Understanding the System Fit Challenge at the Initial Post-Adoption Stage: The Roles of Emotions in Users' Adaptation Behaviors

Completed Research Paper

Fang Zhou
Department of Information Systems
National University of Singapore
Singapore
fang.zhou@comp.nus.edu.sg

Yu Tong
Department of Information Systems
City University of Hong Kong
Hong Kong
yutong@cityu.edu.hk

Hock Hai Teo
Department of Information Systems
National University of Singapore
Singapore
teohh@comp.nus.edu.sg

Sharon Swee-Lin Tan
Department of Information Systems
National University of Singapore
Singapore
tansl@comp.nus.edu.sg

Abstract

Users' adaptation behaviors are vital to the success of the system if there is a poor fit between task and technology at the initial post-adoption stage. However, prior studies have mixed results on how users adapt to the fit challenge. We draw on coping theory and appraisal theory of emotion to develop an encounter-emotion-coping framework to reconcile the mixed results by exploring the links between fit, emotions, individual adaptation and task-technology adaptation behaviors. The paths were tested through a survey of 283 nurses. Results suggest that emotions felt by users at the initial stage explain the relationship between fit and the two adaptation behaviors. This study (1) extends our understanding of the consequences of fit issue, (2) unveils the roles of different emotions in eliciting users' adaptation behaviors, and (3) differentiates individual adaptation from task-technology adaptation in terms of their emotional antecedents. Implications for practice are discussed.

Keywords: task-technology fit, adaptation, emotion

Introduction

In any system implementation at the early post-adoption stage, it is rare that a newly introduced system will fit the needs and abilities of the users perfectly to allow them to execute their work tasks effectively and efficiently (Goodhue and Thompson 1995). The information systems implementation literature is replete with studies showing that users have to adapt their work practices or routines to suit the way enterprise systems were implemented (e.g., Fuller and Dennis 2009). From these studies, it is clear that users' adaptation behaviors are vital to the successful use of the system especially when there is a misfit between task and technology. Generally, there are two types of adaptation behaviors: 1) task-technology adaptation that refers to behaviors that change the system, the related work tasks, or the way in which users use the IT (e.g., appropriation) (Barki et al. 2007) and 2) individual adaptation that reflects the individual's learning behavior to better understand the new system (Barki et al. 2007). As new technologies are rarely perfect (Tyre and Orlikowski 1994), task-technology misfit[1] would probably lead to poor performance (Goodhue and Thompson 1995) if users do not take any actions to resolve the misfit problem (Dennis et al. 2001). User adaptation behaviors are thus important to the extent that they will help the users reap the intended benefits of the system and confer significant performance gains on the organization. Without adaptation from users, the implemented system is likely to atrophy and turn into a white elephant. Indeed, recent reports (e.g., Kimberling 2015) have reported high failure rates of ERP system implementation, notwithstanding its high investment costs.

Despite the importance of the relationship between task-technology fit and adaptation behaviors, our review of the literature has suggested that our understanding of it has been rather superficial and inconclusive. Some studies show that a misfit between work system and technology would not only motivate users to redesign the workflow or modify the technology structure (Desanctis and Poole 1994), but also make them engage in learning initiatives such as training, external documentation, and observations of others (Jasperson et al. 2005). Yet, other studies suggest that users do not engage in any adaptation behaviors even when there is a task-technology misfit (Boudreau and Robey 2005; Lapointe and Rivard 2005; Tyre and Orlikowski 1994). Reasons proffered for the variance in adaptation behaviors include feelings of frustrations (Boudreau and Robey 2005), failure to notice the opportunity embedded in task-technology misfit (Tyre and Orlikowski 1994), and cost of learning new technique that is inconsistent with established way of work (Lapointe and Rivard 2005; Tyre and Orlikowski 1994). While these studies have offered significant insights, they do not provide a coherent theoretical framework to understand why and how users respond in the form of adaption behaviors to the problem of task-technology misfit at the initial post-adoption stage.

The inconclusive findings suggest that there could be different paths from task-technology fit to users' adaptation. Research in psychology has shown that emotions, being multidimensional in nature, play an important role in influencing how people behave (Bechara et al. 2000; Loewenstein and Lerner 2003). At the initial post-adoption stage, the influence of emotions could be even more salient with the huge changes encountered by users. Hence, to systematically understand the relationship between task-technology fit and adaptation behaviors, we take into account the emotional responses that intervene between the misfit and users' reaction (i.e., adaptation behavior). According to appraisal theory of emotion, emotions can be understood by understanding their appraisal components (Lazarus 1991a). The difference in their appraisal components accounts for the difference in the antecedents and consequences of various emotions (Lazarus 1991a). In addition, the coping theory argues that appraisal (Lazarus 1991b) is a key mediator that can strongly influence how a person copes with an encounter (i.e., task-technology misfit). Combining these two theories, we develop an encounter[2]-emotion-coping framework to explain why and how users respond to the task-technology fit issue. At the initial post-adoption stage, the task-technology fit challenge is a critical encounter that users need to cope with through adaptation behavior (Leonard-Barton 1988). Prior evidence also implies that various users' emotions are easily evoked at the initial post-adoption stage such as interest (Jasperson et al. 2005), guilt (Thatcher and Perrewe 2002), and satisfaction (Bhattacherjee

[1] Task-technology fit/misfit mentioned in this paper means perceived task-technology fit/misfit. For simplicity, we use the term "task-technology fit/misfit" throughout the paper.

[2] Task-technology fit can be viewed as an "affective event" (Weiss and Cropanzano 1996) since it evokes emotional reactions of users at work. Thus, the terms "encounter" and "event" are used interchangeably in this paper.

2001). As such, users' adaptation behaviors at the initial post-adoption stage can be understood in light of the encounter-emotion-coping framework.

While some studies have examined users' adaptation behaviors (e.g., Beaudry and Pinsonneault 2010; Bruque et al. 2009; Tyre and Orlikowski 1994), very few have examined why people engage in a particular adaptation behavior vis-a-vis other adaptation behavior within the same study. Prior studies either consider only one type of adaptation (e.g., Fuller and Dennis 2009; Goh et al. 2011; Majchrzak, Rice, Malhotra, King, and Ba 2000) or assert that individual adaptation and task-technology adaptation result from the same causes (e.g., Beaudry and Pinsonneault 2005, 2010). However, Barki et al. (2007) proposed that individual adaptation and task-technology adaptation are distinct adaptation behaviors - individual adaptation focuses on learning and self-enhancement while task-technology focuses on modifying the work processes or technology (Barki et al. 2007). In light of this distinction, one should expect that the two adaptation behaviors should have different antecedents (or theoretical mechanisms) when users appraise the task-technology fit issue.

This paper contributes to information systems post-adoption literature by opening the black box between task-technology fit and adaptation behaviors. It shows why and how certain adaptation behavior ensues when users encounter the task-technology fit issue at the initial post-adoption stage. By understanding the emotional responses that mediate the task-technology fit issue and adaptation behaviors, managers can design appropriate intervention messages to evoke and/or manage the emotional responses better so as to elicit the appropriate adaptation behaviors.

Literature Review

The notion of task-technology fit has been extensively examined in the literature of information systems. This stream of literature focuses on the effect of task-technology fit on performance. Task-technology fit theory argues that a good fit between task and technology can enhance individual performance (Goodhue and Thompson 1995) and group performance (Zigurs and Buckland 1998). To this end, many other studies have provided strong empirical support for task-technology fit theory (e.g., Parkes 2013; Sarker and Valacich 2010). Overall, this research stream highlights the importance of task-technology fit in predicting performance but overlooks plausible user responses to resolve the misfit problem. Fuller and Dennis (2009) noted that the misfit problem may lead to poor performance in the short run. To the extent that misfit is likely to occur during the initial post-adoption phase, it is important to examine how users react to and cope with the misfit. From this perspective, literature on user adaptation behaviors should provide additional insights into understanding the consequences of task-technology fit. Consequently, we identify two streams of literature on users' adaptation behaviors in response to the misfit problem.

One stream of the literature examines the mutual adaptation of work processes and technology (i.e., task-technology adaptation), while the other set of literature examines the user learning aspect (i.e., individual adaptation). From the perspective of task-technology adaptation, the model proposed by Leonard-Barton (1988) suggests that users will alter the technology or/and change the environment in response to misalignment between task and user environment. Similarly, adaptive structuration theory developed by Desanctis and Poole (1994) indicates that the way users use the technology (faithful or unfaithful appropriation) is determined by the technology, task and organization environment. Faithful appropriation refers to using the technology consistent with the spirit of technology, while unfaithful appropriation is the technology use that is not intended by the designer (Desanctis and Poole 1994). In this sense, unfaithful appropriation could manifest as the adaptation where users modify the way they use the system (Desanctis and Poole 1994), which leads to the emergence of new social structures, behaviors, and work processes (Desanctis and Poole 1994; Jasperson et al. 2005). Applying the adaptive structuration theory, many studies have found that a good fit between technologies and tasks motivates users to use the technology faithfully, but a poor fit triggers unfaithful appropriation (i.e., adaptation) (Im 2014; Majchrzak et al. 2000; Thomas and Bostrom 2010), and such appropriation would lead to changes in tasks (Goh et al. 2011). Similarly, Dennis et al. (2001) propose a fit appropriation model (FAM) based on the task-technology fit model and adaptive structuration theory. The fit appropriation model notes that a good fit is more likely to lead to faithful appropriation, while poor-fitting technology motivates users to innovate and adapt in order to improve performance (Fuller and Dennis 2009). Although some studies find a relationship between misfit and mutual adaptation of task and technology, other studies assert that users do not always react to the misfit by engaging in task-technology adaptation. For example, Tyre and Orlikowski (1994) observe that once a system is put in use, users typically ignore the misfit between the system and the task. Users rarely make any technological adaptation unless serious discrepant events (e.g., system breakdown) occur (Tyre and Orlikowski 1994). Hence, there is no definitive answer on whether users will engage in task technology adaptation if there is a task-technology misfit.

From the perspective of individual adaptation, users may also engage in learning to advance their knowledge of the technology (Barki et al. 2007). Some research posits a positive relationship between task-technology fit and learning (individual adaptation). By constructing a cognitive account of good fit between task and technology, users are likely to initiate technology-learning (Jasperson et al. 2005). Specifically, a good fit between task and technology leads to positive instrumental belief in, and satisfaction with the technology, and thus positively affect users' voluntary learning behavior (Hsieh et al. 2011). When there is a poor fit between task and technology, users may resist the new technology and put little effort into learning the new technology because of the economic cost of learning (Lapointe and Rivard 2005) or frustrations (Boudreau and Robey 2005). However, other studies have noted that users would also put more effort in learning when there is a poor fit between task and technology (i.e., a negative relationship between fit and learning). Although task-technology misfit increases the learning cost, it also paradoxically increases the demand for individual learning. Task-technology misfit that results from task complexity (Goodhue and Thompson 1995) is found to be positively related to learning from others (Wang et al. 2014) when users try to minimize the gap between the outcome and their goals (Sun and Ping 2008). Therefore, the literature on the relationship between task-technology fit and individual adaptation is also divisive. In sum, despite much research on users' adaptation, the findings are mixed as to the relationship between misfit and adaptation (both task-technology and individual adaptation).

There is thus a need to move beyond the direct relationship and assess the underlying process which links task-technology fit and adaptation behaviors. From this perspective, the coping model of user adaptation (CMUA) (Beaudry and Pinsonneault 2005) is developed to examine the relationship between users' cognition of an IT (not specific to task-technology fit) and user adaptation behaviors. The CMUA model asserts that task-technology adaptation and individual adaptation coexist and can be explained by the same cognitions of an IT or relevant emotions (Beaudry and Pinsonneault 2005, 2010). However, the research results are mixed. Beaudry and Pinsonneault (2010) find that task-technology adaptation and individual adaptation are affected by perceived controllability in the same manner. However, Bala and Venkatesh (2016) find that perceived controllability affects modification of the way in which the technology operates (task-technology adaptation) only, but does not affect users' learning behavior (individual adaptation). This suggests that more caution is needed when assessing the two adaptations and their antecedents. As Barki et al. (2007) indicate, individual adaptation and task-technology adaptation are two distinct adaptations with different focuses. While individual adaptation focuses on improving the user self, task-technology adaptation focuses on improving the task and technology. Failure to identify the distinction between antecedents of the two adaptations could be problematic because it could confuse our understanding of mechanisms by which they are triggered. Our study differs from the above studies by examining the mediating role of emotions in the relationship between task-technology fit and adaptation behaviors. More importantly, we make a distinction between individual adaptation and task-technology adaptation. Our study unravels the different emotion-related paths through which task-technology fit leads to individual adaptation and task-technology adaption respectively.

Theoretical Foundation

An Overview

Two theories (i.e., coping theory and appraisal theory of emotion) serve as the theoretical foundation for this paper. Coping theory answers how and why people cope with encounters. Coping includes "behavioral efforts to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person" (Lazarus and Folkman 1984, p.141). By taking the appraisal element into consideration, coping theory highlights that people differ in their interpretations (i.e., appraisal) of the same event and thus differ in their coping response to the same event (Lazarus and Folkman 1984). Given that user adaptation is recognized as a coping behavior (Beaudry and Pinsonneault 2005), we infer that users could engage in varied adaptation behaviors (coping response) when they are confronted with the task-technology misfit (encounter).

Appraisal theory of emotion states that emotions triggered by an event can be explained from the lens of appraisals of the event and appraisals are non-separable components of emotions. An analogy given by Lazarus (1991b) is germ theory of disease, which stated that disease (which is analogous to emotion) would likely occur with the presence of a certain microbe (which is analogous to appraisal) and the disease also includes the microbe. Therefore, the relationship between appraisals and emotions is a part-whole relationship, in which different patterns of appraisals predict the presence of different emotions as well as their antecedents and consequences.

The relation between these two theories is summarized in Figure 1. Coping theory explains the process in which people appraise an encounter, and the appraisal outcomes affect their subsequent behaviors. Appraisal theory of emotion links the appraisals with emotions. By combining these two theories, we are able to develop an encounter-emotion-coping framework which uncovers how emotions mediate the relationship between task-technology fit and adaptation. We focus on the part-whole relationship between emotion and appraisals in this study and using appraisals to help explain the relationships between emotions and task-technology fit as well as adaptation behaviors in the framework.

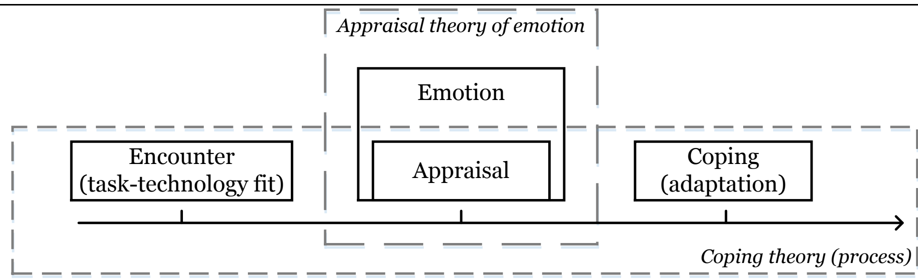

Figure 1. An Encounter-Emotion-Coping Framework

Coping as a Two-stage Process

According to coping theory, coping is a two-stage process. At the first stage, individuals appraise the encounter. At the second stage, people react to the encounter.

Stage 1. There are two aspects of appraisals: primary and secondary (Lazarus and Folkman 1984; Smith and Lazarus 1993). Primary appraisal mainly concerns "how" the encounter is relevant to the person's well-being, which is termed as "motivational congruence" (Lazarus and Folkman 1984). Motivational congruence concerns whether the encounter is consistent or inconsistent with the person's goals. The person assesses "Does the event help me achieve my desire or goal?" In the context of our study, when a new technology is implemented, users would assess whether the technology can help them achieve their goals or not. As task-technology fit theory indicates, a good fit between task and technology is likely to improve their task performance (Goodhue and Thompson 1995). Therefore, task-technology fit is more likely to induce appraisal of motivational congruence, while task-technology misfit is more likely to induce appraisal of motivational incongruence.

Secondary appraisal concerns what might and can be done. Two main components are proposed: accountability and controllability. Accountability provides direction and focus of coping response. It is rooted in attribution theory and refers to a person's evaluation of who should be held accountable and therefore who or what should be the target of any subsequent coping efforts (Smith and Lazarus 1993). An individual can hold himself, others, or other environmental factors accountable for the encounter (Smith and Lazarus 1993). In the context of our study, when a new system fits well with their tasks, users would have different appraisals of accountability. They may attribute the task-technology fit to the good design of the system or their good mastery of the system. Likewise, when a new system does not support users' tasks, users may believe that the misfit is a result of the mistakes made by the system designers, or the complexity of the tasks or their own lack of understanding of the system. Controllability concerns the coping potential for managing the encounter (Scherer 1988). When an event is perceived as relevant to a person's well-being, the person will evaluate the resources, power, abilities, and control in relation to the event (Silvia 2005). Controllability reflects the evaluation of a person's ability to change the situation (e.g., coping potential, power and effort) to make it in accord with his desire or goal (Smith and Lazarus 1990, 1993). In the context of our study, for example, when users are aware of a poor fit between task and technology, they may feel strong control over the situation if they perceive that they have the resources or ability to address the cause of misfit. Conversely, they may feel weak controllability over the situation if they do not know how to solve the misfit problem.

Stage 2. After individuals have appraised the encounter, they will engage in certain coping strategies (Lazarus and Folkman 1984). Coping strategies can be emotion-focused (i.e., coping response aiming at altering the perception of the event) or problem-focused (i.e., coping response aiming at solving the problem) (Lazarus and Folkman 1984). People using problem-focused strategies try to identify, change or eliminate the source of the encounter. It has been acknowledged that the individual adaptation and task-technology adaptation belong to the problem-focused coping (Beaudry and Pinsonneault 2005, 2010). As the focus of our study is on adaptation behaviors, we do not consider the relationship between appraisals and emotion-focused coping. Ellsworth and Smith (1988a) note that effective coping requires a fit between appraisals of the event and choice of coping responses. On the one hand, accountability predicts the direction of individuals' subsequent behaviors (Lazarus and Folkman 1984). In our context, after identifying the cause of misfit, users cope with it by addressing the cause (Lazarus and Folkman 1984). For example, when users attribute the misfit to their own mistaken use of the new system, they will direct the focus of adaptation to themselves and assess whether they could enhance themselves or not. When users attribute the misfit to the fault in system design or the task environment, they will direct the focus of adaptation to the system and/or tasks and assess whether they could improve them or not. On the other hand, controllability determines whether individuals proactively address the problem or avoid the problem (Lazarus and Folkman 1984). When the perceived controllability is high, people are more likely to adopt problem-focused coping (i.e., adaptation). In other words, as users perceive that they have ability or power to cope with the misfit, they tend to put more effort in adaptation to solve the misfit problem.

To conclude, at stage 1, the encounter (task-technology fit or misfit) determines users' appraisal of motivational congruence. At the same time, the appraisals of accountability and controllability are also constructed but they vary between users at the post-adoption stage. At stage 2, the appraisal of accountability determines the focus or direction of adaptation (individual adaptation vs. task-technology adaptation), whereas the appraisal of controllability determines whether the adaptation behavior is triggered or impeded. In the following section, we leverage on the appraisal theory of emotion to explore how different emotions can be understood from the lens of these three appraisals.

Appraisal Theory of Emotion

Appraisal theory of emotion contends that different patterns of appraisals can be produced by the same event and thus various emotions, each containing a distinct appraisal pattern, can occur (Lazarus 1991b; Roseman and Smith 2001). All the three appraisals discussed in the coping theory contribute to the uniqueness of a particular emotion. First, appraisal of motivational congruence determines whether negative emotions (guilt, irritation, etc.) or positive emotions (interest, satisfaction, etc.) are elicited (Ellsworth and Scherer 2003; Roseman and Smith 2001). Negative emotions usually contain motivational incongruence component while positive emotions usually contain motivational congruence component (Roseman and Smith 2001). Second, accountability can further differentiate emotions based on how individuals attribute the event (Roseman and Smith 2001). Empirical research has found significant difference in accountability among emotions. Some emotions are associated with self-accountability, such as guilt and shame, while other emotions are closely related to other-accountability, such as anger and satisfaction (Smith and Ellsworth 1985). Third, emotions also differ in appraisal of controllability (Roseman and Smith 2001). Empirical research has found that emotions such as anger and interest are of high controllability, and emotions such as satisfaction and guilt are of low controllability (Smith and Ellsworth 1985). Based on prior empirical research on appraisal patterns of emotion (e.g., Lazarus and Folkman 1984; Lazarus 1991; Smith and Ellsworth 1985; Smith and Lazarus 1993), we aim to classify various emotions based on the three dimensions mentioned above–motivational congruence, accountability and controllability. In this study, we focus on four types of emotion: guilt, interest, irritation and satisfaction. These four emotions are widely examined in the emotion literature (Ellsworth and Smith 1988b; Roseman 1991; Smith and Ellsworth 1985), and are commonly triggered at the post-adoption stage (e.g., Beaudry and Pinsonneault 2010; Jasperson, et al. 2005) . For example, Bhattacherjee (2001) find that satisfaction at the initial post-adoption stage is critical in determining IS continuance intention; interest, as one of dimensions of perceived enjoyment (Heijden 2004; Lee et al. 2005), plays an important role in user acceptance of information systems; anger/irritation positively influences information technology use in an indirect way (Beaudry and Pinsonneault 2010); emotions including guilt (Thatcher and Perrewe 2002) are usually experienced when users use the technology. Despite all these studies that explored the roles of emotions in IT use or acceptance, we would like to unravel how these emotions would influence users' adaptation behaviors. Table 1 summarize how these four emotions (i.e., guilt, interest, irritation and satisfaction) demonstrating distinct patterns of appraisal.

	Motivational congruence/incongruence	**Accountability**	**Controllability**
Guilt	Motivational incongruence	Self	Low
Interest	Motivational congruence	Self and others	High
Irritation	Motivational incongruence	Others	High
Satisfaction	Motivational congruence	Others	Low

Table 1. Appraisal Components of Guilt, Interest, Irritation and Satisfaction

Model and Hypotheses Development

Figure 2 depicts the research model. Our central thesis is that the four emotions (i.e., guilt, interest, irritation and satisfaction) differ in the three appraisal components. Hence, they have distinct relationships with task-technology fit and adaptation behavior. In other words, each emotion represents a different path from which task-technology fit triggers or inhibits adaptation behavior. Specifically, motivation congruence component deals with the relationship between task-technology fit and emotions; accountability deals with which adaptation (individual or task-technology adaptation) is involved; controllability deals with the relationship between emotions and the adaptation behavior involved.

Guilt. Guilt has been consistently identified as a negative emotion. The primary appraisal of guilt is motivational incongruence (Smith and Lazarus 1993). Where there is a misalignment between work and technology at the initial stage of post-adoption, users would not be able to realize their work goals and objectives, thereby causing them to feel guilty. This guilt is further exacerbated if the users attribute the misalignment to themselves and feel that they deserve this negative event. Hence we hypothesize

H1: Task-technology fit is negatively related to guilt emotion.

One of the appraisal components of guilt is self-accountability (Smith and Lazarus 1993). The pattern of appraisal for guilt highlights a theme of "self-blame" that differentiates it from other emotions (Ellsworth and Smith 1988a). Users feel guilty only when they attribute the misfit to internal causes instead of external causes. In other words, users may have regretted doing something such as failing to understand the functions of the new system or failing to use the system in a correct way. In addition, some studies have identified a low controllability in guilt and found it related to avoidance of thinking about the situation (Ellsworth and Smith 1988a; Smith and Ellsworth 1985). Guilt is often compared with shame in the psychology literature. The notion that guilt is linked to approach and shame is linked to avoidance has been simply accepted by many researchers, but the empirical evidence for the distinction is not always clear. For example, Tangney et al. (1996) found that guilt and shame do not differ in motivation to make amends. Other studies that test a broader range of emotions have also indicated that guilt does not necessarily lead to approach, but distancing instead (Schmader, T., and Lickel, B. 2006). Kubany and Watson (2003) also suggested that both guilt-reduction and guilt-avoidance strategies exist. Thus, more caution is needed to assess the link between guilt and avoidance, and it is necessary to take into account the research context. At the initial post-adoption stage, users' ability to use the system is relatively low. Users would feel guilty because they feel powerless to utilize the system to fulfill their job responsibilities. Such feeling of powerless will result in avoidance of engagement in implementation and decrease in their efforts in learning. Thus, we hypothesize

H2: Guilt emotion is negatively related to individual adaptation.

Interest. Though the history of interest being viewed as an emotion is not very long, it has been shown that interest has a stable pattern of appraisal (Silvia 2005). Interest emotion has been associated with high attention and effort (Ellsworth and Smith 1988b; Smith and Ellsworth 1985). Just like other positive emotions, one determinant appraisal of interest is motivational congruence. If the technology fits the tasks and the abilities of the individuals, the users would likely experience improvement in his work, which should in turn arouse the users' attention and thus elicit interest emotion However, if the technology cannot support their work, they would be less motivated to devote attention or effort to understand and use the technology and would thus be less interested. Therefore, we hypothesize that

H3: Task-technology fit is positively related to interest emotion.

Smith and Ellsworth (1985) find that when individuals have interesting experiences, they are likely to attribute the interest emotion experience to the self as well as to the event. That is, they would feel that they have the ability to understand the event and that this interesting event deserves further exploration (Silvia 2005). Because they feel that they have the ability to understand the event (the technology cum task), they are then more likely to engage in further individual adaptation to further enhance their ability. And because they find the task-technology interesting, users would then devote more effort to engage in task-technology adaptation to maximize the interestingness of the new technology by modifying or improving the technology. Therefore, we hypothesize

H4a: Interest emotion is positively related to individual adaptation.

H4b: Interest emotion is positively related to task-technology adaptation.

Irritation. Irritation is conceptually indistinguishable from anger[3] (Crawford and Henry 2004; Scherer 1988; Watson et al. 1988). Roseman (1996) indicates that irritation/anger is elicited when the individual holds the belief that s/he deserved a better outcome than s/he had received. In our study context, users would feel irritable because they thought the new system could support their work, but only to find that their work and the system was not well aligned. If the technology is compatible with the task, then irritation is less likely to be experienced. Thus, we hypothesize

H5: Task-technology fit is negatively related to irritation emotion.

Irritation emotion is usually compared with guilt. Perceived locus of causality differentiates irritation from guilt (Scherer 1988). The second appraisals for anger consist of other-accountability and high controllability (Smith and Lazarus 1993). If a negative event is caused by another's action, irritation toward the person is experienced. Applied to impersonal events, if an object does not meet the individual's expectancy and causes a negative outcome, irritation/anger toward the object is experienced. Besides, irritation is found to be related to high controllability (Ellsworth and Scherer 2003; Smith and Ellsworth 1985) and is believed to motivate individuals to attack or remove the source of irritation, which is usually an external factor (Ellsworth and Smith 1988b). In our study context, users who attribute the task-technology misfit to others' mistake in using the system or others' fault in designing the system are likely to feel irritable about it. To deal with these causes of misfit, users will consider correcting others' mistakes by modifying the technology or adapting their work practices. Thus, we hypothesize

H6: Irritation emotion is positively related to task-technology adaptation.

Satisfaction. Although prior research usually consider satisfaction as different from emotion, recent studies have identified satisfaction as an emotional state and found its impact on coping behaviors (Beaudry and Pinsonneault 2010; Lazarus 1991a; Scherer 1988). In the Information Systems (IS) literature, various conceptualizations of the satisfaction construct are presented. Satisfaction has been conceptualized as an emotion (Kim 2004), an attitude (Wixom and Todd, 2005), or an affect in general (Bhattacherjee 2004). According to an extensive review of IS research on affect provided by Zhang (2013), satisfaction is categorized into affective evaluation rather than emotion, because satisfaction can be stored and is temporally unconstrained while emotions are usually temporally constrained. However, since this study focuses on users' adaptation behaviors while they are using the system every day, the difference in temporal constrain is unlikely to affect our understanding of users' adaptation behaviors. Therefore, satisfaction is conceptualized as an emotion in this study. Satisfaction is goal-oriented and is highly related with goal consistency (Smith and Lazarus 1993). Satisfaction mainly deals with "whether the goal is achieved or not" (Roseman 1991). Users are likely to feel satisfaction when they find that the technology fits with their tasks, which may improve their work performance. Therefore, we hypothesize

H7: Task-technology fit is positively related to the user's satisfaction toward the system.

---

[3] The terms "irritation" and "anger" are used interchangeably.

The appraisal of accountability is mainly about others' credit. For example, users would feel satisfied about the system and appreciate the work of the designer. Users may also feel satisfied with the way they interact with the system and appreciate the workflow that caters to the system. Therefore, satisfaction is associated with task-technology adaptation rather than individual adaptation. In addition, satisfaction is associated with the appraisal of low controllability. Dependent on goal consistency, feeling of satisfaction is an outcome-based emotional response toward the object. Specifically, individuals would experience satisfaction when there is already a beneficial outcome. In this sense, users who feel satisfied do not have much control over the process preceding the outcomes. Furthermore, with a goal achieved, the individual is unlikely to devote any more effort to improve the system. Consequently, users will likely not engage in task-technology adaptation. One noteworthy issue is that although satisfaction is related to more IT use (Beaudry and Pinsonneault 2010), it does not mean more adaptation. Users who are satisfied would probably persist in using the IT but are motivationally inhibited to improve the IT. Therefore, we hypothesize

H8: Satisfaction toward the system is negatively related to task-technology adaptation.

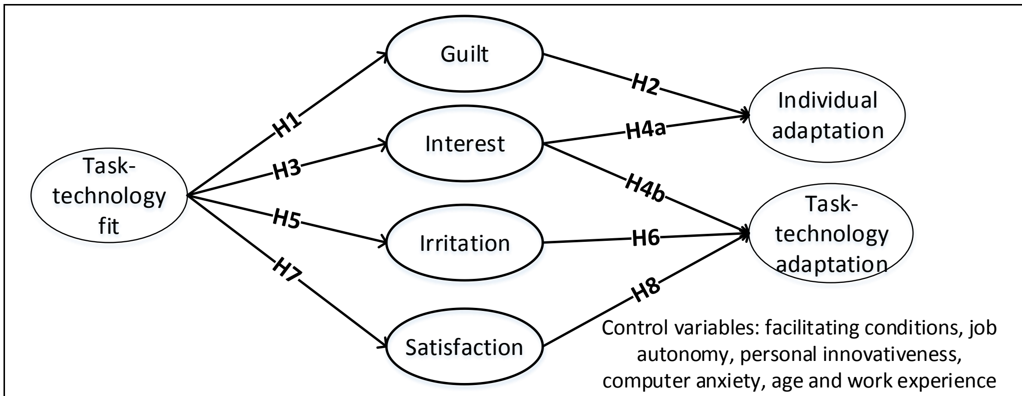

Figure 2. Research Model

Research Methodology

To assess model constructs, a questionnaire was developed. We included items that were previously validated (see Table 2). The questionnaire included items that measured task-technology fit, individual adaptation, task-technology adaptation, emotions and control variables (i.e., facilitating conditions, job autonomy, personal innovativeness, computer anxiety, age, and work experience).

The reflective items for task-technology fit were adapted from the measure of compatibility proposed by Moore and Benbasat (1991). These items assess the general perception of fit between system and work. The formative items for task-technology adaptation and individual adaptation were adapted from the measures proposed and validated by Barki et al. (2007). Although the items proposed by Barki et al. (2007) were measured when respondents had been using their IT for at least a year, prior literature acknowledges that system users also adapt the system or tasks at the early stage of post-adoption (Beaudry and Pinsonneault 2010). Measures of guilt, interest and irritation emotion were adapted from the Positive and Negative Affect Schedule (PANAS) items (Watson et al. 1988). PANAS has validated the emotions regarding the positive-negative dimension such that interest belongs to positive affect while guilt and irritation belong to negative affect. In this study, we operationalized these emotions as single-item constructs as they are in the PANAS (e.g., Thatcher and L.perrewe 2002; Watson et al. 1988) and other studies (Beaudry and Pinsonneault 2010). Satisfaction was operationalized as a reflective construct, which was in line with the satisfaction measurement in the literature (Bhattacherjee 2001). Two items for it were adapted from the measures for physician job satisfaction (Konrad et al. 1999), which captures individuals' satisfaction in a clinical context.

In an effort to increase robustness of our study, we included several important control variables. According to coping theories (Lazarus and Folkman 1984), individual differences and environmental factors affect coping response. Therefore, we included constructs such as facilitating conditions, job autonomy, personal innovativeness, computer anxiety, age, and work experience. Facilitating conditions are defined as objective factors in the environment that are perceived to make the system use easy (Venkatesh et al. 2003).

Facilitating conditions are found to affect adaptation (Sun and Ping 2008). The reflective items for facilitating conditions were adapted from the Unified Theory of Acceptance and Use of Technology (UTAUT) model (Venkatesh et al. 2003). Job autonomy concerns the degree of discretion users have regarding how they do their jobs. Users with high job autonomy are more likely to engage in adaptation because they are given more opportunities to alter the work and learn (Ahuja and Thatcher 2005). The reflective items were adapted from measures proposed by Breaugh (1985). Personal innovativeness concerns users' willingness to change. Users with high personal innovativeness are more prone to take risks and thus are more likely to learn new things and reinvention (Agarwal and Prasad 1998). The reflective items for it were adapted from measures proposed by Agarwal and Prasad (1998). Computer anxiety is anxiety about the implications of computer use and the reflective items for it were adapted from measures proposed by Thatcher and Perrewe (2002). Computer anxiety leads to lower computer self-efficacy (Thatcher and Perrewe 2002) and will affect avoidance or resistance. Thus, computer anxiety may contribute to less adaptation. Last, we control users' age and work experience.

Construct and sources	**Items**
Task-technology fit (Moore and Benbasat 1991)	a. Using the system is compatible with all aspects of my work. b. Using the system fits well with the way I like to work. c. Using the system fits into my work style.
Guilt (Watson et al. 1988)	Guilty
Interest (Watson et al. 1988)	Interested
Irritation (Watson et al. 1988)	Irritable
Satisfaction (Konrad et al. 1999)	a. Overall, I am pleased with using the system. b. My use of the system has met my expectations.
Individual adaptation (Barki et al. 2007)	Since the system has been implemented, a. I have communicated with colleagues in order to better understand how this system operates. b. I have communicated with IT specialists in order to better understand how this system operates. c. I have researched, on my own initiatives, in order to increase my knowledge and mastery of this system. d. I have explored several information sources, on my own initiative, concerning this system.
Task-technology adaptation (Barki et al. 2007)	Since the system has been implemented, how much effort (time and energy) have you spent recommending or suggesting _______? a. improvements to this system's functionalities b. improvements to this system's interface c. improvements to this system's hardware d. modifications to your tasks so that they better fit this system e. modifications to this system so that it better fits your tasks
Personal innovativeness (Agarwal and Prasad 1998)	a. I am constantly on the lookout for new ways to improve my work. b. I tend to take the initiative to start new ideas. c. I am always a powerful force for constructive change.
Computer anxiety (Thatcher and Perrewe 2002)	a. I feel apprehensive about using computers b. It scares me to think that I could cause the computer to destroy a large amount of information by hitting the wrong key. c. I hesitate to use a computer for fear of making mistakes that I cannot correct. d. Computers are somewhat intimidating to me.
Facilitating conditions (Venkatesh et al. 2003)	a. I have control over using the system. b. I have the resources necessary to use the system. c. I have the knowledge necessary to use the system.
Job autonomy (Breaugh 1985)	a. I am allowed to decide how to go about getting my job done. b. I am able to choose the way to go about my job. c. I am free to choose the method(s) to use in carrying out my work.
Age	What is your age? Below 20[_] 20-24 [_] 25-29 [_] 30-34 [_] 35-39 [_] 40-44 [_] 45-49 [_] 50 and over [_]
Work experience	How many years have you been working at the focal hospital?

Table 2. Questionnaire Items

The questionnaire was administered to nurses in a public hospital (referred to as the focal hospital hereafter) approximately one month after the rollout of a new medication management system (referred to as the focal system hereafter). We select only one hospital to control for hospital-specific effects. There are three reasons for the selection of focal system and respondents. First, the focal system is a complex enterprise system. The misfit between work tasks and the system is salient for such system at the early post-adoption stage. Second, the system is closely related to daily work and main business of the hospital, so that users' adaptation is crucial and encouraged. Third, nurses constitute the majority of the system users. They have intensive interaction with the system, such as checking the medication orders, tracking existing order status and marking performed medication administration tasks. Their emotions are likely to be triggered during their abundant interaction with the system.

The survey questionnaire was distributed to the nurses along with a cover letter which stated the objective of this study. The nurses were assured of the confidentiality of their responses. Generally, the nurses completed the questionnaire in their break time. Each of them was provided with a lunch coupon after they returned the questionnaire. A total of 377 questionnaires were returned. We dropped four cases because of subject duplication (the same subjects filled the questionnaire twice). For the missing value in the remaining data, we did Little's Missing Completely at Random (MCAR) Test (Chen and Little 1988) in SPSS 22.0. MCAR Test showed that the data was missing at random (Chi-Square=847.033, DF=856, p=0.58). Thus, we dropped the cases with missing value, which would not introduce any bias into parameter estimates (Allison 2001). The final dataset consisted of 283 data points.

Data Analysis

Power analysis (Faul et al. 2007) showed that for a small effect size (f2=0.05) and 11 predictors, the required sample size ranged from 160 to 262 depending on the alpha power ranging from 0.8 to 0.95. Hence, our valid sample size of 283 was sufficient for data analysis. Among the 283 nurses, 98.9% of the respondents (280) were female. The distribution of age is relatively even with 69 respondents (24.4%) aged 20 to 24, 59 respondents (20.8%) aged 25 to 29, 43 respondents (15.2%) aged 50 and above, 34 respondents (12%) aged 40 to 44, 32 respondents (11.3%) aged 30 to 34, 27 respondents (9.5%) aged 35 to 39, 18 respondents (6.4%) aged 45 to 49, and one respondent (0.4%) aged below 20.

Measurement Model Evaluation

For reflective constructs (i.e., task-technology fit, satisfaction, personal innovativeness, computer anxiety, job autonomy, and facilitating conditions), we assessed the convergent and discriminant validities. Convergent validity was assessed using factor loadings, Cronbach's alpha, composite reliability of constructs, and average variance extracted. Since some items were modified from previously validated measures, we first did an exploratory factor analysis with a principal component method and varimax (orthogonal) rotation in SPSS. Then we did the measurement model analysis using SmartPLS 2.0. PLS was appropriate because it allows estimation for formative constructs. For an exploratory factor analysis, a measurement item with a loading coefficient above .60 is considered to have satisfactory convergent validity. The t value of factor loadings should be significant. Cronbach's alpha, and composite reliability values should be larger than 0.7 to meet the satisfactory convergent validity. Similarly, the average variance extracted (AVE) should be larger than 0.5 (Fornell and Larcker 1981). The test results of factor loadings, Cronbach's alpha, composite reliability (CR), and AVE are shown in Table 3. All scores exceeded the acceptable level, indicating adequate convergent validity. Discriminant validity was assessed using factor loadings, construct correlation and heterotrait-monotrait ratio of correlations (HTMT) (Henseler et al. 2015). All items need to load more highly on their intended constructs than other constructs. All the factor loadings were larger than 0.7, which indicated significant discriminant validity. Besides, the square root of the average variance extracted for a construct should be larger than its correlations with the other constructs (Fornell and Larcker 1981). In addition, all of the HTMT ratios should be smaller than the threshold of 0.85 and all the upper confidence interval limits should be much smaller than 1. The reflective constructs satisfied all these criteria (see Table 4). Generally, the results indicated convergent and discriminant validities for reflective constructs.

Dimension	Outer loading	Cronbach's Alpha	CR	AVE	Factor Analysis					
Task-technology fit		0.937	0.960	0.888	1	2	3	4	5	6
Fit A	0.912				.852	.134	.109	.001	.123	.254
Fit B	0.964				.901	.179	.160	-.007	.181	.152
Fit C	0.950				.882	.221	.141	-.001	.192	.126
Satisfaction		0.890	0.948	0.901						
Satisfaction A	0.946				.437	.752	.247	-.041	.075	.207
Satisfaction B	0.952				.468	.726	.197	-.018	.095	.294
Personal innovativeness		0.836	0.902	0.754						
Personal A	0.802				.045	.294	.744	-.019	.070	.191
Personal B	0.921				.155	.104	.902	-.051	.077	.085
Personal C	0.881				.194	-.037	.846	.071	.162	.143
Computer anxiety		0.883	0.920	0.743						
Anxiety A	0.712				-.04	.000	.043	.733	.111	-.015
Anxiety B	0.903				.00	-.063	.049	.894	-.004	-.013
Anxiety B	0.932				.023	-.049	-.039	.913	.015	-.119
Anxiety C	0.883				.003	.060	-.069	.887	.015	-.087
Job autonomy		0.906	0.940	0.840						
Autonomy A	0.928				.083	.126	.076	.064	.890	.114
Autonomy B	0.955				.186	.041	.103	.067	.915	.129
Autonomy C	0.864				.166	-.032	.116	.026	.867	.079
Facilitating conditions		0.911	0.944	0.848						
Facilitating A	0.888				.158	.007	.152	-.064	.155	.872
Facilitating B	0.941				.142	.163	.128	-.065	.119	.906
Facilitating C	0.933				.252	.224	.153	-.133	.072	.828

Table 3. Assessment of Convergent Validity for Reflective Constructs

For formative constructs (i.e., task-technology adaptation and individual adaptation), we assessed the variance inflation factors (VIF), weights, and loadings (bivariate correlation between item and construct) (Cenfetelli and Bassellier 2009). VIF reflected the extent of multicollinearity among formative items. Table 5 shows the test results. All statistics of VIF for formative measures were smaller than 3.3. Thus, there was no multicollinearity problem. The magnitudes of weights and loadings for both constructs were not small given that the number of items for each construct was 4 or 5. The results for weights showed a co-occurrence of negative and positive indicator weights for task-technology adaptation. After assessing the bivariate correlation between items and construct as well as other items, we found that the negative weight for the item “modifications to this system so that it better fits your tasks” might be caused by a suppression effect. It is difficult to interpret its meaning, but its loading was significant and it contributed to a unique aspect of task-technology adaptation. We decided to keep it for conceptual completeness.

	1	2	3	4	5	6	7	8	9	10	11	12	13
Task-technology fit	0.94												
Individual adaptation	0.43	--											
Task-technology adaptation	0.22	0.39	--										
Guilt	-0.10 (0.11)	-0.05	0.14	1									
Interest	0.47 (0.49)	0.40	0.26	-0.18 (0.18)	1								

Irritation	-0.37 (0.38)	-0.09	0.08	0.28 (0.28)	-0.26 (0.26)	1							
Satisfaction	0.68 (0.74)	0.40	0.13	-0.18 (0.19)	0.58 (0.62)	-0.41 (0.43)	0.95						
Facilitating conditions	0.44 (0.47)	0.40	0.09	-0.15 (0.16)	0.42 (0.44)	-0.22 (0.23)	0.51 (0.56)	0.92					
Job autonomy	0.36 (0.40)	0.26	0.13	-0.05 (0.05)	0.12 (0.12)	-0.12 (0.12)	0.26 (0.28)	0.28 (0.31)	0.92				
Personal innovativeness	0.36 (0.41)	0.39	0.31	-0.03 (0.04)	0.30 (0.33)	-0.13 (0.13)	0.44 (0.52)	0.36 (0.42)	0.27 (0.31)	0.87			
Computer anxiety	-0.01 (0.02)	-0.05	0.05	0.26 (0.27)	-0.19 (0.20	0.02 (0.04)	-0.06 (0.07)	-0.17 (0.18)	0.08 (0.10)	-0.01 (0.07)	0.86		
Age	0.05 (0.06)	0.17	0.12	0.09 (0.09)	0.16 (0.16)	0.02 (0.02)	0.14 (0.14)	0.14 (0.14)	0.04 (0.06)	0.16 (0.18)	0.01 (0.06)	1	
Work experience	-0.01 (0.03)	0.12	0.12	-0.02 (0.02)	0.14 (0.14)	0.00 (0.00)	0.08 (0.03)	0.03 (0.03)	0.01 (0.02)	0.08 (0.09)	-0.04 (0.04)	0.62 (0.62)	1
Mean	4.41	4.65	2.69	1.49	3.54	2.61	4.82	5.15	4.53	5.08	3.28	4.43	8.80
Standard deviation	1.27	1.23	1.21	0.87	0.97	1.10	1.29	1.20	1.23	1.06	1.52	2.15	10.3

Note: Diagonal elements are the square roots of AVE. Values of correlation greater than 0.6 are highlighted. HTMT ratios are shown in parentheses.

Table 4. Factor Correlation

Constructs	Dimension	VIF	Weights	Loadings
Individual adaptation	individual adaptation A	1.304	0.220	0.626
	individual adaptation B	1.543	0.535	0.879
	individual adaptation C	2.296	0.135	0.751
	individual adaptation D	2.190	0.367	0.793
Task-technology adaptation	Task-technology adaptation A	1.055	-0.355	-0.137
	Task-technology adaptation B	3.088	0.606	0.896
	Task-technology adaptation C	2.901	0.311	0.812
	Task-technology adaptation D	2.828	0.399	0.715
	Task-technology adaptation E	2.948	-0.216	0.6

Table 5. Assessment of Formative Constructs

Structural Model Tests

Because there are two dependent variables in the theoretical model, one appropriate way to test the hypotheses is to run three types of models: one regression model with emotion as outcome variables and two regression models to estimate the effect of emotion on individual adaptation and task-technology adaptation, respectively (Streukens et al. 2010). However, the error terms in the individual adaptation equation and task-technology adaptation equation could be correlated. For example, users who hold a managerial position are more likely to engage in both individual adaptation and task-technology adaptation because they are responsible for the outcome of the system. To capture the possible correlation between the error terms in the two equations, we decide to run the seemingly unrelated regression to estimate the effects of emotions on adaptation. To capture possible correlation among emotions, multivariate regression model with emotions as dependent variables was chosen. We first compute the latent variable scores for all constructs (i.e., task-technology fit, emotions, adaptations, and control variables) in SmartPLS 2.0 with the theoretical model. PLS allows for concurrent estimation for measurement model and structural model and is suitable for estimating models with formative constructs. The obtained latent variable scores entered the multivariate regression model (type-1 model) with emotions as outcome variables and the seemingly unrelated regression model (type-2 model) with individual adaptation and task-technology adaptation as outcome variables. In type-1 model, the relationships between task-technology fit and the four emotions were estimated. In type-2 model, we carried out a hierarchical multiple regression analysis. In step 1, only control variables were entered. In step 2, control variables and hypothesized emotions were entered. The variable task-technology fit was also controlled to take into consideration other possible emotion-based paths since we only select four emotions. In step 3, control variables and all emotions were entered. Step 3 served as a post-hoc analysis. The estimation results are shown in Table 6 and 7.

The Breusch-Pagan test of independence for the multivariate regression model with the four emotions as outcome variables was significant ($chi^2(6)=93.16$, $p=0.00$), validating the use of multivariate regression model. The correlation of the residuals in the individual adaptation equation and task-technology adaptation equation was 0.25 (chi^2 (1) =18.03, $p=0.00$), giving support for using the seemingly unrelated regression model. The R squares for emotion equations were acceptable except guilt (R square=0.01). The R squares for adaptation equations in our full model were acceptable and the changes in R square were significant, which means that emotions had additional contribution to explain the adaptations.

	Guilt	**Interest**	**Irritation**	**Satisfaction**
Task-technology fit	-0.10	0.47***	-0.37***	0.68***
R^2 (Adjusted R^2)	0.01 (0.01)	0.22 (0.22)	0.14 (0.13)	0.46 (0.40)
Hypothesis testing	H1 ×	H3 √	H5 √	H7 √

Note: *<0.05, **<0.01, ***<0.001.

Table 6. Estimation Results for Type-1 Regression Models

	Control variable		**Full model**		**Full model + post-hoc**		Hypothesis testing
	Individual adaptation	Task-technology adaptation	Individual adaptation	Task-technology adaptation	Individual adaptation	Task-technology adaptation	
Task-technology fit	0.25***	0.14**	0.19**	0.20*	0.23**	0.19**	
Facilitating conditions	0.19**	-0.07	0.15*	-0.07	0.16**	-0.07	
Job autonomy	0.06	0.02	0.07	0.03	0.07	0.03	
Personal innovativenes	0.20***	0.28***	0.18**	0.28***	0.18**	0.28***	
Computer anxiety	-0.02	0.05	0.00	0.08	0.00	0.05	
Age	0.06	0.02	0.05	0.00	0.04	-0.02	
Work experience	0.07	0.09	0.05	0.08	0.06	0.10	
Guilt			0.01		0.01	0.13*	H2 ×
Interest			0.17**	0.27***	0.19**	0.28***	H4a,b √
Irritation				0.14*	0.09	0.14*	H6 √
Satisfaction				-0.19*	-0.018	-0.19*	H8 √
R^2 (Adjusted R^2)	0.30 (0.28)	0.13 (0.11)	0.32 (0.29)	0.20 (0.18)	0.32 (0.29)	0.22 (0.19)	
ΔR^2	0.30	0.13	0.02	0.07	0.00	0.02	
$\Delta \chi^2$	118.59***	41.62***	11.71***	28.88***	5.05**	8.67***	

Note: *<0.05, **<0.01, ***<0.001.

Table 7. Estimation Results for Type-2 Regression Models

Our hypotheses testing results showed that task-technology fit had significantly positive relationships with interest and satisfaction emotions, and significantly negative relationships with irritation emotion. Task-technology fit had no relationship with guilt. Users did not attribute the misfit problem to themselves. In sum, H1 is not supported, but H3, H5, and H7 are supported. Guilt emotion was not significantly related to individual adaptation. Thus, H2 is not supported. Interest emotion had significantly positive relationships with both individual adaptation and task-technology adaptation. Thus, H4a and H4b are supported. Irritation emotion had significantly positive relationship with task-technology adaptation. Therefore, H6 is supported. Finally, satisfaction was significantly related to task-technology adaptation. H8 is supported. The summary of the hypotheses testing results is in Table 6 and Table 7. Except for H1 and H2, all the hypotheses are supported.

To explicitly examine the mediation roles of emotions, significance of the indirect effects was tested. Following Preacher and Hayes (2008), we performed bootstrapping for testing the indirect effects due to its high accuracy and power. Bootstrap resampling with replacement was done 1000 time. From each of these samples, the theoretical model was estimated using the seemingly unrelated regression model, and then the indirect effects were computed. The results are shown in Table 8. Except guilt, all the emotions had significant mediating effect in task-technology fit on adaptation behaviors. The total indirect effect of task-technology fit on individual adaptation was positive, while the total indirect effect of task-technology fit on task-technology adaptation was not significant.

Mediator	Coefficient of indirect effect	95% BCa confidence interval		Significance
Dependent variable: individual adaptation				
Guilt	-0.003	-0.023	0.004	Not significant
Interest	0.083	0026	0.147	Positively significant
Total indirect effect	0.079	0.023	0.143	Positively significant
Dependent variable: task-technology adaptation				
Interest	0.127	0.067	0.220	Positively significant
Irritation	-0.063	-0.115	-0.025	Negatively significant
Satisfaction	-0.134	-0.256	-0.012	Negatively significant
Total indirect effect	-0.070	-0.209	0.059	Not significant

Note: (BCa) bias-corrected and accelerated confidence interval

Table 8. Estimation Results for Indirect Effects

In the post-hoc analysis, we tested the relationships between all the emotions and the two adaptations. The results (last two columns in Table 7) show that our findings were robust. The estimates of hypothesized relationship did not change if more links between emotions and adaptations were added. Besides, as predicted, irritation and satisfaction did not affect individual adaptation. However, the results show that guilt emotion positively affected task-technology adaptation.

Since self-reported measures were used, common method bias was assessed. First, a Harmon one-factor test was conducted on the six reflective variables in our model including task-technology fit, satisfaction, personal innovativeness, computer anxiety, job autonomy and facilitating conditions. The results show that the most covariance explained by one factor is 34.18 percent, indicating that common method bias is not a serious threat to our results. Second, following Podsakoff et al. (2003) and Liang et al. (2007), we included in the model a common method factor whose indicators included all the principal constructs' indicators and calculated each indicator's variance substantively explained by the substantive construct and by the method factor. The results show that the average substantively explained variance of the indicators was 0.754, while the average method biased variance was 0.002. In addition, most method factor loadings were not significant. Therefore, common method bias is unlikely a serious concern for this study.

Discussion and Conclusion

Drawing on coping theory and appraisal theory of emotion, this paper examines the relationship between task-technology fit and adaptation behaviors and the emotion-based process between them. Consistent with H3, H4a and H4b, interest positively mediates the relationship between task-technology fit and both individual adaptation. Consistent with H5, H6, H7 and H8, both irritation and satisfaction mediate the relationship between task-technology fit and task-technology adaptation, but in an opposite manner. Irritation is negatively related to task-technology fit and positively related to task-technology adaptation, whereas satisfaction is positively related to task-technology fit and negatively related to task-technology adaptation. Inconsistent with H1 and H2, we find that task-technology fit does not cause guilt, but guilt affects task-technology adaptation behavior. One plausible explanation is that at the initial post-adoption stage, users experience a sudden and huge change. At this stage, users were busy dealing with the misfit problem and did not reflect on their own problems. Guilt emotion may result from not taking care of the patients because of distraction by the new system. In this case, users were motivated to improve the system to better serve the patients. The results of this paper indicate that both negative and positive emotions could be related to adaptation behavior. Different from prior research (Beaudry and Pinsonneault 2010), this paper indicates that negative emotions could have positive consequences. For example, irritation emotion can trigger task-technology adaptation.

The results of mediation test indicate that task-technology fit would lead to both individual adaptation and task-technology adaptation through interest, while task-technology fit would inhibit task-technology adaptation through either irritation or satisfaction. Particularly, the competitive mediating effects of interest and irritation (or satisfaction) lead to an insignificant total indirect effect of task-technology fit on task-technology adaptation. The results demonstrate that the indirect effects of task-technology fit through different emotions could be not only complementary (i.e., irritation and satisfaction), but also competitive (i.e., interest and satisfaction, or interest and irritation). Presumably, the total effects of task-technology fit on adaptation in different situations could be different. In the situations where fit-reactive emotions such as interest dominate, adaptation behaviors are more likely to ensue after task-technology fit, while in the situation where misfit-reactive emotions such as satisfaction and irritation dominate, adaptation behaviors are more likely to ensue after task-technology misfit. However, when multiple fit-reactive emotions and misfit-reactive emotions are balanced, an insignificant relationship between task-technology fit and adaptation is likely to be observed. This can explain prior inconsistent findings on relationship between task-technology fit and adaptation behaviors to some extent. In addition, the findings show that individual adaptation and task-technology adaptation are different in that they have different sets of emotional antecedents. For example, satisfaction and irritation influence task-technology adaptation only.

Limitations and Future Research

This research has a few limitations that offer opportunities for future research. First, in the current research, we captured users' emotions approximately one month after the system rollout. While the current data can reflect the emotions at the initial post-adoption stage, it will be interesting for future research to collect the emotions at multiple time points such as initial vs. stable post-adoption stage. Moreover, techniques allowing real-time analysis of emotions could be employed to more accurately capture the emotional reaction from the users. Second, only four emotions are covered in this study. We believe that there exist other emotions that mediate the effect of task-technology fit on adaptation behaviors. We encourage future research on the roles of other emotions. Third, this study focused on users' adaptation behavior regarding one particular medication system in hospital. Our findings may not be fully generalized to other types of information systems, although the focal system shares much commonality with most other systems in terms of high complexity and inflexibility. Future research could consider replicating the results in different organizations using different systems.

Theoretical Contributions

The present study first complements the research on task-technology fit challenge at the early post-adoption stage. Prior studies have provided inconsistent evidence regarding whether users would respond to task-technology misfit problem (Desanctis and Poole 1994; Fuller and Dennis 2009; Tyre and Orlikowski 1994). This study provides plausible explanations regarding the inconsistency from a new perspective (i.e., emotion), which deepens our understanding of the task-technology fit problem. By relating task-technology fit and adaptation behavior through emotions, we present a complete picture of the whole process from environment stimulus to emotions followed by behavioral response. As either task-technology fit or misfit can trigger some adaptation, our findings regarding the indirect effect of task-technology fit contribute to reconciling prior inconsistencies. Our findings suggest that the total effects of task-technology fit on adaptation in different situations could be different because the mediating roles of different emotions could be not only competitive but also complementary.

Second, this study adds to a more nuanced understanding of adaptation. Although theoretical models in prior studies do not differentiate individual adaptation and task-technology adaptation in terms of their cause, they presented mixed findings (Bala and Venkatesh 2016; Beaudry and Pinsonneault 2010). Our theoretical model allows for integrating prior studies and mixed empirical results on adaptation in IS. This study contributes to the theoretical understanding of adaptation behavior by differentiating individual adaptation from task-technology adaptation and identifying different paths to individual adaptation or task-technology adaptation. Specifically, we illustrate the difference by highlighting the focus of the two types of adaptation. While individual adaptation focuses on self-enhancement, task-technology adaptation focuses on improvement of task or technology (Barki et al. 2007). Based on it, we proposed distinct emotion-based paths from task-technology fit to individual adaptation and task-technology adaptation. Our finding of different sets of emotional causes of the two adaptations demonstrates the necessity of differentiating individual adaptation from task-technology adaptation. This paper opens a new revenue for future research on joint examination of individual adaptation and task-technology adaptation.

Lastly, this study also contributes to the literature on emotion at the post-adoption stage. This study specifies the conditions under which different emotions are triggered by task-technology fit/misfit and shows the possibility of occurrence of various emotions at the initial post-adoption stage. By classifying emotion based on three dimensions—motivational congruence, accountability and controllability, we are able to classify emotions in a more nuanced manner. This enhances our understanding of both how emotions are triggered and how emotions carry over to affect users' adaptation behavior. Our findings emphasize the need to move beyond the simple negative-positive classification of emotions and take into consideration more dimensions of emotions. Our findings suggest that negative (positive) emotions do not always have negative (positive) consequences, which is overlooked in the prior literature. Specifically, satisfaction impedes task-technology adaptation while irritation activates task-technology adaptation.

Practical Implications

This research provides managers a better understanding of, and strategies to deal with task-technology misfit challenge at the initial post-adoption stage. Given that neither task-technology fit nor misfit could always stimulate adaptation behaviors, managers should look beyond the superficial presence of fit or misfit and pay more attention to users' emotions occurring when they use the system. For example, managers should conduct surveys to learn about users' emotions when the system is first rolled out. Our paper suggests that managers should pay attention to users who feel less control over the situation (e.g., satisfaction). As users who are satisfied with the system no longer put effort in suggesting modification of the system, manager need to facilitate emotions with high-controllability, such as interest. Managers can also put effort in making users feel interested in the system by, for instance, emphasizing interesting parts of the new system. They can also provide platforms where users can communicate and learn from each other.

In addition, managers are suggested to give compatible support when users experience emotions that motivate them to adapt. When users feel irritable, it is more effective to provide technical support to help them modify their work or the system than to provide support for user learning. When users feel interested in the system, it is necessary to encourage both individual learning and modification of task and technology. To support task-technology adaptation, managers can encourage users to communicate with technicians and report their suggestions on improving the technology or optimizing the working process. To support user learning, managers can help create learning groups and encourage peer learning. They can also provide training courses and learning materials that are readily accessible.

References

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

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

Allison, P. D. 2001. *Missing data*, Sage University Papers Series on Quantitative Applications in the Social Science, 07-137. Thousand Oaks, CA: Sage.

Bala, H., and Venkatesh, V. 2016. "Adaptation to Information Technology: A Holistic Nomological Network from Implementation to Job Outcomes," *Management Science* (62:1), pp. 156–179.

Barki, H., Titah, R., and Boffo, C. 2007. "Information System Use-Related Activity: An Expanded Behavioral Conceptualization of Individual-Level Information System Use," *Information Systems Research* (18:2), pp. 173–192.

Beaudry, A., and Pinsonneault, A. 2005. "Understanding User Responses to Information Technology: A Coping Model of User Adaptation," *MIS Quarterly* (29:3), pp. 493–524.

Beaudry, A., and Pinsonneault, A. 2010. "The Other Side of Acceptance: Studying The Direct and Indirect Effects of Emotions on Information Technology Use," *MIS Quarterly* (34:4), pp. 689–710.

Bechara, A., Damasio, H., and Damasio, A. R. 2000. "Emotion, Decision Making and the Orbitofrontal Cortex.," *Cerebral Cortex* (10:3), pp. 295–307.

Bhattacherjee, A. 2001. "Understanding Information Systems Continuance: An Expectation-Confirmation

Model," *MIS Quarterly* (25:3), pp. 351–370.
Boudreau, M., and Robey, D. 2005. "Enacting Integrated Information Technology: A Human Agency Perspective," *Organization Science* (16:1), pp. 3–18.
Breaugh, J. A. 1985. "The Measurement of Work Autonomy," *Human Relations* (38:6), pp. 551–570.
Bruque, S., Moyano, J., and Eisenberg, J. 2008. "Individual Adaptation to IT-Induced Change: The Role of Social Networks," *Journal of Management Information Systems* (25:3), pp. 177–206.
Cenfetelli, R., and Bassellier, G. 2009. "Interpretation of Formative Measurement in Information Systems Research," *MIS Quarterly* (33:4), pp. 689 – 708.
Chen, H. Y., and Little, R. 1988. "A Test of Missing Completely at Random for Generalised Estimating Equations with Missing Data," *Journal of the American Statistical Association* (86:404), pp. 1198–1202.
Crawford, J. R., and Henry, J. D. 2004. "The Positive and Negative Affect Schedule (PANAS): Construct Validity, Measurement Properties and Normative Data in a Large Non-clinical Sample," *British Journal of Clinical Psychology* (43), pp. 245–265.
Dennis, A. R., Wixom, B. H., and Vandenberg, R. J. 2001. "Understanding Fit and Appropriation Effects in Group Support Systems via Meta-Analysis," *MIS Quarterly* (25:2), pp. 167–193.
Desanctis, G., and Poole, M. 1994. "Capturing the Complexity in Advanced Technology Use: Adaptive Structuration Theory," *Organization Science* (5:2), pp. 121 – 147.
Ellsworth, P. C., and Scherer, K. R. 2003. "Appraisal Processes in Emotion," in *Handbook of Affective Sciences*, pp. 572–595.
Ellsworth, P. C., and Smith, C. A. 1988a. "From Appraisal to Emotion: Differences Among Unpleasant Feelings," *Motivation and Emotion* (12:3), pp. 271–302.
Ellsworth, P. C., and Smith, C. A. 1988b. "Shades of Joy: Patterns of Appraisal Differentiating Pleasant Emotions," *Cognition and Emotion* (2:4), pp. 301–331.
Faul, F., Erdfelder, E., Lang, A.-G., and Buchner, A. 2007. "G*Power 3: A Flexible Statistical Power Analysis Program for the Social, Behavioral, and Biomedical Sciences," *Behavior Research Methods* (39:2), pp. 175–191.
Fornell, C., and Larcker, D. F. 1981. "Evaluating Structural Equation Models With Unobservable Variables and Measurement Error," *Journal of Marketing Research* (18:1), pp. 39–50.
Fuller, R. M., and Dennis, A. R. 2009. "Does Fit Matter? The Impact of Task-Technology Fit and Appropriation on Team Performance in Repeated Tasks," *Information Systems Research* (20:1), pp. 2–17.
Goh, J. M., Gao, G. G., and Agarwal, R. 2011. "Evolving Work Routines : Adaptive Routinization of Information Technology in Healthcare," *Information systems research* (22:3), pp. 565–585.
Goodhue, D. L., and Thompson, R. L. 1995. "Task-Technology Fit and Individual Performance," *MIS Quarterly* (19:2), pp. 213–236.
Heijden, H. van der. 2004. "User Acceptance of Hedonic Information Systems," *MIS Quarterly* (28:4), pp. 695–704.
Henseler, J., Ringle, C. M., and Sarstedt, M. 2015. "A New Criterion for Assessing Discriminant Validity in Variance-Based Structural Equation Modeling," *Journal of the Academy of Marketing Science* (43:1), pp. 115–135.
Hsieh, J. J. P.-A., Rai, A., and Xu, S. X. 2011. "Extracting Business Value from IT: A Sensemaking Perspective of Post-Adoptive Use," *Management Science* (57:11), pp. 2018–2039.
Im, G. 2014. "Effects of Cognitive and Social Factors on System Utilization and Performance Outcomes," *Information & Management* (51:1), pp. 129–137.
Jasperson, J., Carter, P. E., and Zmud, R. W. 2005. "A Comprehensive Conceptualization of Post-Adoptive Behaviors Associated With Information Technology Enabled Work Systems," *MIS Quarterly* (29:3), pp. 525–557.
Kimberling, E. 2015. "Key Findings From the 2015 ERP Report," *Panorama* (available at http://panorama-consulting.com/key-findings-from-the-2015-erp-report/).
Konrad, T. R., Williams, E. S., Linzer, M., McMurray, J., Pathman, D. E., Gerrity, M., Schwartz, M. D., Scheckler, W. E., Kirk, J. Van, And, E. R., and Douglas, J. 1999. "Measuring Physician Job Satisfaction in a Changing Workplace and a Challenging Environment," *Medical Care* (37:11), pp. 1174–1182.
Kubany, E. S., and Watson, S. B. 2003. "Guilt: Elaboration of a Multidimensional Model," *The Psychological Record,* (53), pp. 51–90.
Lapointe, L., and Rivard, S. 2005. "A Multilevel Model of Resistance to Information Implementation," *Mis Quarterly* (29:3), pp. 461–491.

Lazarus, R. S. 1991a. "Progress on a Cognitive-Motivational-Relational Theory of Emotion," *American psychologist* (46:8), pp. 819–834.
Lazarus, R. S. 1991b. "Cognition and Motivation in Emotion.," *American psychologist* (46:4), pp. 352–367.
Lazarus, R. S., and Folkman, S. 1984. *Stress, Appraisal, and Coping*, New York: Springer Publishing Company.
Lee, M. K. O., Cheung, C. M. K., and Chen, Z. 2005. "Acceptance of Internet-Based Learning Medium: The Role of Extrinsic and Intrinsic Motivation," *Information and Management* (42:8), pp. 1095–1104.
Leonard-Barton, D. 1988. "Implementation as Mutual Adaptation of Technology and Organization," *Research Policy* (17:5), pp. 251–267.
Liang, H., Saraf, N., Hu, Q., and Xue, Y. 2007. "Assimilation of Enterprise Systems: The Effect of Institutional Pressures and the Mediating Role of Top Management," *MIS Quarterly* (31:1), pp. 59–87.
Loewenstein, G., and Lerner, J. S. 2003. "The Role of Affect in Decision Making," in *Handbook of Affective Science*, pp. 619–642.
Majchrzak, A., Rice, R. E., Malhotra, A., King, N., and Ba, S. 2000. "Techonology Adaptation: The Case of a Computer-Supported Inter-Organizational Virtual Team," *MIS Quarterly* (24:4), pp. 569–600.
Moore, G. C., and Benbasat, I. 1991. "Development of an Instrument to Measure the Perceptions of Adopting an Information Technology Innovation," *Information Systems Research* (2:3), pp. 192–222.
Parkes, A. 2013. "The Effect of Task-Individual-Technology Fit on User Attitude and Performance: An Experimental Investigation," *Decision Support Systems* (54:2), pp. 997–1009.
Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., and Podsakoff, N. P. 2003. "Common Method Biases in Behavioral Research: A Critical Review of the Literature and Recommended Remedies.," *Journal of Applied Psychology* (88:5), pp. 879–903.
Preacher, K. J., and Hayes, A. F. 2008. "Asymptotic and Resampling Strategies for Assessing and Comparing Indirect Effects in Multiple Mediator Models.," *Behavior Research Methods* (40:3), pp. 879–891.
Roseman, I. J. 1991. "Appraisal Determinants of Discrete Emotions," *Cognition & Emotion* (5:3), pp. 161–200.
Roseman, I. J. 1996. "Appraisal Determinants of Emotions: Constructing a More Accurate and Comprehensive Theory," *Cognition and Emotion* (10:3), pp. 241–278.
Roseman, I. J., and Smith, C. A. 2001. "Appraisal Theory: Overview, Assumptions, Varieties, Controversies," in *Appraisal Processes in Emotion: Theory, Methods, Research,* K. R. Scherer, A. Schorr, and T. Johnstone (eds.), New York: Oxford University Press, pp. 3–19.
Sarker, S., and Valacich, J. S. 2010. "An Alternative to Methodological Individualism: A Non-Reductionist Approach to Studying Technology Adoption by Groups," *MIS Quarterly* (34:4), pp. 779–808.
Scherer, K. R. 1988. "Criteria for Emotion-Antecedent Appraisal: A Review," *Cognitive Perspectives on Emotion and Motivation* (1986), pp. 89–126.
Silvia, P. J. 2005. "What Is Interesting? Exploring the Appraisal Structure of Interest," *Emotion* (5:1), pp. 89–102.
Smith, C. A., and Ellsworth, P. C. 1985. "Patterns of Cognitive Appraisal in Emotion," *Journal of Personality and Social Psychology* (48:4), pp. 813–838.
Smith, C. A., and Lazarus, R. S. 1990. "Emotion and Adaptation.," in *Handbook of Personality: Theory and Research*, New York: Guilford, pp. 609–637.
Smith, C. A., and Lazarus, R. S. 1993. "Appraisal Components, Core Relational Themes, and the Emotions," *Cognition & Emotion* (7:3-4), pp. 233–269.
Streukens, S., Wetzels, M., Daryanto, A., and Ruyter, K. de. 2010. "Analyzing Factorial Data Using PLS: Application in an Online Complaining Context," in *Handbooks of Partial Least Squares: Concepts, Methods and Applications,* V. E. Vinzi, W. W. Chin, J. Henseler, and H. Wang (eds.), Berlin Heidelberg: Springer, pp. 567–587.
Sun, H., and Ping, Z. 2008. "Adaptive System Use: An Investigation at the System Feature Level," *Proceedings of the 29th International Conference on Information Systems* (Paper 170), Paris.
Tate, M., Evermann, J., and Gable, G. 2015. "An Integrated Framework for Theories of Individual Attitudes Towards Technology," *Information & Management* (52:6), Elsevier B.V., pp. 710–727.
Thatcher, J. B., and Perrewe, P. L. 2002. "An Empirical Examination of Individual Traits as Antecedents to Computer Anxiety and Computer Self-efficacy," *MIS Quarterly* (26:4), pp. 381–396.
Thomas, D. M., and Bostrom, R. P. 2010. "Vital Signs for Virtual Teams: An Empirically Developed Trigger Model for Technology Adaptation Interventions," *MIS Quarterly* (34:1), pp. 115–142.

Tyre, M. J., and Orlikowski, W. J. 1994. "Windows of Opportunity: Temporal Patterns of Technological Adaptation in Organizations," *Organization Science* (5:1), pp. 98–118.

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

Wang, Y., Gray, P. H., and Meister, D. B. 2014. "Task-Driven Learning: The Antecedents and Outcomes of Internal and External Knowledge Sourcing," *Information & Management* (51:8), Elsevier B.V., pp. 939–951.

Watson, D., Clark, L. A., and Tellegen, A. 1988. "Development and Validation of Brief Measures of Positive and Negative Affect - the Panas Scales," *Journal of Personality and Social Psychology* (54:6), pp. 1063–1070.

Weiss, and Cropanzano, R. 1996. "Affective Events Theory: A Theoretical Discussion of The Structure, Cause and Consequences of Affective Experiences at Work," *Research in Organizational Behavior* (18), pp. 1–74.

Zhang, P. 2013. "The Affective Response Model: A Theoretical Framework of Affective Concepts and Their Relationships in the ICT Context," *MIS Quarterly* (37:1), pp. 11–20.

Zigurs, I., and Buckland, B. K. 1998. "A Theory of Task/Technology Fit and Group Support Systems Effectiveness," *MIS Quarterly* (22:3), pp. 313–334.