2009

A Motivational Account for Post-Acceptance Routine and Innovative Use: Introducing the Concept of Tri-Dimensional Intrinsic Motivation

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Recommended Citation

Li, Xixi; Po-An Hsieh, J. J.; and Rai, Arun, "A Motivational Account for Post-Acceptance Routine and Innovative Use: Introducing the Concept of Tri-Dimensional Intrinsic Motivation" (2009). ICIS 2009 Proceedings. Paper 177. http://aisel.aisnet.org/icis2009/177.

1-1-2009

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A MOTIVATIONAL ACCOUNT FOR POST-ACCEPTANCE ROUTINE AND INNOVATIVE USE: INTRODUCING THE CONCEPT OF TRI-DIMENSIONAL INTRINSIC MOTIVATION

Completed Research Paper

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Abstract

We conceptualize two distinct post-acceptance usage behaviors: (1) routine use (RTN) refers to the use of information system (IS) consistent with normal work processes and (2) innovative use (INV) means users' applying system features in novel ways. While RTN helps integrate the implemented IS into work processes, INV further extracts the value of the IS. Drawing on motivation theory, we propose a tri-dimensional intrinsic motivation (3D-IM) construct and hypothesize about the differential roles of intrinsic motivation (IM) and extrinsic motivation (EM) in explaining RTN and INV. Our first study confirms the measurement model of 3D-IM and illustrates its superior predictive power over perceived enjoyment, a typical measure of IM in prior literature. Study 2 reveals the differential impacts of IM (measured as 3D-IM) and EM (measured as perceived usefulness) on INV and RTN. Specifically, relative to EM, IM has a stronger effect on INV but a weaker impact on RTN.

Keywords: routine use, innovative use, motivation theory, post-acceptance stage

A MOTIVATIONAL ACCOUNT FOR POST-ACCEPTANCE ROUTINE AND INNOVATIVE USE: INTRODUCING THE CONCEPT OF TRI-DIMENSIONAL INTRINSIC MOTIVATION

Introduction

'Routine' and 'innovative' behaviors usually coexist in various circumstances. For example, management scholars often evaluate employees' standard performance and innovative performance separately (Janssen 2001; Katz and Kahn 1966). Whereas standard performance refers to behaviors prescribed by management, innovative performance refers to when employees go beyond management's standards and develop creative ideas for organizational change. How to effectively manage these two types of behaviors simultaneously is always an intriguing challenge for both researchers and practitioners (Katz 1964). Such juxtaposition between routine and innovation can also be observed in the information systems (IS) context, especially when IS implementation processes enter the post-acceptance stage in which usage behaviors may diverge into different patterns (Cooper and Zmud 1990; Kwon and Zmud 1987).

IS are typically adopted at the organizational level, and top management usually expect employees to use these systems in some predefined manner as part of their job duties (Hartwick and Barki 1994; Seddon 1997). Nevertheless, users still have considerable discretion to decide in which way and to what extent they will apply the system to support their tasks (Silver 1990; 1991). The complex designs of modern IS also provide users with many opportunities to apply system features at different levels of sophistication (Karahanna and Agarwal 2006; Moore 2002). For instance, users can utilize system features in a routine and standardized manner that is consistent with work processes (Saga and Zmud 1994; Schwarz 2003). Routine use, defined here as system use consistent with normal work processes, represents users' familiarity with using the system and facilitates the integration of IS with work processes. Alternatively, users can apply system features in innovative fashions that go beyond the routine (Ahuja and Thatcher 2005; Jasperson et al. 2005). Innovative use, which refers to users' application of system features in novel ways to support their task performance, thereby enabling them to explore the value potential of implemented IS more fully (Jasperson et al. 2005). Given the distinct values of routine use and innovative use, how can management stimulate different types of usage behaviors among its employees?

In an attempt to answer this question, we examine routine use and innovative use from a motivational perspective and evaluate the impact of different types of motivation on these post-acceptance usage behaviors. According to motivation theory, people engage in activities because of two types of motivations: intrinsic motivation and extrinsic motivation. Intrinsic motivation refers to situations in which a person performs an activity for the joy or satisfaction derived from the activity itself; extrinsic motivation refers to situations in which a person performs an activity in the hope of gaining certain external benefits (e.g., rewards, money) other than the partaking in the activity itself (Deci and Ryan 2002).

Motivation theory has been applied in previous research to understand IS acceptance and use. IS scholars typically view perceived usefulness (PU) as the extrinsic motivator and perceived enjoyment (PE) as the intrinsic motivator for system use (Davis et al. 1992; Brown and Venkatesh 2005). However, we have found that these two types of motivations have received (1) imbalanced attention in IS research and (2) limited attention in terms of their differential roles in predicting post-acceptance usage behaviors.

While IS studies have widely recognized the influence of perceived usefulness on generic technology acceptance/use (Legris et al. 2003; Venkatesh et al. 2003), the importance of perceived enjoyment, which usually substitutes for intrinsic motivation, has been confined to hedonic system use (Fang et al. 2006; van der Heijden 2004). However, we suspect that this limited attention to intrinsic motivation toward using IS may be due to its oversimplified conceptualization in the IS domain. As suggested by Thomas and Velthouse (1990), intrinsic motivation in workplaces should be distinguished from intrinsic motivation in hedonic contexts. In workplace contexts, users usually do not find amusement in IS use as they tend to pay more attention to its utilitarian aspect for job related purposes. Nevertheless, system use in itself may still be enjoyable due to the meaningfulness, satisfaction, and fulfillment experienced by users throughout the process of technology application (Deci and Ryan 2002; Malone 1981; Maslow 1970; Vallerand 1997). Unfortunately, the notion of perceived enjoyment cannot fully capture the richness of these innately rewarding perceptions. Hence, in order to provide a more comprehensive and precise conceptualization of intrinsic motivation toward using IS in workplaces, we adapt and appropriate Vallerand's (1997) tri-dimensional intrinsic motivation construct (3D-IM) to the IS use context. The three dimensions of intrinsic motivation are intrinsic motivation toward accomplishment (IMap), intrinsic motivation to know (IMkw), and intrinsic motivation to experience stimulation (IMst).

In addition, most IS studies that have applied motivation theory in organizational contexts have concluded that extrinsic motivation (i.e., PU) is the dominant predictor for IS acceptance and use (e.g., Davis et al. 1992; Legris et al. 2003). However, creativity research suggests that intrinsic motivation has tremendous impact on innovative performance in organizations (Amabile 1996, 1998; Shin and Zhou 2003), whereas extrinsic motivation, though instrumental in enhancing common job performance, may hinder creativity (Bass 1998; Deci and Ryan 2002; McGraw 1978). Thus, considering both routine and innovative usage behaviors, together with the proposed richer conceptualization of intrinsic motivation, we challenge the predominant role of extrinsic motivation and argue for a more balanced view toward both extrinsic and intrinsic motivation for explaining post-acceptance use.

We aim to address the aforementioned knowledge gaps by (1) discussing two different post-acceptance usage behaviors – routine use and innovative use, which capture the routine and innovative aspects of IS use; (2) contextualizing and appropriating the 3D-IM construct to the IS use context, so as to enrich the conceptualization of users' intrinsic motivation toward using IS; and (3) examining the differential roles of extrinsic motivation and intrinsic motivation (i.e., 3D-IM) for explaining routine and innovative use in workplaces.

Routine Use and Innovative Use

According to Zmud and his colleagues (Cooper and Zmud 1990; Saga and Zmud 1994), IS implementation in an organization typically involves the following six stages: initiation, adoption, adaptation, acceptance, routinization, and infusion. While the first three stages primarily concern activities at more macro levels, such as at the organizational or departmental level, the latter three stages can manifest at both macro and micro levels. Specifically, at an individual level, *acceptance* reflects users' commitment to use the system, *routinization* describes the state in which system use is no longer perceived as out of the ordinary but actually becomes institutionalized, and *infusion* refers to the process of embedding an IS application deeply and comprehensively in the work system (Cooper and Zmud 1990; Saga and Zmud 1994). Routinization and infusion, which follow the acceptance stage, can be conceived together as the post-acceptance stage (Wang and Hsieh 2006). Importantly, while routine use and innovative use are typically associated with routinization and infusion stages, respectively (Sage and Zmud 1994; Ahuja and Thatcher 2005; Schwarz 2003), these two stages do not necessarily occur in sequence; they can actually take place in parallel (Cooper and Zmud 1990; Saga and Zmud 1994). Thus, although routine use and innovative use represent different aspects of post-acceptance behaviors, individuals can engage in both of them during the post-acceptance stage (Cooper and Zmud 1990; Saga and Zmud 1994).

Table 1 lists a review of the concepts relative to routine and innovative use. Three inter-related concepts, routine use (Schwarz 2003; Sundaram et al. 2007), standardized use (Saga and Zmud 1994), and (use) perceived as being normal (Saga and Zmud 1994), jointly suggest two key characteristics of routine use – (1) perceived as normal and (2) consistent with work processes – both of which are commonly expected by management. Therefore, we define routine use (RTN) as system use that is consistent with normal work processes. Routine use is a representative usage behavior during the routinization stage of the IS implementation process. During the routinization stage, system use would already be well integrated with an organization's work processes (Schwarz 2003), and using the system's features at work would be perceived as a normal part of job performance and no longer new to end-users (Saga and Zmud 1994). Implicitly, routine use involves users' compliance to a set of predefined rules and procedures when employing an IS to complete job-related tasks (Saga and Zmud 1994). Routine use, while signifying users' familiarity with system use, also institutionalizes procedures of system use (Saga and Zmud 1994).

On the other hand, a number of concepts have been introduced to explain individuals' creative application of IS. Examples include emergent use (Agarwal 2000; Saga and Zmud 1994; Wang and Hsieh 2006), individual feature extension (Jasperson et al. 2005), intention to explore (Nambisan et al. 1999), and trying to innovate with IT (Ahuja and Thatcher 2005) (see Table 1). By integrating the extant literature, we define innovative use (INV) as users' application of system features in novel ways to support their task performance. At the post-acceptance stage, through the accumulated direct experience and learning processes with IS, employees have the ability to apply system features in innovative ways, thereby further realizing the potential values of IS (Saga and Zmud 1994; Jasperson et al. 2005). The complexity and sophistication of modern IS, in particular, allow users to apply system features flexibly in creative ways (Agarwal 2000; Ahuja and Thatcher 2005; Saga and Zmud 1994; Wang and Hsieh 2006).

Table 1. Similar Usage Concepts in IS Literature

Usage Type	Sources
Routine Use	1. Routine use (Schwarz 2003) The extent to which an individual's work patterns are consistent with the technology 2. Routine use (Sundaram et al. 2007) The extent to which the use of the technology has been integrated into the salesperson's normal work routine 3. Standardized use (Saga and Zmud 1994) Users' using systems in a way as required by management 4. (Use) perceived as being normal (Saga and Zmud 1994) Users' perceiving system usage as normal
Innovative Use	1. Emergent use (Agarwal 2000; Saga and Zmud 1994) Users' using a technology in order to accomplish work tasks that were not feasible or recognized prior to the application of the technology to the work system 2. Emergent Use (Wang and Hsieh 2006) Users' using a technology in an innovative manner to support an individual's task performance 3. Individual feature extension (Jasperson et al. 2005) Users' discovering ways to apply features that go beyond the ways originally conceived by designers or implementers of the systems 4. Intention to explore (Nambisan et al. 1999) Users' willingness and purpose to explore an information system and identify its potential use 5. Trying to innovate with IT (Ahuja and Thatcher 2005) Users' goal of finding novel uses for information technologies

Although familiarity with the system is a common pre-requisite for both types of post-acceptance behaviors, what distinguishes innovative use from routine use lies in the idea that innovative use is essentially a self-driven behavior that builds on individual discretion (Silver 1990, 1991; Wang and Hsieh 2006). Toward this end, motivation theory offers a solid theoretical foundation for explaining these two usage types.

Motivation Theory

In general, people engage in activities due to two types of motivations: intrinsic motivation and extrinsic motivation (Deci and Ryan 2002). Intrinsic motivation refers to the state in which people perform an activity for no other reward that completing the activity itself, whereas extrinsic motivation refers to the state in which people complete tasks in order to gain benefits other than the merely partaking in the activity, such as rewards or money (Deci and Ryan 2002). While both kinds of motivations lead individuals to complete activities, intrinsic motivation, as compared to extrinsic motivation, tends to make individuals feel more passionate and enthusiastic about activities (Vallerand 1997). Further, intrinsic motivation, which gives individuals cognitive flexibility, enjoyment, and satisfaction while they perform activities, is often viewed as an important innovation stimulator (Amabile 1988, 1998; Shin and Zhou 2003; Tierney et al. 1999).

As mentioned earlier, IS studies in the past have contextualized and applied motivation theory to investigate technology acceptance and use (Venkatesh et al. 2003). Yet, we believe intrinsic motivation in the IS field is under-conceptualized. In the following section, we review the existing literature to examine users' extrinsic and intrinsic motivations toward using IS and propose our tri-dimensional conceptualization of intrinsic motivation toward IS use in workplaces.

Perceived Usefulness as Extrinsic Motivation toward Using IS

In the IS field, perceived usefulness (PU) is typically viewed as one most important example of extrinsic motivator toward using IS (Davis et al. 1992; Venkatesh et al. 2003). Over the past two decades, there has been strong empirical evidence suggesting that PU is the most salient determinant for general system use (Davis et al. 1989; Legris et al. 2003; Venkatesh et al. 2003). PU, as defined by Davis et al. (1989), refers to users' perception whether using an IS will effectively enhance their work performance. It is common that employees would like to improve their job performance, since they are informed by organizational rewarding structure that improved performance would lead to 'raises, promotion, bonuses, and other rewards' (Davis et al. 1989, p. 320; Venkatesh and Speier 1999; Venkatesh et al. 2003).

A Tri-Dimensional Conceptualization of Intrinsic Motivation toward Using IS

Perceived enjoyment (PE) derived from IS use is often conceived as intrinsic motivation (e.g., Brown and Venkatesh 2005; Davis et al. 1992; Hong and Tam 2006; Kamis et al. 2008; van der Heijden 2004; Venkatesh et al. 2003). While PU is the strongest determinant for general system use (Venkatesh et al. 2003), PE is suggested to be a focal factor for hedonic system use (van der Heijden 2004; Fang et al. 2006).

Several social psychologists, however, suggest that intrinsic motivation results not only from physical sensations (i.e., PE) but also from accomplishments and learning experiences from performing activities (Deci and Ryan 2002; Malone 1981; Maslow 1970; Vallerand 1997). However, the current IS literature on intrinsic motivation focuses almost exclusively on physical enjoyment, and excludes the joyful feelings that come from accomplishment and learning (e.g., Hsieh et al. 2008, forthcoming; Kamis et al. 2008; van der Heijden 2004; Venkatesh 1999).

To address this limitation in the conceptualization of intrinsic motivation in general, Vallerand and his colleagues propose a tri-dimensional intrinsic motivation (3D-IM) concept – intrinsic motivation toward accomplishments (IMap), intrinsic motivation to know (IMkw), and intrinsic motivation to experience stimulation (IMst) (Vallerand et al. 1989; Vallerand et al. 1992, 1993). According to Vallerand, most studies usually examine only one of the three aspects of intrinsic motivation, rather than taking an integrated perspective. Established through a meta-review approach, this tri-dimensional conceptualization of intrinsic motivation incorporates of the predominate types of intrinsic motivation that have been considered in the rich literature in social psychology (Vallerand and Briere 1990; Vallerand et al. 1989). IMap refers to the pleasure and satisfaction experienced while an individual is trying to strive beyond him/herself to achieve or innovate something (e.g., Kagan 1972; Nicholls 1984; White 1959). IMkw is the enjoyment one experiences when learning or exploring things (e.g., Berlyne 1971; Brophy 1987; Harter 1981). The last dimension, IMst, pertains to the intensely pleasant feelings associated with performing certain activities (e.g., Csikszentmihalyi 1978; Zuckerman 1979). Similar rationales have also been discussed by IS scholars. Specifically, Malone (1981) proposed three types of intrinsic motivating factors in computer games: challenge, curiosity, and fantasy (also see Piaget, 1951, 1952, 1971). The three intrinsic motivating factors suggested by Malone are indeed quite similar to the three dimensions identified by Vallerand, i.e. IMap – challenge, IMkw – curiosity, and IMst – fantasy.

The three dimensions of intrinsic motivation to different extents are driven by individuals' innate needs such as autonomy, competence, and relatedness (Deci and Ryan 2002; Vallerand 1997). For instance, IMap is stimulated when individuals want to prove their competence among counterparts; IMkw is aroused when individuals feel that knowing more than others could promote interaction with coworkers and thereby satisfy the need for relatedness; IMst is called by individuals' need for autonomy, as autonomy allows them to freely search for information and enjoy varieties of experiences and pleasure (Steenkamp and Burgess 2002; Steenkamp and Baumgartner 1992).

From an alternative perspective, the three dimensions also satisfy different aspects of individual innate needs in Maslow's hierarchy of needs (Maslow 1970). First, IMap meets individual desire for esteem and self-actualization. When individuals successfully solve problems, they realize their self-value; when they overcome difficulties, they feel the sense of accomplishment. Second, IMkw manifests individuals' needs to reduce uncertainty, i.e., safety need. Individuals display a tendency to explore when they feel unfamiliar with the surrounding environments (Berlyne 1950; White 1959). Hence, it is intuitive for individuals to strive to learn new things or understand something new when they encounter uncertain situations during daily work performance. Third, IMst is linked with hedonic needs, which belongs to the physiological category. Overall, the inclusive nature of the 3D-IM concept renders a more comprehensive and faithful conceptualization to capture the richness of intrinsic motivation.

Considering the comprehensiveness and richness of the 3D-IM concept, we contextualize and appropriate the three dimensions to the context of IS use in workplaces. We propose that intrinsic motivation toward using IS in workplaces is also manifested in three ways. From the viewpoint of individual IS users, IMap is defined as the pleasure and satisfaction that they experience when solving problems, overcoming difficulties, or making improvements in using the system; IMkw signifies the pleasure and satisfaction that they experience when learning new things or trying to understand something new in using the system; and IMst refers to the pleasure and satisfaction that users experience in using the system. Following earlier discussion, the three dimensions represent different aspects of enjoyment and satisfaction associated with the activity of using IS. In addition, perceived enjoyment (PE) in prior IS literature is define as the enjoyment users experience when using IS and often linked with hedonic IS use (e.g., van der Heijden 2004). With this root in hedonism, PE captures the physiological aspect of intrinsic motivation; however, it oversimplifies the innate needs for high-order realization. Also noted by Venkatesh (1999), the enjoyment and playfulness in computer training programs crystallizes primarily the fantasy part of intrinsic motivation (i.e., IMst), but not the challenge and curiosity aspects. Therefore, 3D-IM provides a more comprehensive conceptualization of users' intrinsic motivation toward using IS.

Research Model and Hypotheses

Below, we develop the research model and hypotheses to examine the motivational causes for routine use (RTN) and innovative use (INV). We propose that intrinsic motivation has a stronger impact on innovative use than extrinsic motivation (H_1 – Figure 1, p. 6) and that extrinsic motivation has a stronger impact on routine use than intrinsic motivation (H_2 – Figure 1).

H_1: INV as DV, $\beta_1 > \beta_2$

H_2: RTN as DV, $\beta_3 < \beta_4$

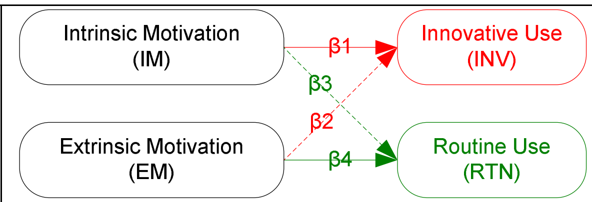


Figure 1. Research Model and Hypotheses

First, intrinsic motivation is likely to positively affect innovative use. Innovative use normally requires users to develop promising original ideas and to maintain their patience during numerous rounds of trial and error before a new solution emerges. Due to the spontaneous enthusiasm and interest that are aroused while users perform activities, intrinsic motivation, as compared to extrinsic motivation, is more effective for enhancing and sustaining people's cognitive flexibility and for developing users' commitment and perseverance to performing activities (McGraw and McCullers 1979; Shin and Zhou 2003; Vallerand 1997). The heightened interest in an activity itself motivates individuals to surpass formal requirements (Piccolo and Colquitt 2006) and/or to seek creative ways to perform tasks that satisfy their higher-order needs (Amabile 1996). Moreover, individuals with a high level of IMap are more inclined to concentrate on challenging tasks and are often more willing to try new alternatives, thus delivering more innovative performance. Also, curious individuals with a high level of IMkw are generally more enthusiastic about devoting efforts toward learning and exploring, which are critical stages leading to innovation (Greif and Keller 1990).

Following similar lines of argument, individual users who experience joy and satisfaction while physically interacting with an IS (IMst), while overcoming difficulties by using the system (IMap), or while learning new things (IMkw) during system use may display higher determination, concentration, and flexibility in their search for novel ways of system use. Further, enabled by their accumulated familiarity with the system from the initial acceptance to post-acceptance stage, intrinsically motivated individuals are more likely to engage in innovative usage behavior.

Compared to intrinsic motivation, extrinsic motivation tends to have a more ambiguous impact on innovative use. Some psychology studies suggest that external rewards are generally characterized by two functional aspects: informational and controlling (Ryan et al. 1983). While the informational aspect informs individuals of their competence and self-determination, which possibly leads to innovation, the controlling aspect pressures individuals toward specified outcomes, which ultimately stifles their creativity (Amabile 1983; Amabile et al. 1986; Deci and Ryan 2002; McGraw 1978; Ryan et al. 1983).

Admittedly, extrinsic motivation also contributes to innovative performance to some extent (Eisenberger 1992; Eisenberger and Cameron 1996). In the IS use context, there is no doubt that if individuals perceive using systems as being functional for enhancing their performance (i.e., PU), they are more likely to find innovative ways to apply system features so as to advance their job performance (Karahanna and Agarwal 2006; Li and Hsieh 2007). Nevertheless, intrinsic motivation produces much more enjoyment, interest, and energy during the performance process and also mitigates the influence external distractions, such as pressure or tension, to a certain degree (Deci and Ryan 2002; Vallerand 1997). All of these advantages of intrinsic motivation effectively contribute to individuals' creativity, commitment, and persistence when pursuing new ways of using IS. In comparison, extrinsic motivation (i.e., motivation based on gaining the material rewards from system use) appears to be much less powerful in coping with the possibly demanding conditions required for innovative use. Therefore, we theorize, that

Hypothesis 1: Intrinsic motivation has a greater impact on innovative use than extrinsic motivation does.

By contrast, we argue that extrinsic motivation is effective in nurturing routine use. Different from innovative use, routine use emphasizes consistency between system use and normal work processes. Organizations usually commit large amounts of effort and resources to establish such consistency (Cooper and Zmud 1990; Igbaria et al. 1997; Yoon et al. 1995); the utilitarian outcomes derived from employees' system use, including bonuses, promotions, and raises (Davis 1989; Davis et al. 1989), serve as the rewards designated to reinforce this consistency (Luthans and Kreitner 1985; Scott and Podsakoff 1982). In other words, when individual users' perceive using systems as being useful, their perception has most likely been informed by the rewarding structure of performing the desired behavior, thereby enabling them to partake in routine use.

Compared to extrinsic motivation, intrinsic motivation appears to be less relevant for routine use. As noted earlier, routine use often requires individuals to comply with certain predefined rules and procedures (Saga and Zmud 1994). Routine use, which is essentially individuals' compliance to external requirements, is often effectively nurtured by economic exchange mechanisms (e.g., bonuses, promotions, raises, etc.), but is rarely affected by emotional appeals, such as the enjoyment and satisfaction derived from interacting with the system (Kelman 1958). Furthermore, spontaneous interest in using the system (i.e., intrinsic motivation) may possibly consume users' time and efforts that could otherwise be dedicated to routine job duties (MacKenzie et al. 2003). Also, the amusing experiences resulting from users' intrinsic motivation could distract users from completing required tasks (Starbuck and Webster 1991). The above reasoning suggests that intrinsic motivation's impact on routine use tends to be less effective as compared with the impact of extrinsic motivation. Thus, we propose that

Hypothesis 2: Extrinsic motivation has a greater impact on routine use than intrinsic motivation.

Next, we conduct two empirical studies (1) to test the measurement properties of the 3D-IM construct and its predictive power relative to perceived enjoyment and (2) to test the two hypotheses.

Study 1

Study 1 validates the tri-dimensional intrinsic motivation (3D-IM) construct in organizational IS use context and paves the way for our hypothesis testing in Study 2. We selected customer support information systems (CSIS) as the target system for investigation. In general, CSIS is designed to facilitate the management of long-term customer relationships by developing and managing huge customer databases (Kim et al. 2004), which mainly contain contact information, customer preferences, and service record histories. Since the 1990s, trend-setting corporations in industries such as banking and telecommunications are among the first to have invested significant resources into implementing CSIS to sharpen their competitive edge in providing and delivering services (Bolton and Tarasi 2006; Rigby and Ledingham 2004). After receiving training, employees (particularly frontline customer contact employees) are expected to use the implemented CSIS to complete their duties and tasks (McCalla et al. 2003; Bolton and Tarasi 2006).

We selected one of the largest telecommunication service companies in China for Study 1. A survey instrument (i.e., a questionnaire) was developed to collect quantitative data for analysis. We followed the standard procedures of translation and back-translation when converting instruments from English into Chinese (Brislin et al. 1973). In the pilot test, we invited 20 employees from the firm to complete the questionnaire, and the results revealed acceptable measurement properties for all of the variables. We also used qualitative feedback from participants to refine the wordings of the 3D-IM measurement items. We then administered questionnaires to 346 users of the CSIS that was installed in the company of which 244 responded (Table 2).

Table 2. Sample Demographics (Study 1)			
Category		Frequency	Percentage (%)
Age	25 or below	195	79.9
	26-30	36	14.8
	31-35	12	4.9
	36-40	0	0.0
	41 or above	1	0.3
	Total	244	100.0
Education	Senior High School	43	17.6
	College	163	66.8
	Bachelor's Degree	38	15.6
	Master's Degree	0	0.0
	Doctorate Degree or above	0	0.0
	Total	244	100.0
Gender	Female	184	75.4
	Male	60	24.6
	Total	244	100.0

Instrument Development

The 3D-IM variable includes three dimensions: intrinsic motivation toward accomplishment (IMap), intrinsic motivation to know (IMkw), and intrinsic motivation to experience stimulation (IMst). We assess IMap (4 items) and IMkw (3 items) by adapting the items from Vallerand (1997), and we evaluate IMst (3 items) by using Davis et al.'s (1992) measures for perceived enjoyment (PE). There are three reasons for not using Vallerand's (1997) measures for IMst. First, Davis et al.'s (1992) measures for PE capture individuals' sensations of physical enjoyment more precisely than the measures we would contextualize from Vallerand's (1997) original IMst items. Previously, we argued that the Vallerand's (1997) dimension of IMst appears to be very similar to PE. The only difference is that Vallerand's (1997) description of IMst explicitly denotes intensely pleasant feelings, while PE by Davis et al. (1992) refers to general enjoyment and fun. We downplay the 'intense' aspect of enjoyment because it is likely that enjoyment in workplaces is not comparable to the intense enjoyment/fun one may experience in certain hedonic activities like riding roller coaster, watching movies or participating in sports activities. This point was also confirmed by the participants in the pilot test. Secondly, many IS studies have validated the PE items and rendered reliable results (e.g., Davis et al. 1992; Fang et al. 2006; Hong and Tam 2006; Igbaria et al. 1996; and Hsieh et al. 2008, forthcoming). Finally, measuring the PE items as one dimension of the 3D-IM also facilitates the statistical comparison between the 3D-IM and PE constructs in terms of their predictive validity. For the above reasons, Davis et al.'s (1992) PE items were adapted to measure IMst.

In addition, we measured perceived usefulness (PU) (4 items), perceived ease of use (PEOU) (3 items), and attitude (ATT) (3 items) in order to test the nomological validity of 3D-IM in the technology acceptance model (TAM) (Davis 1989; Davis et al. 1989). We chose user attitude instead of general system use as the dependent variable because (1) attitude also serves as an important mediator linking PU and PEOU with actual use (Davis et al. 1989); (2) regardless of the level of actual use, attitude can suggest whether an individual psychologically accepts or identifies with the technology; and 4) two concrete post-acceptance usage behaviors will be examined in Study 2. We also controlled for other important factors that may affect individual IS acceptance, including age (AGE), gender (GEN), education (EDU), use experience (EXP), and work experience (WORK) (Agarwal and Prasad 1999).

Validating 3D-IM as a Second-Order Construct

We model the 3D-IM as a second-order construct, comprising three formative dimensions (IMap, IMkw, and IMst), with each dimension as reflective at the first level. Following characteristics together suggest that the three dimensions of IM are formative (Jarvis et al. 2003; Petter et al. 2007). First, the three dimensions (IMap, IMkw, and IMst) are different sources of users' feelings of joy or satisfaction. Overcoming difficulties in using the system, knowing more about its use, and immersing oneself in system use are experiences that generate, rather than result from, pleasant feelings and satisfaction among users. Second, IMap, IMkw, and IMst represent three different causes of users' joyful experiences related to system use and are, therefore, not substitutable; deletion of any one dimension distorts the meaning of 3D-IM as a whole. Third, the three dimensions do not necessarily covary with each other. For instance, it is possible that a change in a user's physical sensation in using a system (IMst) will not affect, or be affected by, a change in his/her satisfaction derived from solving problems by using the system (IMap).

For data analysis, we used Partial Least Square (PLS), a component-based Structural Equation Modeling (SEM) technique. PLS accommodates formative measurement models effectively with minimal constraints that can otherwise change the meaning of the model, and it is especially suitable for theoretical development purposes (Chin 1998; Jarvis et al. 2003; Peter et al. 2007). SmartPLS was chosen as the analytical software (Ringle et al. 2005).

Psychometric properties: The following evidence collectively suggest acceptable measurement properties of all of the variables involved in Study 1, including the three dimensions of the 3D-IM construct. Table 3 (p. 9) shows the descriptive statistics, composite reliability, Cronbach's alpha, and average variance extracted (AVE). The fact that the values of Cronbach's alpha and composite reliabilities are all higher than the recommended 0.707 (Nunnally 1994) and that the values of AVE are all above 0.50 (Fornell and Larcker 1981) indicates high internal consistency and convergent validity of our measurements. Discriminant validity is also supported because (1) the AVE value of each variable is higher than its squared correlations with any other variable (Table 3) and (2) item loadings on its own variable are higher than the cross loadings on any other variable (Chin 1998). Due to space limitations, we do not provide details of item loadings and cross loadings.

Table 3. Descriptive Statistics and Psychometric Properties (Study 1)

	Mean	Standard Deviation	Composite Reliability	Cronbach's Alpha	ATT	IMap	IMkw	IMst	PU	PEOU
ATT	4.78	1.22	0.97	0.95	***0.91***					
IMap	4.58	1.11	0.93	0.90	0.39	***0.77***				
IMkw	4.20	1.13	0.94	0.90	0.29	0.48	***0.83***			
IMst	3.79	1.14	0.97	0.96	0.22	0.33	0.36	***0.93***		
PU	4.18	1.11	0.95	0.93	0.38	0.37	0.43	0.35	***0.82***	
PEOU	4.28	0.99	0.88	0.80	0.37	0.35	0.27	0.25	0.38	***0.72***

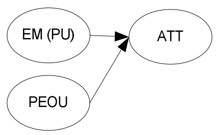
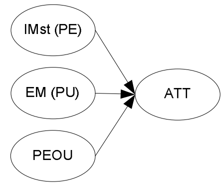
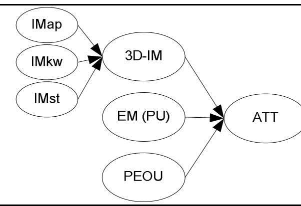
Note: The diagonal elements are AVEs and the off-diagonal elements are the squared correlations among constructs.
For discriminant validity, diagonal elements should be larger than off-diagonal elements.

To further confirm the discriminant validity of the three dimensions of 3D-IM, we applied covariance-based SEM (AMOS 16.0). Following Segars (1997), we compared the χ^2 of the original measurement model of 3D-IM against three other possible measurement models in which any two dimensions of 3D-IM are combined as one dimension. Discriminant validity is supported when the original measurement model displays χ^2 significantly better than any other possible model (Gefen et al. 2003; Segars 1997). The results of the chi-square test suggest that the original measurement model (χ^2 =58.3) outperformed the other three possible models (combining IMap and IMkw: χ^2 = 187.3, combining IMap and IMst: χ^2 = 386.2, and combining IMkw and IMst: χ^2 = 434.6). Therefore, the discriminant validity of the three dimensions of 3D-IM is well supported.

Nomological validity: We examine the nomological validity of 3D-IM in the TAM network (Davis et al. 1989, 1992). We selected user attitude (ATT) as the dependent variable and tested three inter-related models (Table 4, p. 10): Model 1 tests the original TAM model without the incorporation of intention or behavior (Davis et al. 1989), Model 2 adds IMst (PE) to Model 1 (Davis et al. 1992), and Model 3 replaces IMst (PE) and models 3D-IM as a second-order construct. The PLS results in Table 4 support the nomological validity of 3D-IM in the TAM network. Note that the Variance Inflation Factor (VIF) values of the three dimensions of 3D-IM, ranging from 1.515 to 1.599, suggest that the threat of multi-collinearity is minimal (Diamantopoulos and Siguaw 2006; Mathieson et al. 2001; Petter et al. 2007; Hair et al. 1998).

In addition, we conducted a pair-wise comparison among the three models to evaluate the superiority of 3D-IM over the single dimensional IMst (PE). Specifically, in Table 5 (p. 10), we (1) calculated the R^2 change of the dependent variable, (2) conducted an F-test for R^2 change, and 3) assessed the effect size of R^2 change by following Burton-Jones and Straub's (2006) approach. The results of the three statistical techniques consistently suggested that 3D-IM performs much better than the single dimension IMst (PE) for predicting user attitude in the TAM nomological network.

Table 4. PLS Results (Study 1)

		Model 1 – TAM	Model 2 – TAM + IMst (PE)	Model 3 – TAM + 3D-IM
Path Diagrams				
Path Coefficients				
IM			IMst (PE) = 0.128*	3D-IM = 0.348** • $\text{IMap}_{(Weight)}$ = 0.447** • $\text{IMkw}_{(Weight)}$ = 0.342** • $\text{IMst}_{(Weight)}$ = 0.363**
PU		0.406**	0.359**	0.231**
PEOU		0.368**	0.314**	0.237**
Control Variables	AGE	0.003	0.028	0.047
	EDU	0.041	0.028	0.033
	GEN	0.028	0.041	0.061
	EXP	0.010	0.022	0.024
	WORK	0.139	0.115	0.115
R^2 of ATT		49.3%	50.1%	53.9%

Note: IM – intrinsic motivation
**: $p < 0.05$, *: $p < 0.1$, two-tailed test.

Table 5. Comparing 3D-IM and IMst (PE)

	Model 3 vs. Model 1 – Impact of 3D-IM	Model 2 vs. Model 1 – Impact of IMst (PE)	Model 3 vs. Model 2 – Relative impact of 3D-IM vs. IMst (PE)
ΔR^2 of ATT	4.6%	0.8%	3.8%
F-test for ΔR^2	8.904**	3.825*	11.277**
f^2 (effect size)	0.100** (small-to-medium)	0.016* (small)	0.083** (small-to-medium)

Note: **: $p < 0.05$, *: $p < 0.1$, two-tailed test.

Common method bias: Finally, since all of the data were obtained from end-users through a single method, we gauged the threat of common method bias (CMB) following the approach suggested by Podsakoff et al. (2003) and implemented by Liang et al. (2007). The inclusion of a common method construct did not change the significance of any of the paths in the original model, indicating that the threat of CMB is minimal. The Harmon one-factor test recommended by Podsakoff and Organ (1986) was also performed. The factor analysis combining all of the items in the nomological net revealed no sign of a single factor accounting for the majority of the covariance. The above evidence suggests that CMB is not a significant issue in this study.

Study 2

After validating of the 3D-IM construct, we performed Study 2 to test the two hypotheses. To extend the generalizability of the 3D-IM construct and the research results, in Study 2, we chose business intelligence (BI) information systems as the target system for investigation. BI systems are data-driven decision-support systems that integrate functions like data gathering, data storage, and knowledge management (Negash and Gray 2008). The main purpose of BI systems is to provide needed intelligence for decision-making in organizations (Negash and Gray 2008). BI systems allow users to analyze large volumes of data, which are typically drawn or refined from a data warehouse, and the results from such analyses are used for firms' strategic decision-making, daily management, and operations. The complex functions embedded in BI systems, together with the large volumes of data available in the data warehouse, permit users to apply system features in new ways in order to cope with emerging needs or tasks. Like the CSIS examined in Study 1, BI systems are also popular among large enterprises for decision-making and strategic management.

Study 2 was conducted in another major telecommunication service firm in China. At the time of data collection, the BI system had been functional for more than one year, implying that the implementation status could be classified as the post-acceptance stage (Boudreau 2003; Wang and Hsieh 2006). This investigation focused on knowledge workers who use the BI system to support their task performance. On the one hand, while the organization expects these knowledge workers to use the system regularly, their execution of the requirements may still vary from one to another (Organ et al. 2006). On the other hand, users are not required to find new ways to apply the technology. Therefore, routine use and innovative use in our context involve sufficient variance for investigation. Further, our in-depth interviews with the firm's senior managers confirmed that while the knowledge workers needed to use the BI system to conduct routine data analysis and generate reports on a regular basis (routine use), the workers could modify current applications and suggest new and creative uses of the system at their discretion (innovative use). We administered the survey to 217 randomly sampled subjects and received 193 responses. Table 6 presents the workers' profiles.

Table 6 Sample Demographics (Study 2)

Category		Frequency	Percentage (%)
Age	25 or below	24	12.4
	26-30	81	42.0
	31-35	50	25.9
	36-40	25	13.0
	41 or above	13	6.7
	Total	193	100.0
Education	Senior High School	5	2.6
	College	34	17.6
	Bachelor's Degree	131	67.9
	Master's Degree	21	10.9
	Doctorate Degree or above	2	1.0
	Total	193	100.0
Gender	Female	72	37.3
	Male	121	62.7
	Total	193	100.0

Instrument Development

We adapted the measures for routine use (3 items) from Saga and Zmud (1994) and Schwarz (2003). The three items for routine use also have been validated by Sundaram et al. (2007). For innovative use (3 items), we integrated and applied the measures from trying to innovate with IT by Ahuja and Thatcher (2005) and from intention to explore by Karahanna and Agarwal (2006). Trying to innovate with IT and intention to explore, though termed differently, are conceptually similar (see Table 1). When further examining the specific measurement items, we found them overlap in some sense. A further note is that, while the measures of trying to innovate with IT and intention to explore describe finding novel ways of using IS, their operationalizations focus primarily on 'trying' and 'intentions', instead of actual usage behaviors and do not associate usage with task performance. Thus, we adapted their measures by emphasizing actual innovative use and the linkage between system use and job performance. The three items for innovative use have also been validated in Wang and Hsieh (2006). Sample items include 'My use of the BI system is now a normal part of my work' (RTN) and 'I have used the BI system in novel ways to support my work' (INV).

Items for PU, PEOU, and 3D-IM are the same as those used in Study 1. In addition to the five control variables in Study 1 (AGE, EDU, GEN, EXP, WORK), we further controlled for system self-efficacy (SSE) (3 items) (Compeau et al. 1995; Cho and Park 2007) and personal innovativeness with IT (PIIT) (3 items) (Agarwal and Prasad 1998), both of which potentially affect general system use. Finally, given the post-acceptance context of this study, we did not incorporate computer playfulness (Webster and Martocchio 1992), since the IMst dimension of intrinsic motivation (i.e., PE) dominates computer playfulness after users gain more usage experience (Venkatesh 2000).

Data Analysis and Results

Following the procedures in Study 1, we confirmed the quality of the psychometric properties for all factors and constructs in Study 2 (Table 7, p. 12). Figure 2 (p. 12) shows the PLS results of our research model. The effects of control variables are reported in Table 9 (p. 13).

Table 7. Descriptive Statistics and Psychometric Properties (Study 2)

	Mean	Standard Deviation	Composite Reliability	Cronbach's Alpha	RTN	INV	IMap	IMkw	IMst	PU	PEOU	SSE	PIIIT
RTN	5.15	1.12	0.98	0.97	***0.95***								
INV	4.73	1.05	0.90	0.83	0.25	***0.75***							
IMap	5.35	0.87	0.94	0.79	0.20	0.15	***0.79***						
IMkw	5.10	0.85	0.95	0.85	0.23	0.23	0.62	***0.85***					
IMst	4.97	0.98	0.97	0.90	0.23	0.22	0.25	0.28	***0.90***				
PU	4.63	1.08	0.96	0.95	0.39	0.14	0.30	0.27	0.32	***0.81***			
PEOU	4.87	1.12	0.92	0.89	0.25	0.12	0.35	0.29	0.24	0.41	***0.70***		
SSE	5.11	1.04	0.92	0.88	0.20	0.08	0.21	0.13	0.19	0.33	0.50	***0.80***	
PIIT	5.41	0.89	0.91	0.86	0.11	0.08	0.19	0.14	0.15	0.11	0.17	0.17	***0.78***

Note: The diagonal elements are AVEs and the off-diagonal elements are the squared correlations among constructs.
For discriminant validity, diagonal elements should be larger than off-diagonal elements.

An examination of the results summarized in Figure 2 suggests that, as expected, intrinsic motivation (measured as 3D-IM) affected innovative use more strongly than extrinsic motivation (measured as PU) and that extrinsic motivation affected routine use more strongly than intrinsic motivation. To test the proposed hypotheses officially, we adopted two complementary statistical methods: one from Cohen and Cohen (1983)[1] and the other from a more recent approach recommended by Cohen et al. (2003)[2]. Table 8 summarizes the results[3] of these two tests. It is important to point out that the two formulas are both based on a two-tailed test, and our research hypotheses are more similar to a one-tailed test. Therefore, even though H_2 showed a moderate significance level (t = -1.80) by Method 1, we still conclude that H_1 and H_2 are strongly supported by both statistical approaches.

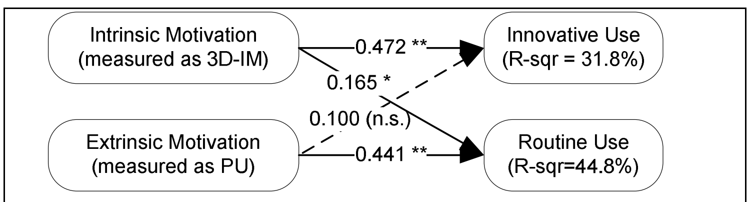


Figure 2. PLS Results of the Research Model

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[1] Cohen and Cohen (1983): $t=\frac{(r_{iy}-r_{jy})\sqrt{(n-1)(1+r_{ij})}}{\sqrt{2(\frac{n-1}{n-3})|R|+\bar{r}^2(1-r_{ij})^3}}$, where I and J are two independent variables, Y is the dependent variable,

$|R|=1-r_{iy}^2-r_{jy}^2-r_{ij}^2+2*r_{iy}*r_{jy}*r_{ij}$, and $\bar{r}=\frac{r_{iy}+r_{jy}}{2}$.

[2] Cohen et al. (2003): $t=\frac{\beta_i-\beta_j}{\sqrt{\frac{1-R_Y^2}{n-k-1}*\left(r^{ii}+r^{jj}-2r^{ij}\right)}}$, where β_i is the path coefficient of independent variable I, Y is the dependent variable, R_Y^2 is the explained variance of Y, n is sample size, k is the number of total independent variables and r^{ij} are the elements of the inverted correlation metrics.

[3] Note: The correlations between 3D-IM and other variables are calculated based on the composite index of 3D-IM.

Table 8. Summary of Hypotheses Testing Results

Hypothesis	Method 1 (Cohen and Cohen 1983)	Method 2 (Cohen et al. 2003)
H_1 – INV	Supported ($t = 2.65^{**}$)	Supported ($t = 14.89^{**}$)
H_2 – RTN	Supported ($t = -1.80^{*}$)	Supported ($t = -13.43^{**}$)

Note: **: $p < 0.05$, *: $p < 0.1$, two-tailed test.

Details of our model are reported in Table 9, including the path coefficients, significance levels, and relative weights of all predictive variables. Relative weight, also termed as relative importance, refers to the proportionate contribution of a predictor in explaining a certain dependent variable (LeBreton et al. 2007). Relative weight considers both unique contribution of the predictor and its contributions in the presence of other predictors (LeBreton et al. 2007; Johnson 2000). In Table 9, the predictors' relative weights for our model are expressed in terms of percentage of contribution to the variance explained in the dependent variables. Specifically, 3D-IM and PU account for 49.0% and 15.8%, respectively, of innovative use, whereas 3D-IM and PU account for 22.5% and 41.0%, respectively, of the R^2 of routine use. To conclude, the results of both the PLS and relative weights analyses strongly support our hypotheses: intrinsic motivation has a stronger impact on innovative use than extrinsic motivation, and extrinsic motivation has a stronger impact on routine use than intrinsic motivation. To be conservative, we also checked the common method bias (CMB) by following the same procedures in Study 1, revealing no sign of CMB in Study 2.

Table 9. PLS Results and Relative Weights (Study 2)

		DV1: Innovative Use		DV2: Routine Use	
		Path Coefficient	Relative Weight	Path Coefficient	Relative Weight
3D-IM		0.472^{**}	49.0%	0.165^{*}	22.5%
PU		0.100	15.8%	0.441^{**}	41.0%
Control Variables	PEOU	-0.031	10.0%	0.043	14.3%
	SSE	0.010	5.0%	0.065	12.6%
	PIIT	0.036	8.1%	0.067	6.9%
	AGE	-0.031	3.9%	-0.089^{*}	1.3%
	EDU	0.111^{*}	2.9%	-0.074	0.6%
	GEN	0.044	2.3%	-0.004	0.6%
	EXP	0.046	1.7%	-0.022	0.1%
	WORK	-0.020	1.4%	0.039	0.2%
R^2		31.8%	100%	44.8%	100%

Note: DV – dependent variable
**: $p < 0.05$, *: $p < 0.1$, two-tailed test.

Discussion

Implications for Theory

First, our study juxtaposes 'routine' and 'innovative' use in the IS context, which is different from such popular conceptualizations as duration of use (Venkatesh et al. 2003), frequency of use (van der Heijden 2003), and contextual richness of use (Burton-Jones and Straub 2006). Routine use and innovative use are two important usage behaviors during the post-acceptance stage of the IS implementation process. Routine use refers to users' employing system features in a way that is consistent with normal work processes (Saga and Zmud 1994; Schwarz 2003), while innovative use refers to users' applying system features in novel ways (Agarwal 2000; Jasperson et al. 2005; Saga and Zmud 1994). This routine versus innovative differentiation offers researchers a new perspective on the unique and significant values of different system usage behaviors. On the one hand, routine use facilitates further incorporation of IS into work processes (Kwon and Zmud 1987; Saga and Zmud 1994). On the other hand, innovative use helps unlock the value potential of adopted IS even at the post-acceptance stage (Cooper and Zmud 1989; Jasperson et al. 2005). Given their important but non-substitutable values, we investigated routine use and innovative use through motivation theory (Deci and Ryan 2002). To further extend the body of knowledge on routine use and innovative use, we suggest that future studies look into the similarities and differences between their nomological networks using other theoretical perspectives.

Second, we developed and validated a tri-dimensional intrinsic motivation (3D-IM) construct for the context of IS use in workplaces, including intrinsic motivation toward accomplishment (IMap), intrinsic motivation to know (IMkw), and intrinsic motivation to experience stimulation (IMst) (Malone 1980; Vallerand 1997). We propose that the traditional perceived enjoyment (PE) conceptualization, which resembles the IMst dimension in 3D-IM, is not sufficient in capturing the richness of intrinsic motivation toward using IS in workplaces (Venkatesh 1999). We argue that intrinsic motivation toward using IS is comprised of enjoyment not only from the activity of using the system but also from the satisfaction and fulfillment users feel when they overcome difficulties or learn new things in using the system. Appropriated from the general tri-dimensional intrinsic motivation concept, our proposed 3D-IM aligns and integrates the conceptualizations of intrinsic motivation from social psychology and IS literatures. Since our 3D-IM construct only targets the IS use context, we recommend that future studies apply the 3D-IM concept to other IS contexts, especially those in which motivation is a salient factor, e.g., information system project development (Roberts et al. 2006; Shah 2006), knowledge management (Wasko and Faraj 2005; Ko et al. 2005), etc.

Third, we linked motivation theory with routine use and innovative use. We found that intrinsic motivation had a stronger impact on innovative use than extrinsic motivation and that extrinsic motivation had a stronger impact on routine use than intrinsic motivation. These research findings reveal meaningful implications for technology acceptance research. Traditionally, perceived usefulness (PU), an extrinsic motivator, is regarded as the most salient determinant for technology use in general (Davis et al. 1989, 1992; Legris et al. 2003; Venkatesh et al. 2003). While it is true that system use in workplaces is basically utilitarian (van der Heijden 2004), our study helps place intrinsic motivation in a unique position that leads to innovative IS use at work. Routine use, with its utilitarian character, is mainly driven by extrinsic motivation. Innovative use, being innately rewarding, is more effectively stimulated by intrinsic motivation. To expand the theoretical implications of our research, future studies should link our findings with the vast motivation literature in social psychology. For example, researchers may investigate how boundary conditions, such as individual traits and situational factors, intervene with different types of motivation, thereby influencing routine use and innovative use (Baron and Kenny 1986). Alternatively, researchers should also explore antecedents of different motivational states toward using systems (Deci and Ryan 2002; Vallerand 1997).

Finally, we highlight the importance of intrinsic motivation toward using IS in organizational contexts. Although it has commonly been acknowledged in the IS field that system use required by organizational management is typically extrinsically motivated (Seddon 1997; van der Heijden 2004), our results point to the unique role of intrinsic motivation in stimulating innovative use.

Implications for Practice

For practitioners, this study depicts the dynamics of individual post-acceptance usage behaviors in organizations: (1) users may follow the procedures and rules consistent with work processes – routine use, or (2) they may take initiatives to apply system features in a novel fashion – innovative use. Each usage behavior has its distinct contribution to organizational performance and values.

Additionally, our findings suggest that routine use is primarily driven by extrinsic motivation and that innovative use is mainly affected by intrinsic motivation. In general, when a situation expects users to follow instructions and keep in line with normal work processes, managers tend to concentrate efforts on articulating the material benefits of using the systems. By contrast, when the predefined routine procedures are no longer sufficient or appropriate, innovative use is needed. Such circumstances are not uncommon, especially for managers and employees in fast-developing companies. The 3D-IM concept broadens managers' view of motivational sources for users' intrinsic motivation which effectively leads to innovative use. According to the 3D-IM conceptualization, individual users' joyful experiences not only come from the amusement sensations derived from using systems, but can also result from the sense of accomplishment when learning, exploring, or even innovating with systems (Vallerand 1997). Hence, managers could cultivate innovative use by nurturing these three aspects. First, as already confirmed by the hedonism literature (Venkatesh 1999; van der Heijden 2004), individual usage behavior can be enhanced by offering a more entertaining user interface or fantasy training programs (Venkatesh 1999). Second, managers should make the needed resources available to users when they encounter difficulties in using systems in order to further their intrinsic motivation toward accomplishment. Third, managers could also nurture a learning culture in their organizations. In an organization with a strong learning culture, users with a high level of curiosity (i.e., they have an intrinsic motivation to know) will feel satisfied and motivated because co-workers will generally be ready to learn and share knowledge with each other. Finally, given that routine use and innovative use are both important usage behaviors, we suggest that organizations' management maintain a balance between fostering users' intrinsic and extrinsic motivations.

Limitations

While our study provides several theoretical and practical implications, it also has its limitations. First, our hypotheses are tested by data for a specific system in a single firm (Study 2). While the confounding effects are largely controlled by collecting data from a single site, caution should be exercised when generalizing the findings to other systems and organizational contexts. As such, we suggest that empirical studies be conducted for other systems and in different organizations.

Besides, while routine use and innovative use are important and distinct post-acceptance usage behaviors, we did not cover other possible usage behaviors in this stage. For example, users may try to use more of the features already available in the implemented system to support their task performance (Saga and Zmud 1994; Schwarz 2003; Hsieh and Wang 2007). Such a usage behavior is constructive for organizational goals but is not characterized by either routine use or innovative use. In this vein, the next step of this research is to develop the understanding of post-acceptance usage behaviors further in a more systematic and inclusive manner.

Conclusion

We draw on motivation theory to understand two distinct post-acceptance usage behaviors: routine use and innovative use. Routine use stands for system use that is consistent with normal work processes, while innovative use refers to users' employing system features in novel ways. We adopted perceived usefulness to capture users' extrinsic motivation toward using IS and developed and validated a tri-dimensional intrinsic motivation construct for the context of IS use in workplaces (intrinsic motivation toward accomplishment, intrinsic motivation to know, and intrinsic motivation to experience stimulation). Our results reveal that (1) the tri-dimensional intrinsic motivation construct outperforms the traditional single-dimensional perceived enjoyment in the technology acceptance nomological net, (2) intrinsic motivation, as compared to extrinsic motivation, displays a stronger impact on innovative use, and (3) extrinsic motivation is more powerful than intrinsic motivation in predicting routine use. These findings suggest that managers must adopt a richer perspective of intrinsic motivation and that they need to place a differential emphasis on intrinsic motivation and extrinsic motivation based on the type of post-acceptance use behavior that they wish to promote among their employees.

Acknowledgements

The Authors are grateful for the financial support from Hong Kong Polytechnic University (grant # A-PC1C).

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