Examining Information Systems Infusion over the Routinization

Completed Research

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ABSTRACT

Information systems (IS) infusion becomes important from the management perspective because organizations can leverage IS investment only at the IS infusion stage. The model for the stages of IS implementation explains that IS infusion can be achieved through IS routinization. This study examined how to achieve IS infusion through routinization based on application of the psychological empowerment theory and the unified theory of acceptance and use of technology (UTAUT), respectively. This study adds value to the IS literature by explaining how IS routinization leads to IS infusion and how their antecedents are different and related across the two stages. This study also provides guidance on how organizations can promote IS infusion beyond IS routinization, which then helps organizations leverage their IS investments.

Keywords

Information systems, infusion, routinization, unified theory of acceptance and use of technology, psychological empowerment theory, user empowerment

INTRODUCTION

Information Systems (IS), including enterprise systems (ES) are costly, and companies invest huge amount of capital to implement them (Peng et al., 2018). However, more than half of the ES projects fail to yield business value because their underutilization fails to yield the expected benefits (Morphy, 2006). Organizations can leverage their IS investments only at the point of IS infusion, which refers to using the system to its full potential (Saga and Zmud, 1994). The underutilization of implemented IS is a major factor underlying the productivity paradox that results in lackluster returns on organizational investments in IS (Sundaram et al., 2007).

Although several studies have emphasized the importance of IS infusion (Saga and Zmud, 1994; Zmud and Apple, 1992), it has not yet been fully examined as a stage in IS implementation. Previous IS studies have focused mainly on technology acceptance and post-acceptance stages. Few studies have focused on the transition from IS routinization to infusion. IS infusion differs from IS acceptance and routinization because it requires users to proactively extend usage of the mandated system to exploit its full potential (Kim and Gupta, 2014; Kim et al., 2016; Saga and Zmud, 1994). One notable exception among these few studies of IS infusion has been the examination of IS infusion in terms of users' empowerment (i.e., a user's active motivational orientation toward using an IT application at work) (Kim and Gupta, 2014). Kim and Gupta (2014) demonstrated users' empowerment as a main driver of IS infusion based on psychological empowerment theory (Spreitzer, 1995). In addition, one missing point in previous research has been achievement of IS infusion through IS routinization as expected in the course of the six-stage IT implementation model. Routinization is needed to stabilize users' motivations toward IS infusion (Saga and Zmud, 1994).

The purpose of this study is two-fold: First, to examine the linkage between IS routinization and IS infusion; second, to examine the antecedents of IS routinization and IS infusion and the relationships between them. For this purpose, we used the six-stage IT implementation model, especially the routinization and infusion stages. As for the antecedents of IS routinization, we adopted the UTAUT (Venkatesh et al., 2003). And as for the antecedents of IS infusion, we adopted the users' empowerment approach (Kim and Gupta, 2014) based on the psychological empowerment theory (Spreitzer, 1995; Thomas and Velthouse, 1990). We validated our model, which we derived by integrating the two perspectives with the previous literature, through a longitudinal study that focused on individuals' use of a customer relationship management (CRM) system at a telecommunication service company. This study contributes to add value to the IS literature by explaining how routinization leads to IS infusion and how their antecedents are different and related across the two stages. This study also helps managers promote IS infusion through IS routinization in organizations.

THEORETICAL BACKGROUND

The Six-Stage IT Implementation Model with IS Routinization and Infusion

To facilitate a better understanding of IS diffusion in organizations, Cooper and Zmud (1990) proposed an IT implementation model consisting of six stages; initiation, adoption, adaption, acceptance, routinization, and infusion. In the initiation stage, active or passive scanning of organizational problems and IT solutions are undertaken.

In the adoption stage, rational and political negotiations ensue to get organizational support for the IT application. In the adaptation stage, the IT application is developed, installed, and maintained and organizational procedures are revised and developed. The IT application is available for use at this stage. In the acceptance stage, the IT application is in use and an organization's members are induced to commit to its usage. At the routinization stage, usage of the IT application is encouraged and considered a normal activity. At the infusion stage the goal is to use the IT application to its full potential to increase organizational effectiveness by comprehensive use of the application to integrate and support higher levels of work.

Previous research had applied UTAUT to examine technology acceptance and use by individual users over time, i.e., IS acceptance and IS routinization (Venkatesh et al., 2003). The IS continuance model (Bhattacherjee, 2001) was also used to explain how an individual decides to continue usage of an IT application — in other words, post-acceptance behavior — based on two direct determinants (i.e., usefulness and satisfaction) and one indirect factor (i.e., confirmation). Although both the IS continuance model and the UTAUT can be used to explain technology usage in the routinization stage, we chose the UTAUT as the theoretical foundation in this study because of its comprehensiveness. Compared with previous research on technology acceptance and post-acceptance (i.e., routinization), only a few empirical studies on IS infusion or its subtypes (e.g., extended use) (Ahuja and Thatcher, 2005; Burton-Jones and Vokoff, 2017; Jones et al., 2002; Kim et al., 2016; Kim and Gupta, 2014; Saeed and Abdinnour, 2008; Sundaram et al., 2007) have been published. We adopted the psychological empowerment theory (Spreitzer, 1995; Thomas and Velthouse, 1990) as the theoretical lens for this examination of IS infusion. Kim and Gupta (2014) explained that users' empowerment, a type of psychological empowerment in the context of IS use, leads to the three subtypes of IS infusion (i.e., extended use, emergent use, and integrative use).

Theoretical Framework

We examined the relationship between IS routinization and IS infusion based on the six-stage IS implementation model. This routinization is a necessary step to stabilize a user's motivation toward IS infusion (Saga and Zmud, 1994). To examine the antecedents of IS routinization and IS infusion and the differences between them, we adopted the UTAUT (Venkatesh et al., 2003) and the psychological empowerment theory (Spreitzer, 1995; Thomas and Velthouse, 1990). UTAUT has four key constructs (i.e., performance expectancy, effort expectancy, social influence, and facilitating conditions).

Regarding the psychological empowerment theory, psychological empowerment (Spreitzer, 1995) reflects an active, rather than passive, orientation to a work role by referring to a motivational construct, in other words, to enable rather than simply delegate (Conger and Kanugo, 1988). Previous research (Thomas and Velthouse, 1990) explained that psychology empowerment is manifested in a set of four cognitions: competence, self-determination, meaning, and impact. As for users' empowerment, we contextualized the four cognitions of psychological empowerment to be specific for system usage at work and defined each of them according to Kim and Gupta (2014): Meaning as the importance that an individual attaches to system usage in relation to an individual's own ideals or standards; Competence as an individual's belief in his or her capability to use the system in tasks with relevant knowledge, skills, and confidence; Impact as the degree to which an individual can influence task outcomes with the system usage; Self-determination as an individual's sense of having choices in system usage.

RESEARCH MODEL AND HYPOTHESES

Based on the theoretical discussion in the preceding section, we proposed a research model and ten hypotheses with two-stage data collection as shown in Figure 1.

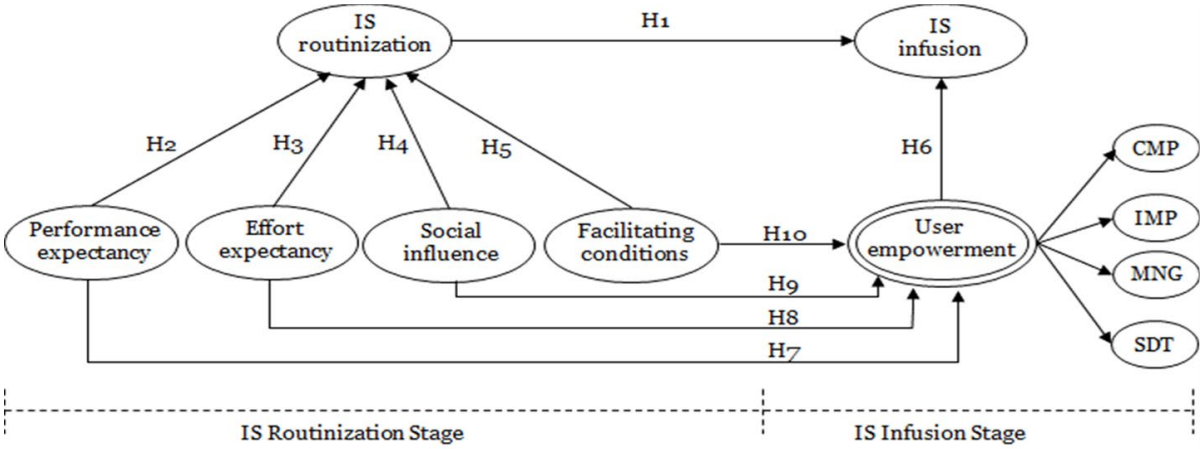

Figure 1. Research Model

** Notes: Users' empowerment is modeled as a second-order reflective construct based on its four dimensions (CMP = Competence; IMP = Impact; MNG = Meaning; SDT = Self-determination)*

Hypothesis 1 (H1): *IS routinization has a positive effect on IS infusion.*

Hypothesis 2 (H2): *Performance expectancy has a positive effect on IS routinization.*

Hypothesis 3 (H3): *Effort expectancy has a positive effect on IS routinization.*

Hypothesis 4 (H4): *Social influence has a positive effect on IS routinization.*

Hypothesis 5 (H5): *Facilitating conditions have a positive effect on IS routinization.*

Hypothesis 6 (H6): *Users' empowerment has a positive effect on IS infusion.*

Hypothesis 7 (H7): *Performance expectancy has a positive effect on users' empowerment.*

Hypothesis 8 (H8): *Effort expectancy has a positive effect on users' empowerment.*

Hypothesis 9 (H9): *Social influence has a positive effect on users' empowerment.*

Hypothesis 10 (H10): *Facilitating conditions have a positive effect on users' empowerment.*

RESEARCH METHODOLOGY

In developing the survey instrument, we adopted existing validated scales whenever possible. We conducted a field survey of users of a CRM system at a telecommunications service company. We collected data for all variables by adopting a cross-sectional data collection approach. For this purpose, we distributed the survey questionnaire to 500 randomly selected users across different business units and different organizational positions and levels. We collected 192 complete and valid responses. The majority of respondents were male (N = 133, 69.3%) with an average age of 38.5 (standard deviation = 7.1), an average tenure of 13.7 years (standard deviation = 5.6) and worked at different positions in the company (frontline employees = 42.7%, middle managers = 34.9%, and managers = 22.4%).

DATA ANALYSIS AND RESULTS

Instrument Validation

We used SmartPLS 2.0 to assess the convergent and discriminant validities of the first- order constructs. The convergent validity for the constructs was supported. We assessed the discriminant validity. The squared root of AVE for each construct exceeded the correlations between the construct and other constructs. Hence, discriminant validity was also established. We then obtained factor scores for each of the first-order users' empowerment dimensions. We then used them as input for the second-order users' empowerment construct. We validated the second-order reflective construct of users' empowerment according to the guidelines of MacKenzie et al. (2011). The test results support the validity and reliability of the second-order reflective constructs of users' empowerment.

Hypotheses Testing

We examined the structural model by applying a bootstrapping resampling technique with 192 cases, 500 bootstrap samples, and no sign change option. The testing results are shown in Figure 2.

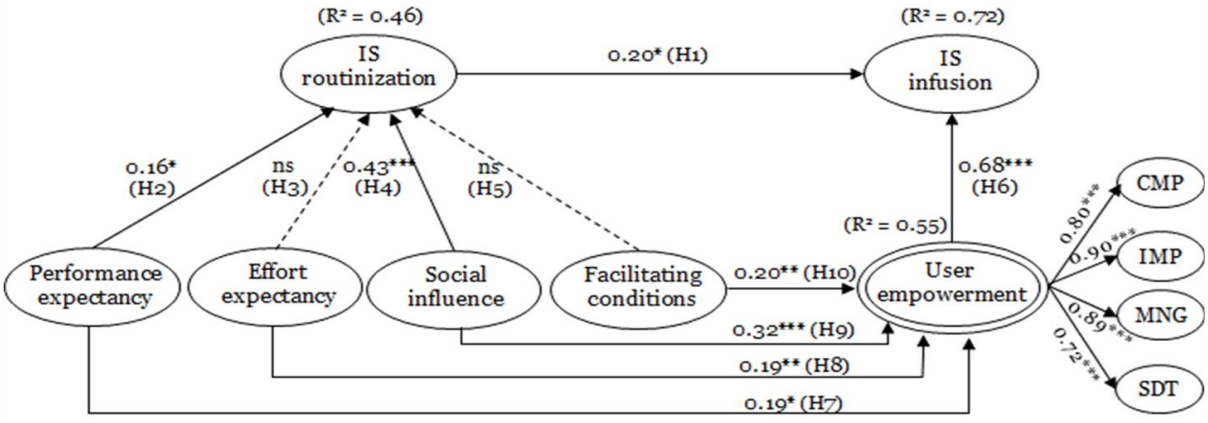

Figure 2. Structural Model Testing Results (*p<0.05; **p<0.01; ***p<0.001; ns: insignificant at the 0.05 level)

We conducted a post-hoc analysis by testing an alternative model by adding direct relationships between the four UTAUT constructs and IS infusion. We found a significant effect of users' empowerment on IS infusion. We also found significant effects of the four UTAUT constructs on users' empowerment. However, we could not find any significant effect of the four UTAUT constructs on IS infusion in the alternative model. We further tested whether users' empowerment mediates the effects of the four UTAUT constructs on IS infusion based on the bootstrapping approach (Zhao et al. 2010). We used the PROCESS macro (Hayes 2013) with a 95% confidence

interval and 5,000 bootstrap resamples with bias corrected bootstrapping. This testing showed a significant indirect effect of performance expectancy on IS infusion through users' empowerment (indirect effect = 0.5569, standard error = 0.0648, lower confidence interval = 0.4379, upper confidence interval = 0.6951); a significant indirect effect of effort expectancy on IS infusion through users' empowerment (indirect effect = 0.5813, standard error = 0.0725, lower confidence interval = 0.4456, upper confidence interval = 0.7280); a significant indirect effect of social influence on IS infusion through users' empowerment (indirect effect = 0.5626, standard error = 0.0799, lower confidence interval = 0.3970, upper confidence interval = 0.7174); a significant indirect effect of facilitating conditions on IS infusion through users' empowerment (indirect effect = 0.3746, standard error = 0.0496, lower confidence interval = 0.2797, upper confidence interval = 0.4720).

DISCUSSION AND IMPLICATIONS

Discussion of Findings

This study has three key findings based on the theoretical model of IS routinization and infusion. First, this study found a significant effect of users' empowerment on IS infusion. IS infusion requires each user to be highly motivated to use the system far more than the mandated usage (Saga and Zmud, 1994). Second, we found that IS routinization has a significant effect on IS infusion, which is consistent with previous research (e.g., Sundaram et al., 2007). The model of stages of IT implementation contains two stages, IS routinization and infusion, after the technology acceptance stage (Cooper and Zmud, 1990). Our study supports the IT implementation stage model, especially the transition from routinization to infusion. Third, in this study we found that the UTAUT model partially explains IS routinization. It found only two constructs (i.e., social influence and performance expectancy) of UTAUT have significant effects on IS routinization. This finding is similar to that of previous research on UTAUT (Venkatesh et al., 2003). Next, we found relationships between the antecedents of IS routinization and IS infusion. Our research also explains the role and effect of four UTAUT constructs leading to IS routinization and IS infusion, none of which has ever been found in previous research. All four UTAUT constructs have significant effects on users' empowerment. Thus, the UTAUT constructs affect IS infusion indirectly through users' empowerment. We further checked the direct effects of UTAUT constructs on IS infusion in the users' empowerment model. The post-hoc analysis explained that users' empowerment fully mediates the effects of the four UTAUT constructs on IS infusion, which supports the argument that IS infusion requires a heightened motivational state that inspires users to go beyond the mandated use of IT to exploit the full potential of the system (Kim and Gupta 2014; Saga and Zmud 1994).

Limitations and Future Research Directions

The results of this study should be interpreted in the context of its limitations. First, our conceptualization and operationalization of IS infusion as a single dimensional construct is rooted in the tradition of IS research (Cooper and Zmud, 1990; Jones et al., 2002; Sundaram et al., 2007) in which it is possible to operationalize it in terms of its subtypes (Kim and Gupta, 2014; Saga and Zmud, 1994). Future research can examine the relationships between IS routinization and the subtypes (i.e., extended use, integrative use, and emergent use) of IS infusion. Second, we used UTAUT and the psychological empowerment theory to identify the antecedents of IS routinization and IS infusion. Nevertheless, we cannot rule out the possibility that other factors unaccounted for in our model determine IS routinization and IS infusion. Future research can test them and compare their effects on IS routinization and IS infusion. Third, although Saga and Zmud (1994) noted that organizations can fully leverage their investments only at IS infusion, further research needs to examine the impact of IS infusion on organizational and task performance. It can also test the relative impacts of IS routinization and infusion on performance.

Implications for Research and Practice

This study has several implications for research, especially because this study is one of the first studies to establish empirically a linkage from IS routinization to IS infusion. Although the IT implementation model (Cooper and Zmud, 1990) explained that IS infusion is achieved after IS routinization, there has been little research on their linkage. This research determined the antecedents of IS routinization and infusion based, respectively, on the application of UTAUT and psychological empowerment theory. This study then highlighted the difference between the antecedents of IS routinization and IS infusion. This research demonstrated that users' empowerment leads to IS infusion while two determinants of UTAUT (performance expectancy and social influence) lead to IS routinization. This study has another theoretical implication in terms of the psychological empowerment theory. Regarding the application of the psychological empowerment theory, Ke and Zhang (2011) and Kim and Gupta (2014) applied the theory to the IS context. This study investigated the hitherto unexplored area of the development of psychological empowerment in terms of an IT acceptance and use model in the context of IS usage at work. Psychological empowerment theory holds that a work environment (e.g., job characteristics) affects the development of psychological empowerment, which then leads to work outcomes (e.g., IS infusion) (Kim and Gupta, 2014; Thomas and Velthouse, 1990). Going beyond the literature, our study explains the development of users' empowerment based on the IS acceptance and use model, i.e., UTAUT (Venkatesh et al., 2003). This study especially highlights how the four determinants of UTAUT lead to the

development of users' motivations (i.e., users' empowerment).

The findings of this study offer suggestions for management about how to increase the level of IS routinization and achieve IS infusion in line with the IT implementation stage model. To attain IS infusion, it is important to develop users' empowerment as a way for users to be highly motivated to exploit the full potential of a system, surpassing the mandated usage. This study further suggests the development of users' empowerment based on the four UTAUT determinants (performance expectancy, effort expectancy, social influence, and facilitating conditions). As another way to attain IS infusion, it is important to attain IS routinization. The findings of this study suggest the attainment of IS routinization based on the two determinants of UTAUT (performance expectancy and social influence).

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