Toward an Understanding of Government Cloud Acceptance
A Quantitative Study of G-Cloud Acceptance by Saudi Government Agencies using Extended UTAUT

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Abstract: With today's rapid advances in Information and Communication Technologies (ICT), an increasing number of governments worldwide are seeking solutions to enhance their IT infrastructures and services, and reshape their e-government systems to meet public needs of providing easily accessible, cost-effective, high quality, and reliable e-services. In recent years, government cloud (G-Cloud) has emerged as a new and innovative computing paradigm with a promising opportunity for many governments to rationalize the way they manage their services and resources. Government cloud's potential benefits has been recognized by many governments around the world. This paper will study the acceptance of cloud computing technologies and services in Saudi government agencies by investigating the significant and influential factors that affect the behavioral intentions to use G-Cloud. Moreover, in light of the rising concerns over trust issues in cloud computing which have been reported to be one of the major barriers to the adoption of the cloud, the study proposes an extended Unified Theory of Acceptance and Use of Technology (UTAUT) model by incorporating trust as a key factor in the acceptance of G-Cloud.

1 INTRODUCTION

Over the last decade, the adoption of ICT solutions in the public sector has been recognized as a strategic tool to enable governmental reforms (Charalabidis *et al.*, 2010). E-government systems and applications are now increasingly leveraging new technological developments and this trend seems to continue at a great pace in the future. It has been noted that e-government initiatives are aimed beyond providing citizens with government information and services into providing permanent access with transparency in government activities and services (Kurdi *et al.*, 2011). Furthermore, there is a need for e-government systems to be redesigned and revised to meet public needs and governments' own demands. It is mainly due to the inflation of the data in e-government systems, complexity in operation flows, and difficulties in business collaboration (Liang, 2012). With regard to this issue, cloud computing has emerged at the right time to solve these challenges by promoting economies of scale to increase business agility and lower IT costs. To this extent, governments are considering the real

value of incorporating the cloud into their practices and making full use of cloud computing potentials for higher working efficiency and better public services (Liang, 2012). This new initiative involves applying cloud computing model to the business processes of e-government and building government cloud (G-Cloud) (Zhang and Chen, 2010).

The Government of Saudi Arabia has recognized the tremendous potentials of the cloud and accorded it a considerable amount of attention. According to the Communications and Information Technology Commission (CITC), the spending on cloud services in Saudi Arabia has been increased enormously between 2011and 2014 by 373%. Moreover, it is expected that cloud services market will expand at a CAGR of 36.6% through 2019, surpassing SAR 898 million; making the cloud one of the fastest growing segments in the Saudi ICT market (CITC, 2015).

This paper aims to study the acceptance of G-Cloud among government agencies. Specifically, it will examine the acceptance of cloud computing technologies and services in Saudi government agencies by studying the key factors that influence the behavioral intention to use G-Cloud which, in turn, affect the actual use.

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A relatively extensive amount of research has been done to study the factors that influence organizations' decisions to adopt cloud computing technologies. However, there is a limited research on cloud adoption and usage in the context of e-government. Moreover, as governmental operations involve sensitive and critical data, and as cloud computing implies risky conditions and uncertainty about data security and safety due to the lack of control and confidence in entrusting sensitive information to cloud service providers, trust has been reported to be a major concern (Kanwal *et al.*, 2013). Indeed, scholars agree that lack of users' trust is a key inhibitor to the adoption of cloud services especially in domains where confidential and sensitive information is involved (Ko, Lee and Pearson, 2011). To the best of our knowledge there is limited research on the acceptance of government cloud, and no studies have considered trust as a key factor when investigating G-Cloud acceptance among government agencies. While the focal point of the majority of studies in the relevant literature was on the benefits and concerns of G-Cloud, other studies focused on finding approaches and models to build trust in the cloud. This issue presents a gap in the research field which this study is addressing by proposing an extended UTAUT model to account for trust as a main construct.

2 LITERATURE REVIEW

2.1 Government Cloud Computing

Government Cloud (G-Cloud) is an emerging paradigm, in which cloud computing is utilized to redesign the business processes of e-government system for allocation, management, distribution and maintenance of IT resources of governments via the internet (Liang, 2012). It has revolutionized how governments operate; governments are leveraging the cloud for its flexibility, scalability, accessibility, elasticity, and substantial cost savings. Thus, this innovative step of moving to the cloud can lead to improved government transparency, accountability, and service value (Zhang and Chen, 2010).

The G-Cloud model can help governments to dramatically cut costs associated with large and expensive IT infrastructures required to support government agencies' work. It also reduces the burden of IT administration, maintenance, and upgrades as it shifts to cloud providers (Khan *et al.*, 2011). G-Cloud provides government organizations with greater ability to focus on core business and mission-critical processes and outsource non-critical applications to service providers (Wyld, 2010). Moreover, it supports resource and information sharing and business collaboration among different departments and agencies within the government which has been perceived as one of the biggest benefits of moving to the cloud (Wyld, 2009).

The cloud movements in the public sector are spreading all around the world; the literature highlights many early government cloud computing initiatives that have been undertaken by governments in a number of worldwide countries. The USA, UK, Thailand, China, New Zealand and Germany have introduced and used cloud computing in the public sector, and realized budget reductions and high-efficiency green IT implementation (Shen, Yang and Keskin, 2012). Australia, Singapore, and Japan are among the most active countries for government-led implementation of the cloud model. These countries are leveraging cloud computing as a solution for e-government efficiency, business innovation, IT development, and cost reduction (Seo, Min and Lee 2014).

2.2 The Unified Theory of Acceptance and use of Technology (UTAUT)

Several models and theories have been developed and surfaced over the last three decades to help explain users' acceptance and use of IT. Such models include the Theory of Reasoned Action (TRA), the Theory of Planned Behavior (TPB), the Technology Acceptance Model (TAM), and the Diffusion of Innovation (DOI). Central to this study is the Unified Theory of Acceptance and Use of Technology (UTAUT), a comprehensive and widely accepted framework that had been formulated by Venkatesh *et al.* (2003) by integrating the findings of eight prominent technology acceptance models. It addresses the limitations and shortcomings identified in previous models by combining determinants from various acceptance theories, and thereby providing superior advantage. Venkatesh *et al.* (2003) argued that this model is able to explain variance in IT behavioral intention and usage behavior better than the previous ones. The theory holds that four key constructs: performance expectancy, effort expectancy, social influence, and facilitating conditions are direct determinants of usage intention and behavior; along with four moderating variables of gender, age, experience, and voluntariness of use are posited to moderate the impact of the core constructs on use intention and behavior (Venkatesh *et al.*, 2003). The UTAUT model validity, reliability

and comprehensiveness in technology adoption have been tested and proven on large real world data sets in various contexts (Im, Hong and Kang, 2011). It has been featured prominently in studies concerning IT acceptance such as cloud based e-government services (Lian, 2015). Accordingly and given the robust theoretical background of this model and its suitability for the context of the study, this study adopt UTAUT as the primary theoretical framework to examine users' acceptance of G-Cloud.

2.3 Trust as an Extension to the UTAUT Model

As cloud computing involves third parties storing and processing sensitive data, and it requires individuals and organizations to transfer some or all control of their data and computing resources to cloud service providers, trust-related concerns arise (Khan and Malluhi, 2010). Indeed, trust is widely perceived as a key concern for cloud consumers, whether they are end users or organizations; they are worried about who have access to their data and how it will be shared and used (Pearson, 2013). It has been reported that the fear of loss of control over data is a major inhibitor to the adoption of the cloud in Saudi Arabia (CITC, 2015). However, according to CITC, as Saudi organizations develop trusting relationships with their service providers, this will boost adoption and usage.

Scholars from various research disciplines believe that trust is crucial in enabling relations and exchanges that involve uncertainty, interdependence, or fear of opportunism (Bradach and Eccles, 1989). That is, it is most needed in risky situations (Kim, Ferrin and Rao, 2008). Mayer, Davis and Schoorman (1995) define trust as "the willingness of a party to be vulnerable to the actions of another party". Consistent with this conceptualization of trust and related literature, this study defines trust as the user's willingness to accept vulnerability based on his/her beliefs and positive expectations that the cloud provider will perform fairly and reasonably as expected, and that using the cloud will result in positive outcomes due to the provider's integrity and competences.

Scholars believe that the adoption of IT can involve high levels of uncertainty, especially when challenged with the emergence of a new technology (Kirs and Bagchi, 2012). Therewith, trust has been recognized as a key driver for adoption due to its relevance to deal with uncertainty and the risk of vulnerability which are present mostly in online contexts (Gefen, Karahanna and Straub, 2003). The

abstract and distributed nature of the cloud technology besides the associated uncertainty pose a considerable obstacle for the acceptance of cloud based solutions (Martucci *et al.*, 2012). Thus, this study has expanded upon the UTAUT model by incorporating trust as a key factor to better comprehend the acceptance of G-Cloud.

Extant research that has examined trust in online environments with respect to consumer–vendor relationships has suggested a generic model of trust that, in essence, concerns two targets: the entity or vendor providing the online service and the technology itself through which the service is provided (Schaupp, Carter and McBride, 2010). Pavlou (2003) argued that when consumers willingly become vulnerable to online vendors, they consider both the characteristics of the e-vendors due to behavioral uncertainty, as well the characteristics of the related technology due to environmental uncertainty. Consistent with related scholarly research, this study defines trust in terms of trust in Cloud Service Providers (CSPs) as well as trust in the reliability and integrity of the cloud technology. In that sense, trust in government cloud can be viewed as the user's confidence in using the cloud, and that the CSPs will fulfill obligations set forth in an exchange. This conceptualization of trust implies that users must have a certain level of confidence in that cloud providers will behave capably (competence), fairly (benevolence), and ethically (integrity) (Adjei, 2015). These three dominantly cited beliefs have been identified as key characteristics for assessing trustees' trustworthiness (Burda and Teuteberg, 2014).

3 RESEARCH MODEL AND HYPOTHESES

3.1 Research Model

As previous research has proved the validity of the UTAUT framework in explaining a wide range of IT acceptance and usage behavior, this study adopt the UTAUT as the baseline model. However, in this study, G-Cloud is a specific context that calls for additional variables to extend the original UTAUT to better explain variances. Thus, the study proposes a modified UTAUT model that incorporates other constructs for a better explanation of G-Cloud acceptance. Figure 1 shows the research model and associated hypotheses investigated under this study.
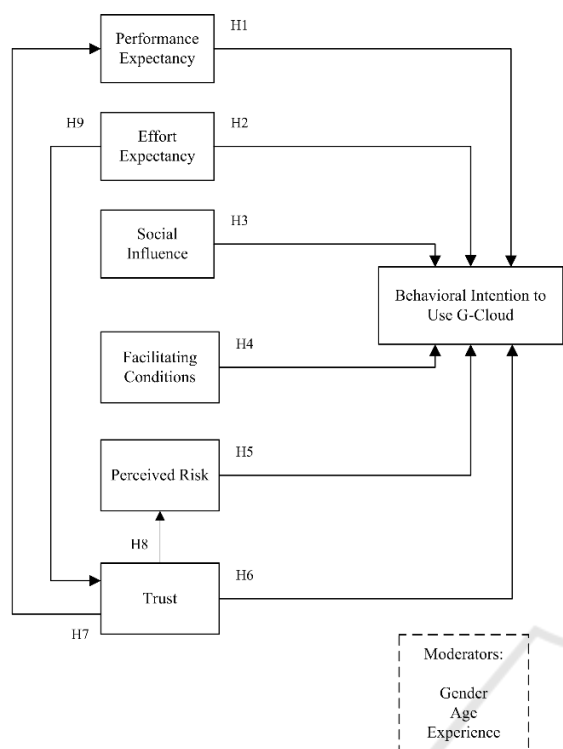
Figure 1: Research Model.

3.2 Hypothesis Development

Performance expectancy (PE) has been constantly found to be a significant predictor, if not the strongest predictor, of intention to use IT (Venkatesh *et al.*, 2003). That is, users who perceive the usefulness of a particular technology will be more likely to adopt it. Prior cloud adoption studies have shown the direct and positive effect of perceptions of usefulness on the behavioral intention toward using the cloud (Opitz *et al.*, 2012). It has been argued that increasing the awareness of users towards the usefulness of using cloud services is most likely to increase the acceptance of such technology (Alharbi, 2012). Therefore, this study has hypothesized that:

H1: Performance expectancy has a significant positive effect on the behavioral intention to use G-Cloud.

Effort expectancy (EE) refers to "the degree of ease associated with the use of the system" (Venkatesh *et al.*, 2003). A system that is perceived to be easier to use is more likely to induce the behavioral intention of usage. Lian (2015) has found that effort expectancy significantly affects user's behavioral intention toward using a cloud-based e-government service. Opitz *et al.* (2012), in their study on the acceptance of cloud computing by CIOs

and IT managers, have found that both perceptions of usefulness and ease of use explained 66.4 % of the variance in the behavioral intention to use cloud based services. Thus, it is hypothesized that:

H2: Effort expectancy has a significant positive effect on the behavioral intention to use G-Cloud.

Social influence (SI), in this study, revolved around users' beliefs that the behavior (using G-Cloud services) is accepted, encouraged, and promoted by their circle of influencers which in turn tends to affect their behavioral intentions. The effect of SI on intention to use technology has been shown to be significant in several previous adoption studies. Park and Ryoo (2013) have validated the significant role of SI on users' intention to use cloud computing services. Alotaibi (2014) has pointed out on the need to investigate the effect of social influence on the intention to use the cloud in Saudi Arabia as Saudis rely heavily on social models to make decisions. Therefore, it is hypothesized that:

H3: Social influence has a significant positive effect on the behavioral intention to use G-Cloud.

Consistent with Venkatesh *et al.* (2003) definition, facilitating conditions (FC) refers to the degree to which users believe that organizational as well technical infrastructure supports the use of government cloud and removes barriers to adoption. The influence of facilitating conditions on IT usage behavior has been investigated and validated in several prior adoption studies. AlAwadhi and Morris (2008) believe that the use of a new system is expected to increase as users find support in using the system. Lian (2015) argues that since cloud based e-government services are relatively new and innovative, unfamiliarity may hinder usage. Hence, according to Lian (2015), the better the facilitating conditions, the more likely people will be to use the service. Thus, it has hypothesized that:

H4: Facilitating conditions has a significant positive effect on the behavioral intention to use G-Cloud.

In light of the inherent risks and uncertainties surrounding the cloud environment, it is expected that perceived risk would affect users' intentions to use cloud services. This study defines perceived risk (PR) as the user's belief of the potential and uncertain negative outcomes of using the cloud. This definition covers both forms of PR, behavioral and environmental uncertainty, that have been identified in the literature (Pavlou, 2003). According to Pavlou, (2003), both behavioral and environmental uncertainty involve privacy risks. In cloud computing environment, scholars argue that the cloud raises risks of security and privacy (Chi, Yeh

and Hung, 2012). CITC has suggested that Saudi organizations are generally reluctant to risks of data security and privacy which are considered major concerns and inhibitors to cloud services adoption (CITC, 2015). Chi, Yeh and Hung (2012), in their study of the effect of perceived risk on intentions to use cloud services, has found that perceived risk significantly and negatively affects usage intentions. Therefore, it is hypothesized that:

H5: Perceived risk has a significant negative effect on the behavioral intention to use G-Cloud.

The role of trust on IT adoption has been investigated in many prior studies that consistently found trust to exert a positive and direct effect on behavioral intentions (Burda and Teuteberg, 2014; Wu and Chen, 2005). Previous cloud adoption studies have recognized trust to be a key predictor of behavioral intention to use cloud services (Wu, Lan and Lee, 2013). Thus, it is hypothesized that:

H6: Trust in G-Cloud has a significant positive effect on the behavioral intention to use G-Cloud.

Prior empirical adoption studies have shown that trust exerts an indirect influence on intention to use via perceived usefulness and perceived risk. Gefen, Karahanna and Straub (2003) argued that when consumers initially trust e-vendors and believe that adopting an online service is beneficial to their job performance and productivity, they will perceive the online service as useful. Burda and Teuteberg (2014) have recognized trust to be a major determinant of cloud adoption decisions that significantly reduces perceived risk on the one hand, and increases usefulness perceptions of cloud services on the other hand. Kim, Ferrin and Rao (2008) have shown that a consumer's trust has a strong negative influence on perceived risk; that is as trust increases, consumers are likely to perceive less risk than if trust were absent. Drawing from these findings, this study has hypothesized that:

H7: Trust in G-Cloud has a significant effect on performance expectancy.

H8: Trust in G-Cloud has a significant negative effect on perceived risk.

Extant research has suggested that perceived ease of use (PEOU) has a positive effect on trust since it helps promoting consumers' favorable impressions on the e-vendor in the initial adoption of an online service (Wu and Chen, 2005). This argument is supported by the cognition-based trust which is built upon first feelings and impressions toward a certain behavior rather than through experiences, which is relevant to the initial stages of adoption (Gefen, Karahanna and Straub, 2003). Wu and Chen (2005) provided empirical evidence that

PEOU influences trust and explains 19% of the variance in trust. Thus, it is hypothesized that:

H9: Effort expectancy has a significant positive effect on trust in G-Cloud.

4 CONCLUSIONS

Today, governments, due to the complexity of their processes and massive data records and the need for a powerful infrastructure, are almost obligated to turn to new technological innovations to provide better public information and services with lower IT costs. Therefore, many government organizations tend to exploit advanced technology trends such as government cloud. Despite the appealing benefits of the cloud, the adoption of such technology raises various challenges including trust that has been reported as one of the major barriers to the widespread growth and uptake of the cloud. This paper, as an attempt to address the gap in the literature, proposes an extended UTAUT model that accounts for trust as a key construct to investigate the acceptance of G-Cloud by government agencies in Saudi Arabia. Approaching this issue would be an added value to the literature of e-government practices, as well the literature of cloud computing. Furthermore, understanding the factors affecting G-Cloud acceptance through validated theoretical foundation, is critical for effective and successful implementation of this technology. As a matter of fact, the understanding of these factors is useful to both cloud computing adopters and providers.

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