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HOW TO UNDERSTAND POST-ACCEPTANCE INFORMATION SYSTEM USAGE BEHAVIORS: PESPECTIVE FROM IS SUCCESS MODEL

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Abstract

The impact of information systems (IS) on organizational performance has gained enormous attention from both academics and practitioners. However, it is the post-acceptance IS use that actually help fully realize the IS potential. We identified three types of IS usage behaviors -- routine use (RU), extended use (EU) and innovative use (IU), which can coexist in the post-acceptance stage and help with the work. Drawing on the IS success model, we proposed a research model with IS characteristics as external variables toward perceived usefulness (PU) and satisfaction to explain RU, EU and IU in respective. The relationships among three dimensions of IS characteristics -- information quality, system quality and service quality were discussed further. As RU, EU and IU reflect various extent of IS use, we suggested that they are linked. Then the model was tested by a survey of 240 ERP system users. The results provided evidence that information quality and service quality influence PU and user satisfaction via system quality, and IS success model was a good basis for understanding RU, EU and IU. We also found that RU had a positive impact directly on EU but indirectly on IU via EU. This study helps bridge the gap between IS characteristics and prediction of different types of post-acceptance IS usage behaviors.

Keywords: Information Quality, System Quality, Service Quality, Routine Use, Extended Use, Innovative Use

1 INTRODUCTION

Over the past decades, information system (IS) usage has been studied extensively given its importance for IS performance. After implementing an IS, system usage is crucial to realize its full potential and achieve business value for an organization. In general, the IS implementation process is conceived to have multiple stages (Kwon & Zmud 1987). Prior IS literature primarily focused on IS usage at the acceptance stage as initial acceptance is acknowledged to be the first step to IS success. Accordingly, technology acceptance has been employed as the dominant approach to evaluate IS success at the acceptance stage (Venkatesh et al. 2003). However, users can barely achieve the promised benefits with a low level of understanding about the implemented IS. By gaining IS experience through the acceptance stage, users get familiar with the implemented IS, which enables a deep use of the system at the post-acceptance stage to realize the returns on their IS investment. In this study, routine use (RU), extended use (EU) and innovative use (IU) are conceived as three distinctive usage behaviors that can be recognized at the post-acceptance stage and are supposed to be helpful for organizations in achieving promised business returns (Jasperson et al. 2005). Specifically, RU pertains to a standardization of system usage (Saga & Zmud 1994), while EU and IU are measured by breadth and depth of use respectively (Hsieh & Wang 2007; Wang et al. 2008). Although RU, EU and IU represent different extent of IS use, they are assumed to be interrelated owning to employees' changing IS usage behavior during their work routine in this study.

IS success model was proposed by DeLone and McLean (1992) based on prior IS success studies which have examined different aspects of system success. In order to organize these diverse studies and present a holistic view of IS success, DeLone and McLean (1992) put forward six dimensions of IS success, i.e. information quality, system quality, use, user satisfaction, individual impact, and organizational impact. Since poor user support would result in user dissatisfaction toward the system thus translating into user group loss, DeLone and McLean (2003) updated the IS success model by introducing the concept of "service quality". Moreover, individual impact and organizational impact were replaced by one concept "net benefits", which captured both the positive and negative impact on all entities in the IS implementation process. Nevertheless, the updated IS success model is still a process model which can be associated with various stages of IS implementation. Following Bhattacherjee (2001), the first step to realize IS success is the initial IS acceptance, while continued use is critical to achieve the long term viability. In this line, we attempted to apply IS success model to the post-acceptance stage and focus on post-acceptance usage behaviors. However, given IS usage behaviors are directly influenced by individual beliefs or attitudes (e.g. Lin et al. 2005; Kim et al. 2007) rather than external factors in the IS adoption literature, we concerned that IS characteristics should be considered explicitly for their possibility of influencing IS usage indirectly (Venkatesh et al. 2003).

In order to have a better understanding of post-acceptance behaviors, drawing on the updated IS success model (DeLone & McLean 2003), we proposed a research model to examine the role of IS characteristics in explaining users' behavioral belief and affect toward different types of IS usage behaviors. The study aims to broaden the research scope about the determinants of post-acceptance IS usage behaviors and link the post-acceptance behaviors with the IS characteristics.

2 THEORETICAL FOUNDATIONS AND RESEARCH HYPOTHESES

2.1 IS Success Model

IS success model is a temporal, process model first introduced by DeLone and McLean (1992) and updated in 2003. DeLone and McLean (2003) suggested that IS success consisted of six dimensions: system quality, information quality, service quality, use, user satisfaction and net benefits. Firstly, an information system is established containing various characteristics, which can be exhibited as system, information and service quality. By using the system, employee users and managers experience these characteristics, whereupon satisfaction or dissatisfaction with the information system emerges. Then the use of and satisfaction toward the system lead to the overall impact of IS implementation. Since

net benefits are very complex and cannot be explicitly attributed to IS implementation, the research scope of this study was limited to IS characteristics, user satisfaction and use.

Following the updated IS success model (DeLone & McLean 2003), we take information quality, system quality and service quality as three dimensions of IS characteristics. Specifically, information quality measures the extent to which the system can produce and transmit high-quality information as intended (DeLone & McLean 1992). System quality refers to the accuracy and efficiency of information processing, measured in terms of reliability, accessibility, flexibility, integration and timeliness (Wixom & Todd 2005). Service quality, however, is adapted from the marketing literature to assess the support for the implemented system, whether it is provided by the IS department or outsourced to an information technology company (DeLone & McLean 2003).

In the extant literature, IS characteristics, whether treated at a holistic level or at several dimensions, are proved to have an impact on behavioral attitudes (e.g., Igbaria et al. 1995; Lim & Benbasat 2000; Hong et al. 2002) or behavioral outcome (Hsieh et al. 2011; Setia et al. 2013). Nevertheless, this study focused on the impact of IS characteristics on the post-acceptance usage behaviors rather than general "use". Due to the evidence that perceived usefulness can be a valuable determinant of post-acceptance usage behaviors (Hsieh & Wang 2007; Wang et al. 2008; Wang et al. 2013), this study made an extension of IS success model by examining the mediating effect of perceived usefulness in parallel with satisfaction between IS characteristics and different types of usage behaviors at the post-adoptive stage.

2.2 Routine Use, Extended Use and Innovative Use

IS implementation process consists of multiple phases from preparation to maintenance. Among the six stages of IS implementation -- initiation，adoption，adaptation，acceptance，routinization and infusion -- introduced by Kwon and Zmud (1987)，the latter two stages primarily concern post-acceptance usage behaviors which transcend superficial level of use in prior stages (Cooper & Zmud 1990; Saga & Zmud 1994). Specifically, routine use (RU) occurs at the routinization stage, and it reflects the degree to which IS usage has been an integrated part of one's normal work (Schwarz 2003; Sundaram et al. 2007). Both extended use and innovative use can be observed at the infusion stage due to users' familiarity with the implemented IS. Extended use (EU) is defined as individuals applying more of the available features of an IS in order to support his/her job performance (Hsieh & Wang 2007). Innovative use (IU) refers to one's identifying and applying novel ways for IS usage (Ahuja & Thatcher 2005; Wang et al. 2008).

Since routinization and infusion are recognized as the post-acceptance stage, and occur either in sequence or in parallel (Cooper & Zmud 1990; Saga & Zmud 1994), users can be associated with all of RU, EU and IU at the post-acceptance stage. Moreover, although users may engage in only one of RU, EU and IU at one time point during their work, they might display all of them within a time period. In this study, RU, EU and IU are supposed to be connected for researchers to understand users' transformation from one usage behavior to another.

Prior studies understand the types of various usage behaviors by the metric "extent of use" (Ahearne et al. 2004; Ahearne et al. 2005; Ko & Dennis 2004), which can be examined by the level of innovation toward users' IS usage and work structure (Sundaram et al. 2007). Thus we posit that users can switch from one usage behavior to another as they devote varied levels of innovation to IS usage at different time periods. Specifically, RU has two distinctive features: (1) its standardization of IS usage pattern in individuals' work activities, (2) its incorporation into users' work routines as a normal part (Li et al. 2013). Such standardized IS use seldom displays innovation, which only familiarizes users with the implemented IS. With the accumulation of IS experience, users may not be content with current IS usage and then try to identify new functionalities (Hsieh & Wang 2007). EU refers to using more system functions to support one's work, including existing tasks and a set of work process. It shows an extension of the functions in use to maximize the utility of IS. IU describes users discovering and applying novel ways that are not recognized previously to utilize IS functions (Wang et al. 2008). Through innovative use with the implemented IS, users employ deep usage of the existing functions to realize the fullest potential of an IS. Thus, IU is associated with a higher level of

innovation than EU. For the reason that RU, EU and IU reflect various extent of IS use, their connections were also discussed in our study.

2.3 Research Hypotheses

Drawing on the IS success model (DeLone & McLean 2003), we developed our research model to investigate the impact of IS characteristics on RU, EU and IU of an IS via users' belief and individual affect, as depicted in Figure 1.

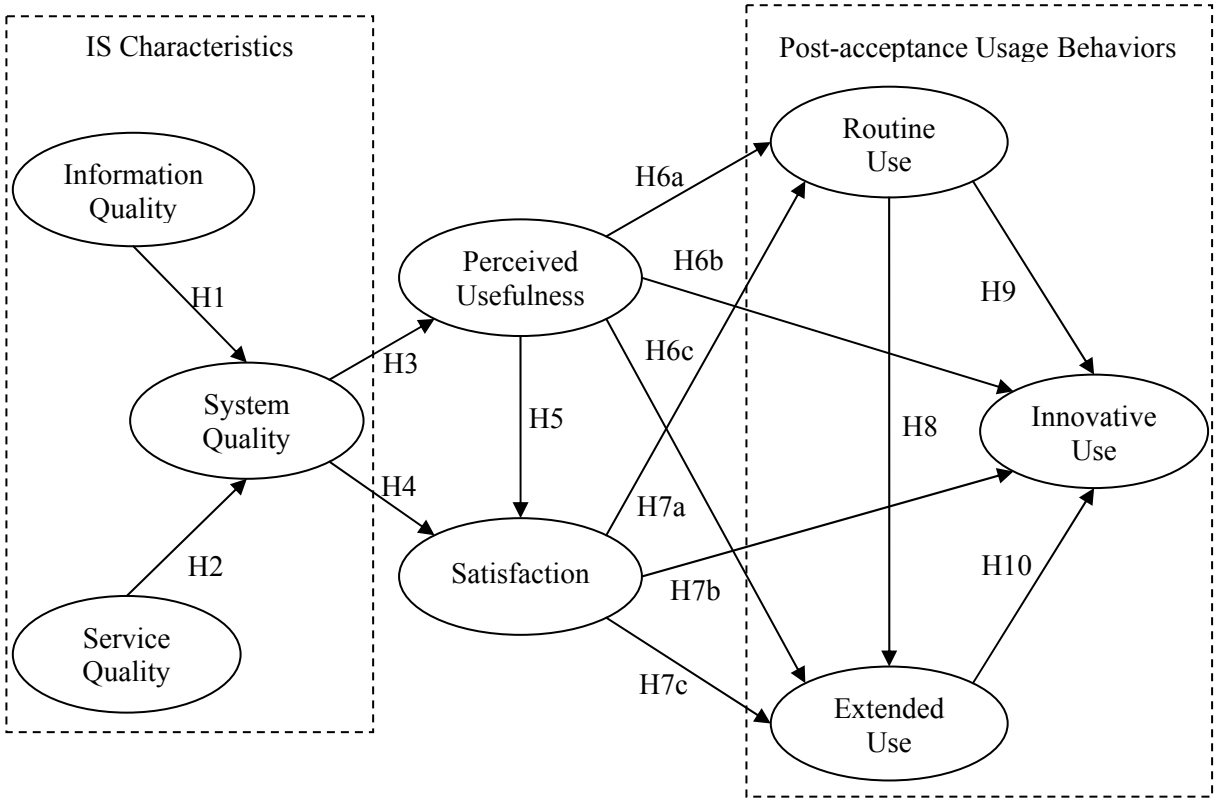

Figure 1.Research Model

We first proposed that users' perception of information quality would influence their perception of system quality. Perceived information quality is up to users' assessments of the system's semantic success or information delivery, while perceived system quality is users' evaluation of information processing operation, efficiency, and system reliability. As information is the output of an IS (DeLone & McLean 1992), no doubt that high-quality information will contribute to positive belief about the system. Besides, information is the subject of technical processing. If the information quality is low in terms of completeness, format, accuracy or currency, it will surely degrade the quality of system operation. In other words, high information quality is indispensable for a good information system. As a consequence, when users evaluate system quality, they will take information quality into account as well. Thus, we put forward the following:

H1: *A user's perceived information quality has a positive influence on his/her perceived system quality.*

Nowadays, the IS department has become a service provider, which beyond its traditional role as technology provider (Pitt et al. 1995). And its service quality is up to system users' subjective examination of the extent to which their service requirements have been satisfied (Jiang et al. 2002). Following Pitt et al. (1995), system and service are not clearly divided, and the IS department's service capability will influence the relationship between system and users. From this perspective, we believed that the overall assistance from service provider supported the system in achieving the goal of ease-of-use, reliability, accessibility, flexibility, integration and timeliness. Therefore, we supposed:

H2: *A user's perceived service quality has a positive influence on his/her perceived system quality.*

DeLone and McLean (1992) studied extensively about the antecedents to IS performance in which system quality was included. Despite the popularity of IS implementation among large-sized enterprises, employees are not willing to use the system at the initial-acceptance stage since IS implementation changes their work style and work environment fundamentally. When employees get used to the new way of working, they will discover and then appreciate the quality of information system. As positive perception can bring about users' strong belief in the technology's functional value (Hsieh et al. 2011), we assumed that perceived system quality played an important role in shaping users' perceived usefulness toward post-acceptance usage (Lin & Lu 2000).

Additionally, users' continuance intention also relies on attitude towards the implemented IS. In the current study, user satisfaction is used to measure attitude and affect, which represent users' positive assessment of IS use experience. As one dimension of IS characteristics, system quality is proved to influence user satisfaction theoretically and empirically (DeLone & McLean 2003; DeLone & McLean 2004; Negash et al. 2003). After users gain knowledge about the value of the implemented IS, they would generate favourable views of the system, thereby facilitating affect toward prior IS use experience. Hence,

H3: *Perceived system quality has a positive influence on a user's perceived usefulness.*

H4: *Perceived system quality has a positive influence on user satisfaction.*

Perceived usefulness (PU) is defined as the extent to which an employee believes that IS utilization would help with his or her task and improve job performance. Prior studies found that PU influences users' attitudes across both acceptance and post-adoptive stages consistently (Limayem & Cheung 2008). At the acceptance stage, PU has a positive impact on user's evaluation of system utility, as suggested by the Technology Acceptance Model (TAM). In this line, some researchers assumed that PU and user satisfaction are also related during a user's continued IS use (e.g. Bhattacherjee 2001; Hsieh & Wang 2007). So we suggested:

H5: *Perceived usefulness has a positive influence on user satisfaction.*

Whether at the acceptance stage or the post-acceptance stage, PU promotes IS usage behaviors as users recognize the system to be instrumental in their work process. At the initial acceptance stage, employees are mandated to use the system in an organization even though they reject it mentally. The inconsistency between users' mental conditions and their usage behavior will result in superficial levels of IS use (Nah et al. 2004). Users would not engage in deep level of usage at the post-acceptance stage unless they mentally accept the technology (Jasperson et al. 2005). As users' positive instrumental belief in the IS implicates their mental acceptance of the system, we suggested that PU can bring about voluntary post-acceptance usages. In this study, RU, EU and IU are representative post-acceptance usage behaviors. Therefore, the following hypotheses were proposed:

H6a: *Perceived usefulness of an IS has a positive impact on a user's routine use.*

H6b: *Perceived usefulness of an IS has a positive impact on a user's extended use.*

H6c: *Perceived usefulness of an IS has a positive impact on a user's innovative use.*

In the IS literature, researchers have tried to connect user satisfaction with IS usage behaviors constantly (Davis 1989; DeLone & McLean 1992; DeLone & McLean 2003; Bhattacherjee 2001). Satisfaction is users' affect about the interaction with the technology based on their prior use experience (Bhattacherjee 2001). When users perceive the IS to be satisfying during their work routines, it means that their expectation of IS has been confirmed and they can appreciate the support from the system. This encouraging perception may contribute to a greater willingness to continue using the IS and learn to use it more extensively and creatively. For employees to voluntarily use the system beyond a superficial level, their satisfaction toward prior IS use is a predominant condition. Toward this end, the higher level of user satisfaction, the more likely users will adopt post-acceptance usage behaviors. Thus we put forward:

H7a: *User satisfaction has a positive impact on a user's routine use.*

H7b: *User satisfaction has a positive impact on a user's extended use.*

H7c: *User satisfaction has a positive impact on a user's innovative use.*

Routinization concerns whether the system has been a component of normal work patterns. Nonetheless, routinization does not necessarily indicate that the full potential of system could be achieved, until behavioral changes associated with infusion occur to enhance task performance (Sundaram et al. 2007). Therefore, it seems that there is a relationship between routinization and infusion. RU is captured in the routinization stage, while EU and IU are captured in the infusion stage. Adapting this to the context of this study, we posit that RU, EU and IU are interrelated. Considering that routinization precedes infusion during the IS implementation process (Cooper & Zmud 1990), and incorporation of IS into work routine makes an indispensable precondition of infusion, we supposed:

H8: *A user's routine use contributes to his or her extended use.*

H9: *A user's routine use contributes to his or her innovative use.*

Extended use means using more of the available functions of an IS to support a comprehensive set of work or the existing task (Hsieh et al. 2011). However, it is important to note that expanding the breadth of IS usage is only prerequisite, but not sufficient, for work performance. Furthermore, the new functions in use do not necessarily fit the work process, so that innovative use is needed to apply new use of the existing system to support task performance. As discussed above, both EU and IU are likely to occur at the infusion stage. In order to attain IU, it is significant for users to extend IS functions in use, identify the utility of the functions and then explore creative ways to use them. Therefore, the following hypothesis was proposed:

H10: *A user's extended use contributes to his or her innovative use.*

3 RESEARCH METHOD

The measures for all the constructs in the research model were adapted from prior literature. Measures for information quality, system quality and service quality were adapted from DeLone and McLean (1992), and Ifinedo et al. (2010). PU and satisfaction were measured based on the items of Bhattacherjee (2001). For RU, measures from Schwarz (2003) were used. For EU, measures from Hsieh and Wang (2007), and Hiseh et al. (2011) were adapted. And items for IU were adapted from Ahuja and Thatcher (2005) and Wang et al. (2008).

Then we collected organizational data to verify the research model. Since organizations implemented many different information systems, we selected ERP system as the focal point of research, given our research subjects being post-acceptance usage behaviors of complex IS. Usually, an ERP system is a suite of integrated applications that help organizations store and manage data from various departments and business processes. With the support of ERP systems, information can flow freely among business functions, and connections to outside operations can be managed well. Thus successful implementation and effective use of an ERP system have a stimulative effect on firm performance. The scope of this current study was restricted to ERP systems that are infused throughout the whole company. We chose a large manufacturing company located in Guangzhou, capital of Guangdong Province in south China, to conduct our study. By the time of data collection, this company has implemented the ERP system for more than 10 years and achieved great success, which made it suitable for our research context.

A cross-sectional field survey was conducted in the large manufacturing company in Guangzhou. Firstly, we interviewed information managers and made some modifications with the questionnaires according to their comments. As post-acceptance usage behaviors, especially EU and IU, are more likely to be captured in intellectual works, we distributed the revised questionnaires to knowledge workers to administer the official study. With the support of CEO and CIO, questionnaires were randomly distributed to 255 ERP users among the targeted knowledge workers. 240 of the delivered survey questionnaires were returned and the response rate was 94.1%. Respondents' demographic characteristics are presented in Table 1.

Dimension	Category	Percentage (%)
Education	Junior High School or Lower	2.9
	High School	17.9
	College	38.3
	Bachelor	37.6
	Master or above	3.3
Age	23-29 years old	35.0
	30-39 years old	43.4
	40-49 years old	20.4
	50 years old or older	1.2
Gender	Male	54.2
	Female	45.8
Working Department	Accounting & Finance	10.4
	Marketing	7.5
	Production	38.3
	Human Resource Management	1.7
	Others	42.1

Table 1. Demographics of the Survey Respondents

4 DATA ANALYSIS

We analyzed the data by the partial least squares (PLS) approach, specifically SmartPLS 2.0 software, to verify the research model. PLS is a component based approach to structural equation modeling (SEM), which is helpful to minimize the unexplained variance in the independent variables (Chin 1998) and suitable for theory extension purpose of this study.

4.1 Measurement Model

The measurement model was examined as the first procedure of the PLS analysis, in terms of construct reliability and validity. The model includes eight constructs with 34 items. Descriptive statistics of the constructs are displayed in Table 2.

Construct	Mean	S.D.	IQ	SeQ	SQ	PU	SAT	RU	EU	IU
Information Quality (IQ)	5.57	0.88	**0.85**							
Service Quality (SeQ)	5.03	0.96	0.73***	**0.87**						
System Quality (SQ)	5.35	0.96	0.80***	0.74***	**0.83**					
Perceived Usefulness	5.29	1.03	0.72***	0.69***	0.69***	**0.93**				

(PU)										
Satisfaction (SAT)	4.72	1.19	0.65***	0.73***	0.68***	0.75***	**0.94**			
Routine Use (RU)	5.37	1.01	0.64***	0.55***	0.56***	0.74***	0.75***	**0.92**		
Extended Use (EU)	5.30	1.21	0.65***	0.59***	0.59***	0.60***	0.65***	0.61***	**0.91**	
Innovative Use (IU)	4.74	1.23	0.55***	0.61***	0.55***	0.57***	0.64***	0.55***	0.69***	**0.93**

Notes: a. All constructs are seven-point scales with the anchors 1=strongly disagree, 4=neutral, and 7=strongly agree.
b. The bold numbers on the diagonal are the square root of the variance shared between the constructs and their measures. Off-diagonal elements are correlations among constructs. For discriminant validity, diagonal elements should be larger than off-diagonal elements.
c. *** Correlation is significant at the 0.01 level

Table 2.Descriptive Statistics and Discriminant Validity

We examined the reliability, convergent validity and discriminate validity of each construct with Confirmatory Factor Analysis (CFA). Table 3 shows the constructs' standardized loadings, Cronbach's alpha, composite reliability, and average variance extracted (AVE). The factor loadings of each construct were above the recommended value of 0.70. And all the standard loadings were significant ($p<0.01$). Cronbach's alpha and composite reliability scores were all larger than 0.90 except for EU (0.89), higher than the criterion of 0.707 (Nunnally & Bernstein 1994). Thus, the reliability was validated by these results.

Latent Construct	**Indicator**	**Standard loading**	**Cronbach's α**	**Composite reliability**	**Average variance extracted**
Information Quality (IQ)	IQ1	0.79***	0.93	0.95	0.72
	IQ2	0.86***			
	IQ3	0.85***			
	IQ4	0.83***			
	IQ5	0.86***			
	IQ6	0.87***			
	IQ7	0.87***			
Service Quality (SeQ)	SeQ 1	0.86***	0.90	0.93	0.76
	SeQ 2	0.86***			
	SeQ 3	0.91***			
	SeQ4	0.86***			
System Quality (SQ)	SQ 1	0.79***	0.91	0.93	0.69
	SQ 2	0.86***			
	SQ 3	0.84***			
	SQ4	0.81***			

	SQ5	0.82***			
	SQ6	0.87***			
Perceived Usefulness (PU)	PU1	0.90***	0.95	0.96	0.86
	PU2	0.93***			
	PU3	0.95***			
	PU4	0.94***			
Satisfaction (SAT)	SAT1	0.90***	0.96	0.97	0.88
	SAT2	0.96***			
	SAT3	0.94***			
	SAT4	0.95***			
Routine Use (RU)	RU1	0.91***	0.91	0.94	0.84
	RU2	0.94***			
	RU3	0.90***			
Extended Use (EU)	EU1	0.89***	0.89	0.93	0.82
	EU2	0.90***			
	EU3	0.93***			
Innovative Use (IU)	IU1	0.93***	0.92	0.95	0.87
	IU2	0.95***			
	IU3	0.91***			

***$p < 0.01$

Table 3.Confirmatory factor analysis

Then the convergent validity of the constructs was confirmed by identifying AVE scores, which were all higher than 0.50. The discriminant validity was supported by the scores in Table 2. As we can see, the square root of AVE of each construct was larger than all the other cross-correlations, suggesting more construct-related variance were explained than the error variance (Fornell & Larcker 1981). Therefore, the above results verified both the convergent and discriminate validity for all the constructs in the research model.

4.2 Structural Model

After verifying the measurement model, we used PLS to assess the structural model. As illustrated in Figure 2, the path coefficients and explanatory power for the dependent variables suggested that the model was supported, except *H6b*, *H6c* and *H9*. Respectively, the model was able to explain 59 percent of the variance in employees' RU, 48 percent of the variance in EU and 54 percent of the variance in IU.

Specifically, information quality (β=0.49) and service quality (β=0.43) had significant impacts on system quality and jointly accounted for 76 percent of its variance, thus supporting *H1* and *H2*. Then the study verified the important role of system quality in explaining behavioral belief and attitude. The results suggested that system quality influenced both PU and satisfaction directly. Meanwhile, perceived usefulness had a direct effect on satisfaction. 50 percent of the variance in perceived usefulness was explained by system quality (β=0.71), 64 percent of the variance in satisfaction was explained jointly by system quality (β=0.40) and PU (β=0.47), thus supporting *H3*, *H4*, and *H5*.

While PU (β=0.52) affected RU significantly, supporting *H6a*, its direct effects on EU and IU were not significant. However, PU influenced EU (β=0.13)[1] indirectly via RU (β=0.25), thus rejecting *H6b* and *H6c* but supporting *H8*. The analysis also indicated the significant influence of user satisfaction on RU, EU and IU, supporting *H7a* (β=0.30), *H7b* (β=0.26) and *H7c* (β=0.39). In addition, EU (β=0.46) contributed to IU significantly, whereas RU had no direct effect on IU, but rather influenced IU (β=0.12)[2] through the mediating role of EU, thus rejecting *H9* but supporting *H10*.

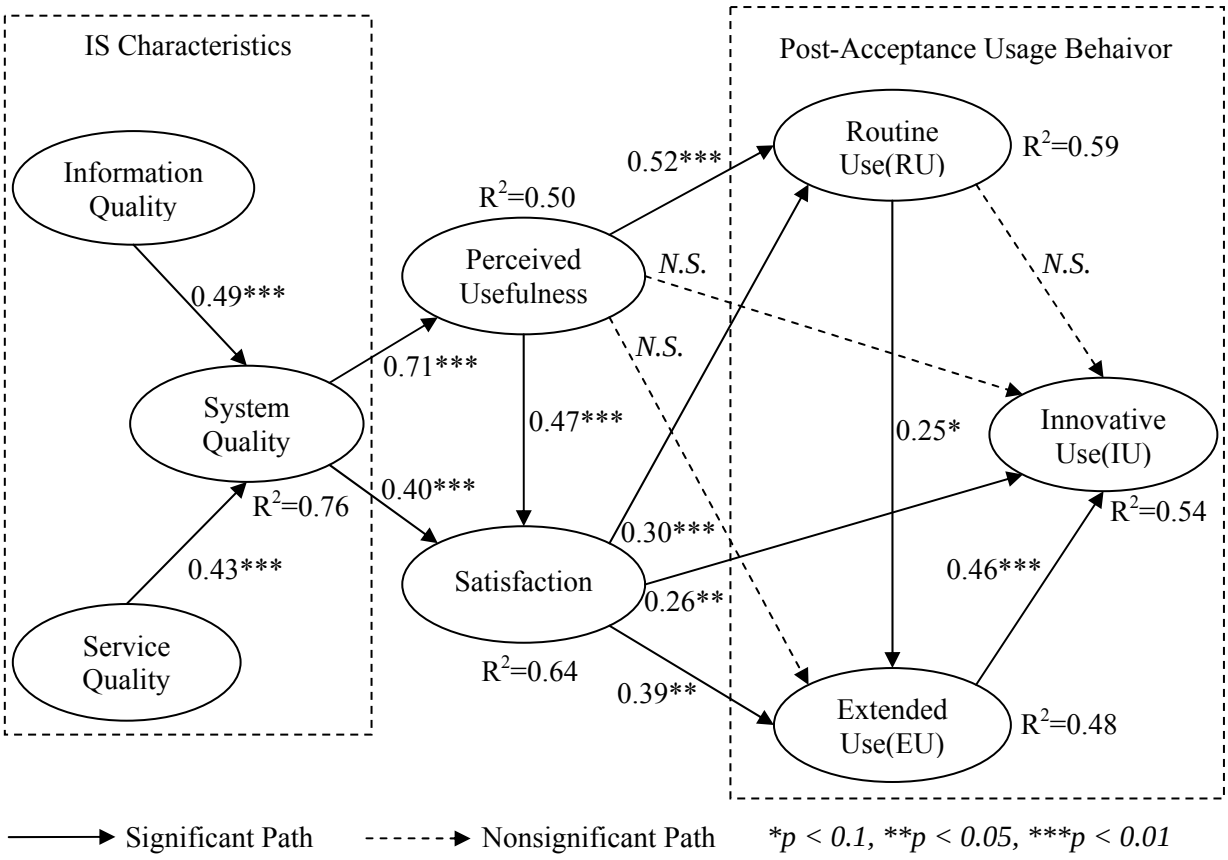

Figure 2.Research Model Results

Of all the fourteen hypotheses in the research model, eleven were supported. Considering the level of variance explained to the dependent variable RU, EU and IU was 59 percent, 48 percent and 54 percent respectively, the analysis results implicated a sufficient model fit.

5 DISCUSSIONS

The overarching objective of this empirical study was to extend IS success model in explaining the post-adoptive usage behaviors, specifically to understand the mechanism for the impact of IS characteristics on the post-adoptive usage behaviors and the interrelationships among different IS usage behaviors. To this end, we examined the proposed model that investigated system quality's relationships with information quality and service quality, and then linked system quality to PU and user satisfaction. In addition, we tested the mediating influence of PU and user satisfaction on three

[1] If perceived usefulness influenced extended use via routine use, its overall impact on extended use was calculated as the cross-product of its impact on routine use (β (perceived usefulness→routine use)) and the impact of routine use on extended use (β (routine use→extended use)).

[2] If routine use influenced innovative use via extended use, its overall impact on innovative use was calculated as the cross-product of its impact on extended use (β (routine use→extended use)) and the impact of extended use on innovative use (β (extended use→innovative use)).

types of post-adoptive IS usage behaviors -- RU, EU and IU. Furthermore, the relationships among RU, EU and IU were examined in respective.

The results suggested that both information quality and service quality enhanced users' perceived system quality, indicating that they relied on information quality and service quality in evaluating system quality of the implemented IS. The research findings also highlighted that users were more likely to have positive belief and attitude toward post-adoptive usages when they perceived the system to be of high quality.

Further, our results confirmed the facilitating roles of PU and user satisfaction on RU, as suggested by Bhattacherjee (2001). However, PU did not necessarily contribute to EU and IU. Our findings only supported the facilitating role of user satisfaction, but not PU, on EU and IU, which was inconsistent with Hsieh and Wang (2007) and Wang et al. (2008). What caused PU to have a dominant effect only on RU? We further tested the model with RU, EU and IU as dependent variables which were not connected to each other. The analysis captured significant influence of PU on RU and EU, but demonstrated little impact of PU on IU. A comparison of these two analyses suggested that the introduction of the relationship between RU and EU seemed to overshadow the direct impact of PU on EU. Presumably, RU, rather than EU, was more constantly affected by PU, especially in the manufacturing industry where business processes were standardized. Meanwhile, the relationship between PU and IU was consistently insignificant across these two analyses. A speculative explanation may lie in that intrinsic motivation was the key to IU. Extant researches mainly identified PU, an extrinsic motivation, as a powerful predictor of general IS use (e.g., Legris et al. 2003; Venkatesh et al. 2003). However, intrinsic motivation, which includes perceived enjoyment and perceived ease of use, is more instrumental in enhancing innovative behavior than extrinsic motivation at the post-acceptance stage (Li et al. 2013).

In the process of gaining new knowledge about ERP, users would have more expectations about the system at the post-acceptance stage, which increased their incentives to seek for non-standardized novel use. Interestingly, RU had a significantly positive influence on EU, whereas it exerted no direct effect on IU. This finding could be attributed to the essence of RU. RU represents the standardization of system usage, which only enables users to get familiar with the implemented IS. After proficient use of the current features, users would be confident about themselves to extend the features in use. Nevertheless, repetitious standardized routine use would not equip users with innovative thoughts about the new use for ERP, but incorporate the existing manner to their normal IS use. At last, the results proved extended use to be stimulative to innovative use, as identifying the utility of the features is a prerequisite for applying novel ways to use them.

6 CONCLUSIONS

6.1 Limitations

There are several limitations of this empirical study that should be noted. First, the sample of this study was consisted of knowledge workers in a manufacturing company. Although restricting our research to one company helped us control the interference of extraneous factors, it cannot be ignored that our study results may not be generalizable to other research contexts. Therefore, it is imperative for future research to validate the proposed model across different user groups in different industries.

Second, information quality, systems quality and service quality were assumed as reflective constructs in this study. However, information quality, systems quality and service quality can also be measured with multiple dimensions. As suggested by Jarvis et al. (2003), misspecification of a construct as formative or reflective could cause measurement errors, thus influencing the structural model. Therefore, future research should be more cautious about the measures of the proposed constructs.

Finally, this study was conducted with a cross-sectional research design. As we know, behaviors that the subjects selected are changing overtime. Thus we call for longitudinal research efforts to enhance our understanding of the relationship among IS characteristics, behavioral belief and post-acceptance usage behaviors.

6.2 Implications for Research

Our findings reveal significant insights for conceptualization on post-acceptance IS usage behaviors. First of all, this current study is among the first to conceptualize the post-adoptive IS use by differentiating three important behaviors, RU, EU and IU simultaneously. We posit that RU, EU and IU are distinct revealing different "extent of use", which can occur in parallel, but also are connected. Researchers have realized the complex and pluralistic features of IS use but refuse to examine it as a broad behavioral category (e.g., Li et al. 2013; Sundaram et al. 2003). Specifically, prior studies either overlook the extended use in their framework (Li et al. 2013; Sundaram et al. 2003) or neglect their mutual relationships of post-acceptance behaviors (Li et al. 2013). Few studies bring together all of these three important post-acceptance behaviors within a single study. Our study enables us to make important differentiation among RU, EU and IU and enrich our understanding of post-acceptance usage behaviors in three different levels, ranging from low to high in maximizing the utility of IS, and from standardization to innovation orientation.

Second, our research model provides a useful framework for future studies to understand post-acceptance usage behaviors of an IS by discovering the mutual relationships among RU, EU and IU. Researchers have identified these three important post-acceptance behaviors and have examined their motivational drivers (e.g., Hsieh and Wang 2007; Li et al. 2013). IU, as the critical indicator of realizing returns on IS investments, has gained much more attention. However, IS literature has not shed lights on whether the low-level post-acceptance usage behaviors are important or even prerequisite for higher-level post-acceptance usage behaviors. Our study highlights that RU, EU and IU are not independent from one another, but are connected. Specifically, EU and RU are both significant influencing determinants of IU, while EU has a direct impact and RU has an indirect effect via EU. RU is also related to EU, indicating that the low-level usage seems to function as important foundations to higher-level usage. The findings may enhance our understanding with regard to post-acceptance behaviors and IS use in a more holistic way.

Third, we extend the IS success literature by introducing individual belief to explain post-adoptive usage behaviors. Draw on the IS success model, we incorporate perceived usefulness as perceptual factors which influenced behavioral attitude toward post-adoptive usages. The study shows the important impacts of information quality, system quality and service quality on perceived usefulness and satisfaction, which are confirmed by IS studies as important drivers of post-acceptance behaviors (e.g., Bhattacherjee 2001). Even though recent studies have empirically examined the parallel outcome of information quality and system quality (e.g., Wixom & Todd 2005), service quality was not considered simultaneously. This study allows researchers to explore how these three types of IS characteristics work together to influence users' post-adoptive usage behaviors. Following Venkatesh et al. (2003), the research analysis verified the prediction that IS characteristics could be related to different types of IS usages indirectly.

6.3 Implications for Practice

Our study posits that employees can use the implemented IS in different ways: (1) they may use IS in a standardized and repetitious manner, (2) they can learn to use more system features to support their tasks, (3) they could also take initiatives to apply IS in a novel and innovative way (Hsieh and Wang 2007; Li et al. 2013). Managers should not only realize the coexistence of these three post-acceptance usage behaviors, but also notice their distinctions. Moreover, managers should encourage their employees to perform higher-level usage behaviors, such as extended use and innovative use, which are contributable to work performance (Hsieh et al. 2011; Hsieh and Wang 2007). Our study indicated that both routine use and extended use are important steps to innovative use, which suggests that managers should help employee users apply the adopted IS in their routine work, and try to identify new system functionalities. Towards this end, fascinating training programs and user-friendlier interfaces are needed to simulate daily IS use to a higher level (Li et al. 2013; Venkatesh 1999).

Additionally, managers should recognize that both extended use and innovative use are voluntary usage behaviors, which reflect whether employees identify with the adopted IS and would like to take initiate to utilize more of the available functions or even create unconventional ways to support their

work. From this point, managers should acknowledge that the more employees have invested in an implemented system, the higher level of usage they will attain. In this line, managers should give positive feed-back on IS use related performance of employee users, which could enhance their intrinsic motivation to devote more efforts in learning and sharing useful experiences of the adopted IS (Harackiewicz 1979; Ryan & Deci 2000).

Third, RU, EU and IU are driven by both perceived usefulness and satisfaction in the post acceptance stage. Even though satisfaction has displayed strong direct effects while PU has only displayed indirect effect on EU and IU, managers may concern how to increase the employees' satisfaction and perceived usefulness. According to our analysis, managers should not only concern about information quality, which meets users' basic needs for information transmission, but also pay attention to system quality and service quality that may influence users' intention toward IS continuance. To this end, firms should focus their efforts on useful information content and efficient information technology support. Based on these two foundations of information quality and service quality, system quality can be built smoothly.

In sum, managers and system designers are advised to investigate the reliability of the enterprise information system in terms of information quality, service quality and system quality (Xu et al. 2013). Meanwhile, the subsequent influences of information quality, service quality and system quality provide important guidance for managers to understand the post-acceptance usage phenomenon.

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