TASK-TECHNOLOGY FIT AND EMPLOYEES' EXPLORATION OF ENTERPRISE SYSTEMS: MODERATING ROLE OF LOCAL MANAGEMENT COMMITMENT

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Abstract

Based on task-technology fit theory and adaptive structuration theory, we propose that employees' exploration of enterprise systems is mainly influenced by three fundamental components: task, technology, and organizational environment. Accordingly, a research model is developed to interpret how task variety, system modularity, and local management commitment jointly affect employees' system exploration. The model is tested with a survey of enterprise system users in six firms, and several meaningful findings are yielded. First, all of the three antecedents can directly affect system exploration. Second, task variety can positively moderate the effects of system modularity on system exploration. Third, local management commitment can strengthen the effects of system modularity and task variety on employees' system exploration. The limitations and implications for research and practice are discussed.

Keywords: *System Exploration, Task Variety, System Modularity, Local Management Commitment, Enterprise Systems.*

1 INTRODUCTION

An enterprise system (ES) often consists of many functional modules and requires coordinated use by users from multiple business departments or units (Markus, Tanis et al. 2000; Sharma and Yetton 2007). Routine use mandated by the firm can only cover the basic functions of the introduced system and routine tasks. Due to dynamics of the work environment (Schyns 2004), employees' tasks are often featured as changing and full of uncertainty (Raub and Liao 2012). As they try to assimilate the system into their job tasks, employees often find that the defined routine use is insufficient, and the dynamic work context is likely to require them to go beyond routine use and explore more possible ways of applying the system to their tasks. By integrating those previously undiscovered features into their daily tasks, employees can achieve better task performance (Hsieh and Wang 2007; Magni, Maruping et al. 2011).

Research in the recent few years has greatly enhanced our understanding of system exploration (e.g., Ahuja and Thatcher 2005; Hsieh and Wang 2007; Magni, Maruping et al. 2011; Maruping and Magni 2012; Ke, Tan et al. 2013; Liang, Peng et al. 2015). However, some critical gaps still exist in the literature. First, as a creative behavior going beyond employees' routine job tasks (Ahuja and Thatcher 2005; Jasperson, Carter et al. 2005; Ke, Tan et al. 2013), system exploration can be influenced by task characteristics (Amabile 1988; Deci, Connell et al. 1989). Particularly, system exploration is often leveraged by employees to adapt to the changing job requirements. However, we have little knowledge on how the dynamic nature of work tasks impacts on employees' system exploration. Second, the effect of the system *per se* on employees' system exploration has been greatly neglected in the prior literature. At the functionality level, system exploration means applying multiple functions embedded in the system to accomplish various tasks (Saga and Zmud 1994; Hsieh and Wang 2007). However, to our knowledge, no research effort has been taken to investigate how functionality-level system characteristics affect users' system exploration.

Third, among the few studies which investigate how the work environment facilitates system exploration (Magni, Susan Taylor et al. 2010; Magni, Maruping et al. 2011; Maruping and Magni 2012), none of them has explored the IT-specific work environment which may provide us with more nuanced theoretical implications. Despite the consensus among scholars that facilitation from management can influence system use (e.g., Leonard-Barton 1987; Klein and Sorra 1996; Venkatesh, Morris et al. 2003), to our knowledge no research has been done to investigate how management facilitation influences employees' system exploration. Particularly with regard to enterprise systems which involve implementation in multiple business units, each unit's local management often takes responsibilities for the implementation and directly interacts with employees on a daily basis (Lewis, Agarwal et al. 2003; Peng, Fang et al. 2011). To this end, more research effort is needed to investigate how local management facilitation affects employees' system exploration.

The broad objective of this study is to explore antecedents of employees' exploration of enterprise systems. Based on task-technology fit (TTF) theory (Goodhue and Thompson 1995) and adaptive structuration theory (AST) (DeSanctis and Poole 1994), we propose that system exploration mainly derives from the interactions among three different components, i.e., task, technology, and organizational environment. Drawing upon prior relevant literature, and scrutinizing their fundamental linkages to system exploration, we identify task variety as a salient task characteristic (Morgeson and Humphrey 2006), modularity as a typical system characteristic (Davenport 1998; Chung, Tang et al. 2011), and local management commitment as a major environmental factor (Leonard-Barton 1987; Lewis, Agarwal et al. 2003). A research model is developed and empirically validated to explain how these variables affect employees' system exploration.

Several significant contributions can be made by this paper. First, while TTF and AST are often employed to investigate technology acceptance and use, we particularly extend them to studying users' exploration of complex information systems. Second, the positive impact of system modularity is a novel finding that has not been reported before. Third and more important, this study integrates an

environmental factor, local management commitment, into the research framework, and explains how it interacts with individual level antecedents so as to better predict system exploration.

2 THEORETICAL DEVELOPMENT

2.1 System Exploration

Contemporary enterprise systems are often characterized by feature-richness, which have provided great latitude in the types of tasks in organizations, and allowed uses to move beyond routine use to value-adding, creative use (Jasperson, Carter et al. 2005; Karahanna and Agarwal 2006; Maruping and Magni 2012). Orlikowski (1992) specifically suggests that many potential ways can be applied to appropriate technology in organizations, and users can choose to explore features of the introduced system to some certain extent. Following prior research, we conceptualize system exploration in this study as the extent to which a user experiments with new features and explore new ways of using the introduced system (Ahuja and Thatcher 2005; Karahanna and Agarwal 2006). It is suggested that different specific features in the systems have critical implications for employees' effectiveness and productivity (Burton-Jones and Straub 2006; Hsieh, Rai et al. 2011). By exploring the introduced system, employees in the organization can identify meaningful applications that may enhance their productivity (Magni, Maruping et al. 2011) or optimize organizational processes (Ahuja and Thatcher 2005).

Generally in organizational context, technology use can be conceptualized as using the introduced technology to accomplish tasks in the specific organizational environment (DeSanctis and Poole 1994), and prior research has identified some technological, task, and environmental antecedents for system exploration. For instance, Ahuja and Thatcher (2005) proposes that job autonomy is positively related to, while work overload can prevent users from system exploration. Perceived usefulness, attitude, and intrinsic motivation can also promote employees to explore the introduced system (Karahanna and Agarwal 2006; Li and Hsieh 2007). Magni (2010) has identified that hedonic and instrumental factors can motive users to explore new features of the system. Recently, Magni et al. (2011) and Maruping and Magni (2012) have further found that team-level climate can drive users to explore the introduced system. Although these studies have greatly improved our knowledge on system exploration, little research effort has been put on integrating the impact of task, technology, and organizational environment. To this end, our study attempts to fill this research gap in the literature.

2.2 Theoretical Framework

In this study, we employ task-technology fit (TTF) theory and adaptive structuration theory (AST) to develop the theoretical frame. According to TTF, the introduced technology is more likely to be used when the capabilities of the technology match the requirements of the tasks that users must perform (Goodhue and Thompson 1995). It is believed that TTF will be of great significance for studying enterprise system exploration. First, different from voluntary technologies, as a kind of mandated system (McAfee 2006), enterprise system requires users to employ the system to accomplish the defined tasks. As employees' daily tasks are embedded in the introduced system (Davenport 1998), it is believed that task characteristics can potentially generate influence on system exploration. Second, enterprise systems are composed of multiple sub-systems and a great deal of functionalities, exploring the system means using some specific functions to accomplish the relevant tasks. Thus, system's technical characteristics can potentially influence system exploration. Third and more importantly, employees' daily business activities are tightly linked with the functionalities of the system; there are potential "fit" between task and technology. System exploration can be considered as the process of searching for the "fit", such that task characteristics and technology characteristics may interact with each other and thus impact on system exploration.

While TTF is meaningful for explaining how technology is appropriated regarding work tasks, it does not take the influence of organizational contextual factors under consideration. Following Liang et al. (2015), we employ adaptive structuration theory (AST) to integrate organizational factors into the research frame with task and technology. Specifically, AST suggests that task, technology, and organizational environment can interact with each other so as to appropriate the focal technology (DeSanctis and Poole 1994). Despite different theoretical nuances, both AST and TTF suggest that the impacts of IT are determined by how IT is adapted to tasks rather than by IT itself alone. Due to the social nature of IT (Orlikowski 1992), it is believed that the process of adaptation is inevitably influenced by various social structures in the organizational environment (DeSanctis and Poole 1994). While TTF underlines the instrumental role of technology, AST focuses on the impact of organizational environment on technology usage. Thus, AST can actually complement TTF with the involvement of organizational environment. And based on AST and TTF, we propose that the antecedents of employees' system exploration mainly stem from three aspects: task characteristics, system characteristics, and organizational environment. In following paragraphs, we will identify task variety as task characteristic, system modularity as system characteristic, and local management commitment as an organizational environmental factor.

2.2.1 Task Variety

Although prior literature has identified various task characteristics (Hackman and Oldham 1976; Oldham and Cummings 1996; Morgeson and Humphrey 2006), we focus on task variety because it's fundamental connections with system per se and system exploration, and also represents the dynamic nature of current work context. Following prior research (Barling, Kelloway et al. 2003; Morgeson and Humphrey 2006), task variety is defined as the extent to which an individual engages in a wide range of tasks at work, and it represents the dynamic nature of work tasks. Practically, business processes are embedded in the introduced enterprise system (Davenport 1998), and different tasks are accomplished by using specific features of the system. To this end, various tasks are interlinked with different system features, and tasks and technology are inherently inseparable (Orlikowski and Scott 2009). Further, task variety has critical implications for system exploration. First and obviously, when employees' tasks are characterized as high variety, they are more likely to be exposed to new system features that they have to learn before they can use them. Second and implicitly, high-level task variety requires employees to possess business knowledge in various task domains (Hackman 1987), and the integration of the different knowledge enables the employees to adapt the system to several interdependent tasks (Burton-Jones and Granger 2013).

2.2.2 System Modularity

Among various system characteristics, we focus on modularity because it has been recognized as the most significant characteristic of enterprise systems (e.g., Uwizeyemungu and Raymond 2005; Chung, Tang et al. 2011), and it is particularly significant for employees' exploration of enterprise systems. Theoretically, system modularity refers to the extent to which modules of the implemented enterprise system can be separated and recombined (e.g., Schilling 2000; Chung, Tang et al. 2011). In practice, modules in enterprise systems are tightly linked to business tasks, and high system modularity can provide users with reusable modules which can be flexibly applied to changing task domains. Further, while high system modularity provides employees with more potential ways of attaining business goals (Jasperson, Carter et al. 2005), it is argued that this potential would not be realized unless employees can well handle the modularity for effectively accomplishing the work tasks. Thus, the impact of system modularity on system exploration is likely to go beyond just the main effect, and it is possible that system modularity interact with work tasks to affect system exploration. This theoretical point will be more fully discussed in the hypothesis development section.

2.2.3 Local Management Commitment

While top management makes the decision of implementation, business units' local management directly interact with employees and actually takes responsibility for reaping benefits from the introduced system (Markus, Tanis et al. 2000). It is possible that an enterprise system is either underutilized or inappropriately utilized due to factors within a particular local context (Orlikowski, Yates et al. 1995) for which the local management takes responsibility and with which it is familiar. Theoretically, local management plays the role of human agency (Liang, Saraf et al. 2007), and can translate the top management's messages into managerial actions, which in turn can affect employees' perceptions and behavior (Lewis, Agarwal et al. 2003). Following Lewis et al. (2003), we employ local management commitment to depict facilitation from local management. Accordingly, local management commitment is defined as the extent to which local management encourages and supports employees to engage in, and recognizes their effort in adapting to, system usage. Practically, local management commitment represents the most direct managerial action that is related to system usage.

With high local management commitment, employees are likely to believe that their system exploration behavior, which aims at enhancing productivity, would be encouraged and recognized by local management. And prior research has particularly suggested that local management commitment can influence employees' selective use of the features of the introduced system (Purvis, Sambamurthy et al. 2001). Further, when applying an enterprise system to conducting their work tasks, employees often experience ambiguity with regard to the value of the introduced system (Weick 1990). Specifically, employees may be confronted with difficulties when appropriating technology for their work tasks. It is believed that, with high level local management commitment, these difficulties will to some extent be reduced. From this point of view, local management can potentially moderate the effects of task and technology on system exploration. And this theoretical point will be discussed in detail in next section.

3 RESEARCH MODEL AND HYPOTHESES

Figure 1 depicts the research model of this study. First, we propose that task variety, system modularity, and local management commitment can directly impact on system exploration (i.e., H1, H2, and H4). More importantly, it is proposed that these three antecedents can interact with each other so as to further predict employees' exploration of enterprise systems (i.e., H3, H5, and H6).

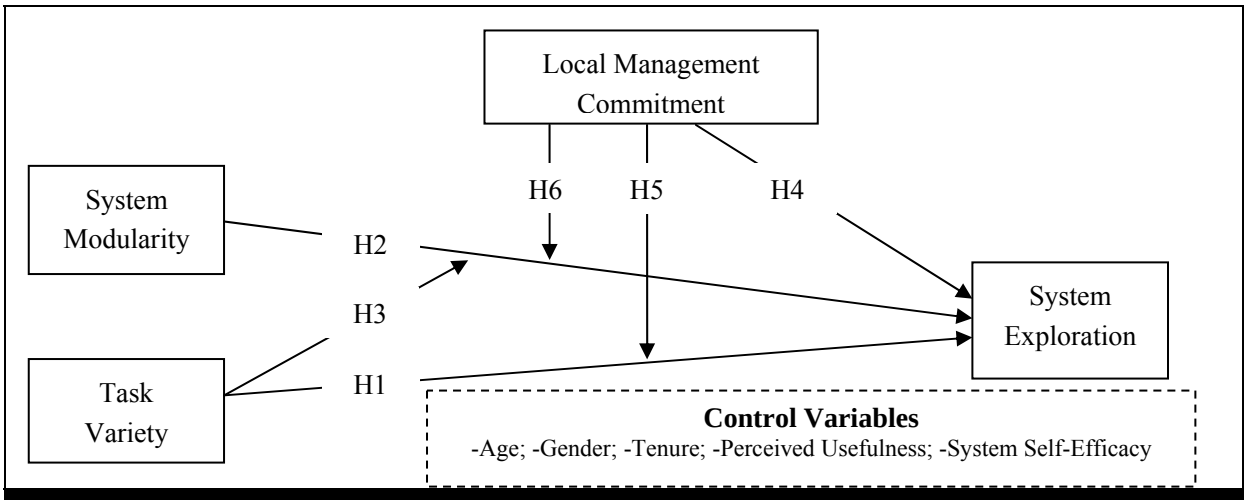

Figure 1. Research Model

3.1 Impacts of Task and Technology

It is proposed that employees whose job tasks are featured as high variety are more likely to explore the introduced enterprise systems. First and generally, high-level task variety requires employees to apply a set of different skills to effectively perform the tasks, such that employees are more likely to find their job enriching and motivating (Hackman and Oldham 1976; Morgeson and Humphrey 2006), which in turn can stimulate them to make more efforts in their jobs (Coelho and Augusto 2010), and be interested in finding new methods to solve problems or creatively accomplishing their job tasks (Oldham and Cummings 1996). This suggests that employees with high-level task variety are more likely to explore the introduced system.

Second and specifically, contemporary firms' businesses are deeply embedded in the introduced enterprise systems, and employees' daily work tasks are tightly interlinked with system functions (Davenport 1998; Orlikowski and Scott 2008). From this point of view, task variety requires employees to engage in using a variety of features and modules of the system, and this type of use would enable employees to better understand the way the system operates, which in turn inspires them to integrate the new features and functions, and thus more effectively accomplish their work tasks. Further, employees with high-level task variety tend to encounter new problems that cannot be solved with existing system skills, such that they have to explore the system to learn new skills to solve the problems. To this end, task variety can create opportunities that stimulate employees to perform system exploration. Thus, we hypothesize:

H1: *Task variety is positively related to employees' system exploration.*

System modularity is proposed to positively impact on employees' system exploration. Generally, employees' involvement in system exploration, which is an extra-role behavior (Karahanna and Agarwal 2006), is dependent upon their evaluation of the tradeoff between perceived cost (including time, money, energy, or other resources) and perceived gains (Aspinwall 2005). From this point of view, reducing perceived cost can increase the likelihood that employees explore the introduced enterprise system. Prior research suggests that system modularity provides employees with reusable modules, which can be flexibly adapted to multiple work tasks (Duncan 1995) and mitigate task ambiguity (Sussman and Guinan 1999), and can greatly reduce employees' cognitive load with regard to technology use (Byrd and Turner 2000). That is, system modularity implies less perceived cost, which in turn can stimulate employees to explore the introduced enterprise system (Parker, Bindl et al. 2010).

Further, prior literature has suggested that freedom and flexibility, with which employees can play with ideas, and expand the range of possibilities and materials from which a solution may emerge, are critical for employees to be creative in workplace (Amabile 1983; 1988). Echoing in this study, system modularity provides employees with increased autonomy and room for system exploration. On one hand, system modules spread in the whole business structure (Chung, Tang et al. 2011), which in turn allow employees to adapt defined functionalities to new task domains. On the other hand, system modularity makes the introduced system loosely coupled with separated modules (Duncan 1995), which in turn would potentially allow employees to apply new functionalities to more effectively accomplishing existing work tasks. Based on the arguments above, we propose:

H2*: System modularity is positively related to employees' system exploration.*

We further propose that the effect of system modularity on system exploration is contingent upon task variety. According to TTF, the introduced technology are more likely to be appropriated in the work place when the technology can satisfy the requirements of the tasks (Goodhue and Thompson 1995). When employees perform various tasks, they are required to engage in using multiple system modules or functions which are interlinked with these tasks (Davenport 1998). More specifically, with high-level task variety, employees are motivated to either adapt existing modules to more tasks or employ new modules to the changing tasks; otherwise, their work performance would be negatively influenced,

such that the perceived cost is likely to increase. Further based on theory of creativity, task variety stimulate employees to believe that their job is enriching and motivating (Hackman and Oldham 1976; Morgeson and Humphrey 2006), such that they are interested in finding new methods to solve problems or creatively accomplishing their job tasks (Oldham and Cummings 1996). From this point of view, with high task variety, employees are likely to be more actively involve in, and to believe that it is more meaningful for them to engage in, integrating multiple system modules into various tasks. Thus, we hypothesize:

H3: *Task variety can positively moderate the relationship between system modularity and system exploration, such that when task variety is perceived as high, the positive effect of system modularity on system exploration would be strengthened.*

3.2 Impact of Local Management Commitment

It is proposed that local management commitment can directly impact on employees' system exploration. In general, local management directly interacts with employees in daily work, and often practically takes responsibilities for reaping benefits from the introduced system, it is thus believed that local management can affect employees' system usage (Lewis, Agarwal et al. 2003; Liang, Saraf et al. 2007). While employees' system exploration often orientated toward more effective task accomplishment (Ahuja and Thatcher 2005; Karahanna and Agarwal 2006), which can potentially contribute to the return from the investment on enterprise systems, local management is likely to expect and desire employees to engage in system exploration which in turn may stimulate employees to behave as expected. More specifically, when local management commitment is high, employees are likely to believe that they should engage in exploration behavior, the behavior is legal, and the behavior is even encouraged and rewarded (Orlikowski 1992; Scott 1995). Further, high local management commitment also implies that exploration behaviour is more likely to be compensated and rewarded, indicating a preferred trade-off between cost and benefit, which can actually drive employees to engage in exploration behavior (Aspinwall 2005). Based on the arguments above, it is hypothesized that:

H4: Local *management commitment is positively related to employees' system exploration.*

Despite that task variety can directly impact on employees' system exploration, we propose that this direct effect is positively moderated by local management commitment. As discussed, high-level task variety would stimulate employees to put more effort in their job tasks, including more effort on system exploration. With high local management commitment, employees' effort on system use will be encouraged and recognized (Lewis, Agarwal et al. 2003). That is, in the presence of more local management facilitation, task variety will stimulate employees to put more effort on, which in turn results in more system exploration. Further, task variety often implies ambiguity and risk for system use (Weick 1990). Particularly with regard to some unfamiliar tasks, the attempt of applying specific functions to these tasks may turn to be a failure and even mistake. However, with high local management commitment, employees are likely to believe that the potential risks of applying the system to these tasks would not bring them into troubles, such that they will be more actively involve in system exploration. Therefore, we hypothesize:

H5: *Local management commitment can positively moderate the relationship between task variety and system exploration, such that when local management commitment is perceived as high, the positive effect of task variety on system exploration would be strengthened.*

As suggested by prior literature, how a technology is appropriated is contingent upon the surrounded social and organizational context (e.g., Zuboff 1988; Orlikowski 1992). From this point of view, the degree to which an employee explores different modules to accomplishing tasks is contingent upon local management commitment (which is a kind of organizational context). Practically, system exploration involves some uncertainty and potential risks (e.g., low productivity due to recombining modules, even mistakes due to using unfamiliar functions), which can prevent employees from conducting this behavior (Weick 1990), system modularity can potentially reduce the perceived cost.

In the presence of high local management commitment, employees are likely to believe that their work context is safe and supportive for risk taking with regard to system usage (Lewis, Agarwal et al. 2003). That is, even employees make some mistakes due to system exploration, they are not likely to be punished, which can actually further lower down employees' perceived cost of experimenting with different modules and practically applying the modules to their daily tasks. Additionally, while system modularity provides employees with increased autonomy and room for system exploration, local management commitment guarantees that the promised autonomy and room are legal and practically available in the work context (Lewis, Agarwal et al. 2003). Based on the arguments above, we propose:

H6: *Local management commitment can positively moderate the relationship between system modularity and systems exploration, such that when local management commitment is perceived as high, the positive effect of system modularity on system exploration would be strengthened.*

4 RESEARCH METHOD

4.1 Data Collection

To test the hypotheses, a field survey was conducted in six Chinese firms which have already implemented ERP systems. Generally, these firms are operating in six industries respectively, belong to three ownership types, employ four ERP providers, and have implemented ERP for an average of 3.67 years. 240 employees from six different functional areas (accounting, marketing, manufacturing, purchasing, R&D, and marketing) in these companies were selected as survey respondents based on following two criteria: (1) the respondents have the experience of using an ERP system for at least one year, and (2) they depend on the ERP system to accomplish their daily work tasks. With the facilitation of the top managers in these firms, 240 paper-based questionnaires were distributed to the respondents by either department head or firm human resource office.

A total of 221 respondents returned the survey questionnaire, with a response rate of 92.1%. Because of excessive missing data, 8 questionnaires were dropped, leaving 213 valid samples for the final data analysis. Among the 213 subjects, 94 (44.1%) were male, and 119 (55.9%) were female. A majority of the respondents age from 20 to 39 (93%), and most of them have an associate, bachelor's degree, or above educational levels (95.3%).

4.2 Measurement Development

Generally, all the measures were adapted or adopted from existing validated scales, and takes seven-point Likert style, ranging from 1 "strongly disagree" to 7 "strongly agree". We adopted Ahuja and Thatcher's (2005) and Karahanna and Agarwal's (2006) instruments for system exploration. In this study, task variety was measured by following Morgeson and Humphrey (2006). Measures for system modularity were adapted from prior relevant research (Rivard, Poirier et al. 1997; Byrd and Turner 2000). And the items for local management commitment was adapted from Lewis et al. (2003). Moreover, two control variables, i.e., perceived usefulness, and system self-efficacy, which were considered as antecedents of system exploration in prior research were included in this study. Specifically, items for both perceived usefulness and system self-efficacy were adopted from Venkatesh and Bala (2008).

5 DATA ANALYSIS

5.1 Measurement Model and Common Method Bias

The constructs were validated by examining their reliability, convergent validity, and discriminant validity. First, construct reliability was assessed by checking composite reliability, Cronbach's alpha, and individual item loadings. As shown in Table 1, all of the values for composite reliability and Cronbach's alpha were greater than the threshold of 0.70, indicating good construct reliability (Hair, Anderson et al. 1998). Second,as shown in Table 2, all of the individual item loadings were greater than the threshold of 0.60 (Barclay, Higgins et al. 1995; Chin 1998b), indicating an acceptable convergent validity (Comrey 1973). Further, discriminant validity was assessed based on two methods: (1) checking whether the item loadings on their own construct were greater than the loadings on other constructs, and (2) checking if a construct's square root of AVE is greater than its correlation with other constructs (Fornell and Larcker 1981). The results in Table 1 and Table 2 indicate good discriminant validity.

Table 1. Statistics and Correlations

	CR	Alpha	Mean	S.D.	1	2	3	4	5	6
1. EXPL	0.949	0.919	4.881	1.166	**0.928**					
2. SYMO	0.891	0.817	5.103	0.995	0.426	**0.855**				
3. TKVA	0.938	0.911	5.034	1.133	0.300	0.285	**0.889**			
4. LMCM	0.948	0.932	5.350	1.046	0.455	0.465	0.266	**0.886**		
5. PU	0.941	0.917	4.914	1.246	0.239	0.195	0.288	0.327	**0.894**	
6. ITSE	0.843	0.759	5.002	1.036	0.503	0.313	0.113	0.215	0.203	**0.758**

Note: CR-Composite Reliability; Alpha-Cronbach's Alpha; S.D.-Standard Deviation; EXPL-System Exploration; SYMO-System Modularity; TKVA-Task Variety; LMCM-Local Management Commitment; PU-Perceived Usefulness; ITSE-System Self-efficacy;
The values on the diagonal line are the square roots of AVE.

Table 2. Loadings-Cross Loadings

	EXPL	SYMO	TKVA	LMCM	PU	ITSE
EXPL1	**0.923**	0.438	0.312	0.442	0.174	0.499
EXPL2	**0.954**	0.378	0.290	0.437	0.230	0.441
EXPL3	**0.907**	0.365	0.227	0.383	0.268	0.457
SYMO1	0.385	**0.841**	0.272	0.436	0.109	0.351
SYMO2	0.364	**0.858**	0.207	0.343	0.174	0.243
SYMO3	0.341	**0.867**	0.249	0.411	0.223	0.201
TKVA1	0.273	0.182	**0.851**	0.283	0.300	0.105
TKVA2	0.252	0.227	**0.898**	0.190	0.199	0.084
TKVA3	0.267	0.279	**0.904**	0.222	0.275	0.094
TKVA4	0.273	0.320	**0.901**	0.245	0.246	0.116
LMCM1	0.494	0.468	0.228	**0.906**	0.252	0.247
LMCM2	0.385	0.467	0.222	**0.917**	0.288	0.151
LMCM3	0.380	0.337	0.218	**0.879**	0.335	0.113
LMCM4	0.343	0.391	0.283	**0.851**	0.267	0.193
LMCM5	0.384	0.381	0.235	**0.878**	0.318	0.234
PU1	0.192	0.218	0.344	0.269	**0.884**	0.170
PU2	0.229	0.226	0.257	0.324	**0.929**	0.209
PU3	0.187	0.174	0.300	0.303	**0.874**	0.113
PU4	0.238	0.090	0.156	0.273	**0.888**	0.219
ITSE1	0.433	0.271	0.121	0.106	0.113	**0.754**
ITSE2	0.391	0.246	-0.018	0.267	0.187	**0.773**
ITSE3	0.219	0.083	0.087	0.129	0.128	**0.682**
ITSE4	0.419	0.284	0.148	0.150	0.184	**0.816**

Table 1 also presents the descriptive statistics including the mean value, standardized deviation, and correlations of all the variables. Due to the relatively high correlations among some constructs, a co-linearity diagnostics was conducted. The results indicated that the VIFs for all the constructs were much smaller than the threshold of 3.3 (Diamantopoulos and Siguaw 2006), indicating that multicollinearity was not a concern for our study. Besides, due to the self-reported nature of the collected data, it is necessary to tests severity of common method bias (Podsakoff, MacKenzie et al. 2003). First, Harman's one-factor test (Podsakoff and Organ 1986) shows that the first construct only explains 17.6% of the variance, indicating that this study did not suffer from high common method bias. Second, a well-established rigorous analysis proposed by Podsakoff et al. (2003) and tailored to PLS analysis by Liang et al. (2007) was further employed to test common method bias. The results in indicate that for each item the variance explained by its theoretical construct is much greater than the variance explained by the latent method factor, suggesting that common method is not likely to be a serious concern.

5.1 Structural Model

Table 3 depicts the results for the hypothesized relationships. First, all of the three direct effects were proved to be statistically significant. Specifically, task variety (β=0.137, $p<0.05$) and system modularity (β=0.135, $p<0.05$) had significant impacts upon system exploration. Therefore, H1 and H2 were supported. Local management commitment can significantly influence system exploration (β=0.300, $p<0.01$), H3 was thus supported. And all of the antecedents (including both control variables and the focused IVs) together can explain 44.1% of the variance in system exploration. Further, following Cohen (1988), we calculated the effect size by comparing Model 2 (with both control variables and the focused IVs) with Model 1 (with only control variables). As shown in Table 3, it can be concluded that adding the focused IVs ($\triangle R^2$=0.158, f^2-statistics=0.283) can significantly increase the effect size of the antecedents of system exploration (Cohen 1988).

Table 3. Summary of PLS Results

Independent Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Age	0.050	0.046	0.039	0.026	0.032
Gender	-0.072	-0.129*	-0.114$^+$	-0.100	-0.131$^+$
Tenure	-0.089	-0.105	-0.095	-0.085	-0.099
Perceived Usefulness (PU)	0.149*	0.008	-0.012	-0.010	0.026
System Self-efficacy (ITSE)	0.452**	0.351**	0.370**	0.4392**	0.349**
Task Variety (TKVA)		0.137*	0.135*	0.123*	0.121*
System Modularity (SYMO)		0.135*	0.144*	0.093	0.089
Local Management Commitment (LMCM)		0.300**	0.279**	0.335**	0.339**
TKVA ×SYMO			0.127*		
TKVA ×LMCM				0.218**	
SYMO ×LMCM					0.131$^+$
R^2	0.283	0.441	0.455	0.484	0.455
$\triangle R^2$		0.158	0.014	0.043	0.014
f^2-statistics		0.283	0.025	0.083	0.025

Note: Following prior research (Cohen 1988), Cohen's f^2-statistics was employed to test model effect size. Specifically, f^2-statistics=$(R_{AB}^2 - R_A^2)/(1-R_{AB}^2)$, where R_A^2 is the variance explained by a set of independent variables A, and R_{AB}^2 is the combined variance explained by A and another set of independent variables B.
Gender: 1-Male, 2-Female; $^+p<0.1$; * $p<0.05$; **$p<0.01$

The three moderating effects were justified by testing Model 3-5. In Model 3, the interaction item (i.e. SYMO ×TKVA) was added in, and the result indicated that the path coefficient for the moderation effect of task variety on the relationship between system modularity and system exploration was positive and significant (β=0.127, $p<0.05$). Therefore, H4 was supported. Similarly, H5 and H6 were

justified via testing Model 4 and 5 respectively. As shown in Table 3, results showed that the path coefficients for the moderating effects were slightly different (β=0.218, $p<0.01$ for TKVA ×LMCM; β=0.131, $0.05<p<0.1$ for SYMO ×LMCM), thus, H5 was supported, while H6 was partially supported. Further, following Cohen (1988), we calculated the effect size by comparing Model 4-6 (with interaction effect) with Model 2 (with IVs' direct effects) respectively. The results in Table 3 ($\triangle R^2$=0.014, f^2-statistics=0.025 for Model 3; $\triangle R^2$=0.043, f^2-statistics=0.083 for Model 4; $\triangle R^2$=0.014, f^2-statistics=0.025 for Model 5) indicated that adding the moderating effects can significantly improve the predicting power of the research model (Chin, Marcolin et al. 2003).

6 DISCUSSION, IMPLICATIONS, AND CONCLUSION

6.1 Discussion of Findings

Our results support most of the hypotheses, yielding interesting findings. First, task variety can directly and positively impact on employees' system exploration. The finding extends our knowledge on the impacts of job properties on system exploration (Ahuja and Thatcher 2005). Second, as expected, system modularity is positively related to system exploration. This finding suggests that technology per se, which has been greatly ignored in prior relevant literature, is also significant for employees' system exploration. Further, the results also indicate that the effect of system modularity on system exploration is dependent upon task variety. This finding suggests that system exploration is actually a process of employees' searching for "fit" between technology and tasks, which in turn confirms that TTF theory can be extended to investigating users' exploration behavior.

While local management commitment has been identified as antecedents for users' belief and behavior (Lewis, Agarwal et al. 2003), this study further suggests that local management can either directly facilitate, or indirectly interact with task and technology per se so as to affect employees' system exploration. Specifically, as expected, local management commitment can directly impact on system exploration. This finding suggests that the facilitation and support of local management is prerequisite for not only the routine use, but also the deep use of the introduced system. Also as expected, local management commitment can strengthen the relationship between task variety and system exploration. This finding further extends our knowledge on the effect of task characteristic on system exploration by additionally underlining that task characteristic can interact with organizational context (local management commitment in this study) so as to better facilitate the exploration of the introduced system. Slightly different from our expectation, the moderation effect of local management commitment on the relationship between system modularity and system exploration is partially other than fully supported. Possible explanations are as following: on one hand, because at post-implementation stage, employees have already got familiar with local management's view with regard to system use, such that they are likely to believe the local management can not guarantee more autonomy and room for system use. On the other hand, as a kind of extra-role behavior (Karahanna and Agarwal 2006), employees' system exploration is likely to involve a deliberate decision process in which they assess the likely outcomes of the behavior (Parker, Williams et al. 2006), and only with enough perceived control of situation (i.e., control appraisal) can employees engage in system exploration (Frese and Fay 2001). Wile local management commitment provide employees with a safe and autonomous work context, it also defines the scope of system use due to the mandated nature (McAfee 2006), indicating that it is hard for employees to judge whether they have enough control with regard to dealing with multiple modules in the introduced system.

6.2 Limitations and Future Research

The interpretation of our research findings should take several limitations under consideration. First, while users' evaluation of the introduced system may vary over time (Karahanna, Straub et al. 1999), our cross-sectional research design has some limitations in providing causalities between research

variables. Future studies would draw upon a longitudinal design so as to further extend our understanding of the antecedents of system exploration. Second, despite prior research has suggested that many organizational factors can shape innovative behavior (Amabile 1988; Oldham and Cummings 1996), we underline the role of local management commitment. It is obvious that future research can step forward by integrating more relevant organizational factors in the research frame, such that a more comprehensive understanding of system exploration would be achieved. Third, there is only one type of enterprise systems, i.e., ERP, this may limit the generalizability of this research. Future research may extend the generalizability of this study by replicating it with involving more types of enterprise systems. By scrutinizing the differences among a couple of enterprise systems, future studies would draw a more comprehensive picture of system exploration and use.

6.3 Theoretical Implications

This study makes several significant theoretical implications. First, while TTF and AST are often employed to investigate technology acceptance and use, this study particularly extend the two theories to investigating users' exploration of complex information systems. Particularly by integrating TTF and AST, we propose that user's system exploration derives from the antecedents from three areas: task, technology, and organizational environment. While prior research only include only some of the three type of antecedents for system exploration (Ahuja and Thatcher 2005; Maruping and Magni 2012; Ke, Tan et al. 2013), we theoretically justify that they can be integrated into a single research frame, and identified specific constructs and further empirically prove that the research frame is insightful for investigating the focal phenomenon. In general, the proposed research frame (based on TTF and AST) can provide a more comprehensive research frame for future studies on technology acceptance and use in general, and deep system use in particular.

Second, going beyond prior research on investigating the role of task properties in affecting system exploration (e.g., Ahuja and Thatcher 2005), we integrate two critical yet understudied factors, i.e., system modularity and task variety into the research frame based on task-technology fit theory. The positive impact of system modularity is a novel finding that has not been reported before, indicating that technology can impact on system exploration at functionality level. Further, system modularity' direct effect on system exploration is moderated by task variety and local management commitment, implying that we need to avoid technology determinism regarding system exploration. That is, although technology per se is important, its effect on system exploration is dependent upon whether it can "fit" with employees' work tasks, or whether the work context is supportive or not.

Third, this study integrates an environmental factor, i.e., local management commitment into the research frame, and explains how it interacts with individual level antecedents so as to further predict system exploration. Specifically, local management commitment can positively moderate the effects of task variety and system modularity on employees' system exploration. These findings confirm that relational characteristics of information systems, i.e., the systems imply relationships between employees and the organization/supervisor, do generate influence upon technology acceptance and use (e.g., Joshi 1991; Orlikowski 1992). Particularly by doing so, this study can stimulate researchers to investigate more factors that represent the relational nature of information systems and their impacts on system exploration.

6.4 Practical Implications

This study can also make several important practical implications for practitioners concerning returns from enterprise system investment. Specifically, due to the significant either direct or moderation effects, it is necessary for firms to take managerial actions to deal with system modularity, task variety, and local management commitment. First, several managerial measures can be employed to enhance system modularity. At the system design stage, both inside and outside (e.g., system provider) IT professionals need to scrutinize the "best practice" of the firm, and actually embed these best practices

in the modules. And they also need to write out operation manual for employees in a simple and easy way, with specific illustration of the potential applications of the modules. Considering that system modules are interlinked with employees' tasks (Davenport 1998), top management may initiate task redesign so as to better appropriate technological modules for tasks, which in turn would make employees perceive that the system modules is flexible for work tasks.

Second, multiple managerial activities can be done to balance task variety for exploration and performance. For instance, the management can reconstruct jobs via either adding more relevant task activities to employees' current job (Morgeson and Campion 2003; Morgeson, Delaney-Klinger et al. 2005), or requiring the coordination among employees and work groups so as to broaden employees' duties and activities in the workplace (e.g., Gist and Mitchell 1992). Third, to increase local management commitment: on one hand, the top management can establish good relationship with local management so as to actually make local managers are committed to system implementation, which in turn increase employees' perception local management commitment (Peng, Fang et al. 2011); on the other hand, local managers need to frequently communicate with employees, such that employees are likely to believe that the local management underlines and support system implementation and use.

6.5 CONCLUSION

Employees' system exploration is critical for contemporary firms to reap benefits from the investment on enterprise systems. By integrating task-technology fit theory and adaptive structuration theory, we propose that employees' exploration of enterprise systems mainly derives from three fundamental components: task, technology, and organizational environment. Three specific factors (i.e., task variety, system modularity, and local management commitment) representing the fundamental components are identified as critical antecedents for employees' system exploration, and a research model is proposed and empirically validated. The findings reveal (1) both system modularity and task variety can directly affect employees' system exploration; and the direct effect of system modularity is positively moderated by task variety; (2) local management commitment can either directly affect, or positively moderate the relationships between task variety/system modularity and system exploration. In all, this paper makes research contributions to literature by: (1) particularly extending TTF and AST to investigating users' exploration of complex information systems, and proposing a comprehensive research frame (including task, technology, and organizational environment) to predict system exploration; (2) revealing that task variety and system modularity can interact with each other so as to further predict system exploration; and (3) integrating an environmental factor which represents the relational nature of information systems into the research frame, and explains how it interacts with individual level factors. Particularly, the study's attempt to explore the interaction effects among task, technological, and organizational antecedents opens a new window for future research to more comprehensively investigate the focused phenomenon, which in turn can advance our knowledge and understanding of technology acceptance and use.

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