The Hong Kong Polytechnic University

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# A MOTIVATIONAL PERSPECTIVE ON POST-ACCEPTANCE IS USAGE BEHAVIORS

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CERTIFICATE OF ORIGINALITY

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_____ (Signed)

Li Xixi (Name of student)

To the obsessive tiny girl and her first four-year dedication to research

# Abstract

While the pre-acceptance and acceptance stages are fundamental milestones for initial information system (IS) success in organizations, the post-acceptance stage could be even more critical in realizing the eventual IS success. We identify three important post-acceptance usage behaviors: routine use (RTN), extended use (EXT), and innovative use (INV). RTN refers to employees' using IS in a routine and standardized manner consistent with normal work processes. EXT denotes employees' using more of the available IS functions to support task performance. INV describes employees' discovery of new ways of using IS to enhance task performance. RTN, EXT, and INV represent behaviors with minimum, moderate, and maximum levels of innovativeness and learning, respectively.

Drawing on motivation theory, we propose two hypotheses with comparative structures that delineate the relative importance of intrinsic motivation (IM) versus extrinsic motivation (EM) in explaining the three usage behaviors. Importantly, we apply and appropriate the tri-dimensional concept of intrinsic motivation from social psychology and propose the Rich Intrinsic Motivation (RIM) as a more comprehensive and precise conceptualization of intrinsic motivation toward IS use. RIM manifests through employees' intrinsic motivation toward accomplishment, to know, and to experience stimulation in using IS.

We conducted three studies in three different telecom service organizations. Study 1 validated the measurement properties of RIM with data from 165 employees who use business intelligence systems (BIS). Study 2, using data from 244 employees who use customer support systems (CSS), verified the superior predictive power of RIM over perceived enjoyment (PE), the traditional measures of IM, in

explaining user attitude in the post-acceptance stage. Study 3, using data from 193 employees who use BIS, revealed that RIM has a weaker impact on RTN than EM and that the importance of RIM relative to EM is greater for INV than for EXT and for EXT than for RTN.

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# Chapter 1. Introduction

This study examines motivational differences across three usage behaviors at the post-acceptance stage of the IS implementation process, routine use (RTN), extended use (EXT), and innovative use (INV). This chapter presents an overview of the whole research project. First, we identify the practical problems and theoretical knowledge gaps. Then, we state research objectives and formulate research questions. Finally, we outline the thesis structure.

## 1.1 Practical Problems

Over the past 30 years, organizations have been investing huge amounts of money in Information Technology (IT) / Information Systems (IS), in order to sharpen and sustain their competitive edges. As a result, organizations' IT investment has been rising rapidly. Since the 1980s, organizations have spent up to 50% of their new capital investment on IT-related activities (Westland and Clark 2000). The worldwide organizational IT budget has grown steadily in the past few decades and the aggregate speding surpassed $3 trillion in 2007. Despite the economic downturn, global IT spending still increased by nearly 8%, reaching $3.4 trillion, in 2008, and has continued to expand in 2009, though at a slower rate (Kanaracus 2008, Morgan 2008). However, the yields, compared to the heavy investment, seem far from satisfactory. Nearly 50% of the enterprise resource planning (ERP) IS and 70% of the customer relationship management (CRM) IS have experienced failures (Adam and O'Doherty 2003, Bolton and Tarasi 2006).

One important reason attributed to this low return problem is employees'

underutilization of the implemented IS (Jasperson et al. 2005), which has recently attracted much attention from practitioners. Certain reports from industrial consultants have found a positive relationship between profitability of organizations and the degree of utilization of the implemented IS (Aberdeen Group 2006). Indeed, accumulating much first-hand usage experience after initial acceptance, employees usually accrue a certain level of understanding about an implemented IS, resulting in their potential and ability to apply the IS in various ways (Saga and Zmud 1994, Wang and Hsieh 2006). First, employees may engage in routine use (RTN) or utilize IS in a routine and standardized manner that is consistent with normal work processes (Saga and Zmud 1994, Schwarz 2003). RTN represents employees' familiarity with IS use and facilitates the integration of IS with work processes. Second, employees may engage in extended use (EXT) or endeavor to use more of the available IS functions to support their work (Saga and Zmud 1994, Schwarz 2003). Incorporation of more IS features usually lead to better individual performance, and at the same time, more effective utilization of the implemented IS. Third, employees may engage in innovative use (INV) or experiment with the IS and apply it innovatively to enhance their job performance (Ahuja and Thatcher 2005, Jasperson et al. 2005). INV further helps leverage the value potential of the implemented IS to an advanced level (Jasperson et al. 2005).

Given the practical significance of RTN, EXT, and INV, it is important for managers as well as researchers to understand the facilitating conditions for these valuable IS usage behaviors. Examining the occurrence of RTN, EXT, and INV contributes not only to the development of individual employees, but also to the overall performance of organizations.

## 1.2 Knowledge Gap

IS researchers conceptualize IS implementation as a multi-stage process (Cooper and Zmud 1990, Kwon and Zmud 1987). While the pre-acceptance and acceptance stages are the fundamental milestones for initial IS success (Thong 1999), the post-acceptance stage is even more critical for organizations to realize the expected returns of their IS investments (Bhattacherjee 2001, Jasperson et al. 2005, Saga and Zmud 1994). As noted earlier, during the post-acceptance stage, employees would have developed certain familiarity with and skills in using the implemented IS, which enable them to apply the IS in various ways, including routine use (RTN), extended use (EXT), and innovative use (INV) (Saga and Zmud 1994, Wang and Hsieh 2006). Unfortunately, extant IS literature has mostly examined IS use at the pre-acceptance and acceptance stages; concrete and valuable usage behaviors at the post-acceptance stage have received only initial attention in the IS field (e.g., Hsieh and Wang 2007, Jasperson et al. 2005). To understand the three post-acceptance usage behaviors theoretically, we draw on two inter-related perspectives – the degree of innovativeness and the amount of learning (Amabile 1996, Gupta et al. 2006, March 1991) – and conceive RTN, EXT, and INV as usage behaviors that vary in required innovativeness and learning. To further examine the occurrence of the three post-acceptance behaviors, we resort to motivation theory and propose that RTN, EXT, and INV are promoted by different motivational types.

People engage in activities based on two major types of motivation: intrinsic motivation and extrinsic motivation (Deci and Ryan 1985, 2002). Intrinsic motivation (IM) refers to the state in which a person performs an activity for the joy or satisfaction derived from the activity itself; extrinsic motivation (EM) refers to the state in which a person performs an activity in hopes of gaining certain external

benefits (e.g., rewards, money) other than simply partaking in the activity itself (Deci and Ryan 1985, 2002). Motivation theory has been applied in previous IS studies to understand general IS use (Venkatesh et al. 2003). IS researchers have typically viewed perceived usefulness (PU) as the most important extrinsic motivator and perceived enjoyment (PE) as the representative intrinsic motivator for IS use (Brown and Venkatesh 2005, Davis et al. 1992, van der Heijden 2004, Fang et al. 2006). However, these two types of motivations seem to have received unbalanced attention in IS research and there is a gap in our understanding about their differential roles in predicting post-acceptance usage behaviors.

While IS studies have widely recognized the influence of extrinsic motivation on general IS use (Legris et al. 2003, Hong et al. 2006, Venkatesh et al. 2003), the importance of intrinsic motivation, particularly PE, has been confined to hedonic IS use (Fang et al. 2006, van der Heijden 2004, Venkatesh and Brown 2001). We suspect that this limited attention may be attributable to the oversimplified conceptualization of intrinsic motivation toward IS use. As suggested by Thomas and Velthouse (1990), intrinsic motivation in workplaces should be distinguished from intrinsic motivation in hedonic, non-workplace contexts. In organizations, employees often do not find IS use amusing, as they tend to pay more attention to its utilitarian aspects for job-related purposes. Nevertheless, IS use in itself may still be enjoyable for employees due to the meaningfulness, satisfaction, and fulfillment derived throughout the usage process (Deci and Ryan 1985, 2002, Vallerand 1997). Unfortunately, PE does not capture the richness of these innately rewarding perceptions. In order to provide a more comprehensive and precise conceptualization of intrinsic motivation toward IS use, we appropriate the tri-dimensional conceptualization of intrinsic motivation (Vallerand 1997, Vallerand et al. 1997, Van

Yperen and Hagedoorn 2003) from social psychology to the IS use context and propose the concept of rich intrinsic motivation (RIM) that consists of three core dimensions: intrinsic motivation toward accomplishment (IMap), intrinsic motivation to know (IMkw), and intrinsic motivation to experience stimulation (IMst).

In addition, most IS studies conducted in organizational settings have concluded that extrinsic motivation is the dominant predictor for general IS use (Davis et al. 1992, Legris et al. 2003). However, creativity research suggests that intrinsic motivation has a tremendous impact on innovative behaviors in organizations (Amabile 1996, Shin and Zhou 2003, Tierney et al. 1999), whereas extrinsic motivation, though instrumental in enhancing common job performance, may hinder creativity (Bass 1998, McGraw 1978). Further echoed by Ryan and Deci (2000a, p. 69), intrinsic motivation is regarded as the "prototypic manifestation of the human tendency toward learning and creativity". Concerning the different levels of learning and innovativeness associated with RTN, EXT, and INV, we challenge the predominant role of extrinsic motivation and argue that RIM, in relation to EM, would be more important for usage behaviors with higher levels of innovativeness and learning.

## 1.3 Research Objectives and Research Questions

Guided by the identified knowledge gaps, our study has the following objectives: (1) to conceptualize three distinct post-acceptance usage behaviors, routine use (RTN), extended use (EXT), and innovative use (INV), (2) to appropriate the rich intrinsic motivation (RIM) construct into the IS use context, so as to enrich the conceptualization of intrinsic motivation toward IS use, and (3) to examine the

relative importance of RIM and extrinsic motivation (EM) in explaining the three post-acceptance usage behaviors.

We also formulate the research questions:

1. Does extrinsic motivation impact the three post-acceptance usage behaviors, i.e. routine use, extended use, and innovative use?
2. Does intrinsic motivation impact the three post-acceptance usage behaviors, i.e. routine use, extended use, and innovative use?
3. How do extrinsic motivation and intrinsic motivation differ in their impacts on the three post-acceptance usage behaviors?

## 1.4 Thesis Structure

The thesis includes a total of nine chapters. Chapter 2 defines the three post-acceptance usage behaviors, including routine use (RTN), extended use (EXT), and innovative use (INV). After setting up the knowledge background of the post-acceptance stage of IS implementation process, we theorize RTN, EXT, and INV from two interrelated perspectives: the degree of innovativeness and the amount of learning. We consider RTN, EXT, and INV as three usage behaviors possessing different levels of innovativeness and learning. Chapter 3 reviews the IS literature on motivation theory and conceptualizes the appropriated rich intrinsic motivation (RIM) construct in the IS use context. Interweaving the post-acceptance use and motivation literature streams, Chapter 4 proposes the research model and hypotheses. Specifically, we hypothesize that RIM has a weaker impact than EM on RTN ($H_1$) and that the importance of RIM relative to EM increases for usage behaviors that involve higher levels of innovativeness and learning ($H_2$). Chapters 5, 6, and 7 conduct three empirical studies. Chapter 5 validates the measurement items of the

RIM construct; Chapter 6 evaluates the second-order conceptualization and the predictive validity of RIM; and Chapter 7 tests the research hypotheses and performs post-hoc analysis. Chapter 8 discusses the implications of our research findings for researchers and practitioners and also addresses limitations, which shed lights on future research directions. Chapter 9 draws the conclusion.

# Chapter 2. Theoretical Background

In this section, we provide a comprehensive theoretical background for our study. First, we define the three post-acceptance usage behaviors, including routine use (RTN), extended use (EXT), and innovative use (INV). We then recapitulate the IS literature on motivation theory, and appropriated and conceptualized the rich intrinsic motivation (RIM) construct in the IS use context.

## 2.1 Post-Acceptance IS Use

We describe the knowledge background of IS implementation process and post-acceptance stage, and then theorize the three post-acceptance usage behaviors, RTN, EXT, and INV, from two interrelated perspectives: the degree of innovativeness and the amount of learning.

### 2.1.1 IS Implementation Process and Post-Acceptance Stage

The IS implementation process model is established on the innovation diffusion theory. The innovation diffusion theory explicates that the diffusion of innovation should be viewed as an ongoing process, where the characteristics in the early stages are different from the ones in the later stages (Agarwal and Prasad 1997). According to Rogers (1985), diffusion of innovation is the process by which an innovation is communicated to the members of a social community through certain channels over time. Similarly, IS implementation refers to an organization's continuous effort to diffuse an IS to targeted users (Kwon and Zmud 1987).

The IS implementation process model was first conceived as consisting of six

stages – initiation, adoption, adaptation, acceptance, use, and incorporation (Kwon and Zmud 1987) (see Figure 2.1). Cooper and Zmud (1989, 1990) later revised this model by eliminating the use stage and further dividing the incorporation stage into routinization and infusion stages (see Figure 2.2).

Figure 2.1 IS Implementation Process Model (Kwon and Zmud 1987)

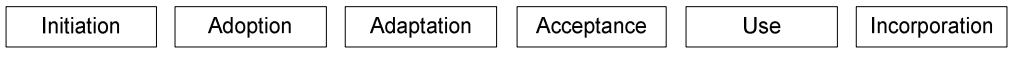
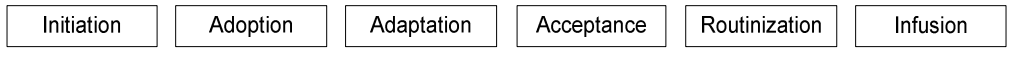



Figure 2.2 IS Implementation Process Model (Cooper and Zmud 1990)




As shown in Figures 2.1 and 2.2, adoption and acceptance are two different stages in the IS implementation process. Adoption, at the organizational level, implies an organization's decision to allocate and ensure resources needed for the change; at the individual level, adoption is the stage characterized by users' (actually, potential adopters) first time decision of whether to use an IS or not. Prior to this decision, the potential adopters might have some knowledge about the installed IS but not first-hand experience is using it (Karahanna et al. 1999).

The acceptance stage, the starting point of the refreezing phase, occurs after the adaptation stage and goes beyond the diffusion process. At the organization level, acceptance means that an organization's devotion of efforts to induce users to employ the implemented IS at work (Cooper and Zmud 1989, 1990); from a user's perspective, acceptance implies such IS implementation outcomes as better work performance, improved productivity, and user satisfaction (Agarwal 2000). Specifically, a user at the acceptance stage may begin to commit to IS use and already has some, if not much, use experience. Saga and Zmud (1994) employ three variables to represent individual IS acceptance: (1) attitude toward use, (2) intention to use, and (3) frequency of use.

While adoption and acceptance are two different stages in IS implementation process, theories explaining the two phenomenon are not explicitly differentiated in IS research. Popular theories understanding IS adoption and acceptance include theory of reasoned action (Davis et al. 1989, Karahanna et al. 1999), theory of planned behavior (Taylor and Todd 1995, Venkatesh et al. 2000), technology acceptance theory (Davis 1989, Davis et al. 1989, Kim and Malhotra 2005), and unified theory of acceptance and use of technology (Venkatesh et al. 2003). Further, the term 'IS use' in these theories are largely conceptualized and operationalized as general use, e.g., duration of use and/or frequency of use (Davis 1989, Taylor and Todd 1995, van der Heijden 2004, Venkatesh et al. 2000, Venkatesh et al. 2003), or intention to use (Davis et al. 1989, Karahanna et al. 1999, Kim and Malhotra 2005) as a proxy.

Such user adoption and acceptance are important for initial IS success, however, the true return on IS investment more depends on the extensive and intensive use by employees during later stages of IS implementation process: the routinization and infusion stages (Bhattacherjee 2001, Bhattacherjee and Premkumar 2004, Jasperson et al. 2005, Saga and Zmud 1994).

According to Saga and Zmud (1994), routinization is manifested in three aspects: use perceived as being 'normal', standardized use, and administrative infrastructure development. Administrative infrastructure development is the organizational-level demonstration assembling Zmud and Apple's (1992) 'routinization' – the permanent change of an organization's governance structure to accommodate for the IS. Use perceived as being 'normal' and standardized use are evidences visible at the individual level (Saga and Zmud 1994, Schwarz 2003). Therefore, routine use (RTN) at the individual level can be conceived as usage behavior perceived by employees

as normal (Saga and Zmud 1994, Schwarz 2003).

Infusion stage moves beyond routinization stage. Infusion refers to the stage where the fullest potential of an IS has been integrated with an organization's operational and management processes (Jones et al. 2002, Zmud and Apple 1992). From a user's viewpoint, the potential value of an IS could be realized through three alternative usage behaviors: extended use, integrated use, and emergent use (Saga and Zmud 1994). Extended use (EXT) is users' applying more of IS features to support a *more* comprehensive set of tasks at work (Saga and Zmud 1994, Schwarz 2003). Integrated use refers to users' utilizing IS to establish or enhance work flow linkages among a set of tasks at work (Saga and Zmud 1990). The applicability of integrated use in current IS research is limited probably because it specifically poses restrictions on employees' task nature. Emergent use means users applying IS to accommodate tasks that were not feasible or recognized prior to the application of IS at work (Saga and Zmud 1994). Emergent use, similar to Jasperson et al.'s (2005) 'individual feature extension' and Ahuja and Thachter's (2005) 'trying to innovative with IT', essentially represents a form of innovative use (INV).

To summarize, the first three stages of IS implementation process primarily concern activities at more macro levels, such as at the organizational or departmental levels; the latter three stages can manifest at both macro and micro levels (Cooper and Zmud 1990, Saga and Zmud 1994). Since our study examines employees' IS usage behaviors at the individual level, we specify that, in our study context, *acceptance* reflects employees' commitment to IS use, *routinization* describes the state in which IS use is no longer perceived as out of the ordinary but actually becomes a normal part of the work processes, and *infusion* refers to the process of embedding an IS deeply and comprehensively in work processes (Cooper and Zmud

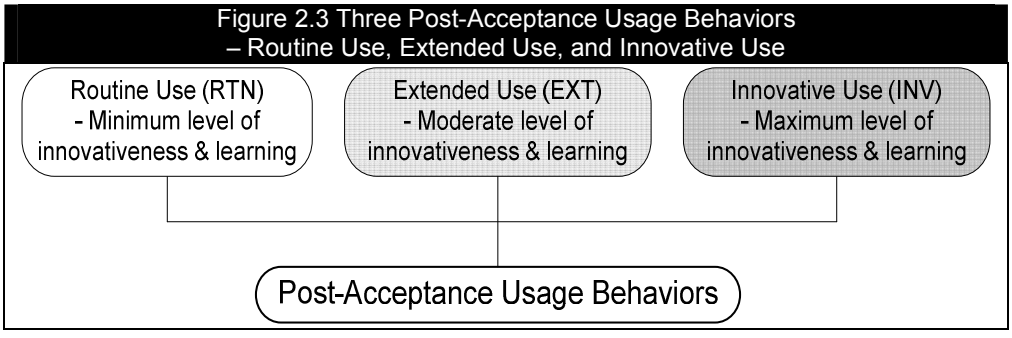
1990, Saga and Zmud 1994).

In addition, according to Zmud and his associates, the six implementation stages do not necessarily follow a sequential process; some stages may be skipped or occur in parallel (Cooper and Zmud 1990, Saga and Zmud 1994). Thus, routinization and infusion, which follow the acceptance stage, are conceived together as the post-acceptance stage (Hsieh and Wang 2007). Although the routinization stage is typically associated with routine use (RTN) and the infusion stage is associated with extended use (EXT) and innovative use (INV) (Sage and Zmud 1994, Schwarz 2003), these two stages do not necessarily occur in sequence but can actually occur in parallel (Cooper and Zmud 1990, Saga and Zmud 1994). Thus, although RTN, EXT, and INV represent different types of usage behaviors, employees can engage in any of them during the post-acceptance stage.

## 2.1.2 Post-Acceptance IS use

We conceptualize routine use (RTN), extended use (EXT), and innovative use (INV) from two theoretical perspectives: the degree of innovativeness and the amount of learning (see Figure 2.3). We consider RTN as representing the minimum level of innovativeness and learning, EXT as the moderate level of innovativeness and learning, and INV as the maximum level.

Figure 2.3 Three Post-Acceptance Usage Behaviors – Routine Use, Extended Use, and Innovative Use



### 2.1.2.1 The Perspective of Innovativeness

Table 2.1 lists concepts related to RTN, EXT, and INV that have been discussed in prior IS literature. We discuss each usage type and argue that they are non-substitutable behaviors at the post-acceptance stage and represent different degrees of innovativeness.

Table 2.1 Similar IS Use Concepts in IS Literature

| IS Use | Similar Concepts and Sources |
|---|---|
| Routine Use (RTN) | 1. Routine use (Schwarz 2003)<br>The extent to which a user's work patterns are consistent with an IS<br>2. Routine use (Sundaram et al. 2007)<br>The extent to which IS use has been integrated into users' normal work routine<br>3. Standardized use (Saga and Zmud 1994)<br>Users' utilizing an IS in a way as expected by management<br>4. Use perceived as being normal (Saga and Zmud 1994)<br>Users' perception that their IS use is normal |
| Extended Use (EXT) | 1. Extended use (Saga and Zmud 1994)<br>Users' utilizing more IS features in order to accommodate a more comprehensive set of tasks<br>2. Deep use (Schwarz 2003)<br>The extent of using different functionalities of an IS<br>3. Deep structure use (Burton-Jones and Straub 2006)<br>The extent to which the user exploits features of an IS to perform a task |
| Innovative Use (INV) | 1. Emergent use (Agarwal 2000, Saga and Zmud 1994)<br>Users' using an IS in order to accomplish work tasks that were not feasible or recognized prior to the application of the IS to the work system<br>2. Emergent Use (Wang and Hsieh 2006)<br>Users' using an IS in an innovative manner to support their task performance<br>3. Individual feature extension (Jasperson et al. 2005)<br>Users' discovery of ways to apply the IS features that go beyond the ways originally conceived by the designers or implementers of the IS<br>4. Intention to explore (Nambisan et al. 1999)<br>Users' willingness to and purpose for exploring an IS and identifying its potential use<br>5. Trying to innovate with IT (Ahuja and Thatcher 2005)<br>Users' goals of finding novel uses for an IS |

To begin with, RTN refers to employees' utilization of IS in a routine and standardized manner that is consistent with normal work processes. Three 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 imply two key characteristics of RTN: 1) it is perceived as a normal part of job activities and 2) it is consistent with work processes. Both of these

characteristics are common expectations of management once IS implementation has progressed to the post-acceptance stage. RTN implies employees' compliance to and familiarity with a set of predefined rules and procedures concerning IS use, thereby facilitating the integration between IS use and work processes (Saga and Zmud 1994). RTN contains the minimum amount of innovativeness as compared with EXT and INV, which are discussed below.

EXT refers to employees' utilization of more of the available IS functions to support task performance. Prior IS literature has suggested similar concepts (see Table 2.1), including 'extended use', which describes employees' use of additional IS features to accommodate more tasks (Saga and Zmud 1994); 'deep use', which denotes the variety of functionalities used (Schwarz 2003); and 'deep structure use', which stands for the variety of functions applied to support tasks (Burton-Jones and Straub 2006). We consider EXT as an incremental form of innovation, since it represents employees' incorporation of more of the IS functions that are already embedded in the installed IS (Oldham and Cummings 1996, West and Farr 1990). EXT is likely to occur during the post-acceptance stage after employees become familiar with an IS and are able to apply the IS to a higher level than expected in routine work processes (Saga and Zmud 1994). Using additional IS functions may expand employees' capabilities and enable them to perform tasks better (Hsieh and Zmud 2006, Saga and Zmud 1994).

INV, the most innovative usage behavior among the three, describes employees' application of IS in novel ways to support task performance. Some concepts have been introduced to explain employees' creative application of IS (see Table 2.1), such as 'emergent use', which describes users' utilization of an IS in order to accomplish work tasks that were not feasible or recognized prior to the application of

the IS to the work processes (Saga and Zmud 1994); 'individual feature extension', which stands for individuals' discovery of ways to apply IS features that go beyond the ways delineated by the designers or implementers (Jasperson et al. 2005); 'intention to explore', which reflects a user's willingness to and purpose for exploring an IS and identifying its potential use (Nambisan et al. 1999); and 'trying to innovate with IT', which denotes users' goals of finding novel uses of the IS (Ahuja and Thatcher 2005). At the post-acceptance stage, through accumulated experiences with IS, employees have the ability to apply the IS in innovative ways, thereby further realizing the potential values of the implemented IS (Jasperson et al. 2005, Saga and Zmud 1994).

Conceptually speaking, the aforementioned concepts that relate to EXT and INV, respectively, concern two essential aspects of IS use: (1) using more of the available IS functions than expected in regular work processes and (2) using the IS innovatively.

Apart from the degree of innovativeness, the amount of learning could be an alternative perspective for understanding the three post-acceptance usage behaviors. Innovation is often linked with the notion of 'learning' – the ability to acquire and/or create new knowledge, because learning is critical for organization innovation, may it be incremental or radical forms (Benner and Tushman 2003, Cohen and Levinthal 1990, Gupta et al. 2006, McGrath 2001). We notice that difference in individual learning among RTN, EXT, and INV bears resemblance to the exploitation and exploration phenomenon in organizational learning research. In the following, we introduce exploration and exploitation theory and discuss its insights for understanding the theoretical differences among RTN, EXT, and INV.

#### 2.1.2.2 The Perspective of Learning

As learning, or the ability to acquire and/or create new knowledge, is critical for achieving innovation, the concepts of exploration and exploitation are often discussed together (e.g., Gupta et al. 2006, He and Hong 2004, Im and Rai 2008, Lavie and Rosenkopf 2006, March 1991). In addition to innovativeness, learning provides another useful lens to understand post-acceptance usage behaviors. The difference in individual learning among RTN, EXT, and INV bears resemblance to the twin concepts of exploitation and exploration in organizational learning research (March 1991, Im and Rai 2008). While exploitation strategy refers to the refinement and extension of existing resources and competencies, exploration strategy describes organizations' experimentation with new alternatives (March 1991, Im and Rai 2008). Essentially, exploration and exploitation differ in the amount, rather than in the presence or absence, of learning (Gupta et al. 2006). We draw on the concepts of exploration and exploitation to develop distinctions among the three post-acceptance usage behaviors of individuals. We conceptualize RTN, EXT, and INV through the perspective of individual learning, a process where prior experience is transformed and new knowledge is created (Kim 1993, Kolb 1984).

First, we distinguish between EXT and INV and draw parallels between them and the twin concepts of exploitation and exploration. While using more of the available IS functions (i.e., EXT) capture the idea behind exploitation, the endeavor for novelty (i.e., INV) is similar to exploration. Arguably, learning to use additional IS functions (i.e., EXT) is an incremental form of learning, as users' cognition is constrained within the scope of functions in the installed IS (Starbuck 1982). On the contrary, INV implicitly goes beyond the pre-defined ways that the IS could be applied (Hsieh and Zmud 2006, Jasperson et al. 2005). Compared to EXT, INV

involves more dramatic learning and expands users' knowledge with regard to the potential of the installed IS.

Second, we also distinguish between RTN and EXT. RTN, the repetition of a certain set of usage procedures in order to comply with normal work processes, involves a minimum amount of learning. Routinization of behavior among individuals is a special form of exploitation that concerns very little learning (Gupta et al. 2006). EXT, which always involves ongoing incremental learning, is more aligned with the original conceptualization of exploitation; however, RTN, which entails a minimal amount of learning, somehow deviates from the normal form of exploitation.

Our discussion so far suggests that **among the three behaviors**, **RTN, EXT, and INV can be respectively conceived as IS usage behaviors with minimum, moderate, and maximum levels of innovativeness and learning.** Given our focus on IS use by employees in their organizational contexts, we define EXT and INV as employees' usage behaviors for their work processes so as to focus on those behaviors for job-related purposes rather than other objectives. The functional complexity of modern IS allows employees to apply these technologies extensively and/or creatively to support task activities more fully (Agarwal 2000, Ahuja and Thatcher 2005, Saga and Zmud 1994, Wang and Hsieh 2006). In a typical situation in which a user applies an IS for a given task, the user's cognitive resources are limited (Gupta et al. 2006). As a result, an employee can only display one of the three usage behaviors at a precise point in time during their workday. Nevertheless, the employee can display all three usage behaviors within a period of time (e.g., throughout an entire typical workday). A side note here is that we assume, in our theorizing, tasks that are assigned for employees remain relatively stable within a

given period of time. So, the cases where employees routinely, extensively, or innovatively apply IS for new tasks are not covered by our research. In addition, while management usually expects RTN, employees' execution of this expectation may vary from one person to another (Organ et al. 2006); EXT and INV can arise at the users' discretion (Hsieh and Wang 2007, Silver, 1990, 1991, Wang and Hsieh 2006). Hence, it is meaningful to examine all three behaviors for a given employee in the context of the post-acceptance stage of a particular IS. Toward this end, motivation theory offers a solid theoretical foundation for explaining the influential predictors of the three usage behaviors.

## 2.2 Motivation Theory

Individuals engage in activities due to two types of motivation: extrinsic motivation (EM) and intrinsic motivation (IM) (Deci and Ryan 1985, 2002). IS studies in the past have contextualized and applied motivation theory to investigate general IS use (Venkatesh et al. 2003). Extrinsic motivation toward IS use is typically captured by perceived usefulness (PU); intrinsic motivation toward IS use is symbolized by perceived enjoyment (PE). As we discuss below, intrinsic motivation has been under-conceptualized in IS use context; consequently, the importance of intrinsic motivation toward IS use has been undervalued, especially in organizational settings.

### 2.2.1 Perceived Usefulness as Extrinsic Motivation toward IS Use

Perceived usefulness (PU) is typically viewed as the most important extrinsic motivator toward IS use (Davis et al. 1992, Venkatesh et al. 2003). PU, as defined by Davis et al. (1989), refers to users' perception of whether using IS will effectively enhance their work performance. Over the past two decades, there has been consistent empirical evidence showing that PU is the dominant determinant for general IS use (Davis et al. 1989, Legris et al. 2003, Venkatesh et al. 2003). It is understandable that employees would like to use an IS if it will improve their job performance and generate rewards for them. As such, their IS use behaviors can be expected to be influenced by organizational reward structures that lead to 'raises, promotion, bonuses, and other rewards' for comparative gains in job performance (Davis et al. 1989, p. 320, Venkatesh and Speier 1999).

### 2.2.2 Perceived Enjoyment as Intrinsic Motivation toward IS Use

IS research has typically viewed perceived enjoyment (PE) as the representative intrinsic motivator for IS use, particularly for hedonic IS use (e.g., Hsieh et al. 2008, van der Heijden 2004). We identified a total of 16 papers that have examined intrinsic motivation, in premier IS or IS related journals, including *MIS Quarterly*, *Information Systems Research*, *Journal of Management Information Systems*, *Management Science, and Journal of Applied Social Psychology*. Table 2.2 summarizes the identified literature.

Based on the motivation theory, Davis et al. (1992) were among the first to position perceived usefulness (PU) as extrinsic motivation and perceived enjoyment (PE) as intrinsic motivation. Since then, the PE concept has been widely applied in a variety of IS contexts, such as voluntary IS use in workplaces (Davis et al. 1992, Venkatesh 1999), home use (Brown and Venketesh 2005, van der Heijden 2004, Hsieh et al. 2008, Venkatesh and Brown 2001), e-commerce transactions (Kamis et al. 2008, Dinev and Hart 2006), adoption of mobile services (Fang et al. 2006, Hong and Tam 2006), knowledge contribution in e-networks (Wasko and Faraj 2005), knowledge transfer in IS implementation (Ko et al. 2005), and open source software projects development (Roberts et al. 2006, Shah 2006). The only exception we found is Venkatesh (2000), who operationalized intrinsic motivation as 'computer playfulness'. Nevertheless, as Venkatesh (2000) notes, after users gain IS use experiences, PE dominates playfulness in determining IS use-related factors (also see Section 2.4.1).

The summary in Table 2.2 further reveals that intrinsic motivation promotes technology acceptance and use across all investigative contexts. Admittedly, PE is a

salient determinant of individual use of technologies. The pleasant sensational experiences of use effectively drive users' interest, ease their cognitive burden, nurture positive attitude toward use, and boost use intentions, all of which enhance IS usage behavior. Particularly in the case of hedonic IS, the amusement perceived by users can be a critical factor leading to individual use intention and behavior (van der Heijden 2004).

Apart from the motivation theory, several studies have employed the idea of hedonic and utilitarian values to explain the effects of intrinsic and extrinsic motivation (Brown and Venketesh 2005, van der Heijden 2004, Hsieh et al. 2008, Venkatesh and Brown 2001). Perceived enjoyment parallels with hedonic value, and perceived usefulness is linked to utilitarian value (Davis et al. 1992, Shah 2006, Venkatesh and Brown 2001).

However, we propose that equaling either hedonic value or perceived enjoyment as intrinsic motivation tends to oversimplify users' intrinsic motivation toward IS use, especially in organizational settings. Intrinsic motivation in workplaces should be distinguished from intrinsic motivation in hedonic contexts (Thomas and Velthouse 1990). In social psychology research, intrinsic motivation is not only derived from physical sensations (i.e., PE) but also from the sense of accomplishment and the learning experience from performing activities (Deci and Ryan 2002, Maslow 1970, Vallerand 1997). Similarly, employee users may less often find IS use to be funny and amusing, but still IS use in itself can be enjoyable due to the meaningfulness, satisfaction, and fulfillment experienced by employees throughout the usage process at work.

Since the IS literature on intrinsic motivation has focused solely on physical enjoyment and has excluded the joyful feelings that result from accomplishment and

learning (e.g., Hsieh et al. 2008, Thong et al. 2006, van der Heijden 2004), we appropriate the rich intrinsic motivation concept from social psychology to IS context.

Table 2.2 IS Studies on Intrinsic Motivation

| Source | IM Definition | IM Measurements | Dependant Variables | Findings | Context |
|---|---|---|---|---|---|
| Brown and Venkatesh (2005) | • Intrinsic motivation: hedonic outcomes (enjoyment and playfulness) | Davis et al. 1992, Venkatesh and Speier 1999, 2000<br>1. The computer provides many applications that are enjoyable.<br>2. I enjoy playing computer games.<br>3. My computer has applications that are fun.<br>4. I am able to use my computer to have fun. | Behavioral intention | - Age negatively moderated the relationship between PE and adoption intention. | Home use |
| Davis et al. (1992) | • Intrinsic motivation: perceived enjoyment – the extent to which the activity of using a technology is perceived to be enjoyable in its own right, apart from any performance consequences that may be anticipated. | 1. I find using XXX to be enjoyable (likely/ unlikely).<br>2. The actual process of using XXX is (unpleasant/ pleasant).<br>3. I have fun using XXX (likely/ unlikely). | Behavioral intention | - PE had a significant impact on behavioral intention, controlling for PU.<br>- PE and PU interactively influenced behavioral intention.<br>- PE mediated the influence of PEOU on behavioral intention. | Voluntary use in workplace |

Table 2.2 IS Studies on Intrinsic Motivation (Continued)

| Source | IM Definition | IM Measurements | Dependant Variables | Findings | Context |
|---|---|---|---|---|---|
| Dinev and Hart (2006) | • Intrinsic motivation – personal Internet interest: the degree of cognitive attraction to Internet interactions. | 1. I find that personal interest in the information that I want to obtain from the Internet overrides my concerns of possible risk or vulnerability that I may have regarding my privacy.<br>2. The greater my interest in obtaining a certain information or services from the Internet, the more I tend to suppress my privacy concerns.<br>3. In general, my need to obtain certain information or services from the Internet is greater than my concern about privacy. | Willingness to provide personal information to transact on the Internet | - Personal Internet interest positively influenced the willingness to provide personal information to transact on the Internet. | E-commerce transactions |
| Fang et al. (2006) | • Intrinsic motivation: perceived playfulness – the extent to which the activity of using a specific system is perceived to be enjoyable in its own right, aside from any performance consequences resulting from system use. | Venkatesh 1999, 2000<br>1. I find this task interesting and enjoyable.<br>2. I do not realize the time elapsed when performing this task. | Intended use | - The intention to perform gaming tasks on handheld devices is positively influenced by perceived playfulness. | Mobile commerce context |

Table 2.2 IS Studies on Intrinsic Motivation (Continued)

| Source | IM Definition | IM Measurements | Dependant Variables | Findings | Context |
|---|---|---|---|---|---|
| Hsieh et al. (2008) | • Intrinsic motivation: hedonic outcomes – the pleasure and inherent satisfaction derived from performing the behavior of interest. | Davis 1989, Venkatesh 1999, Venkatesh and Brown 2001<br>1. Using the Internet TV is enjoyable.<br>2. Using the Internet TV is pleasant.<br>3. Using the Internet TV is fun. | Continuance use intention | - PE affected continued use intention of the socially-economically disadvantaged group. | A city government project (free access to Internet) |
| Hong and Tam (2006) | • Intrinsic motivation: perceived enjoyment – the extent to which the activity of using an innovation is perceived to be enjoyable in its own right, apart from any performance consequences that may be anticipated. | Davis et al. 1992<br>1. I expect that using MDS would be enjoyable.<br>2. I expect that using MDS would be pleasurable.<br>3. I expect to have fun using MDS.<br>4. I expect that using MDS would be interesting. | Behavioral intention | - PE influenced behavioral intention directly and indirectly through PU and PEOU | Adoption of multipurpose information appliances in nonwork settings (mobile data services) |
| Igbaria et al. (1996) | • Intrinsic motivation: perceived fun/ enjoyment – an intrinsic motivation for the use of micro computers (Davis et al. 1992) | Davis et al. 1992<br>Using a microcomputer in my job is:<br>1. pleasant/ unpleasant<br>2. enjoyable/ frustrating<br>3. enjoyable/ unenjoyable | System use | - PE positively related to microcomputer usage. | Microcomputer usage |
| Kamis et al. (2008) | • Intrinsic motivation: perceived enjoyment – the intrinsic enjoyment of the interaction with the website. | Davis et al. 1992<br>1. While using the web site, I found my visit interesting.<br>2. While using the web site, I found my visit enjoyable.<br>3. While using the web site, I found it to be fun. | Intention to purchase & intention to return | - PE fully mediated the system interface design on behavioral intention (intention to purchase and intention to return).<br>- PE followed an inverted U-shaped curve as the choice set size increased. | Customizing products online with attribute-based decision support systems (ABDSS) |

Table 2.2 IS Studies on Intrinsic Motivation (Continued)

| Source | IM Definition | IM Measurements | Dependant Variables | Findings | Context |
|---|---|---|---|---|---|
| Ko et al. (2005) | • Intrinsic motivation: deriving satisfaction that lies in the content of the activity itself.<br>• Extrinsic motivation. | Amabile et al. 1994<br>1. I enjoy learning business and technical knowledge about *(Purchasing)* module.<br>2. The more difficult it is to understand business and technical knowledge about the *(Purchasing)* module, the more I enjoy learning it.<br>3. I enjoy learning business and technical knowledge about the *(Purchasing)* module that are completely new to me.<br>4. I have to feel that I'm personally benefitting from learning business and technical knowledge about the *(Purchasing)* module.<br>5. I want to find out how good I really can be at learning business and technical knowledge about the *(Purchasing)* module.<br>6. I'm more comfortable when I can set my own goals for learning business and technical knowledge about the *(Purchasing)* module. | Knowledge transfer | - Intrinsic motivation from both clients and consultants positively contributed to knowledge transfer.<br>- Extrinsic motivation did not contribute. | Knowledge transfer in complex information system implementation |

Table 2.2 IS Studies on Intrinsic Motivation (Continued)

| Source | IM Definition | IM Measurements | Dependant Variables | Findings | Context |
|---|---|---|---|---|---|
| Roberts et al. (2006) | • Intrinsic motivation: the extent to which participants make code contributions because developing software is an activity they enjoy and one that satisfies their needs for accomplishment, control or autonomy.<br>• Extrinsic motivation: use value and status | Adapted from subscales of the *Multi-Item Measures of Values* instrument (Herche 1994) and the *Job Diagnostic Survey* (Hackman and Oldham 1974), including Task Identity, Task Significance, and Autonomy.<br>1. It is the satisfaction of seeing the results.<br>2. It gives me the chance to do things I am good at.<br>3. I really enjoy it. It is fun.<br>4. It gives me a sense of personal achievement. | Individual performance mediated by participation | - Extrinsic motivation did not undermine intrinsic motivation<br>- Status motivation (one aspect of extrinsic motivation) enhanced intrinsic motivation.<br>- Intrinsic motivation did not have significantly impact participation. | Open source software projects development |
| Shah (2006) | • Intrinsic motivation – fun and enjoyment derived from participation<br>• Extrinsic motivation – need-driven | Qualitative analysis: interviews, mailing list postings, and online project documentation | Participation | - The hobbyist group displayed high level of participation and long-term commitment. | Open source software development |
| van der Heijden (2004) | • Intrinsic motivation: perceived enjoyment – the extent to which fun can be derived from using systems | Cheung et al. 2000, Igbaria et al. 1995<br>1. enjoyable – disgusting<br>2. exciting – dull<br>3. pleasant – unpleasant<br>4. interesting – boring | Behavioral intention | - For hedonic systems, PE and PEOU were stronger determinants of intention to use than PU. | Hedonic systems |
| Venkatesh (1999) | • Intrinsic motivation: playfulness – capturing the fantasy aspect defined by Malone (1981) | Experiment<br>Game-based training vs. traditional training | Behavioral intention mediated PEOU | - Game-based training, as compared with traditional training, improved users' behavioral intention, by increasing PEOU. | Game-based training |

Table 2.2 IS Studies on Intrinsic Motivation (Continued)

| Source | IM Definition | IM Measurements | Dependant Variables | Findings | Context |
|---|---|---|---|---|---|
| Venkatesh (2000) | • Intrinsic motivation: computer playfulness – the 'cognitive spontaneity' in computer interactions | Webster and Martocchio 1992 – computer playfulness<br>The following questions ask you how you would characterize yourself when you use computers:<br>1) spontaneous<br>2) unimaginative<br>3) flexible<br>4) creative<br>5) playful<br>6) unoriginal<br>7) uninventive<br><br>Davis et al. 1992 – enjoyment<br>1. I find using the system to be enjoyable.<br>2. The actual process of using the system is pleasant.<br>3. I have fun using the system. | Perceived ease of use | - Computer playfulness significantly influenced PEOU during the initial use stages.<br>- Such impact diminished as usage experience increased.<br>- PE then took the dominant place of computer playfulness. | Voluntary use in workplace |
| Venkatesh and Brown (2001) | • Intrinsic motivators: hedonic outcomes – the pleasure derived from PC use<br>• Extrinsic motivators: utilitarian and social outcomes | Telephone interviews<br>Key words implying hedonic outcomes: games, fun, enjoyment, and pleasure | Computer adoption intention and behavior | - Hedonic outcomes affected computer adoption among the adopters (vs. non-adopters). | Home use |

Table 2.2 IS Studies on Intrinsic Motivation (Continued)

| Source | IM Definition | IM Measurements | Dependant Variables | Findings | Context |
|---|---|---|---|---|---|
| Wasko and Faraj (2005) | • Intrinsic motivation – enjoy helping: the perception that helping others with challenging problems is interesting. | Constant et al. 1996<br>1. I like helping other people.<br>2. It feels good to help others on the Massage Board.<br>3. I enjoy helping others on the Message Board. | Knowledge contribution (helpfulness and volume) | - The 'enjoy helping' factor moderately impacted knowledge contribution (helpfulness).<br>- Reputation, the other construct of motivation category, significantly affected knowledge contribution in terms of both contribution helpfulness and volume of contribution. | Knowledge contribution in electronic networks |

### 2.2.3 A Rich Conceptualization of Intrinsic Motivation toward IS Use

To offer a more comprehensive conceptualization of intrinsic motivation toward human behaviors in general, Vallerand and his colleagues suggest that intrinsic motivation consists of three core dimensions: 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, Vallerand et al. 1997). According to Vallerand, most behavioral studies examine only one of the three aspects of intrinsic motivation, rather than adopting an integrated perspective. Established through a meta-analysis approach, the above three dimensions of intrinsic motivation incorporate the predominate types of intrinsic motivations in the extant social psychology literature (Vallerand and Briere 1990, Vallerand et al. 1989). Specifically, IMap refers to the pleasure and satisfaction experienced while individuals are trying to solve problems or accomplish something (e.g., Kagan 1972, Nicholls 1984, White 1959). IMkw is the enjoyment individuals experience 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) (see Table 2.3).

IMap, IMkw, and IMst, to different extents, are driven by individuals' innate needs, including competence, relatedness, and autonomy (Deci and Ryan 1985, 2002, Vallerand 1997). For instance, IMap is stimulated when individuals want to prove their competence; IMkw is aroused when individuals feel that knowing more could promote interactions with coworkers and thereby satisfy their need for relatedness;

IMst is generated by individuals' need for autonomy, since autonomy allows them to freely search for information and enjoy a variety of experiences and pleasures (Steenkamp and Burgess 2002).

Meanwhile, the three dimensions also satisfy different aspects of individuals' innate needs in Maslow's hierarchy (Maslow 1970). First, IMap relates to individuals' desires for esteem and self-actualization. When individuals successfully solve problems, they realize their self-value; when they overcome difficulties, they feel a sense of accomplishment. Second, IMkw manifests individuals' needs to reduce uncertainty, which relates to their needs for safety. Individuals display a tendency to explore when they feel unfamiliar with their surrounding environment (Berlyne 1971, White 1959). Hence, it is intuitive for individuals to strive to learn and understand new things when they encounter uncertain situations in their daily jobs. Third, IMst is associated with hedonic needs, which belong to the physiological category.

Overall, this tri-dimensional view of intrinsic motivation renders a holistic conceptualization and captures the richness of intrinsic motivation in regards to complex human behaviors, such as the IS usage behaviors of employees in the post-acceptance stage.

Accordingly, we propose that intrinsic motivation toward IS use manifests in three ways: IMap, IMkw, and IMst (see Table 2.3). We define IMap as the pleasure and satisfaction that users experience when solving problems or overcoming difficulties in using IS; IMkw refers to the pleasure and satisfaction that users experience when learning new things or trying to understand something new in using IS; and IMst represents the pleasure and satisfaction that users experience when using IS. These three dimensions, as a whole, constitute the concept of rich intrinsic

motivation (RIM) for IS use. As such RIM goes beyond PE, which has its root in hedonism and captures only the physiological aspects of intrinsic motivation but overlooks individuals' innate needs for high-order realization, such as challenge, accomplishment, curiosity, and learning (Malone 1981, Vallerand 1997, Venkatesh 1999). Toward this end, the RIM concept provides a rich conceptualization of intrinsic motivation toward IS use.

Table 2.3 Conceptualizing the Three Dimensions in RIM

| | Intrinsic Motivation (Vallerand 1997 p.280) | Intrinsic Motivation toward IS Use |
|---|---|---|
| Intrinsic motivation toward accomplishments (IMap) | *Individuals engage in activities because of* the pleasure and satisfaction experienced while one is attempting to surpass oneself, or to accomplish or creating something | *Individuals engage in IS use because of* the pleasure and satisfaction that users experience when solving problems or overcoming difficulties in using IS |
| Intrinsic motivation to know (IMkw) | *Individuals engage in activities because of* the pleasure and satisfaction that one experiences while learning, exploring, or trying to understand something new | *Individuals engage in IS use because of* the pleasure and satisfaction that users experience when learning new things or trying to understand something new in using IS |
| Intrinsic motivation to experience stimulation (IMst) | *Individuals engage in activities because of* the experienced pleasant sensations associated mainly with one's senses | *Individuals engage in IS use because of* the pleasure and satisfaction that users experience when using IS |

### 2.2.4 Other Constructs Similar to Intrinsic Motivation in the IS Context

Still, we find some constructs similar to intrinsic motivation in prior IS literature, from which the rich intrinsic motivation (RIM) concept should be distinguished. The three representative constructs are playfulness (Webster and Martocchio 1992), flow (Agarwal and Karahanna 2000, Koufaris 2002, Webster and Ahuja 2006), and intrinsic task motivation (Cooper 2000, Elam and Mead 1990, Gill 1996, Igbaria et al. 1994, Nelson et al. 2000). In the following, we review the relevant IS literature on each construct and elaborate their differences from RIM.

#### 2.2.4.1 Playfulness

Webster and Martocchio (1992) propose the concept of 'computer playfulness', the degree of users' cognitive spontaneity when interacting with computers. Playfulness is basically a personal trait that includes five factors: cognitive spontaneity, social spontaneity, physical spontaneity, manifest joy, and sense of humor (Barnett 1991, Lieberman 1977). In the IS context, computer playfulness mainly deals with individual cognitive spontaneity when interacting with computers (Webster and Martocchio 1992). Webster and Martocchio (1992) examined computer playfulness as a 'situation-specific trait', which is assumed to remain relatively stable under a certain environmental condition, i.e., when users interact with computers. Empirical results proved that computer playfulness had significant impacts on users' interaction with computers (Webster and Martocchio 1992, Webster et al. 1993).

Unlike computer playfulness, intrinsic motivation toward IS use is a motivational state that varies with contextual factors (Vallerand 1997). Although prior studies have argued that 'playful individuals are intrinsically motivated (Barnett 1991, Dewey 1913)' (Webster and Martocchio 1992, p. 217), our study explicitly distinguishes between computer playfulness and intrinsic motivation toward IS use. We contend that computer playfulness captures a concrete psychometric disposition that manifests through individuals' intellectual interaction with computers, while intrinsic motivation concerns individuals' motivational tendency toward their interactions with technologies.

In addition, although both computer playfulness and intrinsic motivation (i.e., perceived enjoyment) are important sources affecting general IS use, Venkatesh (2000) contends that intrinsic motivation dominates computer playfulness in

determining IS use-related factors after users gain more usage experience. Given that our study context emphasizes the post-acceptance stage in which employees have sufficient usage experience, we examine intrinsic motivation rather than computer playfulness.

#### 2.2.4.2 Flow

The second concept that warrants attention is flow, which refers to 'the state in which people are so involved in an activity that nothing else seems to matter' (Csikszentmihalyi 1990, p. 4). The four dimensions of flow in the IS context are control, attention focus, curiosity, and intrinsic interest (Trevino and Webster 1992, Webster et al. 1993). Alternatively, some studies examine flow as concentration and enjoyment (Ghani and Deshpande 1994, Koufaris 2002). The application of flow concept in IS context later diverges. For instance, some scholars consider cognitive engagement as a subset of flow without the notion of control (Webster and Ahuja 2006, Webster and Hackley 1997, Webster and Ho 1997). Others extend the concept of flow by adding other dimensions, e.g., temporal dissociation (Agarwal and Karahanna 2000), or computer playfulness and ease of use (Agarwal et al. 1997). Basically, the flow concepts have a positive contribution to IS-related cognition (e.g., perceived usefulness, perceived ease of use), intention, and/or behavior (Agarwal and Karahanna 2000, Koufaris 2002, Webster and Ahuja 2006).

We argue that flow is conceptually distinct from intrinsic motivation. Flow refers to users' cognitive status when interacting with IS, while intrinsic motivation concerns the motivational tendency toward IS use. The similarity between flow and intrinsic motivation lies in the enjoyment experienced during the interaction process. Nevertheless, flow represents users' enjoyment status throughout the usage process,

whereas intrinsic motivation toward IS use in our study refers to the enjoyment as reasons for users to engage in IS use.,

### 2.2.4.3 Intrinsic Task Motivation

Another noteworthy research stream related to intrinsic motivation is intrinsic task motivation. Several IS studies contend that job design could positively impact users' intrinsic task motivation, which consequently affects general IS use (Gill 1996, Igbaria et al 1994, Nelson et al. 2000) and user creativity in IS-related contexts (Cooper 2000, Elam and Mead 1990). Such a contention is essentially established on the job characteristics model (Hackman and Oldham 1980), suggesting that key job characteristics satisfy such individual cognitive psychological needs as meaningfulness, responsibility, and feedback, thereby promoting job motivation, performance, and satisfaction.

We here clarify that this intrinsic task motivation is also different from intrinsic motivation toward IS use in terms of the underlying theoretical assumptions. First, intrinsic task motivation presumes that a task is meaningful and influential in the eyes of beholders (Thomas and Velthouse 1990). Individuals are assumed to identify with and internalize the value that accomplishing the task signifies their impact within organizations. In other words, intrinsic task motivation by nature is a cognition-based motivation (Thomas and Velthouse 1990). Individuals' cognition of their 'illusionary' power could be constructed by surrounding social environments they experienced or their own interpretations of external conditions, including the meaning of their tasks (Thomas and Velthouse 1990). By contrast, the intrinsic motivation concept in our study is mainly driven by individuals' innate desires for autonomy, competence, and relatedness (Deci and Ryan 1985, 2002). Such innate

needs are assumed to be inherent in human beings as 'organisms', rather than being based on their cognitive experiences (Deci and Ryan 1985). Intrinsic motivation adopts an organismic approach, recognizing that 'human beings attempt actively to master the forces in the environment and the forces of drives and emotions in themselves' (Deci and Ryan 1985, p. 8). Moreover, individuals, when striving for activities to satisfy their innate needs, would generate corresponding affective, behavioral, and cognitive consequences (Vallerand 1997).

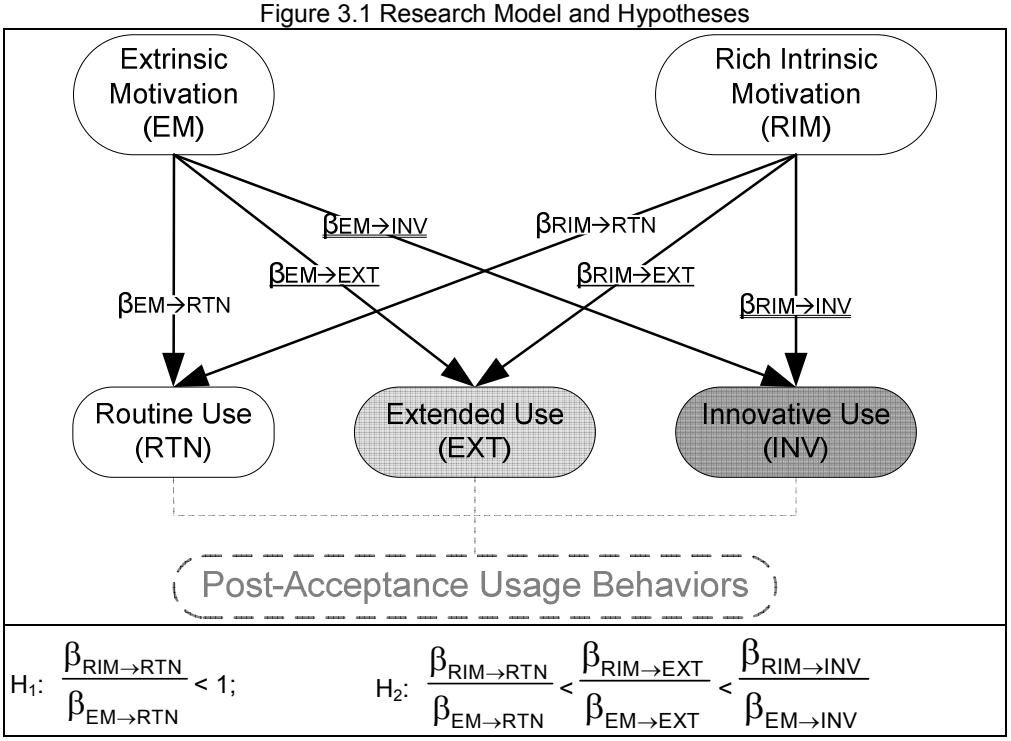
The second difference between intrinsic task motivation and intrinsic motivation toward IS use lies in the contextual elements. Intrinsic task motivation specifically links motivation with tasks; intrinsic motivation toward IS use, as conceptualized earlier, mainly concerns IS-related contexts. We propose that intrinsic motivation toward IS use could be applicable wherever IS plays a significant role, either in hedonic or workplaces settings. Moreover, since our literature review indicates that the concept of rich intrinsic motivation toward IS use (i.e., RIM) is more desirable in workplace than in hedonic contexts (see Sections 1.2 & 2.2.2), our study takes the initial step of verifying the applicability of RIM in organizational settings.

# Chapter 3.

# Research Model and Hypotheses

Chapter 3 interweaves the three post-acceptance usage behaviors and motivation theory and proposes our research model and hypotheses. Specifically, we hypothesize that RIM has a weaker impact than EM on RTN ($H_1$) and that the importance of RIM relative to EM increases for usage behaviors that involve higher levels of innovativeness and learning ($H_2$). Integrating the three post-acceptance usage behaviors (i.e., RTN, EXT, and INV), extrinsic motivation (EM), and the rich intrinsic motivation (RIM) concept in particular, we present our research model in Figure 3.1. We propose two research hypotheses with a comparative structure: $H_1$) RIM has a weaker association with RTN than with EM and $H_2$) the importance of RIM relative to EM is greater for (a) INV than for EXT and (b) EXT than for RTN.

Figure 3.1 Research Model and Hypotheses




As noted earlier, RTN emphasizes the consistency between IS use and the standards for normal work processes, a consistency that organizations usually commit large amounts of efforts and resources to establish (Cooper and Zmud 1990, Saga and Zmud 1994, Yoon et al. 1995). The utilitarian rewards derived from employees' IS use, such as bonuses and promotions (Davis 1989), serve as the organizational efforts and resources designated to reinforce this consistency (Luthans and Kreitner 1985, Scott and Podsakoff 1982). In other words, when employees perceive using IS to be instrumental, their perceptions have most likely been informed by organizations' reward structures, thus driving the employees to partake in RTN.

Compared to extrinsic motivation, rich intrinsic motivation should be less relevant for RTN. RTN, which typically reflects employees' compliance to external requirements (e.g., managerial expectations, process standards), is generally promoted through economic exchange mechanisms (such as bonuses, promotions,

raises, etc.) but is less likely to be affected by emotional appeals (such as the enjoyment and satisfaction derived from interacting with IS) (Kelman 1958). Furthermore, spontaneous interest in learning and seeking novelty when using IS can consume employees' time and effort, which could otherwise be dedicated to routine activities like RTN that have low uncertainty (MacKenzie et al. 2001). The above reasoning suggests that RIM, in relation to EM, will be associated with RTN less strongly. Thus, we propose:

*$H_1$: Rich Intrinsic Motivation has a weaker association with Routine Use than Extrinsic Motivation.*

Next, we theorize that rich intrinsic motivation will play a more important role than extrinsic motivation in explaining usage behaviors that involve greater innovativeness and learning. Ryan and Deci (2000b) contend that "intrinsic motivation results in high-quality learning and creativity" (p. 55). Learning refers to individuals' attempts to transform prior experience and create new knowledge (Kim 1993, Kolb 1984), and innovation requires individuals to develop promising original ideas and to remain patient during numerous trial-and-error iterations before a new solution emerges. Toward this end, intrinsic motivation that is derived from performing a particular behavior induces the spontaneous enthusiasm and interest that enhances individuals' cognitive flexibility and develops their commitment to and perseverance toward a behavior (McGraw and McCullers 1979, Shin and Zhou 2003, Vallerand 1997). Specifically, individuals with a high level of IMap are inclined to concentrate on challenging tasks. Curious individuals with a high level of IMkw are generally excited about devoting efforts toward learning and exploring, which are critical steps that lead to innovations (Greif and Keller 1990). The heightened

interest in an activity itself (i.e., IMst) motivates individuals to surpass formal requirements (Piccolo and Colquitt 2006) and to seek creative ways to perform tasks that satisfy their higher-order needs (Amabile 1996).

Accordingly, we suggest that employees who experience joy and satisfaction while resolving problems or overcoming difficulties in using an IS (IMap), while learning or trying to understand new things in using an IS (IMkw), or while physically interacting with a IS (IMst) will display high determination, concentration, and flexibility when learning additional functions and searching for novel ways to use the IS. Individuals with higher needs for experience enjoyment and stimulation also display higher tendencies to take risks, seek information and variety, and try out new possibilities (Raju 1992, Steenkamp and Burgess 2002, Zuckerman 1994). Furthermore, employees in the post-acceptance stage typically accumulate a certain level of familiarity with the implemented IS (Saga and Zmud 1994, Wang and Hsieh 2006). This familiarity serves as the knowledge base that facilitates employees, especially those who are intrinsically motivated, to engage in more innovative behaviors. Thus, when considering the three behaviors, we argue that the higher users' intrinsic motivation, the more likely they will display behaviors associated with higher levels of innovativeness and learning. Relatively speaking, the highest level of intrinsic motivation should generate a behavior that is radically innovative and involves much more learning (i.e., INV), moderate intrinsic motivation should stimulate a behavior that is incrementally innovative and requires a moderate amount of learning (i.e., EXT), and minimum intrinsic motivation should result in a behavior that is minimally innovative and entails the least amount of learning (i.e., RTN).

We now turn to discuss the relative importance of rich intrinsic motivation and extrinsic motivation in explaining the three behaviors. Unlike the extant literature

that consistently suggests the positive role of intrinsic motivation for innovative and learning behaviors, prior studies reveal inconsistent results regarding the effect of extrinsic motivation on innovative and learning activities. Psychologists submit that external rewards have two important functions: informational and controlling (Ryan et al. 1983). While the informational aspect of rewards makes individuals aware of their competence and self-determination, which contribute to innovative ideas and learning initiatives, the controlling aspect pressures individuals toward specified outcomes and stifles their creativity and learning interest (Amabile et al. 1986, McGraw 1978, Ryan et al. 1983). Admittedly, extrinsic motivation may contribute to innovative performance to some extent (Eisenberger 1992, Eisenberger and Cameron 1996); that is, if employees perceive IS use as functional for enhancing their performance, they are likely to devote extra effort to engage in more innovative IS use to advance their job performance, may it be incrementally (EXT) or radically (INV) innovative (Karahanna and Agarwal 2006, Li and Hsieh 2007). Nevertheless, intrinsic motivation, as compared to extrinsic motivation, produces much more enjoyment, interest, and energy during the process of learning and innovation and also mitigates the negative effects of external distractions, like pressure or tension (Deci and Ryan 1985, 2002, Vallerand 1997). All of these advantages of intrinsic motivation can contribute to employees' creativity, commitment, and persistence, which enable them to pursue usage behaviors that demand higher levels of learning and innovativeness. By contrast, extrinsic motivation appears to be much less powerful in coping with the possibly demanding conditions associated with higher level usage behaviors. The above discussion suggests an increasingly import role for RIM, relative to EM, in terms of its effects on post-acceptance behaviors with minimum, moderate, and maximum levels of innovativeness and learning.

Therefore, we propose the following:

*$H_{2a}$: The importance of Rich Intrinsic Motivation relative to Extrinsic Motivation is greater for Innovative Use than for Extended Use.*

*$H_{2b}$: The importance of Rich Intrinsic Motivation relative to Extrinsic Motivation is greater for Extended Use than for Routine Use.*

In the following Chapters (Chapters 5, 6, and 7), we report the three empirical studies that were built upon each other to operationalize RIM and evaluate its measurement and predictive properties and to test the comparative hypotheses. Study 1 was conducted to establish the measurement properties of RIM. Study 2 builds on Study 1 and was conducted to assess the predictive power of RIM over traditional conceptualizations of intrinsic motivation (i.e., PE) for explaining users' attitudes toward IS use. Finally, Study 3 builds on the previous two studies to test the model and the hypotheses.

# Chapter 4.

# Study 1: Measurement Validation for the Dimensions of RIM

Since RIM is a new, multidimensional construct, we conducted Study 1 to develop operational measures and validate them. We chose business intelligence systems (BIS) as the target IS for investigation. BIS are data-driven decision-support IS that synthesize data gathering, data storage, and knowledge management with complex analytical functions (Negash and Gray 2008). They are popular among large enterprises for decision-making and strategic planning tasks (Negash and Gray 2008). We surveyed employees who use BIS at a large telecommunication service organization in China. At the time of data collection, the organization had implemented their BIS for about nineteen months, which is well beyond the typical eight-to-twelve-month acceptance timeframe for major IS implementation initiatives (Gattiker and Goodhue 2005, Morris and Venkatesh forthcoming). The BIS had also been effectively functioning after the initial year of the implementation. As further confirmed by the top management, the use of the BIS had been well integrated into the management and operational processes in the organization, though it had not necessarily attained its fullest potential. Indeed, empirical evidence suggests that in the post-acceptance stage a complex organizational IS can be used on a routine basis but may not be utilized to its fullest potential (Boudreau 2003, Hsieh and Wang 2007,

Wang and Hsieh 2006). Therefore, we consider the selected organization for Study 1 has progressed into the post-acceptance stage. The employees were knowledge workers who possessed rich market knowledge and sufficient BIS usage experience. A survey instrument was developed for data collection. Questionnaire translation and back-translation between English and Chinese were carried out independently by two certified professional translators (Brislin et al. 1973). In the pilot test, we invited thirty-five employees to complete the questionnaire. The initial results revealed acceptable measurement properties for the three dimensions of RIM. Some minor modifications in wording of the items and instructions were made based on participant feedback. We then administered the instruments to 200 BIS users in the organization, out of which 165 responded (see Table 4.1).

Table 4.1 Sample Demographics (Study 1)

| Category | | Frequency | Percentage (%) |
|---|---|---|---|
| Age | 25 or below | 18 | 10.9 |
| | 26-30 | 39 | 23.6 |
| | 31-35 | 50 | 30.3 |
| | 36-40 | 33 | 20.0 |
| | 41 or above | 25 | 15.2 |
| Education | Senior High School | 7 | 4.2 |
| | College | 55 | 33.3 |
| | Bachelor's Degree | 102 | 61.8 |
| | Master's Degree | 1 | 0.6 |
| | Doctorate Degree or above | 0 | 0.0 |
| Gender | Female | 102 | 61.8 |
| | Male | 63 | 38.2 |

## 4.1 Measures

We assessed IMap (four items) and IMkw (three items) by adapting the items from Vallerand (Vallerand 1997, Vallerand et al. 1997, Van Yperen and Hagedoorn 2003) and evaluated IMst (three items) by using Davis et al.'s (1992) measures for perceived enjoyment (PE). We adapted the PE measures instead of Vallerand's measures of IMst for three reasons. First, enjoyment in workplaces is not the same as the *intense* enjoyment one experiences in hedonic behaviors like participating in

sports activities; Davis et al.'s PE measures capture users' sensations of physical enjoyment in workplaces more precisely than the measures we would contextualize from Vallerand's IMst items. This point was also confirmed by the participants in the pilot test. Second, 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, Hsieh et al. 2008, Thong et al. 2006). Finally, measuring the PE items as the IMst dimension of RIM facilitates the statistical comparison between RIM and PE in terms of their predictive validity (as examined in Study 2). All measures used in Study 1 are listed in Table 4.2.

Table 4.2 Measurement Items (Study 1)

| Variable | Sources | Measures |
|---|---|---|
| Intrinsic Motivation toward Accomplishment | Van Yperen and Hagedoorn 2003, Vallerand 1997 | "Why do you use the business intelligence system (BIS)?"<br>IMap1. Because I feel a lot of personal satisfaction while mastering certain difficult skills in using the BIS.<br>IMap2. For the pleasure I feel while improving some of my weakness in using the BIS.<br>IMap3. For the satisfaction I experience while I am perfecting my use of the BIS.<br>IMap4. For the satisfaction I feel while overcoming certain difficulties in using the BIS. |
| Intrinsic Motivation to Know | Van Yperen and Hagedoorn 2003, Vallerand 1997 | "Why do you use the BIS?"<br>IMkw1. For the pleasure it gives me to know more about the BIS.<br>IMkw2. For the pleasure I feel while learning new things in using the BIS.<br>IMkw3. For the pleasure of developing new skills in using the BIS. |
| Intrinsic Motivation to Experience Stimulation (Perceived Enjoyment) | Davis et al. 1992 | "Why do you use the BIS?"<br>IMst1. Because I find using the BIS to be enjoyable.<br>IMst2. Because The actual process of using the BIS is pleasant.<br>IMst3. Because I have fun using the BIS. |

Note: All measures adopt a 7-point Likert scale with anchors ranging from strongly disagree (1) to strongly agree (7).

## 4.2 Validating measurement items of RIM

Table 4.3 shows the descriptive statistics, composite reliability, Cronbach's alpha, and average variance extracted (AVE) for the three dimensions of RIM. 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) indicate high internal consistency and convergent validity of the three dimensions of RIM. The discriminant validity of the three dimensions is also supported because 1) the AVE value of each dimension is higher than its squared correlations with any other dimensions (see Table 4.3), 2) item loadings on its own variable are higher than the cross loadings on any other variable (see Table 4.4) (Chin 1998), and 3) the results of the pair-wise discriminant test by the covariance-based SEM technique with AMOS 16.0 (Gefen et al. 2003, Segars 1997) confirmed that the tri-dimensional measurement model outperformed three other possible measurement models in which any two dimensions of RIM are combined as one[1] (see Table 4.5). These evidences suggest acceptable measurement properties for the three dimensions of RIM.

Table 4.3 Descriptive Statistics and Psychometric Properties (Study 1)

| | Mean | Standard Deviation | IMap | IMkw | IMst |
|---|---|---|---|---|---|
| IMap | 5.44 | 0.95 | ***0.78*** | | |
| IMkw | 4.96 | 1.07 | 0.31 | ***0.70*** | |
| IMst | 4.32 | 1.15 | 0.17 | 0.34 | ***0.72*** |
| Composite Reliability | | | 0.94 | 0.88 | 0.95 |
| Cronbach's Alpha | | | 0.91 | 0.78 | 0.93 |

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

[1] Following Segars (1997), we compared the $\chi^2$ of the original measurement model of RIM against three other possible measurement models in which any two dimensions of RIM were combined as one dimension. Discriminant validity is supported when the original measurement model displays $\chi^2$ significantly better than any other possible model (Gefen et al. 2003, Segars 1997). Inferring from the results in Table 5.5, we conclude that the discriminant validity of the three dimensions of RIM is well supported.

Table 4.4 Item Loadings and Cross Loadings (Study 1)

| | IMap | IMkw | IMst |
|---|---|---|---|
| IMap1 | 0.852 | 0.479 | 0.338 |
| IMap2 | 0.899 | 0.526 | 0.429 |
| IMap3 | 0.904 | 0.505 | 0.327 |
| IMap4 | 0.887 | 0.469 | 0.378 |
| IMkw1 | 0.379 | 0.748 | 0.390 |
| IMkw2 | 0.506 | 0.875 | 0.534 |
| IMkw3 | 0.509 | 0.884 | 0.553 |
| IMst1 | 0.428 | 0.587 | 0.935 |
| IMst2 | 0.385 | 0.567 | 0.956 |
| IMst3 | 0.354 | 0.503 | 0.915 |

Table 4.5 $\chi^2$ and d.f. of Four Different Measurement Models of RIM (Study 1)

| Measurement Model | $\chi^2$ | d.f. |
|---|---|---|
| IMap, IMkw, and IMst freely covary | 33.5 | 31 |
| Combining IMap and IMkw | 141.6 | 33 |
| Combining IMap and IMst | 287.7 | 33 |
| Combining IMkw and IMst | 143.3 | 33 |

# Chapter 5.

# Study 2: Evaluation of the Second-Order Conceptualization and the Predictive Validity of RIM

After establishing the measurement properties of each dimension of RIM, we proceeded to validate RIM as a second-order construct and compare its predictive power relative to PE. To evaluate the generalizability of the RIM measures across types of IS, we selected customer support systems (CSS) as the target IS for investigation in Study 2. In general, CSS are 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 and background information, customer preferences, and service record histories. Like BIS, which was the target IS in Study 1, CSS are also popular among large enterprises for business operation and management (Bolton and Tarasi 2006, Rigby and Ledingham 2004). We conducted Study 2 at another large telecommunication service companies in China. At the time of data collection, the organization had been using the CSS for about twenty-one months, which again exceeds the eight-to-twelve-month time horizon for IS implementation to move past the acceptance stage (Gattiker and Goodhue 2005, Morris and Venkatesh forthcoming). Again, the organization in Study

2 was at the post-acceptance stage of the implementation process. Our respondents were frontline service employees who apply the CSS to support their work. The informal interviews with our respondents suggested that their use of CSS already became an integral part of their job performance, which is a primary characteristic of the post-acceptance stage (Saga and Zmud 1994). We conducted a pilot test prior to the large-scale survey by inviting twenty employee users to complete the questionnaire and obtained acceptable psychometric properties for all of the measured variables. We then administered questionnaires to 346 employees who used the CSS to support their service activities, and 244 of them responded (see Table 5.1).

Table 5.1 Sample Demographics (Study 2)

| 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 |
| 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 |
| Gender | Female | 184 | 75.4 |
| | Male | 60 | 24.6 |

## 5.1 Measures

We adapted the RIM measures validated in Study 1 to the CSS context. We also measured perceived usefulness (PU) (four items) (Davis 1989, Davis et al. 1989), perceived ease of use (PEOU) (Davis 1989, Davis et al. 1989), and attitude toward IS use (ATT) (three items) (Karahanna et al. 1999) in order to test the predictive validity of RIM in the nomological network that is well established in the technology acceptance model (TAM). We chose ATT instead of general IS use as the dependent variable because 1) ATT is an important mediator linking PU and PEOU to actual IS

use (Davis et al. 1989); 2) ATT can suggest whether a user psychologically accepts the IS in use, even in non-volitional or quasi-volitional IS use organizational contexts (Agarwal 2000, Karahanna et al. 1999); and 3) the three concrete post-acceptance usage behaviors are to be examined in Study 3. We controlled for important factors that may affect ATT, including age (AGE), education (EDU), gender (GEN), prior use time (PRI), and tenure (TEN) (Agarwal and Prasad 1999). All measures used in Study 2 are listed in Table 5.2.

Table 5.2 Measurement Items (Study 2)

| Variable | Sources | Measures |
|---|---|---|
| Intrinsic Motivation toward Accomplishment | Van Yperen and Hagedoorn 2003, Vallerand 1997 | "Why do you use the customer support system (CSS)?"<br>IMap1. Because I feel a lot of personal satisfaction while mastering certain difficult skills in using the CSS.<br>IMap2. For the pleasure I feel while improving some of my weakness in using the CSS.<br>IMap3. For the satisfaction I experience while I am perfecting my use of the CSS.<br>IMap4. For the satisfaction I feel while overcoming certain difficulties in using the CSS. |
| Intrinsic Motivation to Know | Van Yperen and Hagedoorn 2003, Vallerand 1997 | "Why do you use the CSS?"<br>IMkw1. For the pleasure it gives me to know more about the CSS.<br>IMkw2. For the pleasure I feel while learning new things in using the CSS.<br>IMkw3. For the pleasure of developing new skills in using the CSS. |
| Intrinsic Motivation to Experience Stimulation (Perceived Enjoyment) | Davis et al. 1992 | "Why do you use the CSS?"<br>IMst1. Because I find using the CSS to be enjoyable.<br>IMst2. Because The actual process of using the CSS is pleasant.<br>IMst3. Because I have fun using the CSS. |
| Extrinsic Motivation (Perceived Usefulness) | Davis 1989, Davis et al. 1989 | EM1. Using the CSS in my job enables me to accomplish tasks more quickly.<br>EM2. Using the CSS improves my job performance.<br>EM3. Using the CSS in my job increases my productivity.<br>EM4. Using the CSS enhances my effectiveness in my job. |
| Perceived Ease of Use | Davis 1989, Davis et al. 1989 | PEOU1. It is easy to get the CSS to do what I want it to do.<br>PEOU2. My interaction with the CSS is clear and understandable.<br>PEOU3. I find the CSS flexible to interact with. |

Note: All measures adopt a 7-point Likert scale with anchors ranging from strongly disagree (1) to strongly agree (7).

Table 5.2 Measurement Items (Study 2) (Continued)

| Variable | Sources | Measures |
|---|---|---|
| Attitude | Ajzen and Fishbein 1980, Karahanna et al. 1999 | ATT1. Using the CSS is positive.<br>ATT2. Using the CSS is good.<br>ATT3. Using the CSS is beneficial. |

Note: All measures adopt a 7-point Likert scale with anchors ranging from strongly disagree (1) to strongly agree (7).

## 5.2 Validating RIM as a Second-Order Construct

We modeled RIM as a second-order construct that consists of three formative dimensions (i.e., IMap, IMkw, and IMst) with each dimension as reflective at the first level (Jarvis et al. 2003, MacKenzie et al. 2005, Petter et al. 2007). Several reasons support this formative conceptualization. First, overcoming difficulties in using IS (IMap), knowing more about its use (IMkw), and immersing oneself in IS use (IMst) are the sources of, rather than the results from, pleasant feelings and satisfaction toward IS use. In addition, IMap, IMkw, and IMst represent three different dimensions of users' joyful experiences related to IS use and are, therefore, not substitutable; deletion of any one dimension distorts the meaning of RIM as a whole. Finally, the three dimensions do not necessarily covary with each other. For instance, it is possible that a change in a user's physical sensation when using an IS (IMst) will not affect, or be affected by, a change in the user's satisfaction derived from solving problems in using the IS (IMap). The results of the non-redundant tetrads analysis also support this formative specification of RIM (Bollen and Ting 2000)[2].

We used Partial Least Square (PLS), a component-based Structural Equation

[2] When there is theoretical ambiguity in the nature of a measure for a construct, non-redundant tetrad analysis can be used to statistically inform if a construct's indicators are reflective or formative. A simultaneous test of the non-redundant tetrads that cannot reject the null hypothesis of a vanishing tetrad is suggestive of reflective indicators, while a test that can reject the null hypotheses is suggestive of formative indicators (Bollen and Ting 2000). We thus applied the vanishing tetrad analysis (Bollen and Ting 2000) to evaluate whether the measures for the RIM construct should be modeled as reflective or formative. The results support modeling RIM as formative.

Modeling technique, for data analysis. PLS can accommodate formative measures effectively with minimal constraints that can otherwise change the meaning of the model (Chin 1998, Peter et al. 2007). PLS is especially suitable for theoretical development purposes (Peter et al. 2007). SmartPLS was chosen as the analytical software (Ringle et al. 2005). Following the procedures in Study 1, we confirmed appropriate measurement properties for all of the latent variables in Study 2 (see Tables 5.3 and 5.4).

Next, we examined the predictive validity of RIM in the nomological network of TAM. Altogether three models were tested (see Table 5.5): Model 1 tests the original TAM, including PU, PEOU, ATT (Davis et al. 1989), and five control variables (AGE, EDU, GEN, PRI, and TEN); Model 2 adds IMst (i.e., PE) to Model 1 (Davis et al. 1992); and Model 3 replaces IMst (PE) with RIM. The PLS results, which are summarized in Table 5.5, support the nomological validity of RIM in TAM. None of the control variables showed significant impacts on ATT across the three models and are thus not reported in detail. Note that the Variance Inflation Factor (VIF) values of the three dimensions of RIM range from 1.515 to 1.599, suggesting minimal threat of multi-collinearity (Diamantopoulos and Siguaw 2006, Mathieson et al. 2001, Petter et al. 2007).

Table 5.3 Descriptive Statistics and Psychometric Properties (Study 2)

| | Mean | Standard Deviation | ATT | IMap | IMkw | IMst | EM (PU) | PEOU |
|---|---|---|---|---|---|---|---|---|
| ATT | 4.78 | 1.22 | ***0.91*** | | | | | |
| IMap | 4.58 | 1.11 | 0.39 | ***0.77*** | | | | |
| IMkw | 4.20 | 1.13 | 0.29 | 0.48 | ***0.83*** | | | |
| IMst | 3.77 | 1.21 | 0.28 | 0.34 | 0.37 | ***0.93*** | | |
| EM (PU) | 4.18 | 1.11 | 0.38 | 0.37 | 0.43 | 0.35 | ***0.82*** | |
| PEOU | 4.28 | 0.99 | 0.37 | 0.35 | 0.27 | 0.39 | 0.38 | ***0.72*** |
| Composite Reliability | | | 0.97 | 0.93 | 0.94 | 0.97 | 0.95 | 0.88 |
| Cronbach's Alpha | | | 0.95 | 0.90 | 0.90 | 0.96 | 0.93 | 0.80 |

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

Table 5.4 Item Loadings and Cross Loadings (Study 2)

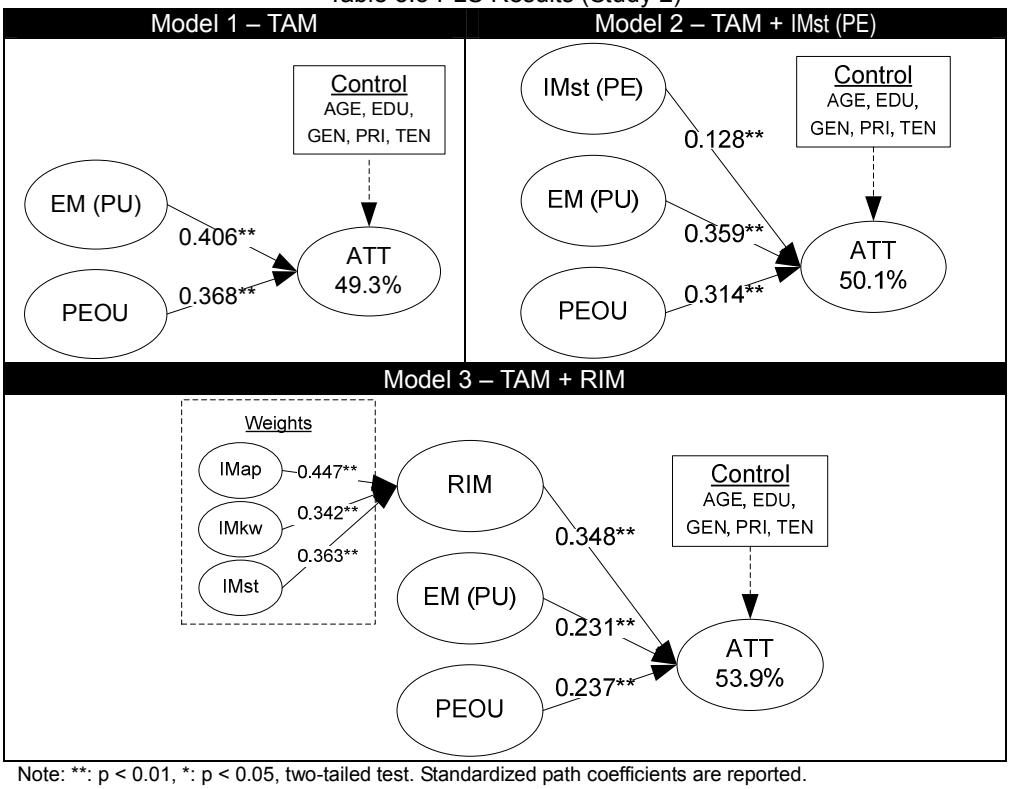
| | ATT | IMap | IMkw | IMst | EM (PU) | PEOU |
|---|---|---|---|---|---|---|
| ATT1 | 0.945 | 0.576 | 0.482 | 0.490 | 0.574 | 0.567 |
| ATT2 | 0.967 | 0.613 | 0.515 | 0.511 | 0.607 | 0.605 |
| ATT3 | 0.954 | 0.595 | 0.568 | 0.519 | 0.615 | 0.584 |
| IMap1 | 0.531 | 0.884 | 0.609 | 0.548 | 0.541 | 0.541 |
| IMap2 | 0.542 | 0.872 | 0.684 | 0.511 | 0.547 | 0.476 |
| IMap3 | 0.563 | 0.873 | 0.596 | 0.491 | 0.537 | 0.537 |
| IMap4 | 0.552 | 0.883 | 0.544 | 0.494 | 0.529 | 0.534 |
| IMkw1 | 0.437 | 0.575 | 0.880 | 0.556 | 0.592 | 0.435 |
| IMkw2 | 0.501 | 0.644 | 0.928 | 0.558 | 0.596 | 0.494 |
| IMkw3 | 0.558 | 0.680 | 0.933 | 0.548 | 0.611 | 0.505 |
| IMst1 | 0.521 | 0.563 | 0.578 | 0.954 | 0.560 | 0.607 |
| IMst2 | 0.513 | 0.552 | 0.582 | 0.967 | 0.571 | 0.605 |
| IMst3 | 0.498 | 0.567 | 0.589 | 0.967 | 0.580 | 0.597 |
| EM1 | 0.493 | 0.498 | 0.564 | 0.525 | 0.876 | 0.489 |
| EM2 | 0.563 | 0.538 | 0.607 | 0.553 | 0.924 | 0.561 |
| EM3 | 0.544 | 0.556 | 0.610 | 0.546 | 0.930 | 0.577 |
| EM4 | 0.645 | 0.612 | 0.589 | 0.520 | 0.886 | 0.605 |
| PEOU1 | 0.459 | 0.474 | 0.409 | 0.483 | 0.518 | 0.837 |
| PEOU2 | 0.533 | 0.552 | 0.525 | 0.581 | 0.571 | 0.869 |
| PEOU3 | 0.553 | 0.479 | 0.392 | 0.518 | 0.487 | 0.830 |

We further conducted pair-wise comparisons among the three models to evaluate the predictive power of RIM relative to IMst (PE) in explaining ATT. Following the procedures by Burton-Jones and Straub (2006), we calculated the $R^2$ change of the dependent variable between the models of comparison and assessed the effect size of the $R^2$ change. The results in Table 5.6 indicate that Model 3, relative to Models 1 and 2, explained the most variance in ATT. The evidences summarized in Tables 5.5 and 5.6 collectively suggest that RIM outperformed the single dimension IMst (PE) in predicting ATT in the TAM nomological network.

Finally, since all of the data were obtained from employees through a survey method, we assessed the threat of common method bias (CMB) by using the single-method-factor approach recommended by Podsakoff et al. (2003). Table 5.7 summarizes the factor loadings of all variables in the measurement model (the left column, $\chi^2$ = 316.520 and d.f. = 155), as well as the factor loadings in the

measurement model plus the common method variable (the right column, $\chi^2$ = 233.647 and d.f. = 135). As shown in Table 5.7, the factor loadings remain stable across the measurement model and the model incorporating the common method variable in the original measurement model. We also performed the Harmon one-factor test (Podsakoff and Organ 1986); the results revealed no sign of a single factor accounting for the majority of the variance. These collective evidences suggest that CMB is not a significant issue.

Table 5.5 PLS Results (Study 2)




Note: **: p < 0.01, *: p < 0.05, two-tailed test. Standardized path coefficients are reported.

Table 5.6 Comparing RIM and IMst (PE) (Study 2)

| | Model 3 vs. Model 1 – Impact of RIM | Model 2 vs. Model 1 – Impact of IMst (PE) | Model 3 vs. Model 2 – Relative impact of RIM vs. IMst (PE) |
|---|---|---|---|
| $\Delta R^2$ of ATT | 4.6% | 0.8% | 3.8% |
| $f^2$ (effect size) | 0.100** (small-to-medium) | 0.016* (small) | 0.083** (small-to-medium) |

Note: **: p < 0.01, *: p < 0.05, two-tailed test.

Table 5.7 Common Method Bias Analysis (Study 2)

| Variable | Indicator | Factor Loading | |
|---|---|---|---|
| | | Measurement Model | Measurement Model with CMV |
| User Attitude | ATT1 | 0.909 | 0.907 |
| | ATT2 | 0.963 | 0.963 |
| | ATT3 | 0.926 | 0.925 |
| Intrinsic Motivation toward Accomplishment | IMap1 | 0.841 | 0.835 |
| | IMap2 | 0.831 | 0.821 |
| | IMap3 | 0.829 | 0.830 |
| | IMap4 | 0.831 | 0.829 |
| Intrinsic Motivation to Know | IMkw1 | 0.793 | 0.729 |
| | IMkw2 | 0.898 | 0.867 |
| | IMkw3 | 0.917 | 0.914 |
| Intrinsic Motivation to Experience Stimulation | IMst1 | 0.919 | 0.874 |
| | IMst2 | 0.955 | 0.922 |
| | IMst3 | 0.956 | 0.926 |
| Extrinsic motivation (Perceived Usefulness) | EM1 | 0.839 | 0.689 |
| | EM2 | 0.908 | 0.766 |
| | EM3 | 0.912 | 0.829 |
| | EM4 | 0.830 | 0.957 |
| Perceived Ease of Use | PEOU1 | 0.749 | 0.729 |
| | PEOU2 | 0.829 | 0.803 |
| | PEOU3 | 0.703 | 0.726 |

Note: CMV = common method variable

# Chapter 6.

# Study 3: Model and Hypotheses Tests

In Study 3, we chose business intelligence systems (BIS) as the target IS to test the model and the hypotheses. As noted in our description of Study 1, BIS allow employees to apply a variety of analytical functions to analyze large volumes of data, which are typically drawn on or refined from data warehouses of internal and external data, and the results from such analyses are used for organizations' strategic planning, decision-making, and daily management (Negash and Gray 2008). The complex functions embedded in BIS, together with the large volumes of data available in data warehouses, permit users to apply BIS more extensively and innovatively to support their tasks. Study 3 was conducted at a third major telecommunication service organization in China. At the time of data collection, the BIS had been implemented for more than eighteen months and had also been well integrated with normal work processes as a key IS for the organization. Thus, the organization for Study 3 was also regarded as at the post-acceptance stage. Our subjects were marketing and sales analysts who use the BIS to analyze customer and sales data, monitor competitors, and observe market conditions and trends in the industry that may affect sales. The results of these analyses can be used for developing strategies for customer acquisition (attracting new customers), retention (keeping current customers), and enhancement (enhancing customer value by cross-selling, up-selling, etc.). Our in-depth interviews with the organization's senior

managers confirmed that 1) while the management expect these analysts to use the BIS regularly (RTN), the analysts' execution of this expectation may still vary from one employee to another (Organ et al. 2006) and that 2) the analysts have discretionary control over whether they want to use more of the available functions (EXT) and/or and suggest new and creative uses of the BIS (INV). Therefore, RTN, EXT, and INV in this investigative context involve sufficient variance for investigation. In the pilot test, we invited thirty-five employees and obtained acceptable psychometric properties for all of the measured variables in our research model. Then, we administered the questionnaires to 217 randomly sampled subjects and received 193 responses (see Table 6.1).

Table 6.1 Sample Demographics (Study 3)

| 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 |
| 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 |
| Gender | Female | 72 | 37.3 |
| | Male | 121 | 62.7 |

## 6.1 Measures

Measures for RTN (three items) were adapted from Saga and Zmud (1994) and Schwarz (2003) (see Appendix A3, the online supplement, for the detailed measures). The measures for EXT (three items) were adapted from Hsieh and Wang (2007), Saga and Zmud (1994), and Schwarz (2003). For INV (three items), we adapted the measures for trying to innovate with IT by Ahuja and Thatcher (2005) and intention to explore by Karahanna and Agarwal (2006). Trying to innovate with IT and intention to explore, though termed differently, are similar in both conceptualization

and operationalization to INV (see Table 2.1). While the measures of trying to innovate with IT and intention to explore describe users' discovery of novel ways to use IS, these measures focus primarily on 'trying' and 'intentions', respectively, instead of actual usage behavior. We adapted these measures to focus on the actual usage behavior, rather than on individuals' attempts or intentions to use the IS. To ensure RTN, EXT, and INV were all evaluated with respect to job-related purposes, we explicitly assessed usage behaviors for employees' work tasks.

Items for RIM, PU, and PEOU that were validated in Study 2 were adapted to the context of Study 3. In addition to the five control variables in Study 2 (AGE, EDU, GEN, PRI, and TEN), we also controlled for personal innovativeness with IT (PIIT) (three items) (Agarwal and Prasad 1998) and system self-efficacy (SSE) (three items) (Compeau and Higgins 1995) both of which may affect general IS use. All measures used in Study 2 are listed in Table 6.2.

Table 6.2 Measurement Items (Study 3)

| Variable | Sources | Measures |
|---|---|---|
| Intrinsic Motivation toward Accomplishment | Van Yperen and Hagedoorn 2003, Vallerand 1997 | "Why do you use the business intelligence system (BIS)?"<br>IMap1. Because I feel a lot of personal satisfaction while mastering certain difficult skills when using the BIS.<br>IMap2. For the pleasure I feel while improving some of my weakness when using the BIS.<br>IMap3. For the satisfaction I experience while I am perfecting my use of the BIS.<br>IMap4. For the satisfaction I feel while overcoming certain difficulties when using the BIS. |
| Intrinsic Motivation to Know | Van Yperen and Hagedoorn 2003, Vallerand 1997 | "Why do you use the BIS?"<br>IMkw1. For the pleasure it gives me to know more about the BIS.<br>IMkw2. For the pleasure I feel while learning new things when using the BIS.<br>IMkw3. For the pleasure of developing new skills when using the BIS. |
| Intrinsic Motivation to Experience Stimulation (Perceived Enjoyment) | Davis et al. 1992 | "Why do you use the BIS?"<br>IMst1. Because I find using the BIS to be enjoyable.<br>IMst2. Because The actual process of using the BIS is pleasant.<br>IMst3. Because I have fun using the BIS. |

Note: All measures adopt a 7-point Likert scale with anchors ranging from strongly disagree (1) to strongly agree (7).

Table 6.2 Measurement Items (Study 3) (Continued)

| Variable | Sources | Measures |
|---|---|---|
| Extrinsic Motivation (Perceived Usefulness) | Davis 1989, Davis et al. 1989 | EM1. Using the BIS in my job enables me to accomplish tasks more quickly.<br>EM2. Using the BIS improves my job performance.<br>EM3. Using the BIS in my job increases my productivity.<br>EM4. Using the BIS enhances my effectiveness in my job. |
| Perceived Ease of Use | Davis 1989, Davis et al. 1989 | PEOU1. It is easy to get the BIS to do what I want it to do.<br>PEOU2. My interaction with the BIS is clear and understandable.<br>PEOU3. I find the BIS flexible to interact with. |
| Routine Use | Saga and Zmud 1994, Schwarz 2003 | RTN1. My use of the BIS has been incorporated into my regular work practices.<br>RTN2. My use of the BIS is pretty much integrated as part of my normal work routine.<br>RTN3. My use of the BIS is now a normal part of my work. |
| Extended Use | Saga and Zmud 1994, Schwarz 2003 | EXT1. I often use more features of the BIS than expected in my regular work practices.<br>EXT2. I use new features of the BIS than normally expected to support my work<br>EXT3. I use additional features of the BIS than required in my routine work. |
| Innovative Use | Ahuja and Thatcher 2005, Karahanna and Agarwal 2006 | INV1. I have *discovered* new uses of the BIS to enhance my work performance.<br>INV2. I have used the BIS in *novel* ways to support my work.<br>INV3. I have developed *new* applications based on the BIS to support my work. |
| Personal Innovativeness with IT | Agarwal and Prasad (1998) | PIIT1. If I heard about a new information technology, I would look for ways to experiment with it.<br>PIIT2. Among my peers, I am usually the first to try out new information technologies.<br>PIIT3. I like to experiment with new information technologies. |
| System Self-Efficacy | Compeau and Higgins 1995 | SSE1. I feel comfortable using the BIS on my own.<br>SSE2. I can easily operate the BIS on my own.<br>SSE3. I feel comfortable using the BIS even if there is no one around me to tell me how to use it. |

Note: All measures adopt a 7-point Likert scale with anchors ranging from strongly disagree (1) to strongly agree (7).

## 6.2 Hypotheses Testing Results

We used the same procedures described in Studies 1 and 2 to evaluate the measurement properties for all of the constructs. Again, the results of the non-redundant tetrads analysis support the formative specification of RIM in Study 3 (Bollen and Ting 2000); the measures for all variables exhibit satisfactory

psychometric properties (see Tables 6.3 and 6.4).

Table 6.5 reports the results of the PLS analysis and the relative weights of all of the predictive variables. To test $H_1$, $H_{2a}$, and $H_{2b}$, we adopted two methods: one from Cohen and Cohen (1983)[3] and the other from a more recent approach by Cohen et al. (2003)[4]. We applied both methods to compare the impact of RIM with the impact of EM for each of the three usage behavior. To facilitate our understanding, we computed the relative importance ratio of RIM to EM by dividing the effect of RIM on each of the three behaviors by the effect of EM on each of these behaviors (see Table 6.6). We found the ratio to be below 1 for RTN, equal 1 for EXT, and exceeding 1 for INV, providing strong support for both $H_1$ and $H_2$.

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[3] 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, $r_{ij}$ is the zero-order correlation between I and J, and Y is the dependent variable, $|R|=1-r_{iy}^{2}-r_{jy}^{2}-r_{ij}^{2}+2*r_{iy}*r_{jy}*r_{ij}$, and $\bar{r}=\frac{r_{iy}+r_{jy}}{2}$.

[4] Cohen et al. (2003): $t=\frac{\beta_i-\beta_j}{\sqrt{\frac{1-R_Y^2}{n-k-1}*\left(\frac{sd_y^2}{sd_i^2}*r^{ii}+\frac{sd_y^2}{sd_j^2}*r^{jj}-2\frac{sd_y^2}{sd_i*sd_j}*\frac{r^{ij}}{\sqrt{r^{ii}*r^{jj}}}\right)}}$, where $\beta_i$ is the unstandardized path coefficient of the independent variable I (see Appendix E for unstandardized path coefficients), $sd_i$ is the standard deviation of I, $r^{ij}$ are the elements of the inverted correlation metrics[4], $R_Y^2$ is the explained variance of the dependent variable Y, n is sample size, and k is the number of total independent variables.

Table 6.3 Descriptive Statistics and Psychometric Properties (Study 3)

| | RTN | EXT | INV | IMap | IMkw | IMst | EM (PU) | PEOU | PIIT | SSE |
|---|---|---|---|---|---|---|---|---|---|---|
| RTN | ***0.95*** | | | | | | | | | |
| EXT | 0.30 | ***0.62*** | | | | | | | | |
| INV | 0.25 | 0.20 | ***0.75*** | | | | | | | |
| IMap | 0.20 | 0.22 | 0.15 | ***0.79*** | | | | | | |
| IMkw | 0.23 | 0.20 | 0.23 | 0.62 | ***0.85*** | | | | | |
| IMst | 0.23 | 0.18 | 0.22 | 0.25 | 0.28 | ***0.90*** | | | | |
| EM (PU) | 0.39 | 0.27 | 0.14 | 0.30 | 0.28 | 0.33 | ***0.84*** | | | |
| PEOU | 0.22 | 0.18 | 0.09 | 0.31 | 0.28 | 0.23 | 0.38 | ***0.76*** | | |
| PIIT | 0.11 | 0.13 | 0.08 | 0.19 | 0.14 | 0.14 | 0.12 | 0.14 | ***0.78*** | |
| SSE | 0.20 | 0.20 | 0.08 | 0.21 | 0.13 | 0.19 | 0.33 | 0.43 | 0.17 | ***0.80*** |
| Mean | 5.15 | 4.75 | 4.73 | 4.97 | 4.63 | 4.87 | 5.39 | 5.05 | 5.41 | 5.11 |
| Standard Deviation | 1.12 | 0.97 | 1.05 | 0.98 | 1.08 | 1.12 | 0.88 | 0.88 | 0.89 | 1.04 |
| Composite Reliability | 0.98 | 0.83 | 0.90 | 0.94 | 0.95 | 0.97 | 0.95 | 0.91 | 0.92 | 0.92 |
| Cronbach's Alpha | 0.97 | 0.69 | 0.83 | 0.91 | 0.91 | 0.95 | 0.93 | 0.85 | 0.86 | 0.88 |

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

We also examined the relative weight of the predictors for corroborative evidence. Relative weight refers to the proportionate contribution of an independent variable (IV) in explaining a dependent variable (DV) (LeBreton et al. 2007). Relative weight considers both the unique contribution of an IV and its contributions in the presence of other IVs, thus offering more precise information about a factor's predictive power (Johnson 2000, LeBreton et al. 2007). In Table 6.5, all of the IVs' relative weights in our research model (see Figure 3.1) are expressed in terms of percentage of contribution to the overall variance explained in the DVs. Specifically, RIM and EM, respectively, accounted for 23.1% and 40.6% of the variance in RTN, 24.6% and 27.2% in EXT, and 50.5% and 16.9% in INV. These results provide additional evidence to support our predictions that 1) RIM, in relation to EM, has a weaker association with RTN and that 2) the importance of RIM relative to EM is greater for (a) INV than for EXT and (b) EXT than for RTN. We also checked for common method bias (CMB) following the same procedures in Study 2 and found no significant influence of CMB on our results for Study 3. Table 6.7 summarizes the

factor loadings of all variables in the measurement model (the left column, $\chi^2$ = 496.552 and d.f. = 419), as well as the factor loadings in the measurement model with the common method variable (the right column, $\chi^2$ = 438.008 and d.f. = 387).

Table 6.4 Item Loadings and Cross Loadings (Study 3)

| | RTN | EXT | INV | IMap | IMkw | IMst | EM (PU) | PEOU | PIIT | SSE |
|---|---|---|---|---|---|---|---|---|---|---|
| RTN1 | 0.970 | 0.562 | 0.488 | 0.446 | 0.467 | 0.464 | 0.647 | 0.498 | 0.336 | 0.469 |
| RTN2 | 0.979 | 0.535 | 0.512 | 0.427 | 0.466 | 0.457 | 0.605 | 0.468 | 0.329 | 0.423 |
| RTN3 | 0.971 | 0.517 | 0.518 | 0.443 | 0.457 | 0.478 | 0.568 | 0.426 | 0.307 | 0.430 |
| EXT1 | 0.545 | 0.797 | 0.444 | 0.332 | 0.318 | 0.359 | 0.397 | 0.309 | 0.321 | 0.384 |
| EXT2 | 0.469 | 0.836 | 0.358 | 0.403 | 0.400 | 0.405 | 0.441 | 0.364 | 0.370 | 0.396 |
| EXT3 | 0.274 | 0.722 | 0.270 | 0.375 | 0.340 | 0.251 | 0.392 | 0.326 | 0.176 | 0.283 |
| INV1 | 0.520 | 0.453 | 0.899 | 0.409 | 0.481 | 0.503 | 0.452 | 0.311 | 0.277 | 0.315 |
| INV2 | 0.479 | 0.397 | 0.925 | 0.371 | 0.454 | 0.458 | 0.379 | 0.338 | 0.301 | 0.320 |
| INV3 | 0.319 | 0.322 | 0.765 | 0.248 | 0.336 | 0.281 | 0.192 | 0.154 | 0.159 | 0.138 |
| IMap1 | 0.327 | 0.394 | 0.355 | 0.874 | 0.720 | 0.405 | 0.414 | 0.448 | 0.411 | 0.351 |
| IMap2 | 0.426 | 0.424 | 0.325 | 0.903 | 0.700 | 0.433 | 0.506 | 0.516 | 0.367 | 0.410 |
| IMap3 | 0.426 | 0.433 | 0.353 | 0.872 | 0.665 | 0.416 | 0.513 | 0.490 | 0.341 | 0.439 |
| IMap4 | 0.426 | 0.424 | 0.410 | 0.913 | 0.721 | 0.508 | 0.521 | 0.554 | 0.417 | 0.436 |
| IMkw1 | 0.471 | 0.434 | 0.468 | 0.652 | 0.881 | 0.518 | 0.490 | 0.466 | 0.349 | 0.326 |
| IMkw2 | 0.411 | 0.375 | 0.448 | 0.755 | 0.949 | 0.464 | 0.468 | 0.483 | 0.354 | 0.338 |
| IMkw3 | 0.441 | 0.440 | 0.463 | 0.772 | 0.941 | 0.481 | 0.497 | 0.517 | 0.343 | 0.354 |
| IMst1 | 0.499 | 0.432 | 0.458 | 0.464 | 0.493 | 0.955 | 0.595 | 0.480 | 0.391 | 0.434 |
| IMst2 | 0.427 | 0.434 | 0.472 | 0.483 | 0.496 | 0.951 | 0.550 | 0.455 | 0.369 | 0.425 |
| IMst3 | 0.441 | 0.377 | 0.475 | 0.467 | 0.514 | 0.947 | 0.508 | 0.446 | 0.330 | 0.388 |
| EM1 | 0.582 | 0.518 | 0.385 | 0.504 | 0.489 | 0.529 | 0.929 | 0.571 | 0.360 | 0.525 |
| EM2 | 0.552 | 0.445 | 0.399 | 0.460 | 0.482 | 0.518 | 0.908 | 0.549 | 0.258 | 0.538 |
| EM3 | 0.592 | 0.467 | 0.372 | 0.490 | 0.458 | 0.544 | 0.908 | 0.559 | 0.324 | 0.511 |
| EM4 | 0.557 | 0.476 | 0.348 | 0.554 | 0.491 | 0.528 | 0.912 | 0.580 | 0.312 | 0.551 |
| PEOU1 | 0.479 | 0.402 | 0.318 | 0.549 | 0.491 | 0.475 | 0.566 | 0.917 | 0.370 | 0.639 |
| PEOU2 | 0.377 | 0.319 | 0.299 | 0.481 | 0.501 | 0.411 | 0.523 | 0.870 | 0.265 | 0.488 |
| PEOU3 | 0.388 | 0.386 | 0.220 | 0.444 | 0.395 | 0.378 | 0.530 | 0.835 | 0.370 | 0.607 |
| PIIT1 | 0.322 | 0.327 | 0.248 | 0.413 | 0.313 | 0.350 | 0.355 | 0.384 | 0.883 | 0.423 |
| PIIT2 | 0.265 | 0.338 | 0.283 | 0.377 | 0.356 | 0.342 | 0.271 | 0.313 | 0.890 | 0.348 |
| PIIT3 | 0.297 | 0.333 | 0.244 | 0.354 | 0.331 | 0.321 | 0.285 | 0.325 | 0.879 | 0.332 |
| SSE1 | 0.456 | 0.431 | 0.335 | 0.416 | 0.356 | 0.411 | 0.568 | 0.628 | 0.376 | 0.912 |
| SSE2 | 0.366 | 0.405 | 0.287 | 0.444 | 0.331 | 0.406 | 0.522 | 0.630 | 0.319 | 0.933 |
| SSE3 | 0.390 | 0.382 | 0.200 | 0.374 | 0.296 | 0.355 | 0.462 | 0.521 | 0.429 | 0.841 |

Table 6.5 PLS Results and Relative Weights (Study 3)

| | | RTN | | EXT | | INV | |
|---|---|---|---|---|---|---|---|
| | | Path Coefficient | Relative Weight | Path Coefficient | Relative Weight | Path Coefficient | Relative Weight |
| RIM | | 0.170* | 23.1% | 0.214** | 24.6% | 0.500** | 50.5% |
| EM | | 0.431** | 40.6% | 0.267** | 27.2% | 0.121 | 16.9% |
| Control Variables | AGE | -0.089* | 1.3% | -0.189** | 6.2% | -0.028 | 3.8% |
| | EDU | -0.079 | 0.7% | -0.116* | 1.6% | 0.117* | 3.0% |
| | GEN | 0.000 | 0.6% | 0.011 | 0.9% | 0.059 | 2.4% |
| | PRI | -0.021 | 0.1% | 0.036 | 0.6% | 0.042 | 1.5% |
| | TEN | 0.044 | 0.2% | 0.060 | 0.6% | -0.018 | 1.3% |
| | PIIT | 0.065 | 7.1% | 0.130* | 12.0% | 0.035 | 8.2% |
| | SSE | 0.075 | 13.1% | 0.154* | 15.9% | 0.021 | 5.4% |
| | PEOU | 0.037 | 13.2% | -0.024 | 10.7% | -0.126 | 7.0% |
| $R^2$ | | 44.3% | 100.0% | 39.4% | 100.0% | 32.5% | 100.0% |

Note: **: $p < 0.01$, *: $p < 0.05$, two-tailed test. Standardized path coefficients are reported here.

Table 6.6 Hypotheses Testing Results (Study 3)

| | RTN | EXT | INV |
|---|---|---|---|
| Ratio | $\frac{\beta_{RIM\rightarrow RTN}}{\beta_{EM\rightarrow RTN}} = \frac{0.170}{0.431} < 1$ | $\frac{\beta_{RIM\rightarrow EXT}}{\beta_{EM\rightarrow EXT}} = \frac{0.214}{0.267} \approx 1$ | $\frac{\beta_{RIM\rightarrow INV}}{\beta_{EM\rightarrow INV}} = \frac{0.500}{0.121} > 1$ |
| Method 1 (Cohen and Cohen 1983) | T = -1.653 (**) | T = 0.039 (n.s.) | T = 2.616 (**) |
| Method 2 (Cohen et al. 2003) | T = -2.223 (**) | T = -0.526 (n.s.) | T = 2.569 (**) |
| Conclusion | $H_1$ (✓): $\frac{\beta_{RIM\rightarrow RTN}}{\beta_{EM\rightarrow RTN}} < 1$<br>$H_2$ (✓): $\frac{\beta_{RIM\rightarrow RTN}}{\beta_{EM\rightarrow RTN}} < \frac{\beta_{RIM\rightarrow EXT}}{\beta_{EM\rightarrow EXT}} < \frac{\beta_{RIM\rightarrow INV}}{\beta_{EM\rightarrow INV}}$ | | |

Note: One-tailed tests were performed as the directional differences were hypothesized
**: $p < 0.01$, *: $p < 0.05$, n.s.: non-significant. Standardized path coefficients are reported.

Table 6.7 Common Method Bias Analysis (Study 3)

| Variable | Indicator | Factor Loading | |
|---|---|---|---|
| | | Measurement Model | Measurement Model with CMV |
| Routine Use | RTN1 | 0.948 | 0.699 |
| | RTN2 | 0.972 | 0.784 |
| | RTN3 | 0.972 | 0.808 |
| Extended Use | EXT1 | 0.716 | 0.561 |
| | EXT2 | 0.828 | 0.760 |
| | EXT3 | 0.659 | 0.529 |
| Innovative Use | INV1 | 0.841 | 0.715 |
| | INV2 | 0.970 | 0.981 |
| | INV3 | 0.670 | 0.632 |
| Intrinsic Motivation toward Accomplishment | IMap1 | 0.867 | 0.840 |
| | IMap2 | 0.875 | 0.792 |
| | IMap3 | 0.840 | 0.743 |
| | IMap4 | 0.909 | 0.842 |
| Intrinsic Motivation to Know | IMkw1 | 0.826 | 0.693 |
| | IMkw2 | 0.945 | 0.901 |
| | IMkw3 | 0.949 | 0.887 |
| Intrinsic Motivation to Experience Stimulation | IMst1 | 0.933 | 0.794 |
| | IMst2 | 0.930 | 0.849 |
| | IMst3 | 0.917 | 0.846 |
| Extrinsic motivation (Perceived Usefulness) | EM1 | 0.929 | 0.807 |
| | EM2 | 0.922 | 0.612 |
| | EM3 | 0.859 | 0.588 |
| | EM4 | 0.872 | 0.628 |
| Perceived Ease of Use | PEOU1 | 0.873 | 0.710 |
| | PEOU2 | 0.840 | 0.633 |
| | PEOU3 | 0.832 | 0.769 |
| Personal Innovativeness with IT | PIIT1 | 0.795 | 0.696 |
| | PIIT2 | 0.892 | 0.832 |
| | PIIT3 | 0.875 | 0.791 |
| System Self-Efficacy | SSE1 | 0.879 | 0.762 |
| | SSE2 | 0.951 | 0.954 |
| | SSE3 | 0.819 | 0.747 |

## 6.3 Post-hoc Analysis Results

We further examined the changes in the respective impacts of RIM and EM across the three post-acceptance usage behaviors. We adopted the statistical method suggested by Cohen and his colleagues (Cohen et al. 1990, Cohen et al. 2003) to compare a certain independent variable's impacts on two different dependent variables within the same sample. First, we obtained unstandardized path coefficients[5] (see Table 6.8). The unstandardized results in Table 6.8 and the standardized results in Table 6.5 are qualitatively consistent. Next, we generated the estimated value of one dependent variable, say $\hat{RTN}$. We subtracted $\hat{RTN}$ from EXT, i.e., EXT - $\hat{RTN}$. We then regressed this new variable, EXT - $\hat{RTN}$, on the original set of independent variables. The resulting path coefficient of a particular independent variable and its t-value, respectively, indicate the magnitude and significance of the difference in the independent variable's impacts on EXT and RTN. A significant t-value suggests that there is a salient difference in the independent variable's impacts on EXT and RTN. We applied this procedure when comparing each motivation's impacts on RTN and EXT, EXT and INV, and RTN and INV.

The results (see Table 6.9) suggest that RIM exerts a greater impact on INV than on RTN and on INV than on EXT but that no differences in impact were detected between RTN and EXT. Meanwhile, as employees display usage behaviors that involve more innovativeness and learning, the influence of EM on RTN, EXT, and INV decreased significantly. We interpret these differential effects in the discussion section.

[5] We first obtained the unstandardized latent variable scores for all variables in the research model from SmartPLS. Then, we calculated the unstandardized path coefficients using multivariate multiple regression analysis in SPSS.

Table 6.8 Unstandardized Path Coefficients (Study 3)

| | | RTN | EXT | INV |
|---|---|---|---|---|
| RIM | | 0.208* | 0.226* | 0.555** |
| EM (PU) | | 0.554** | 0.300** | 0.142 |
| Control Variables | AGE | -0.019 | -0.034** | -.008 |
| | EDU | -0.135 | -0.173* | 0.176 |
| | GEN | 0.001 | 0.022 | 0.138 |
| | PRI | 0.014 | 0.017 | -0.005 |
| | TEN | -0.021 | 0.032 | 0.046 |
| | PIIT | 0.085 | 0.141* | 0.043 |
| | SE | 0.079 | 0.142* | 0.012 |
| | PEOU | 0.043 | -0.027 | -0.140 |
| $R^2$ | | 40.9% | 35.9% | 27.7% |

Note: **: $p < 0.01$, *: $p < 0.05$, two-tailed test. Unstandardized path coefficients are reported.

Table 6.9 Post-hoc Analysis Results (Study 3)

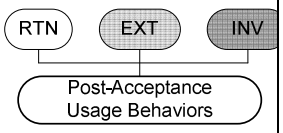
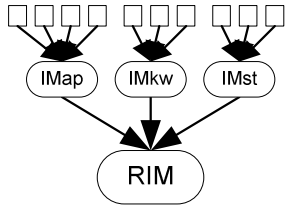
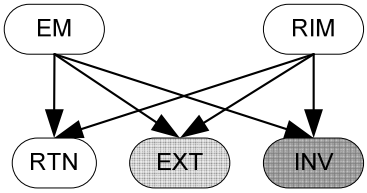
| DV / IV | RTN vs. EXT | EXT vs. INV | RTN vs. INV |
|---|---|---|---|
| RIM | $\beta_{RIM\rightarrow RTN} \approx \beta_{RIM\rightarrow EXT}$<br>T = -0.072 (n.s.) | $\beta_{RIM\rightarrow EXT} < \beta_{RIM\rightarrow INV}$<br>T = -3.277 (**) | $\beta_{RIM\rightarrow RTN} < \beta_{RIM\rightarrow INV}$<br>T = -3.339 (**) |
| EM | $\beta_{EM\rightarrow RTN} > \beta_{EM\rightarrow EXT}$<br>T = 2.624 (**) | $\beta_{EM\rightarrow EXT} > \beta_{EM\rightarrow INV}$<br>T = 1.686 (**) | $\beta_{EM\rightarrow RTN} > \beta_{EM\rightarrow INV}$<br>T = 3.960 (**) |
| Conclusion | 1. $\beta_{RIM\rightarrow RTN} \approx \beta_{RIM\rightarrow EXT} < \beta_{RIM\rightarrow INV}$<br>2. $\beta_{EM\rightarrow RTN} > \beta_{EM\rightarrow EXT} > \beta_{EM\rightarrow INV}$ | | |

Note: One-tailed tests were performed as the directional differences were hypothesized.
**: $p < 0.01$, *: $p < 0.05$, n.s.: non-significant.
DV: Dependent Variable, IV: Independent Variable

# Chapter 7. Discussion

The results reveal important insights with regard to the conceptualization of both post-acceptance usage behaviors and intrinsic motivation toward IS use as well as the dynamic role of intrinsic motivation and extrinsic motivation in explaining the three post-acceptance behaviors. We summarize the findings in Table 7.1 and discuss their implications for theory, practice, and future research in the following sections.

Table 7.1 Theoretical Implications

| A Holistic View on Diversified Post-Acceptance Behaviors | An Enriched Conceptualization of Intrinsic Motivation toward IS use | Dynamic Relationships between IS Motivations & Post-Acceptance Behaviors |
|---|---|---|
|  |  |  |
| ● Identified three distinct post-acceptance usage behaviors (RTN, EXT, and INV) that differ in their degree of innovativeness and amount of learning<br>● Extended organizational learning theory on exploration and exploitation to the individual-level IS use context | ● Appropriated the RIM concept from social psychology to the IS use context<br>● Adapted and validated RIM measures in three empirical studies<br>● Illustrated the superiority of RIM over perceived enjoyment (PE) in explaining attitude toward IS use | ● Identified the relative importance of RIM versus EM in determining distinct post-acceptance usage behaviors<br>● Discovered that RIM's effect on usage behaviors increases as the level of learning of usage behaviors increases from exploitation to exploration<br>● Discovered that the effect of EM on usage behaviors decreases as the level of innovativeness and learning of usage behaviors increases |

## 7.1 Implications for Theory

**Conceptualization of Post-Acceptance Behaviors**

Our findings suggest that users engage in ***diverse IS usage behaviors at the post-acceptance stage*** and that a holistic view of the post-acceptance stage requires understanding the distinctions and the motivational drivers of each of these behaviors (Column 1, Table 7.1). IS use is one of the most critical elements in the causal chain from IS implementation to individual performance and organizational success (DeLone and McLean 1992, Seddon 1997). Prior IS literature has commonly treated IS use as a broad behavioral category and has examined it in the forms of duration or frequency (e.g., van der Heijden 2004, Venkatesh et al. 2003). Though these assessment approaches capture the quantity of a user's engagement with an IS, they overlook the pluralistic nature of IS use in the post-acceptance phase and do not make important qualitative distinctions between the different behaviors. We propose that IS usage behaviors expand during the post-acceptance stage and that multiple behaviors need to be understood. At the post-acceptance stage, employees are comfortable using a certain number of functions to support their daily duties (Jasperson et al. 2005, Saga and Zmud 1994). We differentiate among three post-acceptance usage behaviors (routine use, extended use, and innovative use) using the theoretical lenses of innovativeness and learning. Our choice of these theoretical perspectives enables us to make important distinctions in the requirements of each of these behaviors to acquire or create new knowledge for innovation (Benner and Tushman 2003, Cohen and Levinthal 1990, Gupta et al. 2006, McGrath 2001). At the same time, given that IS use is 'an appropriate measure of IS success in most cases' (DeLone and McLean 2003), theorization of the three concrete post-acceptance usage behaviors also helps push forward the notion of IS

success.

Furthermore, we appropriate the concepts of exploration and exploitation from organizational learning literature to understand individual-level behaviors. Exploration and exploitation are two important learning strategies. While researchers acknowledge that the concepts of exploration and exploitation can be applied at various levels within organizations, the current literature has predominantly examined the distinctions in these learning behaviors at the macro-level unit of analysis (Gupta et al. 2006, March 1991). Interestingly, the studies at the individual unit of analysis that have drawn on these concepts have also viewed exploration and exploitation as organizational strategies for learning (e.g., Miller et al. 2006, Taylor and Greve 2006). Our study demonstrates that the twin concepts of exploration and exploitation are useful to differentiate individual-level post-acceptance usage behaviors. Specifically, our study suggests that INV represents exploration, EXT represents exploitation, and RTN represents exploitation that is limited to IS use based on managerial expectations.

**A Multidimensional Perspective of Intrinsic Motivation toward IS Use**

We advance the IS motivation literature by introducing ***a multidimensional conceptualization of intrinsic motivation toward IS use*** (Column 2, Table 7.1): rich intrinsic motivation (RIM). Intrinsic motivation toward IS use has been conceptualized in prior IS studies as perceived enjoyment (PE), leading it to be evaluated in hedonic IS contexts (van der Heijden 2004) and not in workplace IS contexts. We contribute to the IS motivation literature by appropriating the tri-dimensional intrinsic motivation concept to the IS use context. Drawing on the intrinsic motivation literature in social psychology (Vallerand 1997, Vallerand et al. 1997), we argue that intrinsic motivation toward IS use is comprised of enjoyment

not only from the activity of using IS but also from the satisfaction and fulfillment that users experience when overcoming difficulties or learning new things in using the IS. We validate the multidimensional conceptualization of RIM in each of the three empirical studies and also demonstrate in Study 2 that RIM has superior predictive power relative to PE in explaining user attitude toward IS use. By validating the construct across two types of IS (i.e., BIS and CSS) and across employees at three telecom service organizations, we extend the generalizability of the tri-dimensional intrinsic motivation concept to go beyond past studies in social psychology, which were conducted in various contexts such as education (Vallerand et al. 1993) and sports (Pelletier et al. 1995).

**Elaborating the Relative Role of Intrinsic Motivation and Extrinsic Motivation**

We contribute to our understanding of the relationships between IS use motivations and IS use in the post-acceptance stage of IS implementation in organizations. With the enriched conceptualization of post-acceptance behaviors and intrinsic motivation toward IS use, we identify ***the dynamic relationships between IS motivations and post-acceptance behaviors*** (Column 3, Table 7.1). We found that RIM had a weaker impact than EM on RTN ($H_1$) and that the importance of RIM relative to EM increased for usage behaviors that involved higher levels of innovativeness and learning ($H_2$). Extrinsic motivation, commonly defined as perceived usefulness, has been regarded as the most important determinant for general IS use (Davis et al. 1989, 1992, Legris et al. 2003, Venkatesh et al. 2003). While it is true that IS use in workplaces is influenced by utilitarian considerations (van der Heijden 2004), our study identifies the critical role of intrinsic motivation in stimulating post-acceptance usage behaviors (EXT and INV) where employees engage in IS use above and beyond the minimal compliant requirements that are

established by management. More broadly, we advance our knowledge of the relative importance of intrinsic motivation and extrinsic motivation for post-acceptance usage behaviors. Several organizational studies suggest that intrinsic motivation, as compared to extrinsic motivation, promotes more constructive performance within organizations (e.g., Amabile 1985, Blais et al. 1990, Hennessey 1989, Vallerand 1997). However, our findings suggest that the relative importance of intrinsic motivation to extrinsic motivation is subject to the specific nature of employees' behavior. In particular, intrinsic motivation is less effective than extrinsic motivation in affecting behavior that represents compliance to managerial expectations and standards (i.e., RTN).

Finally, our post-hoc analysis provides insights into the effects of RIM and EM, respectively, on each of the three usage behaviors. Specifically, we found the effect of RIM to be stronger for INV than for RTN and EXT but not to be different between RTN and EXT (see Table 6.10). The twin concepts of exploration and exploitation may offer a possible explanation for this finding. As theorized earlier, while EXT and INV epitomize exploitative and explorative IS use, respectively, RTN can be viewed as an exceptional form of exploitation that involves the minimum amount of learning. In other words, RTN and EXT, though different in the amount of learning they require, are both exploitative in nature. INV, which is demanding in mental concentration and cognitive flexibility, usually requires a much higher level of intrinsic motivation than either RTN or EXT (Louis and Sutton 1991). By contrast, IS exploitation behaviors, such as RTN and EXT, entail significantly less learning than IS exploration behaviors, such as INV (Gupta et al. 2006, March 1991). Consequently, the impacts of intrinsic motivation on RTN and EXT may be too trivial to be differentiated between.

Due to the challenging nature of innovation and learning, past literature has focused on the impacts of intrinsic motivation rather than on extrinsic motivation (e.g., Amabile 1996, MacKenzie et al. 2001, Piccolo and Colquitt 2006, Shin and Zhou 2003). However, we found that in the presence of intrinsic motivation, the influence of extrinsic motivation on usage behaviors decreases as the levels of innovativeness and learning increase. We draw on the job satisfaction literature to interpret this finding. Past research has observed that when performing tasks that involve less innovativeness and learning, employees need more extrinsic rewards, interpret organizational rewards as material, and are less interested in intrinsic rewards (Kalleberg and Griffin 1978, Locke 1976, Ronen and Sadan 1984). This may explain why the influence of extrinsic innovation is most powerful for the least innovative behavior (i.e., RTN), moderate for the incrementally innovate behavior (i.e., EXT), and least effective for the most innovative behavior (i.e., INV).

**Relative Weights of Predictors**

Finally, our application of the ***relative weight*** statistical technique also contributes to IS research. Traditional statistical techniques typically evaluate the importance of a new independent variable (IV) based on its *incremental* contribution to the $R^2$ of the dependent variable (DV) above and beyond the set of existing IVs. This approach assumes that the effect of the new IV is independent of the effects of existing IVs, yet the reality is that IVs are usually not orthogonal to one another in organizational research (LeBreton et al. 2007). The relative weight approach addresses this issue by taking the influence of other IVs on the DV into consideration; it is thus capable of evaluating the new IV's *unique* contribution to the overall $R^2$ of the DV in the presence of other IVs (Johnson 2000, LeBreton et al. 2007). To our knowledge, the statistical concept of relative weight has not been applied in the IS

field. Given its value in offering insights to the unique predictive power of each IV, we believe the technique has significant potential for IS research.

## 7.2 Implications for Practice

For practitioners, the three IS usage behaviors examined in this study (i.e., RTN, EXT, and INV) collectively present a more comprehensive picture regarding the diversity of employees' behaviors during the post-acceptance stage. Our results reveal qualitative differences among the three usage behaviors. That is, each of these behaviors is associated with a distinct amount of innovativeness and learning. Thus, during the post-acceptance stage, practitioners are advised to pay attention to the quality of IS use above and beyond the quantity of IS use (e.g., time and frequency) (Boudreau and Seligman 2005, Hsieh and Wang 2007).

In addition, the RIM concept points out ***three different sources of intrinsic motivation toward IS use***. While the sensations derived from interacting with an IS may be enjoyable for employees, the sense of fulfillment and accomplishment when overcoming difficulties or learning new things in using an IS are even more innately rewarding. Toward this end, managers can cultivate employees' intrinsic motivation toward IS use by taking several actions. To stimulate employees' intrinsic motivation toward accomplishment, managers should make the needed resources available to assist employees when they encounter difficulties in using an IS. Managers can also help employees to set up meaningful performance objectives that could be accomplished through employees' effective IS use (Malone 1981). To enhance employees' intrinsic motivation to know, managers should foster a learning environment in which co-workers are ready to learn and share knowledge with each other so as to satisfy their curiosity. Constructive feedback from managers on

employees' IS-use-related performance can also nurture employees' intrinsic motivation to know (Malone 1981). Finally, to increase employees' intrinsic motivation to experience stimulation, managers can focus on offering more entertaining user interfaces or fantasy training programs (Venkatesh 1999).

In addition, managers may tactically emphasize certain types of motivations among employees for the desired usage behaviors. Specifically, our findings suggest that RTN is primarily driven by extrinsic motivation, EXT is affected by both, and INV is mainly determined by intrinsic motivation. Thus, when the situation requires employees to display routine use, managers can focus on enhancing employees' extrinsic motivation by placing an emphasis on the rewards that employees can obtain by applying the installed IS in a manner that is consistent with normal work processes. When the predefined use is no longer appropriate and incrementally- and even radically-innovative usage behaviors are desirable, managers can pay more attention to increasing employees' intrinsic motivation toward IS use.

## 7.3 Limitations and Future Research

Despite of its contributions to theory and practice, this paper has several limitations, which also give opportunities for future research. To begin with, while the core construct, RIM, is validated across three empirical settings (Studies 1, 2, and 3), the research hypotheses are tested against one specific IS in a single telecom service organization (Study 3). Although the confounding effects were controlled by collecting data from a single site, including several control variables, and performing CMB tests, caution should still be exercised when generalizing the findings to other technological, organizational, and industrial contexts. Also, the cultural differences between Eastern and Western counties could be another concern with regard to result generalizability. As such, we encourage future studies to examine the proposed

research model and hypotheses in different technological, organizational, and cultural settings.

Next, we apply the concept of RIM specifically to the IS use context. Given the richness and comprehensiveness of the RIM concept, we recommend future studies to appropriate RIM to other IS contexts, especially those contexts in which intrinsic motivation may play an important role, e.g., IS project development (Roberts et al. 2006, Shah 2006) and knowledge management (Ko et al. 2005, Wasko and Faraj 2005). In addition, interested scholars may endeavor to identify the corresponding antecedents and consequences of RIM in the IS use context (Vallerand and Fortier 1998, Vallerand 1997). For instance, this paper has validated that RIM has contextual effects on various post-acceptance usage behaviors. Future studies can possibly examine the antecedents and other behavioral outcomes of RIM in the IS use context. In addition, we suggest that researchers may further refine the measurement items of intrinsic motivation in a way that is more consistent with the ones of extrinsic motivation in future studies. For example, the items for intrinsic motivation toward accomplishment could be adapted as 'In using the system, I derive a lot of personal satisfaction while mastering certain difficult skills'. As such, the measurement instrument bias for path comparison analysis between intrinsic motivation and extrinsic motivation could be reduced.

Scholars may link our research findings with the rich body of motivation literature in social psychology. For example, the conceptualization and operationalization of extrinsic motivation toward IS use could be further enriched. Deci and Ryan (1985, 2002) propose to differentiate four types of extrinsic motivations, including external regulation, introjected regulation, integrated regulation, and identified regulation. Extrinsic motivation in our study is similar to

introjected regulation and external regulation (Vallerand and Fortier 1998). The more constructive forms of extrinsic motivations, like integrated and identified regulation, have received limited attention in IS research. We suggest that interested researchers devote efforts in developing definitions and measurements for the above four types of extrinsic motivations for IS-related phenomenon so as to further leverage the profound knowledge in motivation literature.

Moreover, each of the three investigated usage behaviors is associated with different levels of innovativeness and learning and could, in theory, enhance individual and organizational performance in different manners. For instance, RTN, which signifies employees' familiarity with IS use, can facilitate the integration between IS and work processes (Saga and Zmud 1994); EXT may help employees deepen their knowledge about IS use and expand their capabilities to perform tasks better (Saga and Zmud 1994); and INV allows employees to capitalize the value potential of the implemented IS and advance the IS utilization to the next level (Jasperson et al. 2005, Kwon and Zmud 1987). As of now, the above contributions of the three post-acceptance behaviors are still hypothetical and require further empirical verification. To advance our theoretical understanding with regard to the significance of post-acceptance usage behaviors, more effort is needed to investigate the performance impacts of these usage behaviors.

Finally, while our paper focuses on RTN, EXT, and INV, there are other types of post-acceptance usage behaviors that deserve further attention. For example, adaptive use (Sun and Zhang 2008) is a higher-order construct, containing four alternative aspects of IS-feature application: trying new features, feature substitution, feature combination, and feature repurposing. These four adaptive use dimensions are interesting and worth investigation. Integrative use, another post-acceptance

usage behavior, is defined as employees' application of an IS to establish or enhance work flow linkages among a set of tasks (Saga and Zmud 1994). Nevertheless, some employees, like frontline operators, usually do not have the authority to modify work-flow linkages between tasks. Therefore, we suggest researchers who are interested in studying post-acceptance behaviors carefully select research contexts, including specific types of IS and user groups, in order to capture the behaviors of interest. Researchers could also incorporate the task dimension, which is not yet covered in our study, as an alternative way to further discuss different post-acceptance usage behaviors (e.g., Hsieh and Zmud 2006).

# Chapter 8. Conclusion

We differentiate among three important post-acceptance usage behaviors—routine use, extended use, and innovative use—and conceptualize them, respectively, as behaviors of minimum, incremental, and radical forms of innovation and learning. Drawing on motivation theory, we identify extrinsic motivation and intrinsic motivation as the antecedents of these behaviors. We introduce and validate the rich intrinsic motivation (RIM) construct as a more comprehensive conceptualization of intrinsic motivation for IS use. Our results across three empirical studies reveal that 1) rich intrinsic motivation consists of three core dimensions: intrinsic motivation toward accomplishment, intrinsic motivation to know, and intrinsic motivation to experience stimulation; 2) rich intrinsic motivation outperforms perceived enjoyment in accounting for users' attitude toward IS use; and 3) the importance of rich intrinsic motivation relative to extrinsic motivation increases for usage behaviors with higher levels of innovativeness and learning. This study represents a significant advance in our theoretical understanding of post-acceptance usage behaviors, IS use motivations, and the relationship between IS use motivations and post-acceptance behaviors. The results provide insights for practitioners to motivate employees to apply the installed organizational IS to higher levels so as to extract the value potential of implemented IS more fully.

# References


Aberdeen Group. "The Precision Marketing Benchmark Report: How Top Performers Turbo-Charge Their Investment," Aberdeen Group, Boston 2006.

Adam, F., and O'Doherty, P. "ERP Projects: Good or Bad for SMEs," in: *Second-Wave Enterprise Resource Planning Systems: Implementing for Effectiveness,* G. Shanks, and P.B. Seddon (eds.), Cambridge University Press, Cambridge, UK, 2003, pp. 275-298.

Agarwal, R., Sambamurthy, V. and Stair, R. "Cognitive Absorption and the Adoption of New Information Technologies," the 58th Academy of Management Annual Meeting, Boston, MA, 1997.

Agarwal, R., and Prasad, J. "The Role of Innovation Characteristics and Perceived Voluntariness in the Acceptance of Information Technologies," *Decision Science* (28:3) 1997, pp 557-582.

Agarwal, R., and Prasad, J. "A Conceptual and Operational Definition of Personal Innovativeness in the Domain of Information Technology," *Information Systems Research* ( 9:2) 1998, pp 204-215.

Agarwal, R., and Prasad, J. "Are Individual Differences Germane to the Acceptance of New Information Technologies," *Decision Sciences* (30:2) 1999, pp 361-391.

Agarwal, R. "Individual Acceptance of Information Technologies," in: *Framing the Domains of IT Management: Projecting the Future...Through the Past,* R.W. Zmud (ed.), Pinnaflex Educational Resources, Cincinnati, OH, 2000, pp. 85-104.

Agarwal, R., and Karahanna, E. "Time Flies When You're Having Fun: Cognitive Absorption and Beliefs about Information Technology Usage," *MIS Quarterly* (24:4) 2000, pp 665-694.

Ahuja, M.K., and Thatcher, J.B. "Moving Beyond Intentions and Toward the Theory of Trying: Effects of Work Environment and Gender on Post-Adoption Information Technology Use," *MIS Quarterly* (29:3) 2005, pp 427-459.

Ajzen, I., and Fishbein, M. *Understanding Attitudes and Predicting Social Behavior* Prentice-Hall, Englewood Cliffs, NJ, 1980.

Amabile, T.M. "Motivation and Creativity: Effects of Motivational Orientation on Creative Writers," *Journal of Personality and Social Psychology* (48:2) 1985, pp 393-399.

Amabile, T.M., Hennessey, B.A., and Grossman, B.S. "Social Influences on Creativity: The Effects of Contracted-for-Reward," *Journal of Personality and Social Psychology* (50:1) 1986, pp 14-23.

Amabile, T.M. *Creativity in Context: Update to the Social Psychology of Creativity* Westview, Boulder, CO, 1996.

Amabile, T.M. "How to Kill Creativity," *Harvard Business Review* (76:5) 1998, pp 76-87.

Barnett, L.A. "The Playful Child: Measurement of A Dispisotion to Play," *Play and Culture* (4:1) 1991, pp 51-74.

Bass, B.M. *Transformational Leadership : Industrial, Military, and Educational Impact* Lawrence Erlbaum Associates, Mahwah, NJ, 1998.

Benner, M.J., and Tushman, M. L. "Exploitation, Exploration, and Process Management: The Productivity Dilemma Revisited," *Academy of Management Journal* (28:2) 2003, pp 238-256.

Berlyne, D.E. *Aesthetics and Psychology* Appleton-Centry-Crofts, New York, 1971.

Bhattacherjee, A. "Understanding Information Systems Continuance: An Expectation-Confirmation Model," *MIS Quarterly* (25:3) 2001, pp 351-370.

Bhattacherjee, A., and Premkumar, G. "Understanding Changes in Belief and Attitude toward Information Technology Usage: A Theoretical Model and Longitudinal Test," *MIS Quarterly* (28:2) 2004, pp 229-254.

Blais, M.R., Sabourin, S., Boucher, C., and Vallerand, R.J. "Toward A Motivational Model of Couple Happiness," *Journal of Personality and Social Psychology* (59:5) 1990, pp 1021-1031.

Bollen, K.A., and Ting, K. "A Tetrad Test for Causal Indicators," *Psychological Methods* (5:1) 2000, pp 3-22.

Bolton, R.N., and Tarasi, C.O. "Managing Customer Relationships," in: *Review of Marketing Research,* N.K. Malhotra (ed.), M.E. Sharpe, Inc., New York, 2006, pp. 3-38.

Boudreau, M.C. "Learning to Use ERP Technology: A Causal Model," Proceedings of the 36th Hawaii International Conference on System Sciences, 2003.

Boudreau, M.C., and Seligman, L. "Quality of Use of A Complex Technology: A Learning-Based Model," *Journal of Organizational and End User Computing* (17:4) 2005, pp 1-22.

Brislin, R.W., Lonner, W., and Thorndike, R. M. *Cross-Culture Research Method* Wiley, New York, 1973.

Brophy, J. "Socializing Students' Motivation to Learn," in: *Advances in Motivation and Achievements,* M.L. Maher, and D.A. Kleiber (eds.), JAI Press, Greenwich, CT, 1987, pp. 181-210.

Brown, S.A., and Venketesh, V. "Model of Adoption of Technology in Households:

A Baseline Model Test and Extension Incorporating Household Life Cycle," *MIS Quarterly* (29:3) 2005, pp 399-426.

Burton-Jones, A., and Straub, D.W. "Reconceptualizing System Usage: An Approach and Empirical Test," *Information Systems Research* (17:3) 2006, pp 228-246.

Chin, W. "Issues and Opinion on Structural Equation Modeling," *MIS Quarterly* (22:1) 1998, pp vii-xvi.

Cohen, J., and Cohen, P. *Applied Multiple Regression/ Correlation Analysis for the Behavioral Sciences* Erlbaum, Hillsdale, NJ, 1983.

Cohen, J., Cohen, P., West, S.G., and Aiken, L.S. *Applied Multiple Regression/ Correlation Analysis for the Behavioral Sciences* Lawrence Erlbaum Associates, London, 2003.

Cohen, P., Brook, J.S., Cohen, J., Velez, C.N., and Garcia, M. "Common and Uncommon Pathways to Adolescent Psychopathology and Problem Behavior," in: *Straight and Devious Pathways from Childhood to Adulthood,* L.N. Robins, and M. Rutter (eds.), Cambridge University Press, Cambridge, 1990, pp. 242-258.

Cohen, W.M., and Levinthal, D.A. "Absorptive Capacity: A New Perspective on Learning and Innovation," *Administrative Science Quarterly* (35:1) 1990, pp 128-152.

Compeau, D.R., and Higgins, C.A. "Computer Self-Efficacy: Development of a Measure and Initial Test," *MIS Quarterly* (19:2) 1995, pp 189-211.

Cooper, R.B., and Zmud, R.W. "Material Requirements Planning System Infusion," *Omega* (17:5) 1989, pp 471-481.

Cooper, R.B., and Zmud, R.W. "Information Technology Implementation Research:

A Technology Diffusion Approach," *Management Science* (36:2) 1990, pp 123-139.

Cooper, R.B. "Information Technology Development Creativity: A Case Study of Attempted Radical Change," *MIS Quarterly* (24:2) 2000, pp 245-276.

Csikszentmihalyi, M. "Intrinsic Rewards and Emergent Motivation," in: *The hidden costs of reward,* M.R. Lepper, and D. Greene (eds.), Erlbaum, Hillsdale, NJ, 1978, pp. 205-216.

Davis, F.D. "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology," *MIS Quarterly* (13:3) 1989, pp 319-340.

Davis, F.D., Bagozzi, R.P., and Warshaw, P.R. "User Acceptance of Computer Technology: A Comparison of Two Theoretical Models," *Management Science* (35:8) 1989, pp 982-1003.

Davis, F.D., Bagozzi, R.P., and Warshaw, P.R. "Extrinsic and Intrinsic Motivation to Use Computers in the Workplace," *Journal of Applied Social Psychology* (22:14) 1992, pp 1111-1132.

Deci, E.L., and Ryan, R.M. *Intrinsic Motivation and Self-Determination in Human Behavior* Plenum, New York, 1985.

Deci, E.L., and Ryan, R.M. *Handbook of Self-Determination Research* University of Rochester Press, Rochester, N.Y., 2002.

DeLone, W.H., and McLean, E.R. "Information Systems Success: The Quest for the Dependent Variable," *Information Systems Research* (3:1) 1992, pp 60-95.

DeLone, W.H., and McLean, E.R. "The DeLone and McLean Model of Information Systems Success: A Ten-Year Update," *Journal of Management Information Systems* (19:4) 2003, pp 9-30.

Dewey, J. "Play," in: *A Cyclopedia of Education, P.* Monroe (ed.), Macmillan, New

York, NY, 1913, pp. 725-727.

Diamantopoulos, A., and Siguaw, J.A. "Formative versus Reflective Indicators in Organizational Measure Development: A Comparison and Empirical Illustration," *British Journal of Management* (17:4) 2006, pp 263-282.

Dinev, T., and Hart, P. "An Extended Privacy Calculus Model for E-Commerce Transactions," *Information Systems Research* (17:1) 2006, pp 61-80.

Eisenberger, R. "Learned Industriousness," *Psychological Review* (99:2) 1992, pp 248-267.

Eisenberger, R., and Cameron, J. "Detrimental Effects of Reward: Reality or Myth?," *American Psychologist* (51:11) 1996, pp 1153-1166.

Elam, J.J., and Mead, M. "Can Software Influence Creativity," *Information Systems Research* (1:1) 1990, pp 1-22.

Fang, X., Chan, S. Brzezinski, J., and Xu, S. "Moderating Effects of Task Type on Wireless Technology Acceptance," *Journal of Management Information Systems* (22:3) 2006, pp 123-157.

Fornell, C., and Larcker, D.F. "Evaluating Structural Equation Models with Observable Variables and Measurement Error," *Journal of Marketing Research* (18:1) 1981, pp 39-50.

Gattiker, T.F., and Goodhue, D. L. "What Happens after ERP Implementation: Understanding the Impact of Inter-Dependence and Differentiation on Plant-Level Outcomes," *MIS Quarterly* (29:3) 2005, pp 559-585.

Gefen, D., Karahanna, E., and Straub, D. "Trust and TAM in Online Shopping: An Integrated Mode," *MIS Quarterly* (27:1) 2003, pp 51-90.

Ghani, J.A., and Satish P. D. "Task Characteristics and the Experience of Optimal Flow in Human-Computer Interaction," *The Journal of Psychology* (128:4)

1994, pp 381-391.

Gill, T.G. "Expert Systems Usage: Task Change and Intrinsic Motivation," *MIS Quarterly* (20:3) 1996, pp 301-329.

Greif, S., and Keller, H. "Innovation and the Design of Work and Learning Environments: the Concept of Exploration in Human-Computer Interaction," in: *Innovation and Creativity at Work: Psychological and Organizational Strategies,* M.A. West, and J. L. Farr (eds.), John Wiley & Sons, Chichester, 1990.

Gupta, A.K., Smith, K.G., and Shalley, C.E. "The Interplay between Exploration and Exploitation," *Academy of Management Journal* (49:4) 2006, pp 693-706.

Hackman, J.R., and Oldham, G. R. *Work Redesign* Addison-Wesley, Reading, MA, 1980.

Harter, S. "A New Self-Report Scale on Intrinsic versus Extrinsic Orientation in the Classroom: Motivational and Informational Components," *Developmental psychology* (17:2) 1981, pp 300-312.

Hartwick, J., and Barki, H. "Explaining the Role of User Participation in Information System Use," *Management Science* (40:4) 1994, pp 40-465.

He, Z.-L., and Wong, P.K. "Exploration vs. Exploitation: An Empirical Test of the Ambideterity Hypothesis," *Organization Science* (15:4) 2004, pp 481-494.

Hennessey, B.A. "The Effect of Extrinsic Constraints on Children's Creativity while Using A Computer," *Creativity Research Journal* (2:2) 1989, pp 151-168.

Hong, S.-J., and Tam, K.Y. "Understanding the Adoption of Multipurpose Information Appliances: The Case of Mobile Data Services," *Information Systems Research* (17:2) 2006, pp 162-179.

Hong, S.J., Thong, J.Y.L., and Tam, K.Y. "Understanding Continued Information

Technology Usage Behavior: A Comparison of Three Models in the Context of Mobile Internet,," *Decision Support Systems* (42:3) 2006, pp 1819-1834.

Hsieh, J., and Zmud, R.W. "Understanding Post-Adoptive Usage Behaviors: A Two-Dimensional View," Proceedings of the 27th International Conference on Information Systems, Milwaukee, WI, 2006.

Hsieh, J., and Wang, W. "Explaining Employees' Extended Use of Complex Information Systems," *European Journal of Information Systems* (16:3) 2007, pp 216-227.

Hsieh, J.P., Rai, A., and Keil, M. "Understanding Digital Inequality: Comparing Continued Use Behavioral Models of the Socio-Economically Advantaged and Disadvantaged," *MIS Quarterly* (32:1) 2008, pp 97-126.

Hsieh, J.P., Rai, A., and Keil, M. "Addressing Digital Inequality for the Socio-Economically Disadvantaged through Government Initiatives: Forms of Capital that Affect ICT Utilization," *Information Systems Research*) forthcoming.

Igbaria, M., Parasuraman, S., Badawy, M.K. "Work Experiences, Job Involvement, and Quality of Work Life among Information Systems Personnel," *MIS Quarterly* (18:2) 1994, pp 175-201.

Igbaria, M., Parasuraman, S., and Baroudi, J.J. "A Motivational Model of Microcomputer Usage," *Journal of Management Information Systems* (13:1) 1996, pp 127-143.

Igbaria, M., Zinatelli, N., Cragg, P., and Cavaye, A.L.M. "Personal Computing Acceptance in Small Firms: A Structural Equation Model," *MIS Quarterly* (21:3) 1997, pp 279-305.

Im, G., and Rai, A. "Knowlegde Sharing Ambidexterity in Long-Term

Interorganiational Relationships," *Management Science* (54:7) 2008, pp 1281-1296.

Jarvis, C.B., MacKenzie, S.B., and Podsakoff, P.M. "A Critical Review of Construct Indicators and Measurement Model Misspecification in Marketing and Consumer Research," *Journal of Consumer Research* (30:2) 2003, pp 199-218.

Jasperson, J., Carter, P.E., and Zmud, R.W. "A Comprehensive Conceptualization of Post-Adoptive Behaviors Associated with Information Technology Enabled Work Systems," *MIS Quarterly* (29:3) 2005, pp 525-557.

Johnson, J.W. "A Heuristic Method for Estimating the Relative Weight of Predictor Variables in Multiple Regression " *Multivariate Behavioral Research* (35:1) 2000, pp 1-19.

Jones, E., Sundaram, S., and Chin, W. "Factors Leading to Sales Force Automatic Use: A Longitudinal Analysis," *Journal of Personal Selling and Sales Management* (3:1) 2002, pp 145-156.

Kagan, J. "Motives and Development," *Journal of Personality and Social Psychology* (22:1) 1972, pp 51-66.

Kalleberg, A.M., and Griffin, L.J. "Positional Source of Inequality in Job Satisfaction," *Work and Occupation* (5:4) 1978, pp 371-400.

Kamis, A., Koufaris, M., and Stern, T. "Using An Attribute-Based Decision Support Systems for User-Customized Products Online: An Experimental Investigation," *MIS Quarterly* (32:1) 2008, pp 159-177.

Kanaracus, C. "Gartner: Global IT Spending Growth Stable ", http://www.infoworld.com/t/business/gartner-global-it-spending-growth-stable-523, 2008.

Karahanna, E., Straub, D.W., and Chervany, N.L. "Information Technology Adoption across Time: A Cross-Sectional Comparison of Pre-Adoption and Post-Adoption Beliefs," *MIS Quarterly* (23:2) 1999, pp 183-213.

Karahanna, E., and Agarwal, R. "When the Spirit is Willing: Symbolic Adoption and Technology Exploration," working paper, University of Georgia, Athens, GA, 2006.

Kelman, H.C. "Compliance, Identification and Internalization: Three Processes of Attitude Change," *Journal of Conflict Resolution* (2:1) 1958, pp 51-60.

Kim, D.H. "The Link between Individual and Organizational Learning," *Sloan Management Review* (35:1) 1993, pp 37-50.

Kim, J.W., Choi, J., Qualls, W., and Park, J. "The Impact of CRM on Firm- and Relationship-Level Performance in Distribution Networks," *Communications of the Association for Information Systems* (14:2) 2004, pp 632-652.

Kim, S.S., and Malhotra, N.K. "Predicting System Usage from Intention and Past Use: Scale Issues in the Predictors," *Decision Science* (36:1) 2005, pp 187-196.

Ko, D.G., Kirsch, L.J., and King, W.R. "Antecedents of Knowledge Transformer from Consultants to Clients in Enterprise System Implementations," *MIS Quarterly* (29:1) 2005, pp 59-85.

Kolb, D.A. *Experiential Learning: Experience as the Source of Learning and Development* Prentice-Hall Englewood Cliffs, New Jersey, 1984.

Koufaris, M. "Applying the Technology Acceptance Model and Flow Theory to Online Consumer Behavior," *Information Systems Research* (13:2) 2002, pp 205-223.

Kwon, T.H., and Zmud, R. W. "Unifying the Fragmented Models of Information

Systems Implementation," in: *Critical Issues in Information Systems Research,* R.J. Boland, and R. A. Hirschheim (eds.), John Wiley & Sons, New York, 1987, pp. 227-251.

Lavie, D., and Rosenkopf, L. "Balancing Exploration and Exploitation in Alliance Formation," *Academy of Management Journal* (49:4) 2006, pp 797-818.

LeBreton, J.M., Hargis, M.B., Griepentrog, B., Oswald, F.L, and Ployhart, R.E. "A Multidimensional Approach for Evaluating Variables in Organizational Research and Practice," *Personnel Psychology* (60:2) 2007, pp 475-498.

Legris, P., Ingham, J., and Collerette, P. "Why Do People Use Information Technology? A Critical Review of the Technology Acceptance Model," *Information and Management* (40:3) 2003, pp 191-204.

Liang, H., Saraf, N., Hu, Q., and Xue, Y. "Assimilation of Enterprise Systems: The Effect of Institutional Pressures and the Mediating Role of Top Management," *MIS Quarterly* (31:1) 2007, pp 59-87.

Lieberman, J.N. *Playfulness* Academic Press, New York, NY, 1977.

Locke, E.A. "The Nature and Causes of Job Satisfaction," in: *Handbook of Industrial and Organizational Psychology,* M.D. Dunnette (ed.), Rand McNally, Chicago, 1976.

Louis, M.R., and Sutton, R.I. "Switching Cognitive Gears: From Habits of Mind to Active Thinking," *Human Relations* (44:1) 1991, pp 55-76.

Luthans, F., and Kreitner, R. *Organizational Behavior Modification and Beyond* Scott, Foresman, Glenview, IL, 1985.

MacKenzie, S.B., Podsakoff, P.M., and Rich, G.A. "Transformational and Transactional Leadership and Salesperson Performance," *Journal of the Academy of Marketing Sciences* (29:2) 2001, pp 115-134.

MacKenzie, S.B., Podsakoff, P.M., and Jarvis, C.B. "The Problem of Measurement Model Misspecification in Behavioral and Organizational Research and Some Recommended Solutions," *Journal of Applied Psychology* (90:4) 2005, pp 710-730.

Malone, T.W. "Toward A Theory of Intrinsically Motivating Instruction," *Cognitive Science* (5:4) 1981, pp 333-369.

March, J.G. "Exploration and Exploitation in Organizational Learning," *Organization Science* (2:1) 1991, pp 71-87.

Maslow, A.H. *Motivation and Personality* Harper & Row, New York, 1970.

Mathieson, K., Peacock, E., and Chin, W.W. "Extending the Technology Acceptance Model: The Influence of Perceived User Resources," *The DATA BASE for Advances in Information Systems* (22:3) 2001, pp 86-112.

McGrath, R.G. "Exploratory Learning, Innovative Capacity, and Managerial Oversight," *Academy of Management Journal* (44:1) 2001, pp 118-131.

McGraw, K.O. "The Detrimental Effects of Reward on Performance: A Literature Review and A Prediction Model," in: *The Hidden Costs of Reward,* M.R. Lepper, and D. Greene (eds.), Erlbaum, Hillsdale, NJ, 1978.

McGraw, K.O., and McCullers, J.C. "Evidence of a Detrimental Effect of Extrinsic Incentives on Breaking a Mental Set," *Journal of Experimental Social Psychology* (15:3) 1979, pp 285-294.

Miller, K.D., Zhao, M., and Calantone, R. "Adding Interpersonal Learning and Tacit Knowledge to March's Exploration-Exploitation Model," *Academy of Management Journal* (49:4) 2006, pp 709-722.

Morgan, T.P. "Gartner: Global IT Spending Will Rise in 2009 (slightly)," http://www.theregister.co.uk/2009/02/24/gartner_2009_it_spending/, 2009.

Morris, M.G., and Venkatesh, V. "Job Characteristics and Job Satisfaction: Understanding the Role of Enterprise Resource Planning System Implementation," *MIS Quarterly*, forthcoming.

Nambisan, S., Agarwal, R., and Tanniru, M. "Organizational Mechanisms for Enhancing User Innovation in Information Technology," *MIS Quarterly* (23:3) 1999, pp 365-395.

Negash, S., and Gray, P. "Business Intelligence," in: *Handbook on Decision Support Systems 2: Variations,* B. Frada, and C.W. Holsapple (eds.), Springer Berlin, 2008, pp. 175-194.

Nelson, K.M., Nadkarni, S., Narayanan, V.K., and Ghods, M. "Understanding Software Operations Support Expertise: A Revealed Causal Mapping Approach," *MIS Quarterly* (24:3) 2000, pp 475-507.

Nicholls, J.G. "Achievement Motivation: Conceptions of Ability, Subjective Experience, Task Choice, and Performance," *Psychological Review* (91:3) 1984, pp 328-346.

Nunnally, J.C. *Psychometric Theory* (3rd ed.) McGraw-Hill, New York, 1994.

Oldham, G.R., and Cummings,A. "Employee Creativity: Personal and Contextual Factors at Work," *Academy of Management Journal* (39:3) 1996, pp 607-634.

Organ, D.W., Podsakoff, P. M., and MacKenzie, S. B. *Organizational Citizenship Behavior: Its Nature, Antecedents, and Consequences* Sage, Thousand Oaks, 2006.

Pelletier, L.G., Fortier, M.S., Vallerand, R.J., Tuson, K.M., and Briere, N.M. "Toward A New Measure of Intrinsic Motivation, Extrinsic Motivation, and Amotivation in Sports: The Sport Motivation Scale (SMS)," *Journal of Sport and Exercise Psychology* (17:1) 1995, pp 35-53.

Petter, S., Straub, D., and Rai, A. "Specifying Formative Constructs in Information Systems Research," *MIS Quarterly* (31:4) 2007, pp 623-656.

Piccolo, R.F., and Colquitt, J.A. "Transformational Leadership and Job Behaviors: The Mediating Role of Core Job Characteristics," *Academy of Management Journal* (49:2) 2006, pp 327-340.

Podsakoff, P.M., and Organ, D.W. "Self-Reports in Organizational Research: Problems and Prospects," *Journal of Management* (12:4) 1986, pp 531-544.

Podsakoff, P.M., MacKenzie, S.B., Lee, J.-Y., and Podsakoff, N.P. "Common Method Biases in Behavioral Research: A Critical Review of the Literature and Recommended Remedies," *Journal of Applied Psychology* (88:5) 2003, pp 879-903.

Raju, P.S. "Optimum Stimulation Level: Its Relationship to Personality, Demographics, and Exploratory Behavior," *Journal of Consumer Research* (7:3) 1980, pp 272-282.

Rigby, D.K., and Ledingham, D. "CRM Done Right," *Harvard Business Review* (82:11) 2004, pp 118-129.

Ringle, C.M., Wende, S., and Will, A. "http://www.smartpls.de," University of Hamburg, Hamburg, Germany 2005.

Roberts, J.A., Hann, I.-H., and Slaughter, S.A. "Understanding the Motivations, Participation, and Performance of Open Source Software Developers: A Longitudinal Study of the Apache Projects," *Management Science* (52:7) 2006, pp 984-999.

Rogers, E. *Diffusion of Innovations* Free Press, New York, 1985.

Ronen, S., and Sadan, S. "Job Attitudes among Different Occupational Status Groups: An Economic Analysis," *Work and Occupations* (11:1) 1984, pp

77-97.

Ryan, R.M., Mims, V., and Koestner, R. "Relation of Reward Contingency and Interpersonal Context to Intrinsic Motivation: A Review and Test Using Cognitive Evaluation Theory," *Journal of Personality and Social Psychology* (45:4) 1983, pp 736-750.

Ryan, R.M., and Deci, E.L. "Self-Determination Theory and the Facilitation of Intrinsic Motivation, Social Development, and Well-Being," *American Psychologist* (55:1) 2000a, pp 68-78.

Ryan, R.M., and Deci, E.L. "Intrinsic and Extrinsic Motivations: Classic Definitions and New Directions," *Contemporary Educational Psychology* (25:1) 2000b, pp 54-67.

Saga, V.L., and Zmud, R.W. "The Nature and Determinants of IT Acceptance, Routinization, and Infusion," in: *Diffusion, transfer and implementation of information technology,* L. Levine (ed.), North-Holland, Amsterdam, 1994, pp. 67-86.

Schwarz, A. "Defining Information Technology Acceptance: A Human-Centered, Management-Oriented Perspective," University of Houston-University Park, 2003.

Scott, W.E., and Podsakoff, P.M. "Leadership, Supervision and Behavioral Control: Perspectives from An Experimental Analysis," in: *Handbook of Organizational Behavior Management,* L. Frederickson (ed.), Wiley, New York, 1982.

Seddon, P.B. "A Respecification and Extension of the DeLone and McLean Model of IS Success," *Information Systems Research* (8:3) 1997, pp 240-253.

Segars, A.H. "Assessing the Unidimensionality of Measurement: A Paradigm and

Illustration Within the Context of Information Systems Research," *Omega* (25:1) 1997, pp 107-121.

Shah, S.K. "Motivation, Governance, and the Viability of Hybrid Forms in Open Source Software Development," *Management Science* (52:7) 2006, pp 1000-1014.

Shin, S.J., and Zhou, J. "Transformational Leadership, Conservation, and Creativity: Evidence from Korea," *Academy of Management Journal* (46:6) 2003, pp 703-714.

Silver, M.S. "Decision Support Systems: Directed and Nondirected Change," *Information Systems Research* (1:1) 1990, pp 47-70.

Silver, M.S. "Decisional Guidance for Computer-based Decision Support," *MIS Quarterly* (15:1) 1991, pp 105-122.

Starbuck, W.H. "Congealing Oil: Inventing Ideologies to Justify Acting Ideologies out," *Journal of Management Studies* (19:1) 1982, pp 4-27.

Steenkamp, J.-B.E.M., and Burgess, S.M. "Optimum Stimulation Level and Exploratory Consumer Behavior in An Emerging Consumer Market," *International Journal of Research in Marketing* (19:2) 2002, pp 131-150.

Sun, H., and Zhang, P. "Adaptive System Use: An Investigation at the System Feature Level," Proceedings of the 29th International Conference on Information Systems, Paris, France, 2008.

Sundaram, S., Schwarz, A., Jones, E., and Chin, W. W. "Technology Use on the Front Line: How Information Technology Enhances Individual Performance," *Journal of the Academy of Marketing Science* (35:1) 2007, pp 101-112.

Taylor, A., and Greve, H. R. "Superman or the Fantastic Four? Knowledge

Combination and Experience in Innovative Teams," *Academy of Management Journal* (49:4) 2006, pp 723-740.

Taylor, S., and Todd, P.A. "Understanding Information Technology Usage: A Test of Competing Models," *Information Systems Research* (6:2) 1995, pp 144-176.

Thomas, K.W., and Velthouse, B.A. "Cognitive Elements of Empowerment: An 'Interpretive' Model of Intrinsic Task Motivation " *Academy of Management Review* (15:4) 1990, pp 666-681.

Thong, J.Y.L. "An Integrated Model of Information Systems Adoption in Small Businesses," *Journal of Management Information Systems* (15:4) 1999, pp 187-214.

Thong, J.Y.L., Hong, S.J., Tam, K.Y. "The Effects of Post-Adoption Beliefs on the Expectation-Confirmation Model for Information Technology Continuance," *International Journal of Human-Computer Studies* (64:9) 2006, pp 799-810.

Tierney, P., Farmer, S. M., and Graen, C. B. "An Examination of Leadership and Employee Creativity: The Relevance of Traits and Relationships," *Personnel Psychology* (52:3) 1999, pp 591-620.

Trevino, L.K., and Webster, J. "Flow in Computer-Mediated Communication: Electronic Mail and Voice Mail Evaluation and Impacts," *Communication Research* (19:3) 1992, pp 539-573.

Vallerand, R.J., Blais, M.R., Briere, N.M., and Pelletier, L.G. "Construction and Validation of the Academic Motivation Scale," *Canadian Journal of Behavioral Science* (21:3) 1989, pp 323-349.

Vallerand, R.J., and Briere, N.M. "Validation of the French form of the Sports Motivation Scale," in: *Final report presented to the Canadian Fitness and*

*Lifestyle Research Institute*, 1990.

Vallerand, R.J., Pelletier, L.G., Blais, M.R., Briere, N.M., Senecal, C., and Vallieres, E.F. "The Academic Motivation Scale: A Measure of Intrinsic, Extrinsic, and Amotivation in Education," *Educational and Psychological Measurement* (52:4) 1992, pp 1003-1009.

Vallerand, R.J., Pelletier, L.G., Blais, M.R., Briere, N.M., Senecal, C., and Vallieres, E.F. "On the Assessment of Intrinsic, Extrinsic, and Amotivation in Education: Evidence on the Concurrent and Construct Validity of the Academic Motivation Scale," *Educational and Psychological Measurement* (53:1) 1993, pp 159-172.

Vallerand, R.J., Fortier, M.S., and Guay, F. "Self-Determination and Persistence in a Real-Life Setting: Toward A Motivational Model of High School Dropout," *Journal of Personality and Social Psychology* (72:5) 1997, pp 1161-1176.

Vallerand, R.J. "Toward a Hierarchical Model of Intrinsic and Extrinsic Motivation," in: *Advances in Experimental Social Psychology,* M.P. Zanna (ed.), Academic Press, New York, 1997, pp. 271-360.

Vallerand, R.J., and Fortier, M.S. "Measures of Intrinsic and Extrinsic Motivation in Sport and Physical Activity: A Review and Critique," in: *Advances in Sport and Exercise Psychology Measurement,* J.L. Duda (ed.), Fitness Information Technology, Inc., Morgantown, WV, 1998.

Van der Heijden, H. "User Acceptance of Hedonic Information Systems," *MIS Quarterly* (28:4) 2004, pp 695-704.

Van Yperen, N.W., and Hagedoorn, M. "Do High Job Demands Increase Intrinsic Motivation or Fatigue or Both? The Role of Job Control and Job Social Support," *Academy of Management Journal* (46:3) 2003, pp 339-348.

Venkatesh, V., and Speier, C. "Computer Technology Training in the Work-Place: A Longitudinal Investigation of the Effect of Mood," *Organizational Behavior and Human Decision Processes* (79:1) 1999, pp 1-28.

Venkatesh, V. "Creating Favorable User Perceptions: Exploring the Role of Intrinsic Motivation," *MIS Quarterly* (23:2) 1999, pp 239-260.

Venkatesh, V. "Determinants of Perceived Ease of Use: Integrating Control, Intrinsic Motivation, and Emotion into the Technology Acceptance Model," *Information Systems Research* (11:4) 2000, pp 342-365.

Venkatesh, V., Morris, M. G., and Ackerman, P. L. "A Longitudinal Field Investigation of Gender Differences in Individual Technology Adoption Decision Making Processes," *Organizational Behavior and Human Decision Process* (83:1) 2000, pp 33-60.

Venkatesh, V., and Brown, S.A. "A Longitudinal Investigation of Personal Computers in Homes: Adoption Determinants and Emerging Challenges," *MIS Quarterly* (25:1) 2001, pp 71-201.

Venkatesh, V., Morris, M.G., Davis, G.B., and Davis, F.D. "User Acceptance of Information Technology: Toward a Unified View," *MIS Quarterly* (27:3) 2003, pp 425-478.

Venkatesh, V., and Bala, H. "Technology Acceptance Model 3 and A Research Agenda on Interventions," *Decision Sciences* (39:2) 2008, pp 273-315.

Wang, W., and Hsieh, J.P. "Symbolic Adoption, Extended Use, and Emergent Use of Complex Information Systems in the Mandatory Organizational Context," Proceedings of the 27th International Conference on Information Systems, Milwaukee, 2006.

Wasko, M.M., and Faraj, S. "Why Should I Share? Examining Social Capital and

Knowledge Contribution in Electronic Networks of Practice," *MIS Quarterly* (29:1) 2005, pp 35-57.

Webster, J., and Martocchio, J.J. "Microcomputer Playfulness: Development of A Measure with Workplace Implications," *MIS Quarterly* (16:2) 1992, pp 201-226.

Webster, J., Trevino, L. K., and Ryan, L. "The Dimensionality and Correlates of Flow in Human-Computer Interactions," *Computers in Human Behaviors* (9:2) 1993, pp 411-426.

Webster, J., and Ho, H. "Audience Engagement in Multimedia Presentations," *The Data Base for Advances in Information Systems* (28:2) 1997, pp 63-77.

Webster, J., and Hackiey, P. "Teaching Effectiveness in Technology-Mediated Distance Learning " *Academy of Management Journal* (40:6) 1997, pp 1282-1309.

Webster, J., and Ahuja, J.S. "Enhancing the Design of Web Navigation Systems: The Influence of User Disorientation on Engagement and Performance," *MIS Quarterly* (30:3) 2006, pp 661-678.

West, M.A., and Farr, J. L. "Innovation at Work," in: *Innovation and Creativity at Work: Psychological and Organizational Strategies,* M.A. West, and J. L. Farr (eds.), John Wiley & Sons, Chichester, 1990, pp. 3-13.

Westland, J.C., and Clark, T.H.K. *Global Electronic Commerce: Theory and Case Studies* MIT Press, Cambridge, MA, 2000.

White, R.W. "Motivation Reconsidered: The Concept of Competence," *Psychological Review* (66:2) 1959, pp 297-333.

Yoon, Y., Guimaraes, T., and O'Neal, Q. "Exploring the Factors Associated with Expert Systems Success," *MIS Quarterly* (19:1) 1995, pp 83-106.

Zmud, R.W., and Apple, L.E. "Measuring Technology Incorporation/ Infusion," *Journal of Product Innovation Management* (9:2) 1992, pp 148-155.

Zuckerman, M. *Sensation-Seeking: Beyond the Optimal Level of Arousal* Erlbaum, Hillsdale, NJ, 1979.

Zuckerman, M. *Behavioral Expressions and Biosocial Bases of Sensation Seeking* Cambridge University Press, New York, 1994.

# Appendix I Questionnaire for Study 1

关于员工使用 XXX 系统情况的问卷调查

**香港　　九龙　　红磡**

Hung Hom　Kowloon　Hong Kong

致

参与调查的各位员工：

您好！首先，衷心感谢各位参与此项目研究，这份调查问卷是由香港理工大学信息系统使用研究小组设计，旨在研究公司员工信息系统使用的状况。所有资料只作科学研究，调查资料将会保密，**研究结果只展现综合数据，不涉及任何个人信息**。

**问卷中的所提及的 XXX 系统均是指**公司所建立的 XXX 信息系统**。**

由于研究结果的可靠性高度取决于阁下对问题的认真和客观回答，请您填写此问卷时，细心阅读各项问题，不要漏答，**并真实地表达您的感受。**您所提供的资料对我们的研究会有很大帮助。阁下如希望进一步了解研究结果，或您对此项研究有任何疑问和建议，请通过下列联系方式与我们联系。

最后，对您的参与及帮助表示衷心的感谢！

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| **第一部分：**以下是关于您对 **使用 XXX 系统** 的感受。请您仔细阅读以下句子，并在适当的数字上画圈。 | **非常不同意** | **不同意** | **有点不同意** | **不能确定** | **有点同意** | **同意** | **非常同意** |
|---|---|---|---|---|---|---|---|
| **例题：** 使用 XXX 系统给我日常工作带来便利。 | 1 | 2 | 3 | (4) | 5 | 6 | 7 |
| 1. 我使用 XXX 系统是因为：对该系统有更深入了解时所带来的乐趣。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 2. 我使用 XXX 系统是因为：使用该系统学习到新事物时所带来的乐趣。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 3. 我使用 XXX 系统是因为：使用该系统学习到新技能时所带来的乐趣。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1. 我使用 XXX 系统是因为：当我掌握该系统高难度使用技术时，我感到很满足。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 2. 我使用 XXX 系统是因为：当我在使用过程中改善我的不足时，我感到很愉快。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 3. 我使用 XXX 系统是因为：当我使用该系统渐趋完美时，我感到很满足。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 4. 我使用 XXX 系统是因为：当我能够克服该系统使用中的困难时候，我感到很满足。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1. 我使用 XXX 系统是因为：使用该系统时是令人愉快的。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 2. 我使用 XXX 系统是因为：使用该系统的实际过程是令人愉快的。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 3. 我使用 XXX 系统是因为：使用该系统是一种乐趣。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

**第二部分：**本部分的资料**只供研究**，所有资料都不会告诉其它人员。请放心回答，在填写实际情况，或在合适的选项上打“✓”。

1. 性别： □ 女 □ 男

2. 年龄：_____（周岁）

3. 教育程度：

□小学或以下 □初中 □高中/中专 □大专 □大学 □硕士 □博士

4. 您从事目前工作岗位的时间（合计）：_____（年）_____（月）

5. 您使用 XXX 系统多长时间（合计）：_____（年）_____（月）

**感谢您对本次调查的支持！**

# Appendix II Questionnaire for Study 2

## 关于员工使用 XXX 系统情况的问卷调查

**香港　　九龙　　红磡**

Hung Hom　Kowloon　Hong Kong

致

参与调查的各位员工：

您好！首先，衷心感谢各位参与此项目研究，这份调查问卷是由香港理工大学信息系统使用研究小组设计，旨在研究公司员工信息系统使用的状况。所有资料只作科学研究，调查资料将会保密，**研究结果只展现综合数据，不涉及任何个人信息**。

**问卷中的所提及的 XXX 系统均是指**公司所建立的 XXX 信息系统**。**

由于研究结果的可靠性高度取决于阁下对问题的认真和客观回答，请您填写此问卷时，细心阅读各项问题，不要漏答，**并真实地表达您的感受。**您所提供的资料对我们的研究会有很大帮助。阁下如希望进一步了解研究结果，或您对此项研究有任何疑问和建议，请通过下列联系方式与我们联系。

最后，对您的参与及帮助表示衷心的感谢！

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| **第一部分：**以下是关于您对 **使用 XXX 系统** 的感受。请您仔细阅读以下句子，并在适当的数字上画圈。 | **非常不同意** | **不同意** | **有点不同意** | **不能确定** | **有点同意** | **同意** | **非常同意** |
|---|---|---|---|---|---|---|---|
| **例题：** 使用 XXX 系统给我日常工作带来便利。 | 1 | 2 | 3 | (4) | 5 | 6 | 7 |
| 1. 使用 XXX 系统能使我更快地完成任务。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 2. 使用 XXX 系统能增进我的工作绩效。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 3. 使用 XXX 系统能提高我的工作效率。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 4. 使用 XXX 系统能够改进我工作的有效性。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1. 对我来说，学习使用 XXX 系统是容易的。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 2. 我觉得使用 XXX 系统去做我想做的事情是很容易的。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 3. 我与 XXX 系统的互动是清晰而且容易理解的。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 4. 我觉得与 XXX 系统的互动是很有弹性的. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 4. 我使用 XXX 系统是因为：对该系统有更深入了解时所带来的乐趣。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 5. 我使用 XXX 系统是因为：使用该系统学习到新事物时所带来的乐趣。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 6. 我使用 XXX 系统是因为：使用该系统学习到新技能时所带来的乐趣。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 5. 我使用 XXX 系统是因为：当我掌握该系统高难度使用技术时，我感到很满足。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 6. 我使用 XXX 系统是因为：当我在使用过程中改善我的不足时，我感到很愉快。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 7. 我使用 XXX 系统是因为：当我使用该系统渐趋完美时，我感到很满足。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 8. 我使用 XXX 系统是因为:当我能够克服该系统使用中的困难时候，我感到很满足。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 4. 我使用 XXX 系统是因为：使用该系统时是令人愉快的。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 5. 我使用 XXX 系统是因为：使用该系统的实际过程是令人愉快的。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 6. 我使用 XXX 系统是因为：使用该系统是一种乐趣。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

**第二部分：以下是关于您对该系统的态度。**请从下列**每个问题**的答案选项中，各圈选出一个您认为最恰当的，**并在相应的答案上画圈**。

| 总得来说，使用该系统会是：（**请答每一题，共五题**） | | | | | |
|---|---|---|---|---|---|
| 1. | 1 非常不值得肯定 | 2 不值得肯定 | 3 中立 | 4 值得肯定 | 5 非常值得肯定 |
| 2. | 1 非常不好 | 2 不好 | 3 中立 | 4 好 | 5 非常好 |
| 3. | 1 非常有害 | 2 有害 | 3 中立 | 4 有益 | 5 非常有益 |
| 4. | 1 非常无生产效益的 | 2 无生产效益的 | 3 中立 | 4 有生产效益的 | 5 非常有生产效益的 |
| 5. | 1 非常无效的 | 2 无效的 | 3 中立 | 4 有效的 | 5 非常有效的 |

**第三部分：**本部分的资料**只供研究**，所有资料都不会告诉其它人员。请放心回答，在填写实际情况，或在合适的选项上打“✓”。

1. 性别： ☐ 女 ☐ 男

2. 年龄：_____（周岁）

3. 教育程度：

☐小学或以下 ☐初中 ☐高中/中专 ☐大专 ☐大学 ☐硕士 ☐博士

4. 您从事目前工作岗位的时间（合计）：_____（年）_____（月）

5. 您使用 XXX 系统多长时间（合计）：_____（年）_____（月）

**感谢您对本次调查的支持！**

# Appendix III Questionnaire for Study 3

## 关于员工使用 XXX 系统情况的问卷调查

**香港　　九龙　　红磡**

Hung Hom　Kowloon　Hong Kong

致

参与调查的各位员工：

您好！首先，衷心感谢各位参与此项目研究，这份调查问卷是由香港理工大学信息系统使用研究小组设计，旨在研究公司员工信息系统使用的状况。所有资料只作科学研究，调查资料将会保密，**研究结果只展现综合数据，不涉及任何个人信息**。

**问卷中的所提及的 XXX 系统均是指**公司所建立的 XXX 信息系统**。**

由于研究结果的可靠性高度取决于阁下对问题的认真和客观回答，请您填写此问卷时，细心阅读各项问题，不要漏答，**并真实地表达您的感受。**您所提供的资料对我们的研究会有很大帮助。阁下如希望进一步了解研究结果，或您对此项研究有任何疑问和建议，请通过下列联系方式与我们联系。

最后，对您的参与及帮助表示衷心的感谢！

谢博安　博士

香港理工大学管理及市场学系

电话　852-2766-7359

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李希熙　博士研究生

香港理工大学管理及市场学系

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| **第一部分：**以下是关于您对 **使用 XXX 系统** 的感受。请您仔细阅读以下句子，并在适当的数字上画圈。 | **非常不同意** | **不同意** | **有点不同意** | **不能确定** | **有点同意** | **同意** | **非常同意** |
|---|---|---|---|---|---|---|---|
| **例题：** 使用 XXX 系统给我日常工作带来便利。 | 1 | 2 | 3 | (4) | 5 | 6 | 7 |
| 1. 我可以自信地使用 XXX 系统。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 2. 我可以容易地自行操作 XXX 系统。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 3. 如果周围没有人告诉我如何做，我也能使用 XXX 系统完成工作任务。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1. 使用 XXX 系统能使我更快地完成任务。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 2. 使用 XXX 系统能增进我的工作绩效。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 3. 使用 XXX 系统能提高我的工作效率。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 4. 使用 XXX 系统能够改进我工作的有效性。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1. 对我来说，学习使用 XXX 系统是容易的。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 2. 我觉得使用 XXX 系统去做我想做的事情是很容易的。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 3. 我与 XXX 系统的互动是清晰而且容易理解的。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 4. 我觉得与 XXX 系统的互动是很有弹性的. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1. 我使用 XXX 系统是因为：对该系统有更深入了解时所带来的乐趣。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 2. 我使用 XXX 系统是因为：使用该系统学习到新事物时所带来的乐趣。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 3. 我使用 XXX 系统是因为：使用该系统学习到新技能时所带来的乐趣。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1. 我使用 XXX 系统是因为：当我掌握该系统高难度使用技术时，我感到很满足。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 2. 我使用 XXX 系统是因为：当我在使用过程中改善我的不足时，我感到很愉快。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 3. 我使用 XXX 系统是因为：当我使用该系统渐趋完美时，我感到很满足。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 4. 我使用 XXX 系统是因为：当我能够克服该系统使用中的困难时候，我感到很满足。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

| **第一部分（续）：**以下是关于您对 **使用 XXX 系统** 的感受。请您仔细阅读以下句子，并在适当的数字上画圈。 | **非常不同意** | **不同意** | **有点不同意** | **不能确定** | **有点同意** | **同意** | **非常同意** |
|---|---|---|---|---|---|---|---|
| 1. 我使用 XXX 系统是因为：使用该系统时是令人愉快的。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 2. 我使用 XXX 系统是因为：使用该系统的实际过程是令人愉快的。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 3. 我使用 XXX 系统是因为：使用该系统是一种乐趣。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1. XXX 系统的使用已经融入到我的日常工作中。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 2. XXX 系统的使用已整合为我日常工作的一部分。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 3. 现在，使用 XXX 系统的已是我日常工作的一部分。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1. 我经常会使用到多于平常使用的 XXX 系统功能来支持我的工作。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 2. 我学习并使用了新的 XXX 系统功能来支持我的工作。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 3. 我 **没有** 尝试使用 XXX 系统功能中任何一个新的功能。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 4. 我 **没有** 必要花力气去进一步理解 XXX 系统功能中的功能会怎样更好地支持我工作。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 5. 我使用了例行性以外的功能(指 XXX 系统功能中的功能)来支持我的工作。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1. 我找到了 XXX 系统功能的新用途来帮助我的工作绩效。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 2. 我通过新颖的方式来使用 XXX 系统功能以支持我的工作。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 3. 我开发了基于 XXX 系统功能的新应用来支持我的工作。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 4. 我试着用 XXX 系统功能来支撑当初该系统没有涵盖到的工作任务。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

| **第二部分：** 本部分有关您 **个人使用一般信息技术** 的调查。请您仔细阅读以下句子，并在适当的数字上画圈。 | **非常不同意** | **不同意** | **有点不同意** | **不能确定** | **有点同意** | **同意** | **非常同意** |
|---|---|---|---|---|---|---|---|
| 1. 如果我听说过一个新的信息技术，我希望寻求尝试这种新技术的方法。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 2. 在我的同事当中，我会首先尝试使用新的信息技术。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 3. 我喜欢尝试使用新的信息技术。 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

**第三部分：**本部分的资料**只供研究**，所有资料都不会告诉其它人员。请放心回答，在填写实际情况，或在合适的选项上打“✓”。

1. 性别： □ 女　　□ 男

2. 年龄：_____（周岁）

3. 教育程度：

□小学或以下　□初中　□高中/中专　□大专　□大学　□硕士　□博士

4. 您从事目前工作岗位的时间（合计）：_____（年）_____（月）

5. 您使用 XXX 系统多长时间（合计）：_____（年）_____（月）

**感谢您对本次调查的支持！**