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Predicting motivators of cloud computing adoption: A developing country perspective



Sujeet Kumar Sharma ^{a,*}, Ali H. Al-Badi ^b, Srikrishna Madhumohan Govindaluri ^a,
Mohammed H. Al-Kharusi ^b

^a Department of Operations Management and Business Statistics, Sultan Qaboos University, Oman

^b Department of Information Systems, Sultan Qaboos University, Oman

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ABSTRACT

Cloud computing is a recent and significant development in the domain of network applications with a new information technology perspective. This study attempts to develop a hybrid model to predict motivators influencing the adoption of cloud computing services by information technology (IT) professionals. The research proposes a new model by extending the Technology Acceptance Model (TAM) with three external constructs namely computer self-efficacy, trust, and job opportunity. One of the main contributions of this research is the introduction of a new construct, Job Opportunity (JO), for the first time in a technology adoption study. Data were collected from 101 IT professional and analyzed using multiple linear regression (MLR) and neural network (NN) modeling. Based on the RMSE values from the results of these models NN models were found to outperform the MLR model. The results obtained from MLR showed that computer self-efficacy, perceived usefulness, trust, perceived ease of use, and job opportunity. However, the NN models result showed that the best predictor of cloud computing adoption are job opportunity, trust, perceived usefulness, self-efficacy, and perceived ease of use. The findings of this study confirm the need to extend the fundamental TAM when studying a recent technology like cloud computing. This study will provide insights to IT service providers, government agencies, academicians, researchers and IT professionals.

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1. Introduction

The emergence of web 2.0 has initiated a new era of collaboration, sharing, and social networking (Lytras, Damiani, & de Pablos, 2008). One of the most popular technologies in web 2.0, Cloud Computing (CC) systems provide on-demand network-based access to subscribers for the metered usage of an easily accessible and secure collection of remotely available information technology (IT) enabled resources and capabilities including network, servers, storage, applications and services (Armbrust et al., 2009). Further, Cloud Computing (CC) is defined by Subashini and Kavitha (2011) as “a way to increase the capacity or add capabilities dynamically without investing in new infrastructure, training new personnel, or licensing new software”. These services include IT infrastructure as a service (IaaS), platform as a service (PaaS) and software as a service (SaaS) on a pay-for-use basis (Rayport & Heyward, 2009).

This computing paradigm seeks to deliver computing services similar to utility services such as water, electricity and gas (Buyya, Yeo, Venugopal, Broberg, & Brandic, 2009). The limitless flexibility, better reliability and security provided by CC enables organizations customize services and data for higher availability without much worry (AMD, 2011). The emergence of cloud computing creates a level playing field for many firms by providing opportunities for utilizing cutting edge information technologies that hitherto were not affordable owing to the high cost of owning these technologies (Marston, Li, Bandyopadhyay, Zhang, & Ghalsasi, 2011). The synergy from the integration of big data technologies and cloud computing constitutes the basis for future computing (Agrawal, Das, & El Abbadi, 2011).

Cloud computing being a relatively recent phenomenon, the research on issues concerning the adoption of cloud computing by both organizations and individuals is still in a nascent stage. Among the research studies on the adoption of CC technologies conducted so far, quite a few have approached the problem from the perspective of organizations and not from individual user's

* Corresponding author.

E-mail address: drsujeeet@squ.edu.om (S.K. Sharma).

perspective (Low, Chen, & Wu, 2011; Morgan & Conboy, 2013; Tashkandi & Al-Jabri, 2015). This research gap in extant CC literature requires considerable attention since individuals' varying perceptions and levels of readiness to adopt CC can be a major determinant of the degree to which the benefits are realized. Partly, the degree of adoption may be attributed to the concerns associated with CC; for example, data security, confidentiality, latency, performance instability and lack of service level agreements (Marston et al., 2011). The majority of adoption studies uses TAM and applies causal-explanatory statistical analysis for understanding relationships (Behrend, Wiebe, London, & Johnson, 2011; Lian, Yen, & Wang, 2014; Oliveira, Thomas, & Espadanal, 2014; Park & Ryoo, 2013; Yang & Lin, 2015). The problems using this approach are two-fold. Firstly, original TAM by Davis (1989) applies only two constructs perceived usefulness and perceived ease of use, which have their own limitations in explaining the intention to use (Venkatesh, Morris, Davis, & Davis, 2003); therefore, a number of researchers have pointed out the need to extend TAM by augmenting the original TAM with additional variables for better modeling of the intention to use. Next, information systems researchers have often highlighted the importance of predictive analytics instead of causal-explanatory statistical analysis that enables enhanced theory building and testing (Chong, 2013a; Shmueli & Koppius, 2010; Sharma, Joshi, & Sharma, 2016).

From the viewpoint of the individual user, the adoption of CC by individuals can be viewed from two perspectives, personal (Park & Ryoo, 2013; Yang & Lin, 2015) and professional. The adoption of a CC from a professional user or employee perspective, has rarely been conducted. Therefore, in this paper we focus on the determinants of individuals' adoption of cloud computing (CC) services in a professional setting for meeting job goals and requirements. This study is more important since the objectives for investing in cloud computing by firms are likely to be met if employees are willing and enthusiastic to adopt cloud computing on their job. Finally, studies on cloud computing adoption have been conducted in developed or large economies like Taiwan (Lian et al., 2014; Low et al., 2011), Portugal (Oliveira et al., 2014), India (Gangwar, Date, & Ramaswamy, 2015) and USA (Behrend et al., 2011). To the best of our knowledge, no study has been conducted in Middle Eastern countries, which is a significant economic block and includes number of emerging economies and oil rich countries. In a number of these countries, cloud computing has been introduced much later compared to developed countries. In Oman, a prominent country in the GCC in Middle East, Cloud Computing services were launched in 2012. This study seeks to bridge the research gaps by developing a research model that provides useful insights into the adoption of CC by Omani IT professionals (individual users) in a professional or work setting using causal explanatory and predictive analytical modeling.

With all the publicity surrounding Cloud computing, the global public sector has embraced this technology much slower than the private sector. Where private sector has been willing to invest in and deploy cloud computing, the public sector still remains in an investigative stage (Kundra, 2010). Government entities can often face many hurdles such as the lack of in-house expertise; lack of trust in the technology; absence of a regulatory authority and most importantly the lack of will (Mell & Grance, 2009; Yoo, 2011). As the public sector companies in Oman transition to cloud computing environments, it becomes important to understand factors that would promote organization wide adoption of cloud computing technologies. To the best of authors' knowledge, a study seeking to understand employees' perception of cloud computing technologies in organizations has not been conducted in any country. Only one study focusing on adoption

of SaaS by organizational users has been recently published (Yang, Sun, Zhang, & Wang, 2015). Thus, this research study fills an important research gap by identifying the key factors that influence the adoption of Cloud computing by employees in public sector organizations in Oman. A quantitative survey was carried out among information technology personnel in Oman. The findings from this study provide the much needed research support for ongoing cloud computing implementations in findings for Oman and other emerging economies in the GCC. The research model and hypotheses employ two types of factors, namely, human-related factors (computer self-efficacy, job opportunity) and system-related factors (Perceived Usefulness, Perceived Ease of use and Trust) to determine any significant impact on the IT personnel's willingness for adoption of Cloud Computing.

The remainder of the paper is structured as follows. A review of the pertinent literature is presented in Section 2. The research design that was used to test our research model is presented in Section 3. Finally, we present the results of our analysis with key conclusions in Sections 4 and 5.

2. Literature review and hypotheses development

The majority of the studies conducted in the literature of cloud computing adoption investigated the determinants of adoption of cloud computing by organization. Low et al. (2011), Morgan and Conboy (2013) and Lian et al. (2014) employed the Technology-Organization-Environment model to study the factors affecting the adoption of cloud computing in organizations such as high technology firms and hospitals. However, the adoption of a new technology by the organization can fail if the individual users within the organization are slow in adopting the new technology. Therefore, several research studies to understand the behavioral constructs influencing individual user adoption of a technology have been reported in the information systems literature (Al-Somali, Gholami, & Clegg, 2009; Davis, 1989; Sharma & Govindaluri, 2014; Venkatesh et al., 2003). The earliest studies in this regard developed models explaining the factors influencing "intention to use" the technology using three theories, Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975), Theory of Planned Behavior (TPB) (Ajzen & Fishbein, 1980) and Technology Acceptance Model (TAM) (Davis, 1989). Intention is considered a direct determinant of behavior in the TRA that is influenced by the attitude (attitude toward performing behavior), and subjective norms (social pressures to perform behavior). TRA and its extension, the theory of planned behavior (TPB) (Ajzen & Fishbein, 1980) have been tested and used extensively.

TAM was originally proposed by Davis (1989) for explaining the link between the actual use of the new technology and the behavioral intention (BI) of the individual to use the technology and is partly based on TRA. TAM posits that perceived usefulness (PU) and perceived ease of use (PEOU) are the fundamental determinants of the attitude towards the acceptance of new technology. Davis (1989) defines PU as "the degree to which a person believes that his/her job performance would be enhanced by using a particular technology" and PEOU as "the degree to which a person believes that using the technology requires less mental efforts". TAM has been employed to investigate the adoption of new technologies in a range of domains including e-learning (Singh & Hardaker, 2014), internet banking (Sharma, Govindaluri, & AlBalushi, 2015), mobile learning (Tan, Ooi, Sim, & Phusavat, 2012), and social networking (Shin, 2010; Sharma et al., 2016). With regard to cloud computing, some studies can be found in the literature that employ TAM to model the technology acceptance by

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