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Summer 6-27-2016

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Recommended Citation

Lee, Yi-Hung; Hsu, Pingyu; Chang, Yu-Wei; and Cheng, Yun-Shan, "INTEGRATING TRA AND TOE FRAMEWORKS FOR CLOUD ERP SWITCHING INTENTION BY TAIWANESE COMPANY" (2016). *PACIS 2016 Proceedings*. 139.

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INTEGRATING TRA AND TOE FRAMEWORKS FOR CLOUD ERP SWITCHING INTENTION BY TAIWANESE COMPANY

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Abstract

ERP systems had played an important role in Taiwanese industry in the past. Nowadays, most of companies have already install traditional type of ERP. However, with the development of cloud computing recently, the scope of applying cloud computing have been gradually expanded to the enterprise information system, such as cloud CRM provided by Salesforce.com, Business by Design provided by SAP. The model in this study is based on TOE model combination of Theory of Reasoned Action(TRA). We try to develop a model and utilize this model to defines critical effect factors to company's intention of switching to cloud ERP from traditional type of ERP. This study used quantitative research methods and survey questionnaire, dates were collected from the 283 employees in Taiwanese company whose companies have already install traditional type of ERP and for cloud ERP have a certain understanding. This research has adopted SPSS and AMOS to analyse the reliability and validity. Last, structural equation model (SEM) for the data analysis to investigate the causalities among all parameters constructed in the proposed model. The results of this study were summarized as follows : The attitude of switching to cloud ERP positively impacted the intention of switching to cloud ERP, system quality positively impacted the attitude of switching to cloud ERP, financial benefit positively impacted the attitude of switching to cloud ERP, the trust factor positively impacted the attitude of switching to cloud ERP, industries pressure positively impacted the intention of switching to cloud ERP, surprisingly, government support is not perceived significant impacted the intention of switching to cloud ERP. This study provides a well criteria for cloud ERP vender, not only system design but also system sales. In addition, business user can also utilize this criterion.

Keywords: Cloud Computing, ERP, Cloud ERP, TOE, Theory of Reasoned Action.

1 INTRODUCTION

Although there are many controversies over cloud computing, it is not difficult to tell that cloud computing has been growing more and more important based on the active deployment for cloud computing in different countries. Take the United States as an example, the US Federal Chief Information Officer, Vivek Kundra, announced the Federal Cloud Computing Strategy on February 8th, 2011, put forward the cloud development direction of the federal government, and intended to transfer 25% of federal IT budget to the cloud-related applications or services. The estimate of annual federal IT budget was approximately \$ 80 billion, so the US government's cloud-related investments would be \$ 20 billion the next year (IT home, 2011-02-23). In addition, according to the 2012 Cloud Computing Applications and Industrial Development Report by Ministry of Economic Affairs, the EU has established the European Cloud Services Platform (Euro-Cloud), and developed the next generation of value added services, to become the first promotion and business exchange platform for European cloud ecology system development. Moreover, the Chinese government has not only introduced IBM cloud technology into the high-tech zone in Wuxi, but also established the first "cloud computing platform" used by governments in Jiangsu Province. The aforementioned allows us understand the current development policies of major economies.

Although cloud computing has been developed in full swing, many people are still unclear about its concept. Cloud information systems allow organizations to pay in a more flexible way, save the initial investment costs, maintenance and other expenses (Miller, 2008); the system can be quickly deployed (Lin and Chen, 2012); also allow members to have access to ubiquitous services through various mobile devices (Angela Lin, 2012). These many benefits should have made cloud computing quickly diffuse at the organizational level. Nevertheless, just as Lechesa et al. (2012) mentioned in their research on enterprises using cloud ERP, the rate of adoption of cloud ERP system is much lower than that of cloud CRM and cloud HRM. In fact, the promotion for cloud ERP has been ineffective. By this research, we hope to identify factors that can affect organizations' willingness to switch the traditional ERP systems to cloud ERP systems.

2 LITERATURE REVIEW

Scholars have often used TOE framework as a tool to study organizations adopt new technologies. For example, Zhu et al (2004) used TOE framework to study the key factors that influenced small and medium enterprises (SMEs) in Australia to use e-market. The research revealed that perceived direct benefit, top management's support, external pressure, and trust positively correlated with SMEs' use of e-market. Ghobakhloo et al. (2011) used TOE framework to explore the factors that influenced SMEs to use e-commerce.

Information systems success model was proposed in 1992 by the two scholars, DeLone and McLean. Based on the communication research by the two scholars, Shannon and Weaverin, the information impact theory developed by scholar Mason in 1978, and the empirical researches on management information system (MIS) from 1981 to 1987, DeLone and McLean used the model to explain the successful process of information systems (Lin, 2010).

2.1 Theory of Reasoned Action

The theory of reasoned action (TRA) was developed by Ajzen and Fishbein (1975), largely used to analyze how attitudes consciously influence individual behavior, to explore the attitude formation process of cognitive information. The basic assumption of the model is that people are rational, and before performing an action they would synthesize the information they get, consider the significance and consequences of their action. TRA is also widely applied model in the field of social psychology,

to explore the actual behavior and behavioral intentions, attitudes, subjective norms, relationship between beliefs and assessments.

3 RESEARCH METHODS

TOE framework is used as the main framework of this research. The TOE framework has been used by many scholars as a research tool for cloud computing. For example, Lian et al (2014) explored the factors driving Taiwan's medical industry to use cloud computing. Low et al (2011) studied factors stimulating organizations in high-tech industries to use cloud computing. Alshamaila et al (2013) used TOE framework to study the key factors affecting SMEs in northeastern England. Next, we will further analyse the three major dimensions, technology, organization, and environment dimension. Technology dimensions are represented by system quality in information system success model are shown in Figure 1 below.

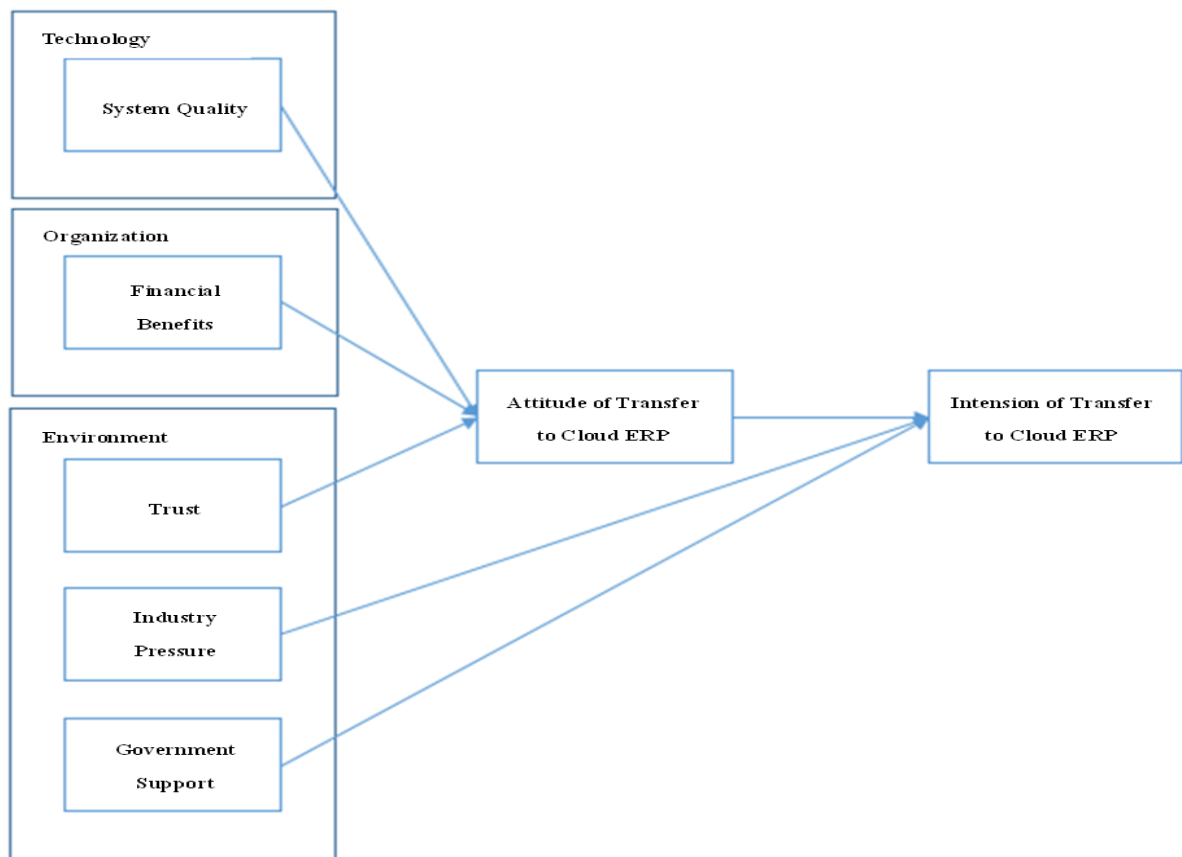


Figure 1. The theoretical model of this research (Source: This Research)

including rapid deployment, efficient use of computing resources, being able to be used any time and everywhere, all of which are contained in system quality. When assessing whether it is necessary to switch to the cloud ERP system, an enterprise would take good information quality for granted.

Organization dimensions refer the financial benefits brought by cloud ERP to the organization. The financial benefit can also be regarded as "behavioral belief", which will further affect the attitude. Finally, environment dimensions include trust, government's support, and industry pressure, in which trust is also seen as "behavioral belief" in this research, which will further affect the attitude, and government's support and industry pressure can be seen as subjective norms, which will directly influence behavioral intentions. Next, how each factor is derived will be introduced one by one.

In this research, attitude refers to a person's assessment of whether the behavior is favourable to himself/herself or not. And the assessment may further influence the intention of the behavior (Ajzen and Fishbein, 1975). The measurement targets of measuring attitude stems from the research carried out by Taylor and Todd in 1995, including enterprises think that it is not bad to switch to Chunghwa Telecom cloud ERP system, enterprises think that it is a good idea to switch to Chunghwa Telecom cloud ERP system, enterprises like the idea of changing to Chunghwa Telecom cloud ERP system, and enterprises think that it is a smart idea to switch to Chunghwa Telecom cloud ERP system (Taylor and Todd, 1995). "Attitude has a direct influence intention" were mentioned by scholars from Since Ajzen and Fishbein (1975) proposing the theory of rational action, to Schifter and Ajzen (1985) proposing the theory of planned behavior. Since then many scholars have used these two models to explore human behavior model one after another. On the other hand, a growing number of scholars have used these two models to explore the behavior of companies to accept new technology. For example, Benamati et al (2010) integrated trust and technology acceptance model into TRA model, to predict user acceptance of e-commerce. Wixom and Todd (2005) combined the technology acceptance model and TRA model, to study users' use of data warehouse system. In addition to exploring the influence of attitude on intention, Chen et al. (2011) used UTAUT model to further explore users' behavioral intentions to switch from online brands to the user to offline brands. Although fewer scholars have explored behavioral intentions to switch, we believe that this reasoning will be used for more and more researches. So we can further infer that enterprises' attitude to changing to cloud ERP system has a significant positive influence on enterprises' intention to switch to cloud ERP system. So it is proposed in this research hypothesis:

H1: Enterprises' attitude to changing to cloud ERP system has a significant positive influence on enterprises' intention to switch to cloud ERP system.

H2: System quality has a significant and positive influence on enterprises' attitude to changing to the cloud ERP system.

H3: Financial benefits have a significant and positive influence on enterprises' attitude to changing to the cloud ERP system.

H4: Trust has a significant, positive influence on enterprises' attitude to changing to the cloud ERP system.

H5: Industry pressure has significant, positive influence on enterprises' intention to switch to the cloud ERP system.

H6: Government's support for cloud ERP has a significant and positive influence on enterprises' intention to switch to the cloud ERP system.

3.1 Sampling Design and Data Collection

The questionnaires were officially distributed from June 17, 2014 to August 20, 2014 at the product presentation meetings held by Chunghwa Telecom & Immense Company. There were 283 valid questionnaires and the response rate was 56.6%, after the invalid ones were excluded. According to the statistics on the respondents, 65% of the respondents were male, 35% female; aged 18-25 (4.9%), 26-35 (25.4%), 36- 45 (34.6%), 46-55 (28.8%), 56-65 (9.2%), older than 65 years (1.1%). Among them, respondents aged 26-55 were in the majority. Most of their positions are staff members (22.3%), managers and assistant managers (18%), presidents and vice presidents (13.4%), and engineers (12.7%). The capital of most companies the respondents worked for was NT\$ 10 million (41.7%), NT\$ 1000-2500 (14.5%), or more than NT\$ 80 million (26.9%). And the number of employees of the companies mainly ranged from 1-10 (35%), 11-50 (31.1%), to 51-100 (10.6%).

3.2 Measurement Model

For goodness of fit of the model, according to Hayduk et al. (2007), in researches on social science, one problem is that the SEM researchers studied the sample rather than the population. As a result, the sampling error must be considered. If the goodness of fit between hypothesis model and sample data model is not ideal, the result of analysis has no meaning. Therefore, at the beginning of this research the analysis of goodness of fit of the model was conducted. The results were as follows: Chi-square / df = 2.102, goodness of fit index (GFI) = 0.859, adjusted goodness of fit index (AGFI) = 0.824, comparative fit index (CFI) = 0.962, normed fit index (NFI) = 0.93, root mean square residual (RMR) = 0.049 and root means square error of approximation (RMSEA) = 0.063. According to Hu and Bentler (1999), as long as AGFI and GFI are greater than 0.8, the goodness of fit of the model is acceptable. In addition, according to Suchmacker and Lommax (2004), if RMSEA ranged between 0.05 and 0.08, the model has a good goodness of fit. Furthermore, according to Wheaton et al (1977), Chi-square / df is acceptable when it lies between 2 and 5. So, generally speaking, the goodness of fit of the model for this research is acceptable.

In this research, convergent validity and discriminant validity are used to verify the detection of the model. Convergent validity is used to assess the degree of correlation between the variables in the same dimension, also known as internal consistency validity, primarily utilized to ensure that there is at least a moderate correlation between variables in each dimension. On the other hand, discriminant validity refers to whether there is difference between different dimensions. If they are highly correlated, it means that these items are used to measure the same thing. According to Fornell and Larcker (1981), component reliability (CR), average variance extracted (AVE), and factor loadings can be used as indicators to assess convergent validity. The factor loadings in this research are from the smallest 0.689 to the largest 0.90. Although the factor loadings of some items are smaller than the standard value of factor loading, 0.7, suggested by scholars Hair et al. in 1992, the loadings, for the most part, approximate the ideal value.

Cronbach's α is adopted as the measurement indicator for reliability analysis. The values of Cronbach's α are from the smallest 0.882 to the largest 0.976. They are greater than the value 0.7 suggested by scholar Nunnally in 1978. This can explain the model used in this research has good reliability.

The values of component reliability are from 0.878 to 0.973, larger than the recommended standard 0.7; the values of average variation extracted (AVE) are from the smallest 0.725 to the largest 0.912, larger than the standard value 0.5 suggested by Fornell and Larcker (1981). These results confirm that the model of this research has convergent validity.

In addition, based on Fornell and Larcker (1981) approach, the discriminant validity of this research is measured by average variation extracted (AVE). If the square root of AVE is larger than the correlation coefficient between the dimension and any latent dimension, this means that the dimension has good discriminant validity. The square root of AVE of each dimension of the proposed model is greater than the correlation coefficient of each facet.

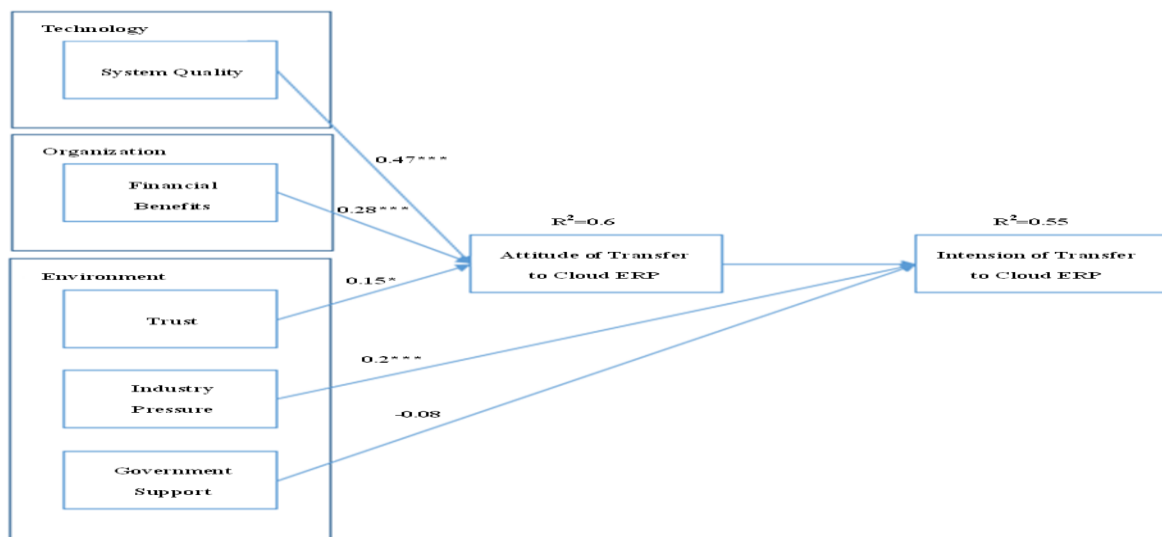
Finally, we must also conduct common method variance (CMV) test. In order to measure whether there is CMV with measurement tools, Harmon's one-factor test is adopted to conduct principal component analysis on the items in the questionnaire. The results show that the sum of the variation of seven dimensions is 85.781, the variations of each dimension are from the smallest 9.507% to the largest 23.423%. Among them no one exceeds 50%, so there is not CMV in this research.

3.3 Structural Model

The goodness of fit of the structural model of this research is measured using the following indices: Chi-square / df = 2.013, goodness of fit index (GFI) = 0.854, adjusted goodness of fit index (AGFI) = 0.821, comparative fit index (CFI) = 0.960, normed fit index (NFI) = 0.928, root mean square error of approximation (RMSEA) = 0.063. GFI and AGFI greater than 0.8 are acceptable according to

MacCallum and Hong (1997), meaning that the goodness of fit between the structural model and observation data is good. In addition, according to Suchmacker and Lommax (2004), if RMSEA values range from 0.05 and 0.08, the model has a goodness of fit. Moreover, according to Wheaton et al (1977), Chi-square / df between 2 and 5 is acceptable. Overall, this research has an acceptable goodness of fit of the model. After confirming that the structural model of this research has a goodness of fit, we can carry out the following structural equation analysis.

The structural equation analysis was conducted to test the 6 hypotheses proposed in this research. The results are described as follows. The enterprise's attitude to changing to the cloud ERP system has a significant positive influence on its intention to switch to the cloud ERP system ($\beta = 0.695$, $P < 0.001$). This confirms the hypothesis H1. The system quality has a significant positive influence on the enterprise's attitude to changing to the cloud ERP system ($\beta = 0.465$, $P < 0.001$). This confirms the hypothesis H2. Financial benefits have a significant positive influence on the enterprise's attitude to changing to the cloud ERP system ($\beta = 0.284$, $P < 0.001$). This confirms the hypothesis H3. Trust has a significant positive influence on the enterprise's attitude to changing to the cloud ERP system ($\beta = 0.15$, $P < 0.01$). This confirms the hypothesis H4. Industry pressure has a significant positive influence on the enterprise's intention to switch to the cloud ERP system ($\beta = 0.166$, $P < 0.001$). This confirms the hypothesis H5. What is surprising is that the analysis result indicates that government's support has no significant positive on the enterprise's intention to switch to the cloud ERP system ($\beta = -0.73$, $P < 0.161$). The result does not confirm the hypothesis H6. The overall structural equation analysis results are shown in Figure 2 below.



* : $P < 0.05$ (Significant) ; ** : $P < 0.01$ (Highly Significant) ; *** : $P < 0.001$ (Very Significant)

Figure 2. The overall structural equation analysis results (Source: This Research)

3.4 Discussion

It is surprising that government's supply has no significant impact on the enterprise's intention to switch to the cloud ERP system. This is different from the results of researches carried out by many scholars, such as Al-Hashedi et al. (2011), Zhai (2010). For this result, we give the following explanation. Most enterprises have made a big investment in the development of traditional ERP systems. Therefore, they would not be willing to scrap their equipment simply owing to government's support. The reason that they want to switch to the cloud ERP system is it has its own advantages, such as lower costs, rapid deployment, and that it can be used any time and everywhere.

3.4.1 Academic Recommendations

An integrated model was adopted in the process of conducting this research, to explore the cloud ERP system. We combined TOE with TRA to become an integrated model, in which system quality in technology aspect, financial benefits in organization aspect, and trust in environment aspect were used as the beliefs in TRA, which directly affected the attitude to changing that in turn affected the intention. And we regarded industry pressure in environment aspect as a subjective norm that directly affected the intention to switch. Scholars may also try to combine TOE with TRA in the way described above, to carry out relevant researches in future.

3.5 Practical Recommendations

Although the advantage of low costs has been highlighted for cloud services, the ERP system also involves enterprises' internal processes, and each company has its own internal process. System providers should have to think about the issue of customization, and send consultants to understand corporate users' internal processes before providing cloud services. However, the advantages of cloud computing is low cost, and blindly pursuing customization may cripple the ability to maintain the advantage. Therefore, this research suggests that system providers should develop the concept of mass customization, to develop distinct cloud ERP systems for different industries and different regions. In the meantime, they should develop the system development environment that is more adjustable, so that the system can be suitable for most users by tiny adjustment. When assessing the system, corporate users should assess whether the system is compatible with their mobile devices too.

For the promotion of cloud ERP system, the system provider not only need to affect corporate users' attitude to the cloud ERP system, but also can affect their intention to use cloud ERP through the subjective norm set up by external factors. This subjective norm refers to the pressure from the industry. When a corporate user sees a number of important business partners have adopted cloud ERP system, it will also affect their intention. Therefore, system providers should establish a mechanism that the members of a supply chain are willing to use, such as adopting a payment method used by many companies, or helping the supply chain to build a community cloud. When promoting the cloud ERP system, salespeople should identify the important business partners of the customer beforehand, and whether they have already adopted the same system.

4 CONCLUSIONS AND RECOMMENDATIONS

When promoting the cloud ERP system, cloud service providers face the situation that many corporate users have used traditional ERP systems. For such a situation, we do not use intention to use as the research target, but use the intention to switch as the measurement target for whether the cloud ERP system can be successfully promoted. In this way we can avoid the traditional research framework. Most of the traditional framework is to explore the issues of enterprises' use of innovative technology. However, currently most enterprises have imported traditional ERP, and whether to use cloud ERP or not should be a problem of changing the information system for enterprises. And enterprises' intention to switch can be viewed from perspective of the theory of reasoned action. Before enterprises have intention of changing to the ERP system, their attitude to changing to the cloud ERP system must switch and subjective norms for changing to the cloud ERP system also need to switch. These two factors determine enterprises' intention to switch to the cloud ERP system. In order to successfully promote the cloud ERP system, cloud service providers and system salespeople should focus on strengthening enterprises attitude to and subjective norms for changing to the cloud ERP system. After verification the findings of this research showed that system quality and financial benefits of cloud ERP system and the trust in the providers will reinforce enterprises' attitude to changing to the cloud ERP system. And industry pressure that represents subjective norms also will directly affect enterprises' intention to switch to the Cloud ERP system. However, so far government's support measures for cloud computing have no influence on enterprises' intention to switch to the cloud ERP.

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