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Switching Behavior to Cloud Enterprise Information Systems in China

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Abstract: Cloud computing has recently become a popular information technology in China. Several China's enterprises tend to move from client/server enterprise information systems (EISs) to cloud EISs. However, few studies have addressed the switching issues. This study aims to investigate factors that affect switching behavior from client/server EISs to cloud EISs. The research model draws from technology-organization-environment framework. We collected data from top managers and owners of China's enterprises to analyze six hypotheses. The results show that technological context (perceived security and compatibility), and environmental context (supplier support and consultant support) significantly influence switching behavior. The findings are useful for understanding switching issues from client/server EISs to cloud EISs.

Keywords: cloud computing, enterprises information systems, switching behavior, technology-organization-environment framework

1. INTRODUCTION

In recent years, cloud computing technology has become an emerging information technology (IT) development. It provides business products, services, and solutions that are delivered and consumed in real-time over the Internet ^[1]. Cloud-based models can be categorized into public cloud, private cloud, and hybrid cloud. In public clouds, organizations pay only for services provided by cloud service suppliers and access to cloud services over the Internet. Thus, organizations can save costs of hardware, software, and IT/IS professionals. In private clouds, organizations access to cloud services through internal networks and must have technological infrastructures and IT/IS professionals to manage the services.

Although private clouds are more expensive than public clouds, most enterprises still prefer to use private clouds due to security and management ^[2]. Several China's enterprises are increasingly moving to private clouds. A cloud computing survey reported that 40% of China's enterprises adopt private clouds, 36% of them adopt both public and private clouds, and only 13% of them adopt public clouds. Therefore, the adoption of private clouds is moving faster than that of public clouds ^{[3]-[4]}.

Previous research has focused on the adoption of cloud computing ^{[5]-[9]}. Since most existing organizations have currently implemented client/server enterprise information systems (EISs), it is important to gain an understanding of switching behavior rather than adoption. However, except for Park and Ryoo's research ^[10], few studies on cloud computing have addressed the switching issues. Even in Park and Ryoo's research, their studied systems are public clouds. To the best of our knowledge, no prior work has investigated factors that affect switching behavior to private clouds. To fill the gap, this study aims to investigate switching behavior from client/server EISs to private cloud EISs. In particular, we address the following questions: (1) what factors motivate organizations' switching behavior? (2) what factors hinder organizations' switching behavior?

2. THEORETICAL MODEL AND HYPOTHESES DEVELOPMENT

Technology-organization-environment (TOE) framework can be used to explain the adoption of innovation ^[11]. TOE framework includes three contexts: technological, organizational, and environmental. The

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technological context refers to internal and external technologies that are relevant to the organization. The organizational context refers to the characteristics and resources of the organization. The environmental context refers to the arena in which the organization conducts its business.

Because cloud EISs are typically enterprise projects and huge undertakings, organizations must decide to switch to cloud computing based on the technological, organizational, and environmental contexts. In addition, cloud EISs are a form of organization innovative IT because the technological characteristics of cloud computing differ from those of client/server EISs. Thus, TOE framework is suitable for investigating organizations' switching behavior to cloud EISs. This study proposes that the factors that affect switching behavior include the technological context (perceived security, complexity, and compatibility), the organizational context (technology readiness), and the environmental context (supplier support and consultant support).

Perceived security refers to the extent to which an organization believes that cloud EISs are secure for transmitting and storing sensitive information. Because organizations believe that organizational information is a very important asset, organizations often worry about whether their information is hacked or disclosed to others. Private clouds allow organizations to access to cloud services through an intranet or secure communication protocols^[12]. Because private clouds can provide a secure environment, organizations tend to switch to private cloud EISs.

Complexity refers to the degree to which cloud EISs are perceived as being difficult to use. Cloud EISs and client/server EISs that are made up of a variety of software modules seem complex. If cloud EISs are difficult to use, organizations will resist switching to cloud EISs. Thus, the complexity of cloud EISs acts as a barrier to switching to new systems.

Compatibility refers to the degree to which cloud EISs are perceived as being consistent with the existing values, needs, and past experiences of potential adopters. Cloud EISs should be required to be compatible with the existing systems of organizations^[13]. Data migration is also an important issue. Data should be successfully migrated between two different systems^[14]. Thus, the compatibility of cloud EISs is a critical factor for organizations' decision to switch to new systems.

Technology readiness refers to technological infrastructures and IT/IS human resources^{[7][15]}. In private clouds, organizations must have their own technological infrastructures and hire IT/IS professionals with cloud-related knowledge and skills to manage the cloud services. Therefore, technology readiness is a critical factor in organizations^[13]. If organizations have enough technological infrastructures and IT/IS human resources, they will switch to cloud EISs.

Supplier support refers to the problem determination and resolution, customization, interfaces, and functional enhancement of cloud EISs^[16]. Organizations generally consider that IS suppliers are the major form of external supports^[17]. Before cloud EISs go live, organizations continually adjust the systems to meet their needs. If cloud service suppliers provide external technical supports, organizations are likely to switch to cloud EISs.

Consultant support refers to implementation plan, problem solution, and ongoing support of cloud EISs^[16]. Although organizations hire IT/IS professionals to manage cloud services, consultants must transfer the cloud-related knowledge to the IT/IS professionals of the organization during the implementation^{[10][17]}. The deployment of private clouds spends more time and effort than other cloud services^[12]. If consultants have enough practical experiences, the likelihood of project success will be increased. Therefore, we hypothesize the followings:

H1 Perceived security positively affects switching behavior.

H2 Complexity negatively affects switching behavior.

- H3** Compatibility positively affects switching behavior.
H4 Technology readiness positively affects switching behavior.
H5 Supplier support positively affects switching behavior.
H6 Consultant support positively affects switching behavior.

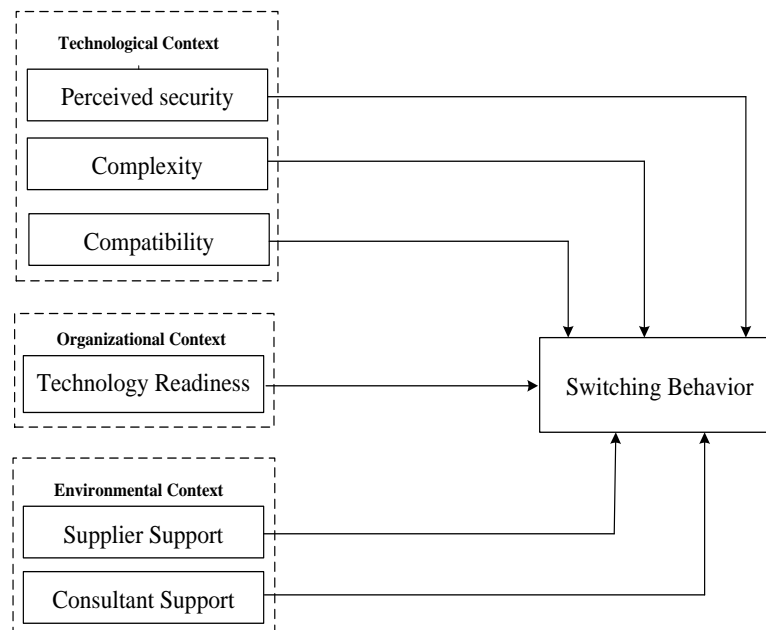


Fig 1. Research model

3. RESEARCH METHODOLOGY

3.1 Instrument development

A survey method was used to test the research model (Fig. 1). Perceived security variable was adapted from Salisbury^[18]. Complexity and compatibility variables were adapted from Moore and Benbasat^[19]. Technology readiness variable was adapted from Kuan and Chau^[15]. Supplier support and consultant support variables were adapted from Benamati and Lederer^[16]. Switching behavior variable was measured by Venkatesh^[20]. All items were measured using a seven-point Likert scale ranging from “strongly disagree” to “strongly agree”.

3.2 Data collection

This study cooperates with Kingdee Software Company to collect the data of its potential customers. A total of 800 questionnaires were mailed to China’s enterprises that had implemented EISs. Only top managers, such as CEO, CIO, and CFO, or owners of organizations were targeted as the respondents because they had the authority to decide whether to switch to cloud EISs. We received 252 questionnaires, for a response rate of 31.5%. Most respondents were male (58.6%), were in the age group of 26-35 (59.4%), had a bachelor degree (89.2%), and worked in a financial accounting department (30.7%). Most organizations were distributed in manufacturing industries (23%). The number of employees in the sample was primarily more than 1000 (27.5%) and the equity capital of the organizations was more than RMB \$100 billion (16.3%).

4. RESULTS

4.1 Measurement model

This study uses partial least squares (PLS) software to evaluate the convergent validity and discriminant validity. The convergent validity was assessed using factor loading, composite reliability (CR), Cronbach's alpha, and average variance extracted (AVE). Factor loadings for all items range from 0.78 to 0.95, exceeding 0.7. CR for each construct ranges from 0.91 to 0.95, exceeding 0.7. Cronbach's alpha for all constructs ranges from 0.86 to 0.93, exceeding 0.7. AVE for each construct ranges from 0.71 to 0.85, exceeding 0.5. The square root of AVE for each construct also exceeds the correlations between the construct and other constructs. Thus, the convergent validity and discriminant validity are supported.

4.2 Structural model

This study uses PLS software to test the hypothesized relationships among all constructs. Perceived security ($\beta=0.176$, $p<0.05$), compatibility ($\beta=0.202$, $p<0.05$), supplier support ($\beta=0.206$, $p<0.01$), and consultant support ($\beta=0.136$, $p<0.05$) have significantly positive effects on switching behavior. Thus, H1, H3, H5, and H6 are supported. Contrary to our expectations, complexity ($\beta=-0.007$, $p>0.05$) and technology readiness ($\beta=0.102$, $p>0.05$) have no direct effect on switching behavior; thus, H2 and H4 are not supported. The proposed model explains 50.2% of the variance in switching behavior.

5. CONCLUSION

Previous research has investigated the adoption and acceptance of cloud computing^{[5]-[9]}. However, few studies on cloud computing have addressed the switching issue^[10]. This study aims to investigate switching behavior from client/server EISs to cloud EISs. Our research model draws from TOE framework. The results show that the technological context (perceived security and compatibility), and the environmental context (supplier support and consultant support) positively influence switching behavior. The findings contribute to the literature of switching behavior of cloud EISs and provide insights for practitioners to concentrate resources to expedite the diffusion of cloud technology.

5.1 Theoretical implications

This study confirms that usefulness of TOE framework in studying switching behavior to cloud computing. The technological context (perceived security and compatibility) and environmental context (supplier support and consultant support) are important determinants of switching behavior. Although complexity and technology readiness are considered to be insignificant determinants of switching behavior, these six factors still explain 50.2% of the variance in switching behavior. Future research should re-examine the proposed model in other cloud-based models, such as public and hybrid clouds.

Our results also confirm the importance of security in switching behavior to private cloud EISs. Security influences organizations' decision to switch to cloud EISs. The results of this study are consistent with the findings of Lian and other Internet-related applications^{[13][18]}. Future work can examine other factors regarding private clouds when investigating the adoption and acceptance of private cloud EISs.

5.2 Practical implications

Compatibility is a significant factor affecting switching behavior to cloud EISs. Cloud service suppliers should also exert effort to improve the compatibility of cloud applications. Organizations believe that security is

a very important issue because organizational information requires a secure environment for access and storage. When most organizations prefer to use private clouds, cloud service suppliers should offer their protection policies for organizational information. This requires cloud service suppliers' continuous effort and resources investment on information security.

While organizations have IT/IS professionals, they still need the supports and suggestions provided by suppliers and consultants. Consultants can provide plans and solve problems for organizations while suppliers can help organizations to customize and develop specific hardware and software. Suppliers and consultants can also provide professional training and guidance to top managers and employees of organizations. Therefore, suppliers and consultants can work together to support organizations' switching to private cloud EISs.

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