Investigating Users' IT Adaptation Behaviors: A Case of a Computerized Work System

Completed Research Paper

Armin Kashefi
Department of Computer Science
Brunel University London
Kingston Lane, Uxbridge
Middlesex, UB8 3PH
Armin.kashefi@brunel.ac.uk

Khalipha A. Nuhu
Department of Computer Science
Brunel University London
Kingston Lane, Uxbridge
Middlesex, UB8 3PH
Khalipha.Nuhu@brunel.ac.uk

Pamela Abbott
Information School
The University of Sheffield
Regent Court, 211 Portobello, S1 4DP
p.y.abbott@sheffield.ac.uk

Daniel A. Ayoung
Department of Liberal Studies
Bolgatanga Polytechnic
Upper East Region, Ghana
Daniel.Ayoung@bpoly.edu.gh

Faris Alwzinani
Department of Computer Science
Brunel University London
Kingston Lane, Uxbridge
Middlesex, UB8 3PH
Faris.Alwzinani@brunel.ac.uk

Abstract

IS research has shown that successful IT implementation projects rely on the extent to which IT users respond and adapt to the new technology and the changes the new technology comes with. Although the phenomenon of user IT adaptation has been studied previously in IS literature our understating of user IT adaptation is still limited. Drawing on the Coping Model of User Adaptation (CMUA) and the Approach vs. Avoidance model of coping, this study seeks to investigate how different user adaptation efforts evolve over time and subsequently influence IT use outcomes. Using a qualitative case study approach, 68 interviews were conducted at a medical center in Iran after the implementation of a Work System Computerization project. Our results indicate that emotions have a great influence on IT users' adaptation efforts. Also, users' IT appraisal might not necessarily happen in sequence as suggested by existing literature. Finally, our findings highlight the theoretical importance of preserving the distinction between approach- and avoidance-oriented emotion-focused adaptation efforts in exploring how emotion-focused efforts may influence system usage.

Keywords: IT adaptation, post-adoption, coping behaviors, user adaptation behaviors

Introduction

Organizations are investing significant amounts of money in acquiring and implementing Information and Communication Technologies (ICTs) to gain strategic and business benefits (Brynjolfsson and Mcafee 2017; McAfee and Brynjolfsson 2008). These complex systems often induce major organizational changes that

engender various responses among users individually or collectively (Barki et al. 2007; Beaudry 2009; Beaudry and Pinsonneault 2005; Bhattacherjee et al. 2017; Fadel 2012a; Fadel and Brown 2010; Griffith 1999; Schwarz et al. 2014). These responses have been attributed to different results for IT implementation projects, with some studies indicating that user responses might even lead to IT project failures (Ng and Kim 2009). Despite the impact of these user responses, IS literature in its current state offers limited insight into how various individual user responses shape user IT adaptation (Stein et al. 2015). In line with Beaudry and Pinsonneault's (2005) definition of user IT adaptation, this paper defines the term 'user adaptation' as the cognitive and behavioral efforts applied by users to manage specific consequences associated with an IT implementation in their work environment. In other words, user adaption efforts are activities that users perform in order to cope with the perceived consequences of an IT-induced organizational change.

Although the phenomenon of user IT adaptation has been studied previously in IS literature (Guinea and Webster 2011; Kane and Labianca 2011; Limayem et al. 2007; Stein et al. 2015) our understating of user IT adaptation is still limited (Bala and Venkatesh 2016). Prior studies often focus on specific aspects of an IT adaptation process. For instance, Poole and DeSanctis (1989) focused on the technology side of the process while other studies of IT-related adaptation responses have been more concerned with the notion of fit in this process (Ives and Olson 1984). Taking a different approach, Majchrzak and Cotton (1988) and Majchrzak et al. (2000) focused on how users' perceptions and attitudes are adjusted in response to an IT implementation. In contrast to the studies mentioned above, other researchers argue that adaptation cannot be referred to as a simple notion of fit between IT and the users. For instance, Tyre and Orlikowski (1994, 1996) defined "adaptation" as comprised of all the changes and adjustments following an IT implementation including the changes to the technology itself, to the work system, as well as those to users' beliefs, knowledge, and working relationships. Later studies, however, advanced this idea by considering that the adaptation process happens as a reciprocal adjustment process among three components of task, technology and self (Bala and Venkatesh 2016; Beaudry and Pinsonneault 2005, 2010; Stein et al. 2015). This study is in-line with these latter-mentioned studies.

Building on the works of Beaudry and Pinsonneault (2005) who propose the use of 'Coping Theory' as a means of interpreting individual users' responses to IT-induced organizational change, and Roth and Cohen's (1986) approach-avoidance model of coping to understand user responses to change associated with stress, this study aims to provide a comprehensive understanding of the process of user IT adaptation and how these responses influence subsequent IT use outcomes. In so doing, this paper responds to calls by Beaudry and Pinsonneault (2005) to extend their work and further explore the sequencing and interplay of problem- and emotion-focused adaptation efforts of various types of users dealing with diverse technologies. In light of the above objectives, our research questions are:

1) How do IS users' adaptation strategies shape and evolve in an IT-induced organizational change?

2) How do these users' adaptation strategies subsequently influence IT use outcomes?

While the first question concerns the "employed adaptation strategies by users" as well as the potential alterations to the patterns of user adaptation efforts, the second question seeks the influences of such alterations on users' subsequent IT-use outcomes. Jointly, these questions provide a clear focus for investigating users' IT adaptation processes when dealing with mandatory IT implementations and the likely consequences of such adaptation efforts on individual-level outcomes such as productivity and system usage over time.

This study contributes to the IT adoption and use literature in several ways: First, by drawing attention to the interplay of users' cognitive and behavioral responses in the complex process of user IT adaptation. Second, by highlighting the impact of user IT adaptation efforts on individual IT use outcomes. Third, by extending the work of Beaudry and Pinsonneault (2005) to highlight the distinction between approach- and avoidance-oriented emotion-focused adaptation efforts. As to the practical implications, the findings provide practical insight for managers by giving a better understanding of how users' IT adaptation efforts influence their work outcomes which in turn is critical to successful IT benefit realization.

The remainder of the paper is organized as follows: a review of IT adaptation literature in IS research is presented, followed by the theoretical framework section. Next, the research methodology and analysis is presented, and the paper ends with the discussion, contributions and suggestions for further research.

Literature Review

IS research has shown that successful IT implementation projects rely on the extent to which IT users respond and adapt to the new technology and the changes the new technology comes with (Bala and Venkatesh 2016; Leonard-Barton 1988; Orlikowski 1996; Tyre and Orlikowski 1994; Wang et al. 2008). An IT implementation comes with expected and unexpected consequences that have a significant impact on employees in their work environment. For example, change in workflows, nature of tasks and in some cases job roles (Boudreau and Robey 2005; Morris and Venkatesh 2010). Based on these consequences, users might respond positively or negatively, depending on their perceptions and experience with the new IT. The significance of understanding how users respond and adapt to these consequences is still of paramount importance, as there are still calls by IS researchers to study the complex nature of user IT adaptation efforts (Bala and Venkatesh 2016; Bhattacherjee et al. 2017; Stein et al. 2015; Tobler et al. 2017). Recent literature on user adaptation to IT has mainly relied upon a process approach and focused on user adaptation (Elie-Dit-Cosaque and Straub 2011; Orlikowski 1996) and its effects on job outcomes (Bala and Venkatesh 2016; DeSanctis and Poole 1994; Gattiker and Goodhue 2005; Häkkinen and Hilmola 2008; Majchrzak et al. 2000; Morris and Venkatesh 2010). This stream over the years has yielded various theories and models to investigate IT adaptation processes in organizations. Researchers have investigated different aspects of the adaptation process such as temporal patterns of adaptation (Tyre and Orlikowski 1994), adaptation behaviors (Beaudry and Pinsonneault 2005), and structural and performance effects of adaptation (DeSanctis and Poole 1994; Majchrzak et al. 2000) using theories such as punctuated-equilibrium (Tyre and Orlikowski 1996), adaptive structuration (DeSanctis and Poole 1994; Korpelainen et al. 2010) and coping model of user adaptation (Beaudry and Pinsonneault 2005). The focus of these studies have been mainly on either the technology side (i.e., how users modify the technology to better fit their work routine) (Leonard-Barton 1988; Poole and DeSanctis 1989) or on the work system side (how users modify their work routines to better fit the technology) (DeSanctis and Poole 1994; Poole and DeSanctis 1990).

Although very insightful, these studies have shed light on the phenomenon in a non-integrated manner (Beaudry, 2009) as different concepts and labels have been used to refer to the same phenomenon or similar concepts have been defined differently (e.g. competing definition of adaptation in different studies). In light of the limitations of prior IT adaptation studies, some researchers have employed the use of coping theory to shed more light on the user side of the IT adaptation process. The coping theory has been used to study users' responses to a range of IT-induced changes. For instance, Benamati and Lederer (2001) investigated the coping mechanisms used by IT managers to reduce the problems associated with rapid changes in IT. Yang and Teo (2007) investigate the coping behaviors triggered by free software trial restrictions and their impact on users' willingness to buy the full software version. Beaudry and Pinsonneault (2005) draw on the coping theory to develop the Coping Model of User Adaptation (CMUA) and investigate the adaptation behaviors of six account managers in two large North American banks. Their study shows that IT users respond and adopt different adaptation strategies in light of an IT-induced change. Their findings also indicate that these responses have a significant impact on IT use outcomes.

A few studies have extended the work of Beaudry and Pinsonneault (2005) in IS research. Elie-Dit-Cosaque and Straub (2011) designed a scenario-based experiment whereby users had to assess their coping strategies when confronted with threats or opportunities of an IT-induced change. The results validated the CMUA and showed it is a reliable model that can be used to study user IT adaptation behaviors. Fadel (2012) builds on the CMUA and shows that problem-focused adaptation behaviors positively influence IT infusion, while avoidance-oriented emotion-focused adaptation behaviors negatively influence IT infusion. Fadel and Brown (2010) investigate how IT adoption perceptions influence individual-level post-adoptive IT appraisal. Their work integrates the IS adoption and use models with coping theory shedding more light on the process of user adaptation. Bala and Venkatesh (2016) develop a model of technology adaptation behaviors that employees perform to cope with a new IT that causes disruptions. Findings from their study indicate that employees perform four different technology adaptation behaviors; exploration to innovate, exploitation, exploration to revert, and avoidance, based on whether they appraised an IT as an opportunity or a threat and whether they had perceptions of control over an IT.

Research Gap

IS research broadly categorizes the post-adoption stage as one of the most challenging stages after a new IT system implementation, if not critical (Wu et al. 2017). In particular, understanding the complexity of user IT adaptation processes and how and why they adjust their earlier efforts over time has gained in importance since the outcomes of IS users' coping mechanisms subsequently affect the extent to which they effectively use the system and maximize its potential (Bhattacherjee et al. 2017; Fadel 2012b; Tobler et al. 2017; Wu et al. 2017). Thus far, we have a limited understanding of specific adaptation behaviors that individuals undertake to cope with an IT, and the antecedents and consequences of these behaviors. In this study, we focus on the complexity of user IT adaptation behaviors and subsequent IT use outcomes to provide a rich understanding of the nature of these behaviors. Since such linkage between 'coping efforts and IT use outcomes' cannot be investigated in isolation without considering other embedded psychological constructs such as users' IS appraisal (that triggers the actions taken by employees), we will briefly explain the IT users' initial appraisal and reappraisal as part of the IT adaptation process.

Theoretical Framework

This study is guided by the use of two theoretical frameworks, the Coping Model of User Adaptation (CMUA) from Beaudry & Pinsonneault (2005) as a primary analytical lens and a typology of adaptive behaviors (approach vs. avoidance) from Roth and Cohen (1986) as the supplementary model.

Coping Model of User Adaptation (CMUA)

Drawing on Coping Theory (Lazarus and Folkman 1984), Beaudry & Pinsonneault (2005) propose the Coping Model of User Adaptation (CMUA) to study how and why individuals adapt to new IT implementations in their workplace. CMUA frames users' responses to a new IT system in terms of three sequential phases as shown in Figure 1.
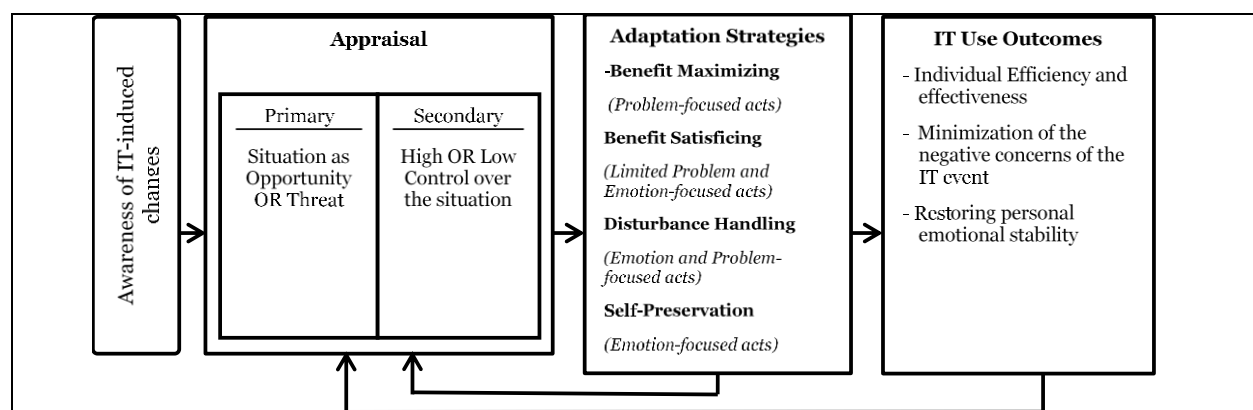
Figure 1. High-Level View of the CMUA, Adapted from Beaudry and Pinsonneault (2005)

As Figure 1 depicts, the adaptation process starts with an appraisal. There are two types of appraisals: primary appraisal, where an individual assesses whether s/he has anything to gain (opportunity) or lose (threat) due to the introduction of an IT system. Secondary appraisal, where an individual evaluates whether s/he has options to exert control over the situation so that s/he can prevent harm or gain benefits from the new IT-induced changes. As outlined in Figure 1, the secondary appraisal will be done with respect to three main components of:

- *Control over task*: refers to the degree to which employees feel that they have autonomy and are able to modify their tasks in response to an IT event
- *Control over self*: refers to whether employees feel they can adapt themselves to the new environment

- *Control over technology*: refers to how much influence employees feel they have over the features and functionalities of the IT

Appraisals of control may change as an IT-induced change unfolds and modifications can be made as the result of new information from the environment and/or as the result of users' coping efforts. The second process involves the adaptation efforts. There are two types of adaptation efforts in the CMUA. Problem-focused adaptation efforts are exerted when an individual engages in activities relating to the change brought about by the new IT system. Emotion-focused adaptation efforts are exerted when an individual attempts to manage the emotional distress brought about by the new IT system. Table 1 provides a summary of problem-focused and emotion-focused adaptation efforts and behaviors.

Adaptation behaviors	Components	Example behaviors
Problem-focused	Technology	Modifying, adding or deleting screens
	Task	Modifying working procedures, streamlining work tasks
	Self	Spending time practicing using the system
Emotion-focused	Self	Minimizing perceived negative consequences, making positive comparisons, seeking social support, avoidance or distancing

Table 1. Types of User IT Adaptation Efforts

As it is seen in Table 1, problem-focused adaptation efforts are oriented towards the three components of task, technology and self and trigger visible actions, while emotion-focused adaptation efforts are oriented towards maintaining self-emotional balance. According to Figure 1 and Table 1, the three main aspects of user IT adaptation efforts can be summarized as follows. First, both problem-focused and emotion-focused efforts can be performed by the IT user as part of his/her adaptation process. Second, adaptation efforts differ from one individual to another depending on one's interpretation of the potential desirable and undesirable consequences that the new IT may bring about. Finally, the adaptation efforts one performs are also related to one's perceived control over the management of the IT-induced changes.

CMUA also identifies four adaptation strategies in response to IT-induced change: (a) *benefit maximizing* (making the most of the opportunities the IT has to offer and maximize personal benefits), (b) *benefit satisficing* (attaining satisfaction by the limited benefits the IT can offer), (c) *disturbance handling* (minimizing the perceived negative consequence associated with the IT and restoring emotional stability), and (d) *self-preservation* (restoring emotional stability, with minimal or no impact on individuals' performance when using the IT). The adaptation process as shown above is iterative with appraisal and adaptation efforts constantly influencing one another. The performance and usefulness of adaptation acts and the resulting outcomes will also lead individuals to reappraise the situation to either continue with their initial adaptation strategies or follow a new set of behaviors. This explains why a new IT implementation initially appraised negatively might be more positively reappraised after an initial round of adaptation acts or vice versa.

CMUA provides a theoretical fit to study the phenomena of user IT adaptation, as prior theories/ models (e.g., TPB, TRA, TAM, and TAM extensions) do not offer much help in understanding the process of post-adoption behavior (Benbasat and Barki 2007). The CMUA, on the other hand, provides a better fit based on Orlikowski and Baroudi (1991) and Walsham (1995) recommendations for theory selection. The first criteria was the scope of the model. CMUA provides a high-level view of IT-related user adaptation processes, it also gives a detailed analysis of the steps in a systematic, dynamic and reciprocal way. The second criteria was based on the explanatory power of the model. CMUA offers strong explanatory power in the context of IT-induced changes. Third, the model takes into account the importance of social and situational factors by considering the feedback loop in the model, which represents the individual-environment relationship. The fourth criteria deals with the procedural aspect of the model. CMUA is a process-oriented framework that allows researchers to consider an individual's concurrent learning, prior experiences and their IT use outcomes as well as new evaluations gained through re-evaluations of new information from the environment. The last criteria was based on the model having a well-established theoretical foundation leveraging a well-known theory from the psychology discipline, Coping Theory.

Supplementary Theoretical Framework

In addition to the CMUA, in order to distinguish the effects of various emotion-focused adaptation behaviors on individual-level IT use outcomes, this study also draws on a typology of adaptive behaviors (approach vs. avoidance) (Roth and Cohen 1986). This supplementary framework offers a more refined perspective on aspects of the collected data that CMUA was mute about. It helps to explain better how IS users' engagement with either of the emotional efforts would affect the restoration of their emotional equilibrium, adaptation strategies taken as well as subsequent IT use outcomes. Collectively, these two models provide a more detailed and nuanced analysis of user IT adaptation behaviors in the case study. Approach behaviors are oriented toward the sources of stress while avoidance behaviors are oriented away from it. Approach-oriented emotion-focused adaptation strategies include acts such as positive reappraisal or seeking social support. Avoidance-oriented adaptation behaviors, in contrast, include cognitive attempts to deny or minimize the threat and distancing.

Research Methodology

Research Site

To achieve the highlighted objectives of this research, a rich data set was needed from an organization that implemented an IT project that brought about significant change in the work environment. As such, data was collected using a Work System Computerization (WSC) project as a case study at a medical clinic attached to the Ministry of Petroleum in Iran over a period of 24 months. This case was deemed fit for the study after both theoretical and practical considerations, in line with recommendations by Benbasat et al. (1987) who stress that the choice of case study should be based on the nature of the topic under investigation and the questions to be answered. The project at the research site involved the computerization of both medical (Public Health Centre (PHC) and Laboratory) and administrative (Medical Documents and Insurance (MDI)) units within the clinic. Upon completion, it was expected that the project would: (a) improve users' efficiency and effectiveness by replacing the paper-based archival records with electronic versions; (b) Improve inter/intra-communication by replacing the traditional exchange of letters with an electronic form; and (c) connect different divisions to one another in order to facilitate the flow of information and improve patient experience (e.g., making a link between the reception, GPs, pharmacy and laboratory units). The new system has features such as: advanced search, which gives a user the ability to search a drug by using various search criteria (e.g., Persian name, English name, drug code and barcode), automating drug prescribing and processing, electronic patient data capturing and storage, real time access to both medical and financial data and a highly secure user authentication protocol.

The computerization project at the research site has a long and dynamic history. The first attempt to computerize the work system in this medical center dates back to around 1996. The enforced wave of Work System Computerization (WSC) was re-initiated in 2010 (after several unsuccessful attempts within different managerial periods over the years). The first attempt was initiated around the year 1996 by the first manager of the clinic who had a strong vision for IT implementation in the clinic. Unfortunately, he passed away and the next manager did not share a similar vision and enthusiasm for IT and cancelled the expansion of the project. Several attempts were initiated between 2000 and 2005, which faced strong resistance from the top management, citing that the project would require a large amount of investment, which the management was not ready for at that instance. Then finally, in 2010, the project was re-initiated by the top management in accordance with new project guidelines and structure.

Data Collection

The data collection exercise involved collecting data from multiple sources. The primary source of data was 68 interviews of 36 participants in the clinic from different units. These interviews were conducted at two points in time between 2010 and 2012. All interviews took place at the post-implementation phase of the computerization project. The first phase took place from July to September 2010, and the second phase from August 2012 to September 2012. Interviews were conducted at different time frames in order to capture the temporal change in user IT adaptation responses over time. It is worth noting that although this study was carried out between 2010 and 2012, the findings are still valid and probably will be for some time as there have been no major changes in managing WSC projects in Iran that would cause IT users to

significantly change their adaptation strategies facing similar IT-related organizational changes. The first author is an Iranian citizen who currently works as a consultant for medium-sized businesses as well as large government organizations. Accordingly, he has noticed that the underlying tenets of this research, especially for those who do not have the necessary computer skills for the new IS, are still appropriate and relevant.

Semi-structured interviews were adopted which allowed for focused, conversational, two-way communication. The interview guide was designed based on the theoretical framework adopted for the study, it is worth noting that the initial questions did not constrain the interview process. The respondents were allowed to express their views and opinions on aspects they considered important. Interview length ranged between 1.5 to 2 hours, and interviews were conducted at convenient times selected by the participants, mostly during break time in informal settings (e.g., coffee lounges). Interviews were tape-recorded with the permission of the respondents, and later transcribed to text. The interviews were conducted in Persian, which were later translated to English for analysis. Participants were selected using the "snow balling" technique. The snowballing technique involves the use of participants to contact other respondents and particularly applicable when discussing sensitive issues (Streeton et al. 2004). Owing to the novel nature of this research, the interviews were expected to build up discussions on various sometimes-sensitive issues (or at least felt 'sensitive' from the employees' perspectives) such as personal thoughts and actions or management's policy and decisions. A doctor at the clinic was the main contact for the research project. The doctor assisted in identifying an initial set of users who had different perceptions about the new system. Participants were also asked to identify potential users who they felt could provide further insight on the phenomena of interest. This technique increased the number of appropriate referrals within a short time frame. Table 2 summarizes the details of the fieldwork conducted.

Data collection techniques	Actions taken	Purpose
In-depth Interviews	68 interviews with 36 participants including the managing director (n=1), local managers (n=7), systems users in each department (n=26), and IT vendors (n=2) Male=19, Female=7	Understand the motives for the new IS, expected functionalities, overall IS strategy (aims and implementation plan), user reactions to the new IT, impact on employees' outcomes, user experience with WSC, and user adaptation strategies to cope with the new IT
Observation	More than 200 hours	Understand how the system is being used on a day-to-day basis, IT users' natural reactions to their systems, and make sense of the contextual factors
Document Analysis	Internal mails, clinical reports related to the WSC project, off-the-record notes (reviewed on site due to sensitivity), available training materials and popular press articles	Capture background information and previous WSC projects, medical center's performance prior to and after the WSC project, reports on alternative information systems prior to the final choice and evaluation reports

Table 2. Summary of The Fieldwork

Data from the interviews were triangulated with other sources of data (notes during interviews, observations and organizational documents) collected during the data collection exercise in order to acquire a rich and comprehensive pool of information. Observations were conducted to get a glimpse of how the system was being used practically and also to see how users were responding to the system in their various work settings. Daily observation at different departments accounted for more than 200 hours of observation. Documents such as internal mails and clinical reports with respect to the IT implementation were analyzed with the view of understanding the research setting, the background data on the medical center's WSC project and the different stakeholders involved in the project. All data interview guides and data collection procedures were reviewed and approved by the ethics approval committee at the researchers' university and the clinic.

Data Analysis

The collected data was transcribed verbatim and then analyzed following the principles of thematic analysis (Braun and Clarke 2006), using the CMUA as an overarching analytical framework for the purpose of finding, analyzing and reporting themes within the collected data. The important point regarding thematic analysis is that writing is an integral part of analysis and not an activity that takes place at the end, as it does with statistical analysis. In general, the process began with careful reading and re-reading of the interview transcripts in order to gain a holistic overview of the main themes discussed by the participants and to look for patterns of meaning and issues of potential interest in the data. Therefore, thematic analysis accommodates emergent codes, which enabled a more in-depth investigation into the process of user IT adaptation.

The process of coding was done in different phases. After familiarizing with data, the next pass involved generating initial codes (Table 3). The initial codes generated from analysis of individual responses included increased productivity, ease of use, safer data storage and quicker access to archive data, which were combined into the 'Opportunity Appraisal' theme. Also, job uncertainty, increased workload, disruption of daily routines and loss of autonomy were grouped into the 'Threat Appraisal' theme. After coding these two themes, they were then combined to form the second level theme 'Primary Appraisal'. Similarly, to understand the participants' 'Secondary Appraisal', initial codes were grouped into high and low control. Codes indicating high levels of control included ability to use the different functionalities of the system without difficulties and access to sufficient IT support and training materials. Whereas, codes indicating a low level of control included lack of user involvement and participation in system design and implementation, and inability to use the system without problems. The second-level themes 'Primary and Secondary Appraisal' were then further combined to form the pattern theme 'Appraisal'. This process was carried out for all the pattern themes relating to the theoretical frameworks used for this study. It is worth noting that the use of thematic analysis and data triangulation aided the authors in capturing the subjective human perceptions and experiences, rather than just counting phrases and merely relying on self-reported statements. For instance, in cases where participants' comments were not in line with their actual system use or perceptions, the authors drew on their direct observations, field notes and feedback from their colleagues. Therefore, such self-reported statements were discounted to give a more realistic insight. Finally, the authors combined all the pattern themes to depict the process of user IT adaptation for each participant.

Data extract	Coded for
"I could not stand the situation so I took a few days off. I needed that break to reorganize myself. During the first couple of weeks, even when I was in the office I was trying to occupy myself with some paperwork and I asked my colleagues to cover my work during that time. I thought I was not able to learn and use the system... I was not even attending the one-hour meeting in the department... I thought the available resources were not sufficient to push me in the right direction (L5)	• negative initial secondary appraisal • low/no control over task • low/no control over self • low/no control over technology • avoidance-oriented emotion-focused adaptation efforts • no problem-focused adaptation efforts

Table 3. Data Extract with Codes Applied for The Stressed IT User in Laboratory

Coding was carried out by four independent researchers experienced in qualitative research. This diverse panel of coders helped us maintain inter-subjectivity by observing themes that might have been unnoticed by coders with similar backgrounds and experiences. Since coders were also the authors of this study, to eliminate any potential bias, we conducted our coding in four rounds. The first round was focused on identifying user IT adaptation. The second and third rounds, respectively, focused on the primary (opportunity/threat) and secondary (high/low control) appraisals, using the coding schema described previously. Finally, the fourth round focused on the participants' responses regarding IT use outcomes. Inter-coder reliability was 77% for user responses, 84% for primary appraisal, 87% for secondary appraisal and 91% for IT use outcomes. All coding disagreements were reconciled by consensus following a discussion and a re-evaluation of interview transcripts, field observations and document analysis data. We then connected our coded primary and secondary appraisals with the user adaptation efforts as well as IT use outcomes constructing empirical 'chains of evidence' for each participant to understand how users'

adaptation efforts were evolved and how it affected subsequent IT use outcomes. The entire manuscript was also reviewed by an independent reviewer to ensure that the researchers' bias and experience did not interfere with the analysis.

Findings

This section demonstrates how users' IT adaptation efforts in different departments of the clinic occurred as a result of the interplay between *personal, technical, and social* dynamics. Such contextual factors which influenced the users' dynamic adaptation processes directly or indirectly over time could be categorized as follows: *Top management influences*: the effects of management's decisions and support with respect to the WSC project; *Social influences*: the effects of colleagues' attitudes and perceptions on one's responses to IT-induced changes; *System operation*: the IT artifact, including both software and hardware aspects; and *Personal attributes*: the effects of users' IT innovativeness, self-efficacy and belief in their adaptation strategies. These contextual factors reformed IS users' understandings of the WSC project and led to the reconsideration of the situation in terms of either reinforcing loops (i.e., negative perceptions becoming more negative or vice versa) or reversing loops (i.e., negative perceptions becoming positive or vice versa). In answering our research questions, the focus will be on three units significantly affected by the IT implementation. These divisions were Public Health Center (PHC), Laboratory, and Medical Documents and Insurance (MDI). In so doing, for each case, users' initial IT adaptation efforts and the evolved efforts in respect to contextual factors are discussed further. Sub-themes and codes are presented in [] within the supporting quotes, while participants' identification codes in () for easier presentation.

PHC Unit

The participants in the PHC unit provided interesting insight into their IT adaptation processes and how their responses changed over time. The participants recalled their initial responses at the early implementation stage (i.e., two months after implementation) and changes in their responses at the post-implementation stages (i.e., at the fourth and eighth month). For instance, a doctor who initially appraised the IT system as an opportunity explained:

"At that time I was happy about the new system in our division. It made my work faster in dealing with patients [System Operation: ease of use]" (PHC1)

This doctor also found the availability of coping resources adequate to develop IT skills and adjust daily routines:

… I felt more positive when I realized that the clinic was sending us to training sessions and paying for our classes]. I believed with such training classes I would become proficient in using the system in no time [Top management influences: training classes]… I thought I could spend time on more important tasks and fine-tune my daily routines and having faster access to patients' records. I could see that by going to the training sessions and by asking my friends for help I was in the process of developing new IT skills [Social influences: perceived encouragement]" (PHC1)

Accordingly, while users were excited and engaged in practical approaches (i.e., problem-focused adaptive acts), this reflected positive emotions which, in turn, reinforced their engagement with the new IT. The consequent outcomes of such positive IS appraisals, emotions and practical adaptation approaches (at least for the first couple of months) were improvements made to daily routines and personal developments.

At the post-implementation stage (about four months after implementation), the situation in the PHC unit changed negatively, as a set of challenges including increase in both system and network failure, lack of top management support and poor decision making, and manifestation of negative attitudes among unit members subsequently affected the users' perception towards the IT system. The participant PHC1 reflected his change of perception towards the new IT system:

"System had started to malfunction after a couple of months. For example, the application started to slow down noticeably, to turn off or reboot the system or to freeze in the middle of use [System Operation: technical issues] but the IT department and top management did not care about our conditions [Top management influences: inadequate support]. I could not do my job properly but I was being forced to use the system. I reduced my working time with the computer as a result of these problems, but I was also

trying to keep myself motivated somehow by telling myself that the software application will be upgraded and adjusted soon" (PHC1)

During this period users' perception of control decreased dramatically. The users' positive reinforcing thoughts gradually decreased and moved towards restoration of emotional stability by seeking social help and appraising the situation more positively to carry on with the situation and remain motivated (approach-oriented emotion-focused acts). Moreover, the users' problem-focused adaptation efforts were also decreased and oriented mainly towards the 'self' (towards learning and developing skills) since they could not do much at this point about the 'technology' and 'task' adaptation. They were still using the system but to a lesser extent.

At about eight months, when the demanding situation continued without much improvement, IT users stopped working with the system at different points in time. However, every time they were forced to reuse the system, which had undesirable effects on employees' perception. Users' sense of control degraded significantly as they perceived that they no longer had control over the work since with a faulty hardware and software and no after-sales-support not only they were unable to adjust their work routines but they could hardly spend time on daily tasks. Furthermore, the software had started to fail months ago and the promises about adding features by the responsible company were not kept (technology) which had resulted in an inoperative software. According to the respondents there was no point after all to take the 'self' component seriously concerning developing skills in the absence of the 'work' and 'technology' components. One of the Doctors explained the situation as below:

"Why should I have put too much effort on that automated work system when the management did not care at all about the whole automation project or our frustrating experiences working with the system? I stopped several times working with the system since everything was terrible... working with that faulty system was even difficult for IT-skilled people" (PHC1)

Doctors relied heavily on their emotional stability to deal with the stressful situation (avoidance-oriented emotional acts) that resulted in a minimum or no usage of the IT system.

"I took a few days off to move away from that disappointing and upsetting situation for a short time... when you are at the core of a problem you are overwhelmed with stress and thoughts... sort of emotional pain... that was what happened to me, it is difficult to detach yourself emotionally when you are exposed to problems... I needed that space to think and plan my next move" (PHC1)

Laboratory Unit

All IS users in the laboratory, except one, welcomed the new system and saw it as an opportunity to improve their jobs and overall performance. They were to some extent computer users (due to working with DOS-based systems) and felt that they had high levels of control over the situation to learn and use the system (i.e., an advanced fully customizable Windows-based software application) and to integrate and improve their work routines. One of the employees, however, had a different perception and appraised the system as a threat (primary appraisal). According to his comments, he was not an IT innovative person, had little self-esteem and was afraid not to be able to work with the new 'complex' system. He explained his concerns about the new system:

The software seemed to be so complex and the whole thing was new to me... it was about time for fundamental changes in every aspect of our work... for example, when I was looking at the computers' screen I was seeing new names, new features and, more importantly, a completely new working environment which was scary to me (L5)

He also felt that he had limited control over the new system and its advanced peripherals (control over technology), to develop his IT-kills (control over self) and to adapt his daily routines to better fit with the technology (control over task). Due to these initial negative appraisals and personal characteristics, the threatened user relied heavily on the 'avoidance-oriented' type of emotional efforts to address his emotional distress. As a result of the distancing and avoidance strategies, he had neither problem-focused adaptive acts nor IT use outcomes.

To address L5's negative perception towards the new IT system, the local manager applied different strategies to engage the stressed employee. First he asked the threatened user to attend the daily local

meetings without having to participate in discussions. Second, the manager considered additional training sessions with the presence of two IT personnel from the software company to present the software and its features. Third, one to one training sessions were carried out to address personalized needs and experiences. Additionally, according to the stressed user's statements, colleagues were so friendly and supportive since the very beginning to the extent that he never asked the clinic's IT department for any help.

The atmosphere was great... The system was fast and reliable, although complex but it was easy to understand and easy to be personalized based on our needs. The workshops held here were managed in a professional way. Two IT personnel from the software company came and presented the software and its features. Then in a one- to-one basis we went through the different options and menus... This level of attention to details in training sessions really caught my eye. For example, during the training sessions, the manager were providing us with refreshments... when I saw this kind of attention and support from the laboratory's manager I wanted to do my best and learn the system [Social influences: perceived encouragement]

After a period, the unit's excellent atmosphere resulted in a more positive and hopeful reappraisal of the situation. His avoidance-oriented emotion-focused strategies gradually changed and improved into continuously seeking help and positive reappraisals (i.e., approach-oriented emotion-focused acts). While he still did not have noticeable system usage, positive evaluations and actively seeking help encouraged him to be more engaged in practical efforts such as developing IT skills and learning how to use the system and its features. After a few months, the system was no longer a threat to him but an opportunity to do his daily routines more efficiently and effectively. Observation of the department's local meetings for several weeks also confirmed his comments as well as other users' involvement in conversations, their willingness to openly share their experiences, mistakes or working together to address a raised issue. During random visits the local manager also confirmed that he performed very competitively in terms of both efficiency (e.g., work faster, make fewer errors, save time and effort) and effectiveness (e.g., reach improvement in the look and quality of reports and the comprehensiveness of the produced reports and provide higher quality services to patients). The threatened IS user switched between different types of adaptation strategies which led him towards gradual enhanced system usage and IT use outcomes. Users' secondary appraisal (evaluation of coping resources) in different instances affected their primary appraisal (evaluation of risk) representing parallel processes rather than sequential.

MDI Unit

The department of 'Medical Documents and Insurance' (MDI) was using an outdated DOS-based system. This division is one of the key units with huge responsibilities and workloads. There was a need to upgrade the unit's IT systems in order to handle the organizational tasks more efficiently. Previously, users had to rely on both paperwork and the DOS-based system in parallel to perform their daily routines. According to respondents, since this division only exists in the body of Ministry of Petroleum, very few software companies could deliver the expected software application with certain functionalities to deal with the complexities of the structure of this unit. Out of the five interviewed, four users in this unit indicated that they had initially welcomed the upgrade to their existing system and saw it as a 'challenging task' which required time, effort and various coping resources to be handled successfully. These users also felt that their coping resources were satisfactory to learn and use the system (self, technology) and to improve their sensitive and huge work processes (task). One of the employees in this unit, nevertheless, had a different perception and despite appraising the system as principally helpful, he did not feel he had control over the situation and considered the availability of the coping resources as inadequate. This employee was the head of MDI who was pessimistic about the consequences of the IS changes in his unit.

The IT adaptation behaviors of employees in the MDI unit were noticeable and revealed two significant alterations in their IT adaptive processes. The first phase occurred during the preparation phase when employees were being sent to the computer training sessions, and the second phase occurred afterwards when employees were working with the new Windows-based application software. Based on their initial positive evaluations (both primary and secondary appraisals), employees' adaptation efforts were initially oriented towards taking full advantage of the computer training sessions to enhance their computer skills needed to work with the new system.

I was extremely happy about learning the Windows program, because I have children at home and I could also use this training sessions for both personal and office use [Top management influences: training

sessions]. I even studied on my own initiatives to increase my knowledge about the Windows and computer in general [Personal attributes: personal innovativeness]" (MDI4)

Nevertheless, the clinic's management due to staff shortage decided to reduce the number of attendees and only allow the head of MDI to carry on with the course, and therefore prevented the rest of employees from attending the training sessions. This decision decreased employees' perception to the degree that their positive reinforcing thoughts and emotions decreased into approach-oriented emotion-focused acts (e.g., seeking social help, positive thinking and positive comparisons) in order to carry on with the situation and remain motivated. Once they realized that the cancellation of training sessions was not temporary but permanent, a dramatic undesirable shift occurred in employees' adaptive behaviors from approach-oriented emotion-focused acts towards avoidance-oriented emotion-focused acts.

I was angry and very disappointed at that time. I was feeling completely down by this decision. They killed the motivation in us. I was really speechless. We were the only people whose classes were cancelled and we were definitely among the minority who were really motivated about the 'learning' idea. The top management at the end increased our salary similar to other employees like we had obtained the certificate... to make us calm or silent... but the cancellation decision demotivated us" (MDI4)

Reliance on the avoidance and distancing strategies resulted in a minimum or no usage of the current system. Due to the MDI's manager's efforts, employees' IT adaptive behaviors were improved to some extent from avoidance-oriented emotion-focused acts (e.g., avoiding and distancing themselves from using and thinking about the system) towards more engaging behaviors and approach-oriented emotion-focused adaptation acts (e.g., seeking social help, reappraising positively and engaging more practically with the existing system).

After a not very promising preparation stage, the second phase of the users' IT adaptation behaviors was triggered when new computers were brought in and the new Windows-based software application was set up on these computers. According to the respondents' comments, although the new software application was offering several advantages over the DOS-based software, two concerns undesirably affected the IS users. The first issue was the application's lack of key features (which had limited its usability) and the second issue was the top management's decision to limit the employees' access to the computer resources. As to the first issue, employees were not able to fully adjust their routines to the new application so they had to rely on all the available work systems in the unit such as the Windows-, DOS-based and manual paperwork systems. The second issue, limiting access to computer resources, worsened the situation even further and made the IS users upset again and to a high degree discouraged.
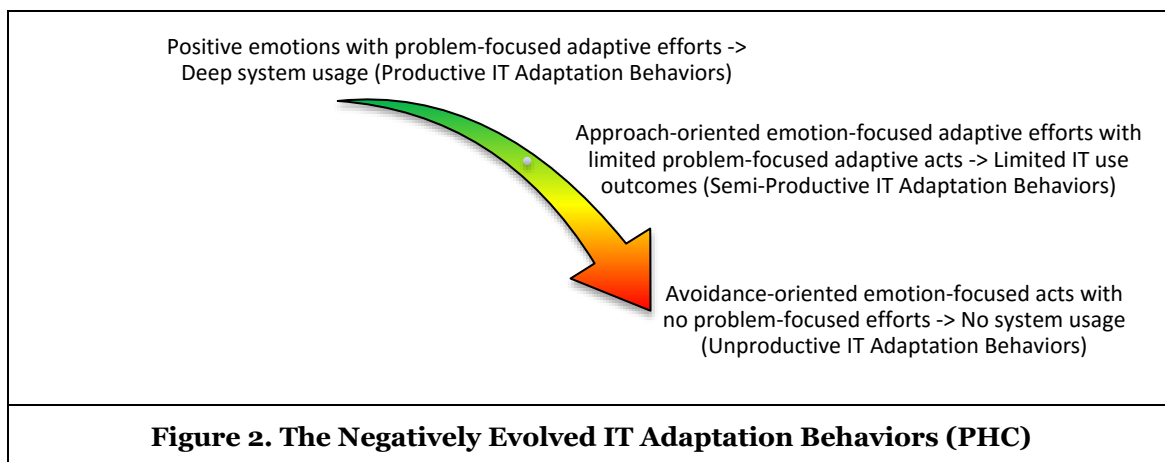
"They came and removed the sound cards, CD-ROMs and modems from the computer cases right in front of us. It gave us a very bad feeling... then they blocked the USB port by filling in the sockets. Can you believe these things really happened to us? They did all these to us and they expect us to be energetic and accept the work pressure and have efficiency in our jobs?! No way!" (MDI4)

As to the three components of adaptation (task, tech and self), during the first research phase, employees perceived that they had no control over either of these components. Users of this unit had already been prevented from attending the training classes so they were not able to develop their computer skills properly (self). They also felt that they no longer had control over the work since with such an application missing after-sales support and key features, they could hardly manage the three inconsistent work routines (task). Additionally, the new software started to malfunction and the promises about adding features by the responsible company were not kept (technology). During the second phase of the research, the regular and occasional observations of the MDI unit revealed that users were relying on the three work systems and were extremely disappointed. Due to various difficulties (i.e., software and hardware issues and top management's decisions), users' adaptive behaviors had been shifted once again from approach-oriented emotion-focused acts towards avoidance-oriented emotion-focused acts to deal with the stressful situation. This resulted in the least possible usage of the new system. IS users switched between different types of adaptation strategies (between the problem-focused adaptive acts, approach-oriented emotion-focused acts and avoidance-oriented emotion-focused acts) which led to various IT use outcomes. Users' secondary appraisal (evaluation of coping resources) in different instances also affected their primary appraisal (evaluation of risk) representing parallel processes.

Cumulative Analysis of IT-Related User Adaptation Behaviors

As to the first question "How do IS users' adaptation strategies shape and evolve over time in an IT-induced organizational change?", by comparing the users' IT adaptation processes (and the changes in the patterns of such behaviors) in these three divisions, it was observed that users' IT adaptation responses could be categorized into three groups: (1) evolved positively; (2) evolved negatively; and (3) fluctuating adaptation strategies.

Accordingly, the positively evolved IT adaptation efforts were related to the stressed user in the laboratory unit. He initially relied heavily on the 'avoidance-oriented' types of emotional efforts with no practical efforts and IT use outcome (derived from a negative primary, negative secondary and low self-esteem). Due to his positive reappraisal, the user's adaptation behaviors gradually shifted from avoidance-oriented emotion-focused strategies towards approach-oriented emotional efforts such as seeking social support with limited system usage. His IT adaptation efforts improved further towards practical approaches to take full advantage of the system's features, higher quality IT use and performance outcome. Concerning negatively evolved IT adaptation efforts, this trend was related to the IS users in the 'Public Health Centre' (PHC) unit (Figure 2). The results of the analysis indicate that users' IT adaptation responses in this category occurred in a reverse arrangement compared to the above trend. In this unit, IS users initially engaged in problem-focused adaptation efforts and system usage to improve their performance. However, IS users' positive appraisals were negatively influenced by the contextual factors and altered over time through the re-appraisal process. Therefore, they engaged in approach-oriented emotion-focused efforts to carry on with the situation and remain motivated. Eventually, when the stressful situation continued, users' adaptation strategies decreased towards avoidance-oriented emotion-focused efforts in order to reduce the stress level, which diminished users' practical efforts (system usage) and their outcomes. Lastly, regarding fluctuating IT adaptation efforts, the IS users in the MDI unit switched between different types of adaptation strategies (between the problem-focused adaptation efforts, approach-oriented emotion-focused efforts and avoidance-oriented emotion-focused efforts) to adapt to the new IT system which led to various levels of system usage and individual-level performance outcomes.

Positive emotions with problem-focused adaptive efforts ->
Deep system usage (Productive IT Adaptation Behaviors)

Approach-oriented emotion-focused adaptive efforts with limited problem-focused adaptive acts -> Limited IT use outcomes (Semi-Productive IT Adaptation Behaviors)

Avoidance-oriented emotion-focused acts with no problem-focused efforts -> No system usage (Unproductive IT Adaptation Behaviors)

Figure 2. The Negatively Evolved IT Adaptation Behaviors (PHC)

As to the second question, "How do these users' adaptation strategies subsequently influence IT use outcomes?", it can be argued that as users' promising IS appraisals shifted towards relying more on emotional efforts to deal with the demanding situation, their productive problem-solving efforts were also reduced and oriented towards limited IT use, to the extent that, their IT performance outcomes were gradually diminished. However, this study took a step further and distinguished between the identified and noticeable approach- and avoidance-oriented emotion-focused behaviors. Approach-oriented emotion-focused coping efforts in this study were found to be critical in elevating individual's emotions (and the subsequent evaluations) towards the optimum conditions, which result in external tangible outcomes such as quality system usage and effectiveness. For example, IS users in the PHC unit employed approach-oriented emotional efforts to retain their hope and motivation by seeking social help or reappraising the situation more positively. When this failed, there was a significant alteration in their adaptation behaviors and they relied heavily on avoidance-oriented emotion-focused strategies to the extent that users' problem-

focused behaviors disappeared, and IT usage diminished. As a result, depending on the user's evaluation of the stressful situation, an individual is oriented towards one of the two emotional approaches with certain IT use outcomes. The more one relies on approach-oriented emotional efforts, the better his/her engagement with IT tasks and their performance outcome will be.

Discussion

We drew on the CMUA (Beaudry and Pinsonneault 2005) and Approach vs. Avoidance model (Roth and Cohen 1986) to shed light on the process of user IT adaptation efforts and subsequent IT use outcomes during a mandated IT implementation project. Drawing on these two models allowed explanations of this phenomenon that was poorly or imperfectly understood and reflected upon beforehand. The 2-year span of this study involved collection of data from multiple sources and comprehensive analysis shows how IT users' adaptation strategies shaped and evolved and how such responses subsequently influenced IT use outcomes. This empirical work makes a number of contributions, as discussed below.

This paper adds to the current body of literature on mandated IT-related adaptation behaviors and the processes through which users adapt to new IT initiatives in work places by focusing on individuals' psychological perspectives and the influences of such complex coping processes on users' IT use outcomes. We extend the work of Beaudry and Pinsonneault (2005) by making a threefold contribution. Firstly, by revealing the concept of emotion that is missing from CMUA, we demonstrate the extent to which extreme emotions may result in person-specific IT use outcomes. For instance, positive emotions, in our case study, reinforced problem-focused adaptation efforts, which resulted in productive IT use outcomes. On the other hand, negative emotions initially escalated adaptation efforts from problem-focused efforts towards more approach-oriented emotion-focused efforts with semi-productive IT use outcomes and further resulted in avoidance-oriented emotion-focused efforts with no productive IT use outcomes. Our findings thus demonstrate how emotions play a vital role in a user's IT adaptation process. Secondly, by identifying parallel processes for users' IT appraisals in contrast to CMUA, which conceptualizes users' IT appraisal as a sequential process, our findings show that primary and secondary appraisals could be sequential or parallel. In some instances, from our case, the users' evaluations of the availability of coping resources (secondary appraisal) had influenced their primary appraisal. From a practical perspective, this consideration can help IS managers to better understand and foresee the system users' coping processes, thus they can better control (and/or shift) their undesirable evaluations of the IT-induced changes.

Thirdly, by highlighting the distinction between approach- and avoidance-oriented emotion-focused adaptation efforts, we contrast with Beaudry and Pinsonneault's (2005), conception of emotion-focused adaptation efforts as a single behavior. This distinction is critical since our results show that avoidance-oriented emotion-focused behaviors such as avoidance and distancing can dramatically diminish the users' degree of system use and lead to lower levels of IT-related performance. Approach-oriented emotion-focused behaviors, on the other hand, play a crucial role in elevating a user's perception and emotions towards a more desirable perspective and IT use outcomes. Our findings also revealed that the approach-oriented emotion-focused adaptation efforts are equally as important as avoidance-oriented emotion-focused efforts. This contrasts with Fadel's (2012) study, which considers these two types of emotion-focused efforts as alternatives. According to our findings, engaging in approach-oriented emotion-focused efforts helped users in the case study achieve a sense of emotional balance, which in turn resulted in a noticeable change in users' evaluations from negative appraisals towards positive appraisals. Finally, this study represents the vital role of personal, social and technical concerns on the users' adaptation processes during the initial period following the implementation of the new IT system and over time.

It is worth noting that the findings of this study could have wider applicability than the particular case studied and still be relevant and insightful to the study of user IT adaptation responses in other contexts with similar characteristics. A better understanding of the users' adaptation processes will enable researchers and practitioners to better foresee IT acceptance (or resistance) and related behaviors and thus to better manage them to achieve the desired IS outcomes. Adopting a qualitative approach through a process-oriented perspective has provided greater insights into a user's psychological constructs, initial patterns of their adaptation efforts, the likely shifts in such efforts over time, and the consequences of these efforts on system usage outcomes.

The findings also suggest implications for practice as well as directions for future research. Understanding how employees' appraisals considerably affect their responses and consequently their IT use outcomes is critical for successful IT implementations in work settings. The results could assist decision makers in assessing user IT adaptation concerns at each phase of the change process and the intensity of the concern. In this study, management's inability to supervise the situation, negatively affected users with high personal efficacy and motivation (e.g., users in the PHC unit), made them reluctant to adapt to the IT system. Therefore, diminished their will to adapt to the new IT system. In contrast, the laboratory's local manager who managed the situation and redirected the stressed user's psychological perspectives (L5), which encouraged and made him determined to work hard and adapt the work system, technology and self, with efficiency and effectiveness outcomes. For practitioners, our research also suggests that managers who wish to promote IT adaptation and use within their organizations should put emphasis on developing IT users' problem-focused adaptation efforts. Such efforts can be improved with on-going user support programs or events that help users to develop their skills and mastery of system features and purify their work routines to better fit with the technology. Nevertheless, practitioners should also be aware that certain emotional reactions might reduce individuals' performance outcomes. Hence, decision makers can focus on lessening avoidance-oriented emotional responses by helping users feel a sense of empowerment over the way they use the system and developing appropriate strategies to encourage approach-oriented emotional behaviors to speed up the process of affecting primary and secondary appraisals as an opportunity rather than a threat.

Conclusions, Limitations and Future Research

This study has limitations that should be acknowledged. The main limitation was in its scope since this study focused on one single case study. In addition, because data was collected from a single work setting, the generalizability of our findings to other contexts may be limited. Nevertheless, because of the broad and well-established theoretical foundation, the general tenets of this research might be insightful in different contexts. Future research is therefore needed to provide more insight into the adaptation responses of various types of users dealing with other technologies. One critical area of investigation concerns how adaptation behaviors change over time. Do adaptive acts occur continuously throughout the use lifecycle or during irregular intervals of disequilibrium as suggested by other research (Tyre and Orlikowski 1996)? A longitudinal study can also investigate how on-going reappraisals direct and re-direct adaptation strategies. More research could be conducted to investigate the effects of political and social factors (e.g., group norms, organizational culture, and colleagues' attitude) on users' adaptation to IT-induced changes in work settings. Having a deeper knowledge of users' adaptation processes will enable researchers and practitioners to better realize IT acceptance and resistance related behaviors and thus leading to more desirable IT use outcomes.

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