Analytics at Oracle Systems Ltd. Previously, he was the Director of Big Data & Analytics at INTRASOFT MEA since early 2015. Before joining INTRASOFT, Al-Debei was serving as an Associate Professor of Information Systems and Computing at the University of Jordan (UJ), and also as an ICT Chief Consultant at the National Center for Security and Crises Management. Al-Debei earned his PhD from Brunel University London (BUL) in Information Systems and Computing. His research has been published in learned Journals and conferences such as European Journal of Information Systems, Decision Support Systems, Internet Research, Computers in Human Behavior, Telematics and Informatics, IEEE Technology and Society, and Government Information Quarterly. Al-Debei's research interests include business models, big data, analytics, mobile data services design, and social networking sites. Furthermore, Al-Debei has received many research awards such as Abdul Hameed Shoman Award for Arab Researchers ICTs, 2015, the prestigious Vice Chancellor's Prize for Doctoral Research from Brunel University London in 2010, the Distinguished Researcher Award from The University of Jordan - two times in 2012 and 2014, and best paper awards from UKAIS (2008), and another one from IFIP 8.2 (2010).

Mahmoud Maqableh is an Associate Professor of Information Systems at the University of Jordan. He is serving now as the chairman of MIS Department. He has published many research papers in the areas of information systems and computing.