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Exploring the determinant and influence mechanism of e-Government cloud adoption in government agencies in China

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ABSTRACT

With the inevitability and emergence of e-Government cloud around the world, there has been an increasing need for exploring the determinants and their mechanism of e-Government cloud adoption. In order to fill the existing knowledge gap, a grounded theory approach is adopted in this study for discussing the determinants of e-Government cloud adoption among government agencies in China. Choosing representative cases, we collect triangulate data and analysis the data using open coding, axial coding and selective coding. This study proposes a grounded theoretical model consists of sixteen sub-categories, five main categories and one core category (e-Government cloud adoption) and explore the factors' influence mechanism. The results show that technology driving, cloud provider support, environmental stimulus, organizational readiness and cloud trust play significant roles in e-Government cloud adoption. In addition, technology driving and cloud provider support indirectly effect e-Government cloud adoption by cloud trust. Environmental stimulus and organizational readiness moderate the relationship between cloud trust and cloud adoption. These findings contribute to academic research and practical implications, advancing our understandings of e-Government cloud applications.

1. Introduction

Electronic government (e-Gov) means harnessing ICTs to reinvent the business processes and deliver government services to transform relations with citizen (G2C), business (G2B), employee (G2E) and other arms of government (G2G) (Carter & Bélanger, 2005; Chang, Li, Hung, & Hwang, 2005; Dwivedi, Williams, Rana, & Williams, 2011; Dwivedi et al., 2017; Eom & Kim, 2014; Ho & Ni, 2004; Hung, Chang, & Yu, 2006; Lee, Kim, & Ahn, 2011; Seo & Bernsen, 2016; Shareef, Kumar, Kumar, & Dwivedi, 2011). Widely adopting e-Gov in public sectors provides undeniable benefits for governments and public, e.g., improving efficiency, facilitating transformation of functions, promoting transparency and providing high quality-service (Al-Hujran, Al-Debei, Chatfield, & Migdadi, 2015; Bertot, Jaeger, & Grimes, 2010; Dwivedi et al., 2011; Dwivedi et al., 2017; Gil-García & Pardo, 2005; Guillamón, Ríos, Gesuele, & Metallo, 2016; Lin, Fofanah, & Liang, 2011; Moon & Norris, 2005; Ozkan & Kanat, 2011; Rana & Dwivedi, 2015; Susanto & Goodwin, 2013). However, with further utilization of e-Gov systems, more technical, organizational and economical challenges, e.g., low usage and high investment, constantly rising cost, duplicative systems and digital divide, increasing citizens' demands, and difficulties of collaboration, have been emerged (Dwivedi, Weerakkody, & Janssen, 2012; Dwivedi et al., 2017; Wang & Shih, 2009). The 'e-Gov paradox' severely restricts the development of e-Gov and construction of smart government, and forces governments to innovate and keep up with the latest IT innovation (Chang et al., 2005; Savoldelli, Codagnone, & Misuraca, 2014; Van Loon & Toshkov, 2015; Zissis & Lekkas, 2011).

Cloud computing, the core of next generation IT revolution, has been gaining popularity recently (Oliveira, Thomas and Espadanal, 2014), and has been widely adopted by enterprises and individuals, e.g., cloud storage, enterprise cloud and mobile cloud. Cloud computing may also profoundly change technological environment of e-Gov construction, and provide the opportunity to solve challenges (Dwivedi & Mustafee, 2010). Recognizing the inevitability of cloud in governmental IT work, many countries, not only developed countries (USA, UK, Singapore, EU and Japan), but also developing countries (Thailand and Malaysia), have launched cloudization movements for higher efficiency (Almarabeh, Majdalawi, & Mohammad, 2016; Paquette, Jaeger, & Wilson, 2010; Wyld, 2010). Although e-Gov cloud strategies are guided by national policies, they are accompanied by many barriers in practice. If public sectors don't prepare for e-Gov cloud adoption (i.e. adoption doesn't reach significant level), the investment of cloud platform established by upstream would be simply wasted and

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have no significant benefit (Al-Hujran et al., 2015; Hung, Tang, Chang, & Ke, 2009; Ozkan & Kanat, 2011; Savoldelli et al., 2014; Susanto & Goodwin, 2013; Wang & Lo, 2016; Wang & Shih, 2009). In order to successfully promote government agencies to widely adopt e-Gov cloud, therefore, it's essential to explore the determinants of e-Gov cloud adoption.

Compared to a large number of studies on cloud computing adoption in private sector, and e-Gov adoption from citizen and government sides, there are relatively few studies investigated cloud computing adoption in the context of public sectors, despite the significance of e-Gov cloud. Most of these studies on e-Gov cloud mainly focus on conceptual descriptions of technological architecture and characteristics (Almarabeh et al., 2016; Zissis & Lekkas, 2011), and analysis of benefits and challenges (Alshammari & Bach, 2013; Smitha, Thomas, & Chitharanjan, 2012). Only a few studies investigate the factors that influence e-Gov cloud adoption (Ali, Soar, & Yong, 2015; Elena & Johnson, 2015; Mohammed & Ibrahim, 2015), and few studies employ adoption models to explore factors from innovation adoption perspective (Mohammed, Ibrahim, & Ithnin, 2016; Sallehudin, Razak, & Ismail, 2015; Shin, 2013). However, previous studies, mostly deploying DOI as theoretical basis, focus on technological factors while pay inadequate attention to other dimensions, e.g., organizational or environmental factors. Furthermore, most studies focus on the direct effects of the determinants, and ignore the indirect effects of the determinants in the process of e-Gov cloud adoption.

Motivated by these issues, this research employs exploratory grounded theory to explore internal and external determinants and their influence mechanism of e-Gov adoption from comprehensive perspectives, and develops e-Gov cloud adoption model based on the technology-organization-environment (TOE) framework (Tornatzky & Fleischer, 1990). The findings not only contribute to understanding of the emerging phenomenon (e-Gov cloud), but also provide policy recommendations to policy-makers and managerial implications to potential agencies and cloud provider.

This paper is organized as follows: The following Section 2 reviews relevant literature. Section 3 explains the research methodology. Then the determinants of e-Gov cloud adoption are elicited and defined in Section 4. This is followed by discussion of findings, and implications in subsequent Section 5. Finally, the last Section 6 concludes the paper and explains the research limitations and future work.

2. Literature review

To identify the adoption factors of e-Gov cloud, this study reviews from innovation adoption models, broader e-Gov adoption and cloud computing adoption in general, and narrow down to e-Gov cloud adoption. Specifically, literature review starts with introduction of various innovation adoption models, and explains the reasons why select TOE as our analytical frame. Then, owning to the combination of e-Gov and cloud computing, we review literature on e-Gov adoption and cloud adoption, which indicates little attention on e-Gov cloud adoption in public sector, as well as serves as a reference and triangulation for development of e-Gov cloud adoption model. Finally, studies on e-Gov cloud and its adoption are given, which shows valuable theoretical insights of e-Gov cloud adoption remain limited.

2.1. Adoption model

Innovation adoption is an enduring topic in IS research, and there have been various popular adoption models, e.g., theory of reasoned action (TRA) (Fishbein & Ajzen, 1975), technology acceptance model (TAM) (Davis, 1989), theory of planned behavior (TPB) (Ajzen, 1991), unified theory of acceptance and usage of technology (UTAUT) (Venkatesh, Morris, Davis, & Davis, 2003), initial trust model (ITM) (McKnight, Cummings, & Chervany, 1998), TOE, diffusion of innovation theory (DOI) (Rogers, 2010), IS success model (Delone & McLean, 2003), and institutional theory (INT) (DiMaggio & Powell, 1983). Numerous scholars have widely used these models to identify key factors at different level, especially individuals (Venkatesh et al., 2003), and to explain the stage-based process of IT innovation adoption in every domain (Hameed, Counsell, & Swift, 2012). Particularly, these models are also adopted as bases of developing models for various e-Gov studies across different countries (Dwivedi et al., 2011; Dwivedi et al., 2017; Gupta, Singh, & Bhaskar, 2016; Rana & Dwivedi, 2015).

At organizational level, innovation adoption process is complex and is influenced by factors from multi-dimension. For one thing, the former five models, although have been extensively used in IT adoption studies, are limited in offering understandings of individual adoption behaviors rather than those of organizations (Wang & Lo, 2016). For another, the latter three models, although have been widely applied to explain organization-level innovation adoption, can't provide the complete essence of adoption behaviors at organization level owning to segmentary perspective of technology or environment. While TOE is a generic taxonomy that suggests different sources of influence without specifying variables (Tornatzky & Fleischer, 1990), so TOE is broadly applicable for exploring the organization-level adoption of different new IT innovations in qualitative research, e.g., RFID (Cao, Jones, & Sheng, 2014) and enterprise cloud computing (Alshamaila, Papagiannidis, & Li, 2013). Therefore, this study uses TOE to guide a systematic analysis e-Gov cloud adoption factors from multi-perspective.

2.2. e-Gov adoption

In order to examine e-Gov adoption in public sectors, this section examines pre-existing literature on the adoption of e-Gov system and IT innovation. Prior literature on e-Gov adoption is immense and classified into two streams (Al-Hujran et al., 2015). One is from user side - citizens (Dwivedi et al., 2011; Dwivedi et al., 2017; Seo & Bernsen, 2016) and business users (Lee et al., 2011), and another is from supplier side - governments (Zheng, Chen, Huang, & Zhang, 2013).

From the citizens and businesses perspective, some scholars utilize various innovation adoption models as theoretical foundation, e.g., TAM (Al-Hujran et al., 2015; Liu et al., 2014; Shyu & Huang, 2011), TPB (Hung, Chang, & Kuo, 2013; Hung et al., 2009; Ozkan & Kanat, 2011) and decomposed TPB (Hung et al., 2006; Susanto & Goodwin, 2013), UTAUT (Dwivedi, Shareef, Simintiras, Lal, & Weerakkody, 2016; Dwivedi et al., 2017; Gupta et al., 2016; Loo, Yeow, & Chong, 2009; Powell, Williams, Bock, Doellman, & Allen, 2012; Van Dijk, Peters, & Ebbers, 2008; Wang & Shih, 2009; Zuiderwijk, Janssen , & Dwivedi, 2015), TRA (Oni, Oni, Mbarika, & Ayo, 2017), social cognitive theory (Rana & Dwivedi, 2015), trust theory (Bélanger & Carter, 2008; Carter & Bélanger, 2005; Warkentin, Gefen, Pavlou, & Rose, 2002), and integrated model (Carter & Weerakkody, 2008; Chang et al., 2005; Lin et al., 2011; Nemeslaki, Aranyossy, & Sasvári, 2016; Seo & Bernsen, 2016; Shareef et al., 2011), to study the individual citizens' adoption behavior of e-Gov, e.g., online-, mobile- (Dwivedi et al., 2016; Hung et al., 2013; Liu et al., 2014), cloud- (Nemeslaki et al., 2016), SMS-based (Susanto & Goodwin, 2013) e-Gov service and open government data (Zuiderwijk et al., 2015). Examples of these factors include usefulness and performance expectancy, ease of use and effort expectancy, credibility and trust, risk, quality, attitude, subjective norm, facilitating conditions, social influence and IT ability, and these factors vary in individual type (age, adopters and non-adopters) (Seo & Bernsen, 2016), e-Gov type, e-Gov service maturity level (Shareef et al., 2011) and country (Dwivedi et al., 2016).

From the government perspective, it aims to acquire understanding of how IT innovation is adopted in public sectors and explore what factors impact its adoption (Van Loon & Toshkov, 2015). Most scholars have applied DOI (Dorner, 2009; Mergel, 2013; Raus, Flügge, & Boutellier, 2009), TOE (Wang & Lo, 2016), and INT (Janssen, Charalabidis, & Zuiderwijk, 2012; Zheng et al., 2013), socio-technical system theory (Oliveira & Welch, 2013), stakeholder theory (Kamal,