User IT Adaptation Behaviors: What Have We Learned and Why Does it Matter?

Full Paper

Armin Kashefi
Brunel University
Armin.kashefi@brunel.ac.uk

Pamela Abbott
Brunel University
Pamela.abbott@brunel.ac.uk

Azerikatoa Daniel Ayoung
Brunel University
Daniel.Ayoung@brunel.ac.uk

Abstract

We provide a review of the IT adaptation behaviors within IS research, addressing questions such as: what have we learned about this multifaceted phenomenon? who are contributors to the debate? and why does this topic matter? The article is intended to be insightful to faculty and students considering research on this emerging, intriguing yet complex topic of IT-related user adaptive behaviors. It is equally useful to instructors preparing lectures, managers and practitioners seeking to understand and assess the 'state-of-the-play' as well as those who want to think about strategic management and investments in human capital. In this article we focus on IT-related user adaptation behaviors, reviewing past studies and proposing integrating views. It is both informative and provocative. Challenges to the value of IT adaptation behaviors research, divergent views, and new perspectives on adaptive responses are presented. It is hoped that the article will spark helpful conversation on the merits of continued investigation of IT alignment.

Keywords

Coping theory, IT adaptation behaviors, IT adaptation process, employees' coping efforts, cognitive appraisal

Introduction

For almost two decades, user adaptation[1] (reactions or responses) to new IT changes in work settings has consistently appeared as a top concern for IS researchers, IT practitioners and company executives (Griffith 1999; Beaudry & Pinsonneault 2005; Barki et al. 2007; Beaudry 2009; Fadel & Brown 2010; Fadel 2012; Schwarz et al. 2014). It has been acknowledged that the benefits of new IT-introduced organizational changes, such as new organizational information systems (IS), depend on the degree that system users adapt by proactively changing themselves, their work routines, and the technology itself in order to reap its strategic capabilities and advantages (Beaudry & Pinsonneault 2005; Beaudry 2009; Leonard-Barton 1988; Ives & Olson 1984; Tyre & Orlikowski 1996). However, researchers are increasingly concerned that IS research has provided very little indication about how IS users' IT adaptive strategies

---

[1] In this paper the terms 'user adaptation to IT', 'user IT adaptation', 'user IT adaptation behaviors', 'user IT adaptation processes', 'adaptive reactions', 'adaptive behaviors', 'adaptive strategies' and 'coping' are used interchangeably; referring to strategies (which are psychological processes including specific types of emotional and practical efforts) that IS users employ to change/modify/adjust either or all of the components of the task, technology and self. The fundamental aim of using these terms synonymously is to make IS researchers familiar with the terms being loosely used in this area of research while referring to the same phenomenon.

are formed and evolved over time and how such adaptive behaviors employed by IS users influence subsequent IT use and individual-level performance outcomes. Until now, two main streams of IS research have attempted to a certain extent to address the complex phenomenon of user reactions to new technologies in work settings.

The first stream, which has applied a variance approach, has mainly focused on the antecedents of adoption and usage of new IT systems in order to predict the IS users' behaviors and has yielded numerous models of user acceptance (Venkatesh et al. 2003). Researchers, most frequently, by taking this approach consider user adaptation to be implicit in system usage (Elie-Dit-Cosaque & Straub 2011). The second stream of research, on the other hand, has mainly relied upon a process approach and has focused on user adaptation (Orlikowski 1996; Tyre & Orlikowski 1994, 1996) and its effects on outcomes such as group performance (DeSanctis & Poole 1994; Majchrzak et al. 2000) and structuring of organizations (Orlikowski & Robey 1991). While these two streams of research have thus far provided significant insights into different aspects related to user adaptation, the extant research is fragmented and has evolved over the years in a fairly non-integrated way (Beaudry & Pinsonneault 2005). The reason, as they explain it, is that IS researchers have studied user adaptation without a universal approach that would allow exploiting the variety of findings from each of the variance and process research traditions. For instance, different labels are used by Clark (1987), Ives and Olson (1984), Leonard-Barton (1988) and Rice and Rogers (1980) to describe the modifications made to a technology by users. Furthermore, similar concepts are defined differently across studies. See, for example, the competing definitions of "adaptation" in Leonard-Barton (1988), Sokol (1994), and Tyre and Orlikowski (1996). This article therefore attempts to shed some light on this topic to provide a clearer understanding of this phenomenon of user adaptive reactions to IT-related organizational changes. Our goal is to be as inclusive of major perspectives on this topic as possible.

The paper is organized into five sections. The first section presents an overview of the motivation and need for user IT adaptation research. The second section describes the intersection of user adaptation to IT with existing well-known IS literature. The third section summarizes the current IT adaptation studies in IS literature. The last section discusses the contribution and implications of our paper and suggests an agenda for future research.

Why Study User IT Adaptation Behaviors?

Organizational change has been characterized as first and foremost an interpretive process (Barr 1998; Isabella 1990; Davidson 2006). How people make sense of technology is an important component in organizational changes in which information technology (IT) plays a central role (Gephart 2004; Griffith 1999). This section highlights the need for user-centered approaches concerning IT adaptation processes since understanding interpretive processes at the individual level could then help managers to improve organizational change outcomes. Griffith (1999) indicates that the introduction of new information technology (IT) can generate a multitude of expected and unexpected consequences in the users' environment. These consequences are interpreted and understood in a variety of ways by users, triggering complex user responses (Beaudry & Pinsonneault 2005) and have been shown to cause stress in employees (Tams et al. 2011). Research within information systems (IS) domain with respect to stress, suggests that individual stress (also called psychological stress) varies in accordance with a user's ability to cope successfully with the IT event (Lazarus & Folkman 1984; Lazarus 1991a, 1991b; Folkman & Lazarus 1985; Folkman 1992). In this paper, an IT event is conceptualized as a personal, social and technical linkage -that dynamically influences and is influenced by users' adaptation acts[2]; with an emphasis on IT-related organizational changes aiming to enhance users' efficiency and effectiveness with regard to their work routines (Figure 1). In IS literature despite being referred to by different names, user adaptation studies share a common theme in their subject matter: an adaptation process between the work system (task), technology and the system user.

---

[2] Beaudry & Pinsonneault (2005) defines 'user adaptation' as the cognitive and behavioral efforts exerted by users to manage specific consequences associated with a significant IT event.
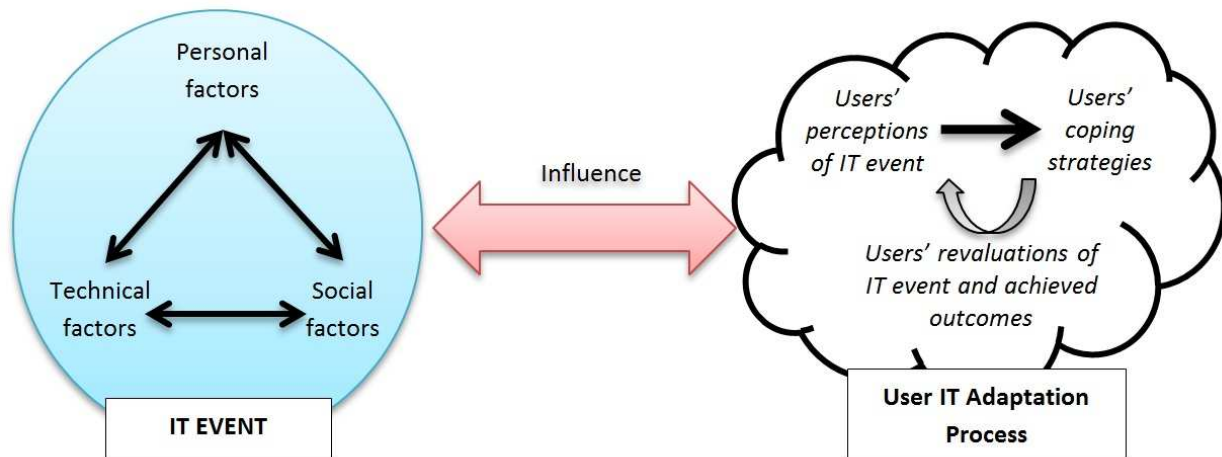
Figure 1. Three Dimensions of the IT Event

In this respect, related IS research has highlighted the vital role of the social side (also referred to as 'human side' or 'employee side') of IT-related organizational changes which has led IS researchers to adopt empirical approaches that focus particularly on human interpretations and meanings (Kashefi et al. 2012; Walsham 1993; Beaudry & Pinsonneault 2005, 2010; Fadel 2012; Fadel & Brown 2010; Tyre & Orlikowski 1994, 1996). Given the fact that many organizational tasks highly depend on effective use of IT, the degree to which computer users adapt to a new IT system can have a major impact not only on the efficiency of the operations at the individual level that are directly based on IT, but certainly on the performance of the organization as a whole (Bruque et al. 2008). Clarke (1994) stresses that even the small routine changes inherent in running any business are often accompanied by stress. Thus, if this is the case for small changes, it is perceived how much more difficult it is to implement big changes such as restructuring the business, major programs of culture change, IT-related change projects or merging the companies (Montalvo 2006; Aziz & Salleh 2014). As a result, researchers and practitioners seek better explanations for the nature of user responses to IS that shape quality system usage behaviors (Bruque et al. 2008). This has therefore left scope for integrating psychological perspectives into the domain of IS to improve both theoretical and practical understanding of how IS users adapt to new IT systems and how particular types of individual user adaptation promote or discourage system usage and IT use outcomes (Guinea & Webster 2011; Elie-Dit-Cosaque & Straub 2011; Fadel 2012).

To this date, however, we have limited knowledge about the ways users employ coping strategies to adapt to the disruptions caused by stressful and disruptive IT events such as changes in users' work processes (Fadel 2011). Little attention has been given to understanding how system users' psychological perspectives influence and are influenced by one another as well as by personal and contextual factors in the process of IT adaptation, which lead to consequent IT use behaviors and individual-level outcomes. Prior work (e.g., Bruque et al. 2008) tends to consider user adaptation as a global concept (Wu et al. 2014) or to be implicit in system usage (Elie-Dit-Cosaque & Straub 2011) without specifying various types of user adaptation strategies and hence missing the richness of the relationships between user, an IT system and tasks (Wu et al., 2014; Techakriengkrai 2014). Fadel (2012), similarly, argues that the complexity of today's organizational IS has resulted in greater user discretion over 'how' as opposed to 'whether' or 'how often' an IS is used since increased use quantity (as frequency, intensity or duration) does not necessarily imply increased individual or organizational benefits. Hence, research must be developed to more fully shed light on the complex nature of adaptation processes that shape quality or depth of use, particularly with regard to complex, mandated organizational IS (Barki et al. 2007; Fadel 2011). User-centered adaptation studies which emphasize the importance of individuals' psychological processes and puts individuals as decision makers at the center of work-task relationship, help to explain the complex underlying reciprocal mechanisms from perception to coping to IT use outcomes and revaluation of IT event. The need for such an understanding is particularly appropriate given the fact that

users with appropriate user adaptation are more likely to achieve a better fit with IT systems and task for system use (Orlikowski 2000; Beaudry & Pinsonneault 2005; Beaudry, 2009 Fadel 2011; Fadel 2012 Kashefi, 2014 Wu et al. 2014; Turel 2014).

As discussed in this section, a proper acceptance of an IT-related change by employees necessitates them to be personally altered to some extent and adopt new ways of doing things. Thus, gaining insight into employees' perspectives and understanding interpretive psychological processes could help managers to strengthen the IT use-performance link. The next section explains how this topic can be used to enhance our understanding of IT adoption and IS Infusion studies.

User Adaptation to Information Systems

This section indicates the necessity of studying user adaptation processes in the IS literature by demonstrating the intersection of this subject with related fields and reviewing the recent discussions in this area of research. In doing so, the study reviews the recent associations that have been established between the topic of user adaptation and existing literature such as information systems infusion studies and IT acceptance and use (Figure 2).
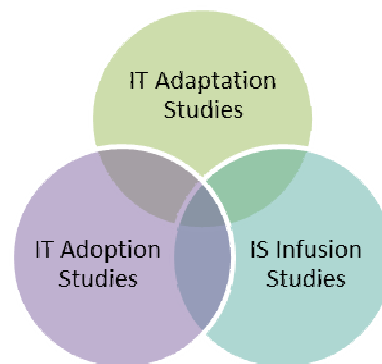

Figure 2. Intersection of IT Adaptation Studies and Related IS Fields

User Adaptation and IT Adoption Studies

With regard to IT adoption studies, there is currently a large volume of research that approaches the issue of adoption with an assumption that the individuals (or organizations) can accept or reject a particular technology. Bruque et al. (2008) explain that models of IT adoption have over-focused on the quantity and pace of adoption and therefore a valuable alternative approach is to explicitly study the outcomes of the technology adoption in individual behavior and performance, focusing on the quality aspect of the innovation process. Moreover, by under-estimating context and the complexity of user behaviors, the models that work well in experimental settings lose predictive power in real-world settings (Gallivan 2001).

While a large body of research examining or refining models such as TAM, IS success Model and UTAUT has analyzed numerous factors that allows us to better understand what motivates individuals to use IT, in none of these models does user adaptation to new IT systems clearly and explicitly appear (Elie-Dit-Cosaque & Straub 2011). Yet, there are several meaningful differences between adaptation and adoption (Bruque et al. 2008). First, adoption is an end-result of a decision-making process that is often time-dependent, whereas adaptation is usually a dynamic, cyclical and long-term process that is in constant evolution and renewal. Second, adaptation could be best considered as a continuous-type process that differs from the dichotomous nature of 'adoption', that is, adopters against non-adopters. Third, by focusing on adaptation, the current focus can be shifted from examining factors affecting top managers' decision-making processes of IT adoption to investigating the issues and concerns affecting members' adaptation to a given technology (Bruque et al. 2008).

Researchers are now more concerned about these limitations in the IT acceptance and usage stream of research (Elie-Dit-Cosaque & Straub 2011). As a solution to the above concern, for example, Benbasat and Barki (2007) propose that "researchers broaden their perspective of system use from one that exclusively focuses on a narrow 'amount' view of users' direct interaction with systems to one that also includes users' adaptation, learning, and reinvention behaviors around a system" (p.215). Benbasat and Barki (2007) argue that IS researchers should shift the way they study how users react to IT and build richer models to take into account a broader range of behaviors instead of focusing only on the direct relationships between use behaviors and their antecedents. Since user adaptation is crucial to IS success and infusion (Fadel 2012), an adaptation focus is a necessary theoretical complement to what literature on adoption has so far revealed with regard to the introduction of IT innovation processes (Bruque et al. 2008).

User Adaptation and Infusion Studies

Information System infusion is another area that is highly associated with user adaptation studies since infusion occurs as the result of individuals' adaptive efforts to modify the system, their work tasks, or themselves to more fully integrate the IS into their work procedures (Fadel 2011). The term 'Infusion' has been defined as the extent to which IT applications are embedded deeply and extensively and are used to their fullest potential within the work system of an individual or of an organization (Cooper & Zmud 1990; Saga & Zmud 1994). This definition refers to the following aspects of IS infusion: 1) technology may be integrated at various levels by both organizations and individuals, and 2) organizational and individual benefits derived from technology depend on the level of this integration (Fadel 2011). Empirical evidence indicates that the benefits of IS often fail to meet the aims for which they are introduced and a frequently cited reason for these failures is that IS are underused, thus undermining their benefits to the organization (Barki et al. 2007; Davidson & Chismar 2007; Jasperson et al. 2005). Although IS use is one of the most frequently studied concepts in IS literature (Barki et al. 2007), most existing research has examined the system use from a quantitative perspective, operationalizing the construct as frequency, intensity, or duration of use behaviors (Burton-Jones & Straub 2006). Nevertheless, increased frequency of system usage does not necessarily mean increased individual or organizational benefits (Fadel 2012).

Prior research has examined infusion from two broad perspectives: infusion via organizational-level technology configuration and infusion via individual-level technology use. The former perspective examines infusion in terms of subsets of IS features that have been implemented by an organization as a whole. While this perspective is valuable from a macro-level, it does not account for the individual-level processes by which infusion is realized. As to the infusion via individual-level system usage, although this type of infusion is a precondition for organizational infusion, studies that have adopted this approach are relatively recent (Fadel 2011). Most of such studies have been based on technology adoption (see Davis, 1989) and continuance (see Bhattacherjee 2001) to examine whether infusion is affected by antecedents such as perceived usefulness, personal innovativeness and so forth. One important precursor to individual-level infusion that has received scant attention and has been absent from studies of this nature is user adaptation to IT systems (Fadel 2012; Fadel 2011; Beaudry & Pinsonneault 2005).

The infusion literature in its current state offers limited insight into how particular types of individual user adaptation promote or discourage IS infusion. Moreover, although user adaptation is generally seen as having positive effects, adaptive efforts however can take many forms, including behaviors that may detract from deeper, infused use (Beaudry & Pinsonneault 2005). Nevertheless, although the concepts of IS adaptation and infusion have been present in the literature for some time, our understanding of how specific types of adaptation lead to infusion of technology in an individual's work system remains limited (Fadel 2011). Research that studies how infusion is enhanced or hindered by various types of individual adaptation behaviors can help researchers and practitioners to better understand and manage these behaviors to achieve desired IS use outcomes.

IT Adaptation Studies: Different Ways to Discuss the Same Topic

Disruptive IT events in work settings are of particular interest to both IS researchers and practitioners. While non-disruptive IT systems (that are compatible with previous systems or work processes with which the IS users are already familiar) still offer challenges to individuals, the technology itself is not fundamentally new to IS users (Elie-Dit-Cosaque & Straub 2011). The same, however, cannot be said about disruptive IT events. Sherif et al. (2006) define a disruptive IT innovation as "a novel idea or

behavior that when introduced in organizational settings, causes dramatic changes in the structure of work processes" (p.341). Lyytinen and Rose (2003) similarly suggest that when the technology is disruptive, IS users do not behave in a predictable manner. As a result, changes induced by disruptive IT events can be threatening for IS users who are also social actors (Lamb & Kling 2003). Therefore it is essential to learn how employees adapt to radical technological advancements in work settings because their needs can be better understood and addressed.

A review of IS literature on user IT adaptation behaviors indicates that although these studies all fundamentally focus on a key phenomenon: the way users respond to changes or disruptions induced by IT, this phenomenon, over years, has been diversely understood and defined in IS research which has resulted in confusion in this area of research (Beaudry & Pinsonneault 2005). Some studies have focused on the 'technology-side' of the adaptation process and investigated about the extent to which a technology is altered by the IS user. For example, Poole and DeSanctis (1988) defined the term "reinvention" as the extent to which an innovation is modified by the user while Rice and Rogers (1980) labelled this phenomenon "appropriation". Taking a different approach, Majchrzak and Cotton (1988) and Majchrzak et al. (2000) focused on the 'user-aspect' of the adaptation process; on how users' perceptions and attitudes are adjusted by the IT implementation and called this process "adjustment". Other studies of user adaptation behaviors have focused on the 'work system' aspect of adaptation, which represents itself as the notion of 'fit' between IS users' requirements and IT systems. For example, Ives and Olson (1984) stated that IT adaptation is the modification of the technology in such a way that it meets users' needs and requirements and support their work processes. Poole and DeSanctis (1990) likewise defined IT "appropriation" as the way a group uses and reproduces the structure of a technology to meet their needs in their daily work processes.
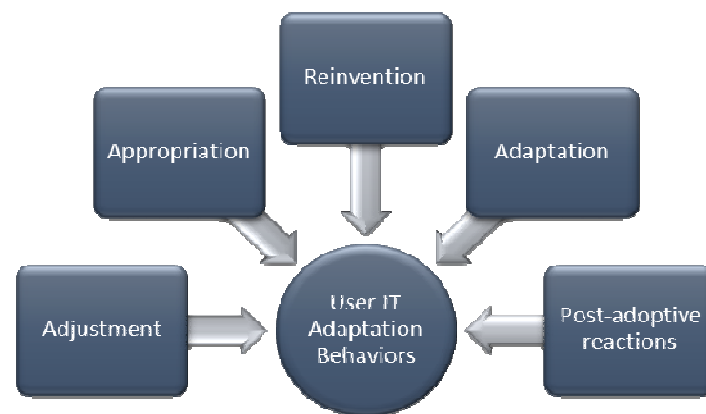

Figure 3. Different Ways to Discuss the Same Topic

Still other studies in this research area argue that adaptation cannot be referred to as a simple notion of fit between IT and the users. These studies have therefore oriented more towards highlighting the role of IS users in the reciprocal process of adaptive behaviors. For instance, Tyre and Orlikowski (1994, 1996) defined "adaptation" as comprised of all the changes and adjustments following an IT implementation (Table 1). From this perspective, when a new IT system is introduced in a work setting, computer users may engage in different adaptation behaviors directed at each of these dimensions (Orlikowski 1996; Beaudry & Pinsonneault 2005). Users may adapt the work task by modifying work routines and procedures. The technology may also be adapted to better fit the needs of users in particular situations. Finally, users may employ adaptation behaviors directed at themselves, such as developing IT skills by attending training sessions or seeking additional knowledge through social support (Spitler 2005). The summary of existing IT adaptation studies can be viewed in Table 2 in the Appendix.

Key Terminology	Focus	Definition
Reinvention Appropriation	Technology-side	These studies have focused on the 'technology-side' of the adaptation process and investigated about the extent to which a technology is altered by the IS user.
Adjustment Adaptation Post-Adoptive reactions	User-side	These studies have focused on the 'user-side' of the adaptation process and investigated about how users' perceptions and attitudes were adjusted by the IT implementation.
Appropriation	Task-side (work system)	These studies of user adaptation behaviors have focused on the 'work system' aspect of adaptation, which represents itself as the notion of 'fit' between IS users' requirements and IT systems.

Table 1. Summary of Key Terms in IT Adaptation Studies

As the timeline of Table 1 indicates, there is a growing interest in the role that IS users play in adaptation studies when it comes to recent studies. The key question however is how have these studies looked at the 'user' aspect and approached the phenomenon of user adaptation? By reviewing the studies between 1988 and 2005 it is understood that while these studies have included the concept of 'user' in their investigation of user adaptation to new IT systems, there has been no explicit recognition or exploration of users' psychological constructs or as Beaudry and Pinsonneault (2005) put it: the complex, underlying and dynamic adaptation processes (especially in mandatory settings) through which individuals cope with new implemented IT systems. For example, Majchrzak & Cotton (1988) by considering four independent sets of factors such as actual job changes experienced on workers' jobs, perceived changes to the jobs, personal factors and management support and measuring four indices of adjustment (stress/psychological problems, job satisfaction, organizational commitment and perceived quality of life), found out that the most important set of factors determining adjustment was the actual changes to individual jobs. Tyre and Orlikowski (1994), taking a different angle, state that the process of technological adaptation is not yet well understood and an important area of uncertainty involves the timing of the adaptations. Although their approach is insightful in better understanding of the episodic pattern of technological adaptation by users and how important the initial episode of adaptation is, the likely relationship between the adjustments made to the technology, users' procedures (task) and users' knowledge (self) at this early episode of adaptation and the types of adaptive efforts users may have employed remains unclear. In other words, while this study gives insight into the importance of the initial episode, it does not explain how users' reliance on different types of adaptive strategies could affect this 'window of opportunity'.

Orlikowski (1996), similarly, argues for an emergent change perspective, one in which change arises as a natural and on-going consequence of everyday work practices. While this perspective helps to explain how appropriation of a technology and the adjustments employees enacted over time facilitated the transformation of the structures of the organization, it does not explain the adaptation process itself that IS users went through to adapt to an IT event. In other words, the focus of this perspective is not on users' adaptation processes per se, but on how such users' appropriations of a technology affect the organizational transformations. Tyre and Orlikowski (1996), too, examine learning by using new technologies. Their findings suggest that ongoing adaptation to technologies in use tends to be a highly discontinuous or 'episodic' process. As it is seen, in neither of these studies were users' psychological perspectives (i.e. the underlying links between how users' different types of user adaptation behaviors contribute to or diminish system usage at the individual level) investigated.

Nevertheless, the most important of the early steps towards greater integration and attention to IS users' psychological perspectives emerged from Beaudry and Pinsonneault's (2001) initial concept of the coping

act model of IT-induced adaptation. Their model suggested that user adaptation behaviors could be conceptualized as coping acts, which were mainly determined by a user's initial assessment of a new IT. The model further suggests that the level of integration moderates the relationship between IT use and individual performance. In 2005, Beaudry and Pinsonneault finalized their initial 'coping act model' and took the study of user adaptation a step further by proposing an integrative model, the coping model of user adaptation (CMUA), based on a well-known psychology theory known as Coping Theory[3] (Lazarus & Folkman 1984). Their aim was to unite both qualitative (Orlikowski 1996; Tyre and Orlikowski 1994, 1996; DeSanctis and Poole 1994; Majchrzak et al. 2000; Leonard-Barton 1988; Poole and DeSanctis 1988, 1990; Griffith 1999) and quantitative (Venkatesh et al. 2003; Davis 1989; Davis et al. 1989; Dishaw and Strong 1999; Dishaw et al. 2002; Goodhue 1995; Goodhue and Thompson 1995; Zigurs et al. 1999) streams of IS research with respect to the complex phenomenon of user reactions to new technologies. The central premise of CMUA was that the introduction of a new technology or the major modification of an existing one can bring about changes that are perceived as novel (Louis and Sutton 1991) and can form a disruption in organizations (Lyytinen and Rose 2003). Adaptation behaviors are, in fact, actions that users perform in order to cope with the perceived consequences of the technological event. By defining user adaptation as coping, they suggested that a wide range of user responses can be studied including how users restore emotional stability, modify their tasks, reinvent and adapt the technology, or even resist it.

Since then different studies have adopted this approach and been particularly based on CMUA and the underlying 'coping theory' to investigate the user aspect of adaptation, the psychological processes they go through to cope with new IT systems and the influence of such behaviors on subsequent quality system use behaviors. For example, Kashefi et al. (2012) investigated the influence of users' emotions and cognitions on their receptivity to and mobilization for change after an IT implementation in a government organization in Iran by synthesizing Huy's (1999) dynamic model of change and coping theory. Fadel's studies (2010, 2011 and 2012) as well as Kashefi's (2014) case study of user adaptation to a computerized work system in a medical center are similarly based on CMUA and demonstrate good examples of attention to the critical role that users' psychological constructs play to determine the subsequent adaptive actions and system usage. Techakriengkrai et al. (2014) similarly aims to develop a multi-level theory of post-adoptive adaptation process by using coping theory, institutional theory, and a socio-technical perspective as sensitizing devices to examine multi-level changes associated with CRM implementations in organizations. Lastly, Wu et al. (2014) investigate the relationships between advice seeking and giving network densities and IT system use. They explore IT system use by drawing on theories of advice networks, user adaptation (based on CMUA and coping theory) and IT system use and predict that IT adaptation, task adaptation and positive reappraisal will positively influence IT system use, whereas emotional venting will negatively influence it.

In summary, from the review of user-focused studies of IT adaptation it is perceived that over the past few years there has been a steady march towards an enhanced understanding of IT-related user adaptive behaviors through integrating IS users' psychological constructs and investigating the complex processes by which users make sense of the IT event and cope with new technologies in work settings. In this respect CMUA (Beaudry & Pinsonneault 2005) has emerged as a promising basis for a deeper understanding of user's varied post-adoptive reactions to new technologies. CMUA provides a framework for explaining how individuals respond to disruptive events in their environment and has shown that it has the potential to open the black box between the complex phenomenon of user adaptive/coping acts and subsequent quality, infused system usage. This emerging stream of research on IT-related user adaptive reactions which has, thus far, been heavily based on coping theory and CMUA, has progressively attempted to shed light on many aspects surrounding when, how and why adaptation unfolds over time at the individual level; the aspects which have never addressed before by other theories/models and remained unclear for many years.

---

[3] Lazarus and Folkman (1984) define coping actions as 'cognitive and behavioral efforts (i.e. a dynamic process) to manage (minimize, reduce, tolerate, master) relations with the environment that generate psychological stress. In a similar vein, Folkman et al. (1986) consider coping efforts as 'cognitive (emotion-focused coping acts) and behavioral efforts (problem-focused coping acts) exerted to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person.

Conclusion

As the above discussion demonstrated, we have already learned a great deal about user IT adaptation behaviors through different studies taking different perspectives on this topic. Understanding how IS users rely on a combination of adaptive/coping strategies to deal with new technologies in work settings and how, why, when and to what extent they adjust their earlier efforts over time has therefore gained importance since the outcomes of IS users' coping mechanisms subsequently affect the individual outcome, their job performance and IS infusion at the individual level (Fadel 2011; Kashefi 2014, Wu et al., 2014). Research attention has been called to broaden the conceptualization of IT system use by studying user adaptation toward IT systems (Barki et al. 2007; Benbasat and Barki 2007; Fadel 2012; Turel 2014). CMUA is an evolving theoretical orientation in this area of IS research that aims for a nuanced understanding of system users' IT adaptation processes and describes how users' adaptation behaviors evolve over time and how such alterations in users' coping strategies contribute to or diminish the system usage at the individual level. Taking the CMUA as the theoretical lens can have important theoretical and practical implications.

For example, adopting an interpretive approach through a process-oriented perspective on CMUA can provide a greater understanding of the patterns of user adaptation to IS, users' psychological constructs, initial patterns of their adapting strategies, the likely shifts in such coping efforts over time, and the consequences of these evolutions on subsequent individual level IT use outcomes in work settings. This method and application of CMUA was similar to Kashefi's (2014) investigation of user IT adaptation to a new computerized work system in a medical center in Iran. Nevertheless, more research of this type is needed to shed light on this complex phenomenon. From a practical perspective, this approach can sketch out the ways in which IS users' motivation, cognition and emotion can be disrupted due to the impacts of the socio-technical factors as a consequence of implementing new IT systems or major modifications to existing ones. To this end, much more research still needs to be done to understand the dynamics of user interactions with disruptive IT events since it has been echoed repeatedly that a key component to the success of any situation that utilized an IT artifact is the adoption and use of that artifact by the necessary users (Claggett 2010; Taylor et al. 2001; Zorn 2003).

Future research can consider longitudinal perspectives for further investigation on how adaptive behaviors are adjusted/ altered over time (Fadel 2012). Future research should also investigate as to whether adaptive behaviors occur constantly throughout the IT use life-cycle or during irregular intervals of instability? Or how do on-going reappraisals direct and re-direct adaptation strategies and under what conditions these adaptive strategies are altered? Guinea and Webster (2011), who proposed a model of user-computer interactions in which users cope with IT interruptions, called for future research about the different types of coping mechanisms that are most effective in terms of user performance. From a practical perspective, future research should investigate methods that companies can use to boost adaptation behaviors that result in desired IT objectives. For instance, if an organization wishes to promote the quality of IS usage, what should be done to stimulate problem-focused adaptation behaviors? Do certain types of training workshops and support programmes better suit this goal than others?

The main contribution of this paper is that it attempted to: 1) go beyond the surface meaning of words and provide a more nuanced perspective on the topic of user adaptation studies by analyzing the focus of current literature based on the three dimensions of IT adaptation behaviors (i.e. task, technology, user), and 2) focus on the existing user-centered adaptation studies to determine what theoretical lens have been used in such studies and how this critical dimension has been explored. Furthermore, this study highlights and gives voice to the critical, under-researched, yet emerging area of user IT adaptation behaviors. Understanding how IS users rely on a combination of coping strategies to adapt to new technologies and how, why, when and to what degree they modify their earlier strategies to better cope with a disruptive IT event has therefore gained importance since the outcomes of IS users' coping mechanisms subsequently affect the individual IT use outcomes. Despite the growing interest in the subject of user adaptation behaviors to new IT artifacts in work settings over the last decade, this topic is still in its infancy and consequently, is ripe for further research. To this end, much more research still needs to be done to understand the black-box of user IT adaptation/coping behaviors/processes. Research is moving towards a more nuanced approach to definitions, measures, models, and prescriptions regarding users' adaptive reactions towards disruptive IT systems in organizations. We hope

that this summary provides helpful information for future explorers and managers of user adaptation behaviors.

REFERENCES

Aziz, N. M. and Salleh, H. 2014. "Case studies of the human critical success factors in information technology implementation in Malaysian construction industry", Journal of Building Performance (5:1)

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.

Barr, P. S. (1998) 'Adapting to unfamiliar environmental events: A look at the evolution of interpretation and its role in strategic change', Organization Science, vol. 9, no. 6, pp. 644-669.

Beaudry, A. 2009. "Coping with Information Technology", In Dwivedi, Y., Lal, B., Williams, M., Schneberger, S. and Wade, M. (eds.) Handbook of Research on Contemporary Theoretical Models in Information Systems, PA: Information Science Reference.

Beaudry, A. and Pinsonneault, A. 2001. "IT-induced adaptation and individual performance: a coping act model", In Proceedings of ICIS, Paper 58.

Beaudry, A. and Pinsonneault, A. 2005. "Understanding user response 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.

Benbasat, I. and Barki, H. 2007. "Quo Vadis, TAM?", Journal of the Association for Information Systems (8) pp. 211-218.

Bhattacherjee, A. 2001. "Understanding information systems continuance: an expectation-confirmation model", MIS quarterly (25: 3), pp. 351-370.

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.

Burton-Jones, A. and Straub, D. W. 2006. "Reconceptualizing system usage: An approach and empirical test", Information Systems Research (17:3), pp. 228-246.

Claggett, J. L. 2010. "Understanding primary appraisal in user adoption: an exploratory case study of a telehealth project", In Proceedings of the Southern Association for Information Systems Conference, Atlanta.

Claggett, J. L. 2010. "Understanding primary appraisal in user adoption: an exploratory case study of a telehealth project", In Proceedings of the Southern Association for Information Systems Conference, Atlanta.

Clark, P.A. 1987. Anglo-American Innovation, DeGruyter, New York.

Clarke, L. 1994. The essence of change, New York: Prentice Hall.

Cooper, R. B. and Zmud, R. W. 1990. "Information technology implementation research: a technological diffusion approach", Management science (36: 2), pp. 123-139.

Davidson, E. (2006) 'A technological frames perspective on information technology and organizational change', The Journal of Applied Behavioral Science, vol. 42, no. 1, pp. 23-39.

Davidson, E. J. and Chismar, W. G. 2007. "The interaction of institutionally triggered and technology-triggered social structure change: An investigation of computerized physician order entry", MIS quarterly, pp. 739-758.

Davis, F. D. 1989. "Perceived usefulness, perceived ease of use, and user acceptance of Information Technology", MIS Quarterly (13: 3), pp. 319-340.

Davis, F. D., Bagozzi, R. P. and Warshaw, P. R. 1989. "User acceptance of computer technology: a comparison of two theoretical models", Management science (35: 8), pp. 982-1003.

DeSanctis, G. and Poole, M. S. 1994. "Capturing the Complexity in Advanced Technology Use: Adaptive Structuration Theory", Organization Science (5: 2), pp. 121-147.

Dishaw, M. T. and Strong, D. M. 1999. "Extending the Technology Acceptance Model with Task-Technology Fit Constructs", Information and Management (36: 1), pp. 9-21.

Elie-Dit-Cosaque, C. and Straub, D. W. 2011. "Opening the black box of system usage: User adaptation to disruptive IT", European Journal of Information Systems (20), pp. 589-607.

Elie-Dit-Cosaque, C., Pallud, J. and Kalika, M. 2011. "The influence of individual, contextual, and social factors on perceived behavioral control of information technology: A field theory approach", Journal of Management Information Systems (28: 3), pp. 201-234.

Fadel, K. J. 2011. "User adaptation and infusion of information systems", Journal of Computer Information Systems (52: 3), pp. 1-10.

Fadel, K. J. 2012. "The role of appraisal in adapting to information systems", Journal of Organizational and End User Computing (24: 1), pp. 8-40.

Fadel, K. J. and Brown, S. A. 2010. "Information systems appraisals and coping: the role of user perceptions", Communications of the Association for Information Systems (26), pp. 107-126.

Folkman, S. 1992. "Making the Case for Coping", In Carpenter, B. N. (ed.) Personal Coping: Theory, Research, and Application, Westport, CT: Praeger.

Folkman, S. and Lazarus, R. S. 1985. "If it changes it must be a process: Study of emotion and coping during three stages of a college examination", Journal of Personality and Social Psychology (48), pp. 150-170.

Gallivan, M. J. 2001. "Organizational adoption and assimilation of complex technological innovations: development and application of a new framework", ACM Sigmis Database (32: 3), pp. 51-85.

Goodhue, D. L. 1995. "Understanding User Evaluations of Information Systems," Management Science (41:12), pp. 1827-1844.

Goodhue, D. L. and Thompson, R. L. 1994. "Task technology fit and individual performance", MIS Quarterly (19), pp. 213-236.

Griffith, T. L. 1999. "Technology features as triggers for sensemaking", The Academy of Management Review (24: 3), pp. 472-488.

Guinea, A. O. and Webster, J. 2011. "A model of coping with technological interruptions", In Proceedings of the 44th Hawaii International Conference on System Sciences.

Huy, Q. N. 1999. "Emotional capability, emotional intelligence and radical change", Academy of Management Review (24: 2), pp. 325-345.

Isabella, L. A. (1990) 'Evolving interpretations as a change unfolds: How managers construe key organizational events', Academy of Management Journal, vol. 33, no. 1, pp. 7-41.

Ives, B. and Olson, M. H. 1984. "User Involvement and MIS Success: A Review of Research", Management Science (30), pp. 586-603.

Jasperson, J. S., 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.

Kashefi, A. 2014. "Investigating the Link between Users IT Adaptation Behaviours and Individual-Level IT Use Outcomes Using the Coping Model of User Adaptation: A Case Study of a Work System Computerisation Project". Published PhD thesis. Brunel University.

Kashefi, A., Pamela, A. and Bell, D. 2012. "The Influences of Employees' Emotions and Cognition on IT Adoption: Some Perspectives from Iran", International Journal of Social and Organizational Dynamics in IT (2: 3), pp. 1-16.

Lamb, R. and Kling, R. 2003. "Reconceptualizing users as social actors in information systems research", MIS quarterly, pp. 197-236.

Lassila, K. S. and Brancheau, J. C. 1999. "Adoption and utilization of commercial software packages: Exploring utilization equilibria, transitions, triggers, and tracks", Journal of Management Information Systems (16: 2), pp. 63-90.

Lazarus, R. S. and Folkman, S. 1984. Stress, Appraisal, and Coping, New York: Springer Publishing Company.

Lazarus, R.S. 1991a. "Progress on a cognitive-motivational-relational theory of emotion", American Psychologist (46: 8), pp. 819-834.

Lazarus, R.S. 1991b. Emotion and Adaptation, Oxford University Press: New York.

Lazarus, R.S. 1999. Stress and Emotion, London: Springer Publishing Company.

Leonard-Barton, D. 1988. "Implementation as mutual adaptation of technology and organization", Research Policy (17), pp. 251-267.

Louis, M. R. and Sutton, R. I. 1991. "Switching cognitive gears: From habits of mind to active thinking", Human relations (44: 1), pp. 55-76.

Lyytinen, K. and Rose, G. M. 2003. "The disruptive nature of information technology innovations: the case of internet computing in systems development organizations", MIS Quarterly (27), pp. 557-595.

Majchrzak, A. and Cotton, J. 1988. "A Longitudinal Study of Adjustment to Technological Change: From Mass to Computer Automated Batch Production", Journal of Occupational Psychology (61), pp. 43-66.

Majchrzak, A., Rice, R. E., Malhotra, A., King, N. and Ba, S. 2000. "Technology adaptation: The case of a computer supported inter-organizational virtual team", MIS Quarterly (24: 4), pp. 569-600.

Montalvo, C. 2006. "What triggers change and innovation?", Technovation (26, pp. 312- 323.

Ng, E. H. and Kim, H. W. 2009. "Investigating Information systems infusion and the moderating role of habit: A user empowerment perspective", In Proceedings of the International Conference on Information Systems, AIS, Arizona, pp. 1-18.

Orlikowski, W. J. 1996. "Improvising Organizational Transformation Over Time: A Situated Change Perspective", Information Systems Research (7: 1), pp. 63-92.

Orlikowski, W. J. 2000. "Using technology and constituting structures: A practice lens for studying technology in organizations", Organization science (11: 4, pp. 404-428.

Orlikowski, W. J. and Robey, D. 1991. "Information technology and the structuring of organizations", Information systems research (2: 2), pp. 143-169.

Rice, R. E. and Rogers, E. M. 1980. "Reinvention in the innovation process", Science Communication (1: 4), pp. 499-514.

Schwarz, A., Chin, W. W., Hirschheim, R. and Schwarz, C. 2014. "Toward a process-based view of information technology acceptance", Journal of Information Technology (29: 1), pp. 73-96.

Sherif, K., Zmud, R. W. and BROWNE, G. J. 2006. "Managing peer-to-peer conflicts in disruptive information technology innovations: the case of software reuse", MIS Quarterly (30), pp. 339–356.

Sokol, M. B. 1994. "Adaptation to Difficult Designs: Facilitating Use of New Technology", Journal of Business and Psychology (8: 3), pp. 277-296.

Spitler, V. K. 2005. "Learning to use IT in the workplace: Mechanisms and masters", Journal of Organizational and End User Computing (17: 2), pp. 1-25.

Tams, S., Craig, C. and Murphy, R. 2011. "Coping with interruptions in computer-mediated environments: The role of computer self-efficacy", In Proceedings of the Southern Association for Information Systems Conference, pp. 175-180.

Taylor, J. R., Groleau, C., Heaton, L. and Van Every, E. J. 2001. The computerization of work: A Communication Perspective, Thousand Oaks.

Techakriengkrai, W., Techatassanasoontorn, A. A., and Tan, F. B. 2014. "Understanding post-adoptive adaptation process in organisational CRM implementations", ACIS.

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.

Turel, O. 2014. "Quitting the use of a habituated hedonic information system: a theoretical model and empirical examination of Facebook users", European Journal of Information Systems.

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

Tyre, M. J. and Orlikowski, W. J. 1996. "The Episodic Process of Learning by Using", International Journal of Technology Management (11), pp. 790-798.

Venkatesh, V. 2000. "a theoretical extension of the technology acceptance model: four longitudinal field studies", Management Science (46: 2, pp. 186- 204.

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.

Walsham, G. 1993. Interpreting information systems in organizations, England: John Wiley and Sons Ltd.

Wu, Y., Chang, K., and Guo, X. 2014. "Network Density as a Double-Edged Sword: A User Adaptation Approach of IT System Use", in Proceedings of 35th International Conference on Information Systems, Auckland 2014

Zigurs, I. and Buckland, B. K. 1998. "A Theory of Task/ Technology Fit and Group Support Systems Effectiveness", MIS Quarterly (22: 2), pp. 313-334.

Zorn, T. E. 2003. "The emotionality of information and communication technology implementation", Journal of Communication Management (7: 2), pp. 160-171.

Appendix A

Authors	Concept	Concept Definition	Focus
Rice & Rogers (1980)	Reinvention	The degree to which the system user modifies an IT innovation during the adoption and implementation periods.	Technology
Ives & Olson (1984)	Adaptation	Configuration of the IT system in such a way it meets user's requirements and needs.	Technology
Leonard-Barton (1988)	Reinvention	The alteration of the initial IT innovation by users to suit their needs.	Technology
Leonard-Barton (1988)	Adaptation	The modification of the technology and the simultaneous adaptation happening at multiple levels within the organization.	Technology, Work system
Majchrzak & Cotton (1988)	Adjustment	Concerns different aspects of user adaptation including: changes in job satisfactions, work commitment, psychological and stress problems, and perceived quality of life.	User
Poole & DeSanctis (1988)	Appropriation	Modification of the IT innovation made by the system user while using it.	Technology
Poole & DeSanctis (1990)	Appropriation	The way a group uses, adapts and reproduces the structures of technology based on their needs.	Technology, Task
Tyre & Orlikowski (1994)	Adaptation	The changes following an IT event such as: technology, work routines, beliefs and knowledge of the users.	Technology, Task, User
Sokol (1994)	Adaptation	Concerns about modifications brought to the technology, environment, social protocols and development of contingency plans.	Technology, Task
Orlikowski (1996)	Appropriation	The continuous, progressive and mutual adjustments between the technology and the users.	Technology, User
Tyre & Orlikowski (1996)	Adaptation	Changes brought to the technology, working system and users' views.	Technology, Task, User
Beaudry & Pinsonneault (2001)	Adaptation	Suggests that user adaptation behaviors can be conceptualized as coping acts, which are mainly determined by users' initial assessments of a new IT.	Technology, Task, User

Beaudry & Pinsonneault (2005)	Adaptation	Focuses on user cognitive and behavioral adaptation responses and accounts for a wide range of user behaviors such as technology appropriation, avoidance, and resistance.	Technology, Task, User
Fadel & Brown (2010)	Post-adoptive IS use behavior	Integrates theories of IS adoption and use with coping theory by examining how adoption-related IS perceptions influence individual-level post-adoptive IS appraisal.	Technology, User
Fadel (2011)	Adaptation	Draws on the Coping Model of User Adaptation to explore how various adaptation behaviors employed by IS users influence its infusion in their work.	Technology, Task, User
Kashefi and Abbott (2012)	Post-Adoptive reactions	Explores the relationship between an employee's cognitive appraisal of an IT initiative, their emotional response and the processes they undergo when faced with difficulties in accepting IT adoption and change in an organizational setting.	Technology, Task, User
Fadel (2012)	Adaptation	Empirically examines and explores the relationship between IS appraisal and adaptive behaviors.	Technology, User
Kashefi (2014)	Adaptation	Investigate the link between users' IT adaptation behaviors and individual-level IT use outcomes using CMUA.	Technology, Task, User
Wu et al. (2014)	Adaptation	Explores IT system use by drawing on theories of advice networks, user adaptation and IT system use. Four types of user adaptation are examined, including IT adaptation, task adaptation, positive reappraisal and emotional venting.	Technology, Task, User
Techakriengkrai et al. (2014)	Post-adoptive adaptation process	Examines post-adoptive adaptation process by using coping theory, institutional theory, and a socio-technical perspective as sensitizing devices to examine multi-level changes associated with CRM implementations in organizations.	Technology, Task, User

Table 2. Summary of Existing User IT Adaptation Studies