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The Impact of Organizational Structure and System Settings on the Healthcare Individual's Perception to Utilize Cloud Services: A Theoretical Literature Survey

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Abstract: Nowadays, the technology utilization and adoption considered as one of the trend researches in different contexts. In order to achieve successful utilization, a number of factors may be taken into consideration from different perspectives depending on the real needs in the context of usage. Healthcare context still needing the utilization of new trend technologies such as utilizing cloud computing services to handle different tasks in this domain. The cloud services can offer a reliable solution to manage, maintain and retrieve health records within hospitals as well as to share the activities among hospitals and healthcare specialists. This allows the healthcare professionals to access, manage and monitor patient's health status anywhere at anytime. In order to make sure to get the full benefits of the new services, a prior examination in the context of usage must be applied to examine the current needs and the suitability of the technology. Therefore, the researchers in the present study trying to provide the suitable factors/domains used in the context of technology utilization in healthcare sector. A literature survey has carried out to check the suitability of the organizational structure and system settings and their impact on the healthcare member's perception to utilize cloud health information systems. A total of 75 previous studies that used the proposed domains in different contexts has been included. Along with that, the researchers found that the studies in the context of technology utilization usually used three theories to combine the relationship between the above-mentioned domains. These theories are the organization theory, diffusion of innovation theory and the theory of reasoned action. Finally, the association between domains and the theories have been established.

Key words: Health information system, cloud computing, organizational structure, system, individuals, technology utilization and adoption

INTRODUCTION

Successful healthcare interoperability in the public sectors is mostly associated with the ability of the service to provide a platform for data sharing among users, processes, procedures and policies (Steinbart and Nath, 1992). It is critical for decision makers to decide the effectiveness of technology utilization in the health sectors due to the lack of evidence about the integrity of IT in health sectors (Petersone *et al*., 2016). Despite these concerns, there are some obstacles in identifying the current needs of healthcare sectors to accommodate technologies such as distributed and grid computing (Kadhum and Hasan, 2017; Rogers, 2004). Lack of understanding of the healthcare status to deploy technologies makes it difficult to handle the utilization of new healthcare systems in terms of dynamicity, scaling and low cost. The speeding up innovations involving cloud services has resulted in various implications in healthcare distribution. There are several challenges that are still facing the latest electronic health systems with regards to cost, online connectivity, client assistant and tragedy recovery (Laupacis *et al*., 1992). Despite these challenges, the cloud services can offer a great benefit to the healthcare sectors in managing their health records based on the cloud features such as self-service, ubiquitous network access, resource pooling, rapid elasticity and pay-per-use pattern. Thus, the application of cloud in this context can offer a remarkable advantage to the health sector.

Cloud computing after all has been addressed as the most sufficient source for providing effective IT services

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to which the power of healthcare devices can be utilized more efficiently through highly scalable hardware and software resources. In addition, cloud health information system can provide a promising business agility by the mean of using competitive tools through rapid deployment, parallel batch processing that process and manage user's requests in real time (Hatch and Cunliffe, 2013). As such, ensuring a successful utilization of cloud computing in the healthcare context needs careful attention to a number of factors from different perspectives which may include technical factors of IT, characteristics of the organization that introduces the technology and the response of individuals within the organization to the new technological too (lsIbrahim and Zainuddin, 2016; Li *et al*., 2013).

Here, we studied how certain organizational structure and system factors may contribute to the utilization of cloud health information system by embracing the ideas encapsulated in green computing, since, not only are the computing resources used more efficiently but further, the computers can be physically located in geographical areas that have access to cheap electricity while their computing power can be accessed long distances away over the Internet. Igbaria *et al*. (1996) stated that utilization of technology is the core factor that ensures organization stability based on the fit between the technology and the tasks it supported.

The aim of this research is to check the suitability of organizational structure and system characteristics in the context of healthcare when applying a new technology in general and specifically when applying cloud services. Furthermore, it will provide sufficient understanding about these domains characteristics necessary for accommodating individual needs in order to be willing and motivated to utilize cloud computing services. This study will also offer richer views for healthcare researchers about the key components of cloud computing services utilization in healthcare information systems. Finally, the association of the above-mentioned domains has been established based on three well-known theories namely, organization theory, Diffusion of Innovation theory (DOI) and the Theory of Reasoned Action (TRA). That shape the relationships and effects among domains and/or factors towards utilizing cloud health information systems.

MATERIALS AND METHODS

In this study, literature survey has carried out on 75 previous studies in order to compare different studies using the organizational structure and system domains that may potentially impact individual's perception to utilize new technology. In our case, we checked the suitability of these domains and its effect on the healthcare professional's (Individuals) perception in order to utilize cloud health information systems. In addition, surveying the organization theory, diffusion of innovation theory and the theory of reasoned action used to combine these domains and their factors in the context of technology utilization.

Organizational structure domain: Organization structure is one of the main domains being investigated in this study to its essential role in influencing the way an individual use and adapt technology within the organization. It provides a structure for the organization by providing the basis within which the organization functions are utilized to achieve certain goals. Moreover, the main elements of the organizational structure are believed to affect the behaviour of members in the same environment. According to Bock *et al*. (2005), hence, several aspects must be considered for sustaining a successful use of technology based on the consequences gained from previous experiences. This includes aspects related to hardware, software, cost, connectivity and training. In addition, factors related to the organizational structure must also comply with the minimum requirements for utilizing technology Srinagesh. It is believed that healthcare member's perception of organization structure may drive their behaviour which is influenced by the experience from the current organizational structure. On the other hand, the influence of this structure is assumed to be significant to the extent that a healthcare member may find it difficult to adapt themselves to a certain use. With this in mind, some previous studies like Zheng *et al*. (2010) suggested that, organization structure may effectively contribute to the behaviour of a person in a way that regulates their performance and intention to adapt in future. This is because the organizational elements are typically designed to minimize the influence of individual variations when communicating with technology which positively affects the organization's activities. From this, the researchers in this study considered the important role of organization structure at the hospital and subunit levels for the behaviour from using information health system based cloud. Organization structure and its relation to the behaviour has been the topic of several previous and current studies (Padmanabhan, 1997).

System domain: System characteristics have always been addressed to influence the way in which a person controls his/her task. This is usually characterized by individual's perception of a system to fulfill certain task

demands. According to Lin (2008), ensuring a successful use of technology requires examining system features as external variables of any adaption for driving one's beliefs of its effectiveness and usefulness. However, most previous studies on system's characteristics have heavily emphasized on the acceptance of a system with regards to other user's characteristics (Safie and Aljunid, 2013; Yu *et al*., 2008). As such, the effect of system related factors on the individual's behaviour within the healthcare context is less discussed. System's factors are assumed to drive healthcare member's perception to use health information system based cloud and potentially influence their behaviour to adapt. The relationship between system related factors and healthcare individuals are the main scope of this study. Wang and Liao (2008) stated that as an organization uses advanced systems to deliver services there is a need for evaluating its impact on users. Meanwhile, the relationships between various system characteristics and the behaviour may result in different usage experience and as a result different interest to adopt the technology.

Individual domain: The general understanding of individual domain includes characteristics of people regarding the context of study (Csikszentmihalyi and Sawyer, 2014). People characteristics can be studied from demographical perceptive or behavioural perspective. The individual domain is one of the key elements that assess people's adoption of technology. This is because it directs one's behaviour to the best practice and experience. Previous studies like Gudiene *et al.* (2014) linked individual factors to the success of an organization by contributing to his/her perception and attitude in a workplace. The individual domain in this study is defined as the extent to which healthcare members perceive the use of health information system to promote their abilities. In the healthcare context, individual factors have been always regarded as the main driver of the belief Lozano. However, the impact of such beliefs to healthcare member's adoption of health information system based cloud is yet to be studied. Additionally, the positive perception of individuals to maintain particular usage behaviour creates a feeling of responsibility and attachment that makes them indebted to the task (Ahimbisibwe *et al*., 2015). As a result, it is believed that such feeling would results to an atmosphere for healthcare members to act more positively. Under such circumstances, a positive attitude can be developed about using health information system based cloud to carry out certain role behaviour's among healthcare member's.

Organization theory: The organizational theory consists of four main components that are assumed to influence the environment. These are culture, organization

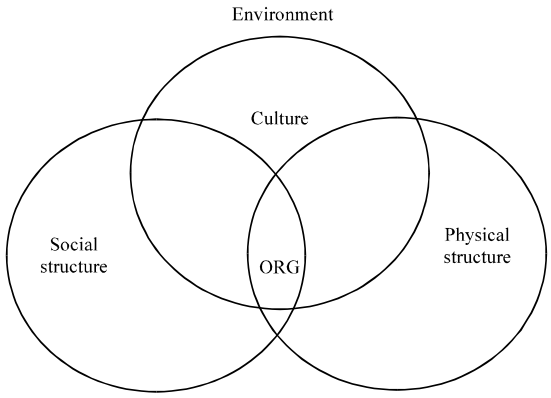

Fig. 1: Organization theory (Hatch and Cunliffe, 2013)

structure, technology and social structure. Hatch and Cunliffe (2013) stated that knowledge distributed throughout the organization has the potential to influence individual's ability to work and the consequent outcomes. The outcome of a person is identified by environmental settings, such as technology, physical structure, culture and social structure as shown in Fig. 1. Hence, understanding the effect of these aspects within organization theory can explain the current shortage of structure and technology in the cloud services utilization in the context of healthcare.

In general, organizational development and change are particularly important elements of human resources that demand a deep knowledge of organizations and organizing: organization theory can provide content for executive training programs. Meanwhile, Hatch and Cunliffe (2013) described the effects of communication on organizational perspectives to conduct successful managing or learning tools, to design effective communication systems or to provide a suitable mean of the network with an organization's needs. This is somehow seen to be relevant to the network capability an organization may offer to its individuals. For example, when healthcare members perceive their access and use of services to be positive, it is assumed that such perception contributes to their behaviour to adopt a process.

From the organizational theory perspective, it is essential that user of a system or service be aware of potential challenges to promote change in routine practice for adoption purposes within organizations (Garland *et al*., 2010). As such, health member's adoption of cloud health information system can be associated with their experience especially when a healthcare member may have difficulty knowing, weighing or selecting appropriate innovations to solve particular problems (Aarons *et al*., 2011). The relationship between the environment and organizational structure is perceived to be an essential

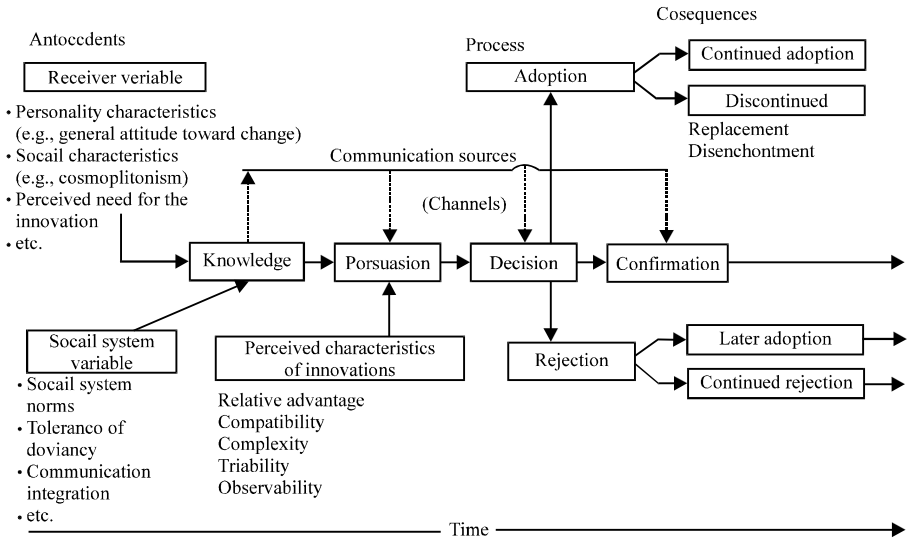

Fig. 2: Diffusion of innovation theory (Rogers, 2003)

component for promoting one's behaviour. Meanwhile, the association between organizational structure and changes in one's behaviour have been addressed to influence individual's use of technology. As such, it is assumed that lack of structural organization can lead the healthcare sector to pose low coordination which may result from the inefficient use of resources along with the lack to respond to internal and external environmental changes.

Diffusion of innovation theory: The DOI theory by Rogers (2004) is also used here to explain how certain utilization of technology can drive one's adoption and use of that technology. As illustrated in Fig. 2, it explores the way of exchanging ideas among individuals in the one organization or others. This theory can be used to emphasis on how the adoption of cloud computing is caused by the interaction among health members through interpersonal networks. It is assumed that innovation from utilizing technology is typically carried through the communication of various channels within the social system based on the solid relationships between individual (leadership attitude toward change), internal organizational structure (centralization, complexity, interconnectedness, the number of employees and organizational slack) and external characteristics (system openness) of the organization.

On the other hand, DOI has been known for its use in explaining certain organizational practices, especially when it is perceived as new by an individual or another unit of adoption (Rogers, 2003). Healthcare member's decision to adopt health information system based cloud was linked to their usage characteristics shaped by their

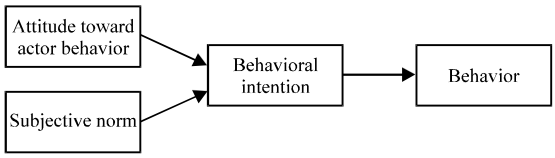

Fig. 3: Illustration of the theory of reasoned action (Ajzen and Fishbein, 1980)

confirmation of service's suitability to their needs which also include addressing how information about an innovation is disseminated.

Theory of reasoned action: The Theory of Reasoned Action (TRA) was originally developed in the field of social psychology by Ajzen and Fishbein (1980) which explains how individual's behaviour is driven by the function of their intentions to use or adapt technology as shown in Fig. 3. The theory was constructed based on the views of many previous scholars like (Ajzen and Fishbein, 1973, 1977) to help us understand people's attitude toward the behaviour when using technology. In this study, the researchers considered the role of this theory in associating healthcare member's behavioural control to their behavioural beliefs and adoption of health information system based cloud. This is mostly evident from the role of TRA in regulating individual's behavioural changes to construct the normative beliefs and the motivation to comply with the offered services. According to Madden *et al.* (1992) in the event that an individual perceives his/her outcome of behaviour is positive from certain use, then it can be said that his/her

behavioural control will be also positive towards performing that behaviour. However, this is not the case when the behaviour is negative. The positive behaviour therefore is strongly associated with the amount of control an individual process that accrues the required sense of motivation to meet the expectation of the task.

Based on these theories, the researchers constructed the understanding of the relationships between organizational structure and system characteristics and their effect on the healthcare professionals (individuals) behaviour to utilize cloud services for health information systems.

RESULTS AND DISCUSSION

To establish the association between the domains (organization, system and individual) and research theories (DOI, TRA and organization theory), Table 1 presents the relationship between each domain and theory. From Table 1, it can be concluded that the adoption of technology can be strongly predicted by the domain of organizational, system and individual.

The organizational theory emphasized on the role of organization structure and individual related factors in assessing the behaviour to adapt or not to adapt a technology in various contexts. From the Theory of Reasoned Action (TRA) perspective, organizational and individual domains are somehow relevant to technology use based on the recognition of individual to health information system based cloud benefits than to the initial decision to attempt using it and finally to the actual decision to attempt to adapt it. According to Damanpour and Schneider (2006), people's adoption of technology requires pre-adoption (e.g., able to configure the technology), peri-adoption (e.g., continuous access to service) and established adoption (e.g., adopter's commitment to the adoption decision) which can effectively contribute to their confirmation that the utilized technology fulfil their needs.

On the other hand, the diffusion of innovation theory demonstrated the association between organization and system domains in regulating one's adoption of technology. For example, Kaminski (2011) stated that individuals gained knowledge of the innovation through the functional attributes of its utility and ultimate implementation can significantly contribute to the final

Table 1: Summary of relevant studies related to the research domains and theories

Studies	Organizational structure	System	Individual	TRA	DOI	Organization theory
Eric (1983)	X	-	-	-	-	-
Son *et al.* (2015)	X	-	-	X	-	-
Kutsogiannis *et al.* (2001)	X	-	-	-	-	X
Babirye *et al.* (2011)	X	X		X	-	-
Waterson	-	X		-	-	X
Chau (1996)	X	-	X	-	X	-
Tarofder *et al.* (2017)	X	-	-	X	-	-
Al-Mamary *et al.* (2015)	-	X	-	X	-	-
O'Brien-Pallas *et al.* (2011)	-	X	-	-	-	X
MacDermid and Graham (2009)	-	X	-	-	X	-
Champagne	X	-	X	-	-	X
Catherine Wang and Ahmed	X	-	-	-	-	X
Olden and McCaughrin	-	X	-	-	-	X
Frambach (1993)	X	-	-	-	X	-
Cliffton and Anak (2011)	-	X	-	X	-	-
Kretzer and Larson (1998)	X	-	-	X	-	-
Stebbins (2017)	-	X	-	-	-	X
Ash (1997)	X	-	-	-	-	X
Hebert and Benbasat (1994)	X	-	-	X	-	-
Skinner *et al.* (1997)	-	X	-	X	-	-
Soderfeldt *et al.* (1996)	-	-	X	-	-	X
Amoako-Gyampah (2007)	X	-	-	X	-	-
Li (2012)	-	X	-	-	X	-
Chang *et al.* (2013)	X	-	-	-	X	-
Hamid and Salim (2010)	-	X	-	-	-	X
Weeks *et al.* (2003)	-	X	-	X	-	-
Wu	-	-	X	-	-	X
Blackler (2009)	X	-	-	-	-	X
Stiffman *et al.* (2004)	X	-	-	X	-	-
Barth *et al.* (2002)	-	X	-	X	-	-
Pinto *et al.* (1993)	-	-	X	-	-	X
McCloskey (2008)	X	-	-	-	X	-
Babirye *et al.* (2011)	X	-	X	X	-	-

Table 1: Continue

Studies	Organizational structure	System	Individual	TRA	DOI	Organization theory
Barr and Steinberg (1983)	-	-	X	-	-	X
Willis *et al.* (2017)	-	X	-	-	X	-
Linnan *et al.* (2001)	X	-	-	X		-
Ashry and Taylor (2000)	-	-	X	-	X	-
Winett *et al.* (1990)	-	-	X	-	-	X
Sun and Zhang (2006)	X	-	X	X	-	-
Kok and Driessen (2012)	-	X	-	-	-	X
Barth *et al.* (2002)	-	X	-	X	-	-
Chau (1996)	-	-	X	X	-	-
Lin and Wan (2001)	X	-	-	-	-	X
Sorensen *et al.* (2003)	-	-	X	X	-	-
Lindsay *et al.* (2011)	-	X	-	-	X	-
Horan *et al.* (2004)	-	X	-	X	-	-
Helden and Reichard (2013)	-	-	X	-	-	X
Weiner *et al.* (2008)	X	-	-	-	-	X
Barnes and Hinton (2012)	X	-	X	-	X	-
Poba-Nzaou *et al.* (2014)	-	X	-	-	X	-
Bekkering *et al.* (2009)	-	X	-	X	-	-
Roberts and Henderson (2000)	-	-	X	X	-	-
Ampt *et al.* (2009)	-	-	X	-	X	-
Sorensen *et al.* (2003)	X	-	-	X	-	-
Schmid *et al.* (2010)	-	X	-	X	-	-
Cresswell *et al.* (2012)	-	-	X	-	X	-
Lemieux-Charles and Barnsley (2004)	X	-	-	-	X	-
Cynthia (2009)	-	X	-	-	-	X
Geenhuizen (2014)	-	-	X	-	X	-
Lin *et al.* (2012)	-	-	X	X	-	-
Greer (1977)	X	-	-	-	-	X
Browning and Thomas (2005)	-	X	X	X	-	-
Baum	X	-	-	-	-	X
Duran *et al.* (2005)	-	X	-	X	-	-
Yoo *et al.* (2007)	X	-	-	-	-	X
Pituch and Lee (2006)	-	X	X	X	-	-
Boonstra (2003)	-	X	-	X	-	-
Estabrooks *et al.* (2004)	X	-	X	-	X	-
Elvira *et al.* (2006)	-	-	X	X	-	-
Hatum and Pettigrew (2006)	X	-	X	-	-	X
Brazil *et al.* (2008)	X	X	-	-	X	-
Carol (2016)	-	X	-	-	X	-
Brooks (2006)	-	-	X	-	X	-
Kim and Newby-Bennett (2012)	-	-	X	-	-	X
Alexandris *et al.* (2004)	-	-	X	X	-	-

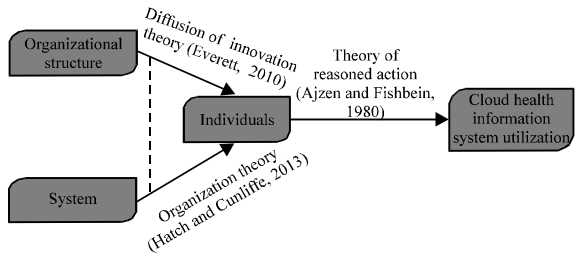

Fig. 4: Illustration of the theoretical model

adoption of a service. From these associations, the researchers have constructed the theoretical model of this study as shown in Fig. 4.

This study prompted by a real need to examine the requirements, challenges and gaps in utilizing new technology in the context of healthcare. Additionally, it helps examine the main influencing factors that possess an effect on the utilization of cloud computing services in the health information systems. As such, we examined the suitability of using the organizational structure and system characteristics and their effect on the healthcare professionals (individuals) perception to utilize cloud health information systems in their hospitals.

The proposed domains can be seen relevant to the context of healthcare as it is the main domains used when considering a new technology utilization and/or adoption as a result from the literature survey. Furthermore, the theoretical understanding of the organization theory, diffusion of innovation theory and the theory of reasoned action led the researchers to establish the association among these domains in the context of healthcare to utilize cloud computing services for health information systems.

CONCLUSION

This research is a part of a PhD research. Next, the researchers will develop the model that will be the next research study and will use a quantitative research method. Meanwhile, the researchers will develop a questionnaire instrument to collect healthcare professional's feedback about the proposed factors and finally, the collected data will be analyzed to verify the final model.

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