The Effect of User Adaptation on the Effective Use of Enterprise Systems

Research-in-Progress

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Abstract

Most of the cost of information system implementation projects is attributable to the post-adaptation phase. Thus, an effective use of the implemented system is necessary to justify the expense. It has been theorized that user adaptation can help to increase the level of effective use of a system. Changes to an enterprise system or to the individual’s tasks with an enterprise system are likely to trigger user adaptation. Yet the effect of user adaptation on effective use of an enterprise system is still widely unknown. We conducted a longitudinal case study to explore the phenomenon and develop a research model to measure the effect of user adaptation on the effective use of an enterprise system. The extension of the nomological network of the concept of effective use by an integration of the effect of user adaptation will be the main contribution of our research.

Keywords: User Adaptation, Post Adoption Behavior, Adaptive System Use, Effective Use, Learning Styles
Introduction

In most information systems (IS) implementation projects, “more than 90 percent of costs [...] are attributable to the post-implementation stage” (Erlikh 2000, p. 17). To counteract these costs, it is important for user organizations to extract the maximum value out of a system by utilizing it effectively during the usage phase of the system (Venkatesh et al. 2008). For instance, effective use (EU) of an enterprise system (ES) can be hampered by confusing menus or screens. An ill-designed feature will reduce employees’ ability to extract the meaning of the presented data (lack of representational fidelity). As a consequence, they get less time to focus on the implications (lack of effectiveness) and may have to spend extra time to search for complete data in order to get the full picture (lack of efficiency) (Burton-Jones and Grange 2013). The following example from practice, observed in our preliminary case study, illustrates this issue: In our case organization, a multi-channel fashion retailer, an online shop content manager can only find the general product number in one system and has to look for the article number of the product variants in a different system. It is important to process products quickly to get them online. Consequently, content managers have less time to check for product attributes and writing a good product description for the shop. Thus, it is important to address the use-related issues not just in the initial adoption phase but also in the post-adoptive / use phase.

However, most current models of IT acceptance and use (e.g., Information System Success Model (DeLone and McLean 1992, 2003), TAM (Davis 1989); UTAUT (Venkatesh et al. 2003), and TTF (Goodhue and Thompson 1995) treat user responses to working with systems as a black box (Barki et al. 2007; Elie-Dit-Cosaque and Straub 2011). Elie-Dit Cosaque and Straub (2011) have answered Beaudry’s and Pinsonneault’s (2005) call for quantitative research on user adaptation in part, when they identified empirically distinct user adaptation strategies (Elie-Dit-Cosaque and Straub 2011). In another study, Sun (2012) developed the concept of adaptive system use (ASU), which describes the user adaptation of features in use (FIU) initiated by triggers of user adaptation. Still, the existing conceptualizations of system use (e.g., frequency, variety of system functionalities, or duration) do not sufficiently explain the relationship between system use and the realization of expected outcomes and have been identified as being too simplistic (Sun 2012). A deeper understanding of users’ reasoning and motivation to adapt and the consequences of adaptation for their ability to perform their jobs effectively could potentially lead to a better understanding of users’ needs for working effectively. The black box of user adaptation therefore needs to be opened further to improve the conceptualization of user adaptation (Benbasat and Barki 2007; Burton-Jones and Straub 2006; Straub and Burton-Jones 2007) and to assess the effects of the adaptation process in detail. Specifically, we aim to analyze the effect of user adaptation in the form of ASU on the EU. Thereby we extend the nomological net of EU with a model of the effect of individual user adaptation on the EU of an ES on the level of FIU. We aim to do this by testing new moderators for the original model by Sun (2012) for one adaptation cycle, which we derived from theory based on initial explorations in a case study, and by adding EU as a dependent variable. This approach is based on the insight that a higher level of technology integration into work systems can be achieved by a higher degree of adaptation (Beaudry and Pinsonneault 2001; Cooper and Zmud 1990; Leonard-Barton 1988). This higher degree of integration can in turn be related to higher performance of the individual users (Beaudry and Pinsonneault 2001). When user adaptation is triggered, users are most likely to adapt to a changed or new system over time due to learning and adaptation of the features relevant for the tasks. Beaudry and Pinsonneault (2005) suggest that there is a reciprocal relationship between actual usage and EU. These would be constituted as loops of appraisal of the changes and subsequent adaptation and explains an individuals’ ability to adapt his/her own work (Burton-Jones and Grange 2013), for example by adapting the FIU to fulfill a task. There is a need for empirical evaluation of the concept of EU and for the evaluation of the effect of ASU on EU, when user adaptation has been triggered. Hence, we pose the following research question: What is the effect of adaptive system use on effective use of an enterprise system?

In attempt to address this question, the remainder of this paper introduces a study we propose to investigate ASU’s effects on EU. To do so, section two introduces our theoretical foundations which subsequently are used for the development of our hypotheses. We then present our research design, covering both the preliminary steps already taken as well as the intended research still to come. After looking at some preliminary findings, we then discuss next steps, expected results, and intended contributions.

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Theoretical Background

The Concept of User Adaptation

There is a diverse body of research on the adaptation processes during technology implementation and use (DeSanctis and Poole 1994; Fichman 2004; Leonard-Barton 1988; Orlikowski 1996, 2000; Rice and Rogers 1980; Tyre and Orlikowski 1994). Researchers in this field commonly agree on the following: The flexibility of interpretation of a system’s purpose makes adaptation possible (Fichman 2004; Orlikowski 1996). Thus, identical technology can be used in very different ways (DeSanctis and Poole 1994; Fichman 2004). The lack of technological fit of standard software often makes adaptation necessary (Fichman 2004; Leonard-Barton 1988). Furthermore, the need for technology adaptation emerges during an implementation project (Fichman 2004; Orlikowski 1996). Thus, the modification or introduction of an IS can cause changes in an organizational environment or be disruptive for it (Louis and Sutton 1991; Lyytinen and Rose 2003). Users are required to adapt when such an IT event occurs. User adaptation actions have been defined as any actions users take to improve a system’s representation of a domain of interest or any action to improve the systems physical structures and surface to improve the access to the representations (Burton-Jones and Grange 2013). This definition of adaptation actions is grounded in the assumption that users can conduct adaptation actions, for example by changing programs or data directly or at least by sending a change request to the IT department (Barik et al. 2007; Burton-Jones and Grange 2013). Thus, adaptation behavior can be understood as coping acts (Beaudry and Pinsonneault 2005). These acts are mainly based on the user’s initial assessment of new IT (Beaudry and Pinsonneault 2001). Beaudry and Pinsonnault (2005) established the two staged appraisal process and subsequent individual adaptation strategies based on initial appraisals. The adaptation strategies that follow from this are empirically distinct (Elie-Dit-Cosaque and Straub 2011). Users often go through several adaptation cycles and continuously adapt to technology (Beaudry and Pinsonneault 2005; Sun 2012). We can take an example from our preliminary case study to illustrate the definition of the concept of user adaptation: The team leaders were enabled to modify the user interface for their role in system use. They adapted to the occurring discrepancies between system design and their current task by modifying the display of items on their user interface depending on the degree of convenience for their daily job and their most common tasks. We based our research approach on research by Sun (2012), which in turn was based on the aforementioned research.

The Construct of Adaptive System Use

ASU in these cycles has been conceptualized in greater detail by Sun (2012). The ASU model illustrates an individual user’s adaptation behavior in one adaptation cycle (Sun 2012). However, there are many adaptation cycles that might follow each other, which are triggered by various conditions (Beaudry and Pinsonneault 2005). If the outcome of the adaptation mechanism does not meet the user’s expectations, it might trigger a new adaptation cycle (Beaudry and Pinsonneault 2005; Jasperson et al. 2005). The adaptation and the adaptive use are analyzed on the level of FIU. FIU have been proven to be an appropriate level of analysis for the evaluation of use on the individual level. The “basket of system features that are ready to be used by a particular user to accomplish tasks” has recently been defined as the FIU (Sun, 2012, p. 455). The FIU can be seen as the ecosystem of system interactions that the end-user needs in the daily task routine. Such an ecosystem also includes the features that a user is not aware of because such features are often necessary to complete a particular task. Once they are not working as intended the user becomes aware of these features and an adaptation behavior is triggered (Sun 2012). Thus, Sun identifies triggers and triggering conditions for adaptation and changes of the FIU (2012). The identified antecedents/triggers of ASU are novel situations, discrepancies, and deliberate initiatives to improve a system. Sun (2012) defined novel situations as the experience of unfamiliar things in general and identified three sub-constructs. These are new tasks, other’s use, and changes in the system environment. New tasks are defined as a situation in which the user has to perform an unfamiliar task. Other’s use is defined as the observation of others’ system use. It is the definition of a change in one’s system environment that hardware, software, or peripherals change. The trigger of discrepancies is defined as a difference between the outcomes of system use and the related expectations. Deliberate initiatives are defined as a situation in which one is asked to revise his/her use of system features (Sun 2012). An identified moderator for the relationship between the triggers and a state of adaptive system use is the personal innovativeness in IT of individual users (Sun 2012). A moderating effect of facilitating conditions for the same relationship was not identified (Sun 2012). The dimensions of actual ASU are the revision of content of FIU and the revision of the spirit of FIU (Sun 2012). The former dimen-
sion comprises the revisions a user makes regarding his/her FIU, while the latter concerns a user’s revision to the way of using his/her FIU. Both dimensions have two sub-dimensions. The sub-dimensions of the revision of content of FIU are trying new features (Barki et al. 2007; Jaspersen et al. 2005; Sun 2012) and the substitution of features (Parthasarathy and Bhattacherjee 1998; Sun 2012). Trying new features is defined as expanding the scope of FIU by adding new features to one’s FIU. The substitution of features is defined as the replacement of current FIU by new features with similar functions (Sun 2012). A revision of the spirit of FIU is conceptualized as the combination of features (Boudreau and Robey 2005; Desouza et al. 2007; Rice and Rogers 1980) or repurposing of features for a user’s specific kind of system use (Ahuja and Thatcher 2005; Desouza et al. 2007; Jaspersen et al. 2005; Saga and Zmud 1993; Singletary et al. 2002; Sun 2012). A combination of features is defined as the first use of some FIU together. Feature repurposing is defined as the use of one’s FIU in a new way (Sun 2012). It is important to state that this model presents just one iteration of an adaptation episode that might include multiple sequences of adaptation caused by different triggers (Sun 2012). Sun hypothesized that novel situations, discrepancies, and deliberate initiatives are positively associated with EU (2012). This hypothesis was accepted for the novel situations and discrepancies, but not for deliberate initiatives. It was argued that the controlling aspect in deliberate initiatives overshadowed the individual autonomy necessary for EU. Individual adaptation can be seen as a goal-directed action to improve individual effectiveness when working on a task.

The Concept of Effective Use

The concept of EU and representation theory are an important theoretical basis for research on individual technology adaptation (Burton-Jones and Grange 2013). Representation theory is based on the assumptions of critical realism (Burton-Jones and Grange 2013). Thereby the nature of representations and their purpose can be analyzed separately. For instance, a company’s ES shows representations of the current state of a work-related process in an enterprise. The surface structure of the system is the component of the system that users interact with to type data in menus and screens. Thereby they perform their tasks. The physical structure behind the surface consists of clients, servers, and networks. These are used to store the data, to execute programs and to send messages (Burton-Jones and Grange 2013). A very important aspect of the link between representation theory and EU is the link between individual affordances and adaptation. Affordances are defined as what someone can extract from an artifact (Hartson 2003), which is then the basis of his/her use of it. EU is defined as using a system in a way which helps to attain the goals related to using the system (Burton-Jones and Grange 2013; Burton-Jones and Straub 2006). This definition of EU is an adaptation of the definition for system use by Burton-Jones and Straub (2006), that a system, a user, and a task as a goal-directed activity are the basic terms for a definition of system use. The focus of this expression was shifted towards the use of a system to attain a goal that is a relevant goal. This allowed to make the distinction between system use and EU.

The construct of the dependent variable of EU consists of the three dimensions informed action, representational fidelity, and transparent interaction (Burton-Jones and Grange 2013). Burton-Jones and Grange define transparent interaction as the extent to which a user is unimpeded by a system’s surface and physical structures in accessing a system’s representations (2013). Representational fidelity is defined as the extent to which the representations obtained from the user, faithfully reflect the represented domain. Informed action is defined as the extent to which a user acts on the representations obtained from a system to improve his/her state (Burton-Jones and Grange 2013). These sub-constructs can be aligned in a hierarchical nature. Transparent interaction helps to increase the representational fidelity of a system and it in turn can lead to informed action (Burton-Jones and Grange 2013). Burton-Jones and Grange (2013) propose that the overall level of EU of an individual is defined by the aggregate levels of transparent interaction, representational fidelity, and informed action. Thus, EU is an aggregate construct (Burton-Jones and Grange 2013; Law et al. 1998). Based on the assumption that users can adapt their technology individually or initiate a change request with the IT department, individual level sense-making and the subsequent adaptation can lead to EU as defined by Burton-Jones and Grange (2013). This links the idea of user adaptation with the idea of performance improvement of the individual user. The type of performance improvements that can be expected are likely to be the reduction of errors, faster work, and increased revenues for the firm overall (Beaudry and Pinsonneault 2005; Goodhue and Thompson 1995; Pentland 1989; Vessey and Galletta 1991). Our research is focused on the effect of users’ adaptation in the form of ASU of FIU on the EU of an ES.
Hypotheses

The initial phase of appraisal efforts in the adoption phase can be strongly supported by top management’s commitment, as it can influence beliefs about usefulness and ease of use (Beaudry and Pinsonneault 2005; Lewis et al. 2003). It can be assumed that during the post-adoption phase users’ personal characteristics are more important. This notion is reinforced by recent findings on the IT feature level which indicate that individual user’s capability to broaden and deepen the use of IT features decreases over time (Benlian 2015). Users in later stages in the adaptation process increasingly make use of stable subsets of features that they know to complete their tasks. Moreover, it has been shown that growth in FIU leads to the perception of increased immediate performance and of objective performance as well (Benlian 2015). The assessment of use of a system from the perspective of particular users is commonly based on “features in use” (Orlikowski 2000; Sun and Zhang 2008). The features of a system are its functional building blocks. On a feature level, system use can be defined as the use of features of a system by an individual user to perform a task (Burton-Jones and Straub 2006; Sun and Zhang 2008). Hence, we adopt a FIU perspective for the development of the hypotheses. We will test and extend the model developed by Sun (2012). Hence, we will test the relationships that are carried over from the ASU model and test new moderators that we believe to have an influence on ASU and thereby on subsequent EU. To save space and to avoid redundancy, we do not formulate hypotheses which are already established in Sun’s paper (2012). See Figure 1 for an overview of the developed hypotheses. The presented research model shows only one full adaptation episode as it represents an extension of the existing ASU research model by Sun (2012). It is extended by the relationship between ASU and EU and the moderation of this relationship by individual learning styles (Kolb and Kolb 2005). It is important to emphasize that several adaptation episodes might occur in sequence and are started by a trigger (novel situation, discrepancy, deliberate initiative) every time. A new adaptation will also lead to a new perception of EU. However, the perception of EU is a dependent variable in second order to ASU and not a trigger, which initiates another adaptation episode. The whole research model thus represents a generic model for one adaptation cycle that occurs at different points in time.

Changes in task are often a cause for novel situations that trigger ASU (Sun 2012). A modification of tasks can trigger a change in the utilization of a system (Jasperson et al. 2005). Other reasons can be changes in other peoples’ use and changes in the system’s environment (Sun 2012). If the users’ expectations and their perceived reality do not match, a discrepancy is perceived. This can also trigger ASU (Sun 2012). Sun (2012) also hypothesized that deliberate initiatives could trigger ASU. However, this hypothesis was not supported. The argument was that individuals could be asked to perform ASU and that the change of behavior of one user triggers the necessity for ASU for another user. We argue that this hypothesis needs to be tested again because our preliminary, explorative case study was a case in which a deliberate initiatives forced users to perform ASU. Sun (2012) argued that all the aforementioned triggers will lead to ASU by the active cognitive processing in individual users. Such an effect can be moderated by several factors. Prior experience with technology (Agarwal and Prasad 1999; Agarwal et al. 2000) and personal innovativeness (Agarwal et al. 2000; Lewis et al. 2003) have been found to be very important influence for the appraisal of technology and thereby its adaptation (Beaudry and Pinsonneault 2005). It was not possible to show the same effect for facilitating conditions (Sun 2012; Venkatesh et al. 2003). We will analyze other moderating effects on the relationship between the individual triggers and ASU. First, we will assess task-technology adaptation behavior. Barki et al. (2007) stated that most adaptation behavior is geared towards improving one individual or others future interactions with an IS (Barki et al. 2007). However, an individual’s interaction with the technology and its adaptation is often intertwined with the individuals’ task-technology-adaptation behavior (Barki et al. 2007). Task-technology adaptation behaviors are defined as all those behaviors which are directed at change or modification of IT and the kind of deployment and use in an organization (Barki et al. 2007).

Based on Barki et al. (2007) the behavior is measured as the self-reported effort (in terms of time and energy) that users spent to recommend or suggest improvements or modifications for systems and tasks, so that they are well synchronized. Hence, we want to assess whether user’s effort invested in task-technology adaptation moderates the relationship between the triggers (novel situations; discrepancies; deliberate initiatives) and ASU. The amount of effort that an individual invests in the adaptation process is likely to moderate the relationship between the triggers and ASU.

H_{soc}: Task-technology adaptation behavior will moderate the relationship between the triggers (novel situations (a); discrepancies (b); deliberate initiatives (c)) and adaptive system use.
Second, we will assess the perceived technology characteristics. Bala and Venkatesh (2013) identified technology characteristics that influence the characteristics of users’ work process. These characteristics were conceptualized as the employees’ perceptions and not as objective characteristics of the ES. The characteristics are perceived technology complexity, perceived technology reconfigurability, and perceived technology customization (Bala and Venkatesh 2013). Perceived technology complexity can be defined as the extent to which a user perceives an IS to be relatively difficult to understand and use (cf. Bala and Venkatesh 2013). The perceived technology reconfigurability can be defined as the degree to which a user believes that the kind of implementation of an IS supports the modifications and of functionalities and features during the use phase (cf. Bala and Venkatesh 2013). The degree to which a user believes that an IS is tailored for his/her accomplishment of tasks in terms of needs for data, functionality, and outputs, is the definition of the degree of perceived technology customization (cf. Bala and Venkatesh 2013). Bala and Venkatesh (2013) stated further that employee’s perceptions of technology characteristics of an ES will have an influence on their perceptions of the characteristics of work processes in the post-implementation phase. However, employees’ initial response is likely to be dominated by their perceptions of technology characteristics (Bala and Venkatesh 2013). This is why it can be stated that the relationship between a trigger (novel situations; discrepancies; deliberate initiatives) and ASU is strongly influenced by technology characteristics perceived by the users. A user’s adaptation based on a trigger is likely to be moderated by his/her perception of the characteristics of the technology in use in terms of complexity, reconfigurability, and customization.

$H_{20}$: Perceived technology characteristics will moderate the relationship between the different triggers (novel situations (a); discrepancies (b); deliberate initiatives (c)) and adaptive system use.

During this use phase after the introduction an individual performs specific behaviors to adapt his/her use of IS features. This collection of behaviors can be understood as ASU and consists of the sub-constructs revision of the content of FIU (trying new features, feature substitution) and revision of the spirit of FIU (feature combining, feature repurposing (Sun 2012). Users perform these ASU behaviors to a varying degree (Sun 2012). Users generally perform adaptation behaviors on their individual level to regain their efficiency and effectiveness in their job or at least piece of mind (Beaudry and Pinsonneault 2005). While EU of an ES has generally been conceptualized on a system level (Burton-Jones and Grange 2013), it can be adapted to a feature level. Previous research has identified the differing effectiveness of ES application based on different patterns in FIU of individual users (Jasperson et al. 2005). However, Jasperson et al. stress the importance of the feature level because the feature level is the level of use that is relevant to different user groups and determines the effectiveness and efficiency of their daily system use, despite changing forms of system use over time (Jasperson et al. 2005). Users of ES are experts on the features of the system that they need to use for their specific functional jobs. Hence, the feature based concept of information system has a good fit with the proposition of our research on individual adaptation (cf. Veiga et al. 2014). Moreover, ASU only concerns the FIU that are specific to an individual and can thus be related to his/her EU of the system (Sun 2012). EU as a concept is case and context specific (Veiga et al. 2014). Thus, the focus is on the adaptation of representations on the feature level via ASU. The adaptations of features are not always beneficial for EU of these features. However, individuals often choose to work with inefficient features because the suit their personal preferences (Sun 2012) and therefore might lead to the measured perceived EU of a feature. Thus, we conclude that ASU mediates the relationship between the triggers and EU.

$H_{3}$: Adaptive system use will mediate the relationship of the triggers with effective system use.

It is assumed that users will adapt (at least in part) by changing their perception and use of the features of the system and essentially modify them (Beaudry and Pinsonneault 2005; Clark 1987; Leonard-Barton 1988; Rice and Rogers 1980). An individual’s control over the technology determines the degree of mastery that is necessary in order to make informed adaptations. The adaptation effort is informed by learning the structure that the individual users subsequently adapt to their needs (Burton-Jones and Grange 2013). Actions to learn about a feature might include actions to understand its functionalities, the domain it represents, and the representational fidelity. Subsequently, users leverage the feature’s representations for their performance at work (Barki et al. 2007; Burton-Jones and Grange 2013; Sun and Zhang 2008). Hence, an interaction effect between adaptation and learning styles of individuals is likely because both are complementary. An uneducated adaptation could fail to offer benefits and instead cause problems that lead to a reduction of EU (Burton-Jones and Grange 2013). However, adaptations are supposed to lead to the achievement of system-related goals. The strength of this relationship can be influenced by the learning style of the individual, as the learning style influences perception of experiences (Kolb and Kolb 2005; Kolb...
2014). An individual's learning style will influence the perception of the effectiveness of an individual's own adaptations of a system for the perceived EU of a system and therefore moderate the relationship between ASU and EU. In other words, what users make of their adaptations depends on their learning style. For instance, someone who likes to immerse herself in a "hands-on" approach as a learning style can gain a different perception of EU, than someone who rather learns from observation. We aim to analyze the influence of learning styles of individual users on the transitory step between ASU and EU.

\[H_4: \text{Learning style will moderate the relationship between adaptive system use and effective system use.}\]

Research Methodology

We started our research effort by exploring the effects of user adaptation on the EU of ES. First, we conducted a longitudinal qualitative study in a case organization, a multi-channel fashion retailer with a sizable online shop. We conducted multiple interviews with individual users over a time period of eight months before and after the introduction of a major release of a product information management (PIM) software. The release was supposed to update the software to the originally contracted level, since this version had not been ready for implementation for the original project. The case study context allowed us to explore different kinds of user adaptation by interviewing different types of users, such as content managers, team leaders, managers, and the technical department responsible for servicing the system. In combination with the insights from the literature, this holistic view on use allowed us to develop our research model for the quantitative study presented in this paper. Furthermore, the explorative case study allowed us to identify the appropriate time frame and level of analysis for the proposed quantitative study. We discovered, like others before us (Henfridsson 2000), that adaptation often occurs in a continuous transition between an ambiguous and a straightforward situation of use. Whenever the users are in a sense-making process, they have to incorporate the technology in their day-to-day activities. These are the situations in which innovative new uses are most likely to be discovered. Hence, we can also expected the highest degree of ASU in these situations. However, once the user has adapted to a technology and put it to use, the main focus of the end-user tends to revert to the work tasks. During this use phase, technology becomes a barely noticeable part of the daily routines (Henfridsson 2000). Thus, we will administer an online-survey shortly (up to 3 month) after the introduction of changes to ES in use to individual end-users in different user organizations. We chose this approach to analyze multiple cases of user adaptation and to compare the observed effects between the organizations. This will allow us to assess the effect of ASU on EU during the shakedown phase (Markus and Tanis 2000). Our interviews indicated that the analysis should be limited to a list of core FIU of an individual user of a system. This allows a comparison between a wide range of individual adaptations regarding specific features. It also ensures that the related tasks are performed a sufficient number of times. An individual's usage behavior of a specific FIU is therefore the unit of analysis.
Based on the aforementioned insights our proposed research model will be measured in the following way. It is the basic premise of our research approach to test the original ASU model, test a different set of moderators, and to extend the ASU model with the relationships of the constructs of EU and learning. Beyond replication of the original ASU, this involves the assessment of a list of moderators (learning styles (Kolb 2014), task-technology adaptation behavior (Barki et al. 2007), perceived technology characteristics (Bala and Venkatesh 2013)) and the assessment of the dependent variable of EU with a self-developed construct. We have developed an instrument for the measurement of EU on the system level as a proxy for users’ efficiency and effectiveness. This instrument and its underlying conceptualization will be adapted for the measurement of EU on the feature level. Based on Burton-Jones and Grange (2013), we will state that transparent interaction, representational fidelity, and informed action are the dimensions for the aggregate construct (Law et al. 1998) of EU. Having such relationships among constructs is essentially not problematic (see Barki et al. 2007, pp. 176-177; Burton-Jones and Grange 2013). Additionally, we will pose questions on control variables related to the individual user such as personal characteristics (e.g., big five), age, gender, computer self-efficacy, motivation, personal innovativeness with IT, and facilitating conditions. To avoid biases, we will employ ex ante and ex post techniques to reduce the threats to validity from the common-method bias. Also, we will analyze non-response biases (e.g., MacKenzie and Podsakoff 2012; Podsakoff et al. 2003). Furthermore, we will run a pilot study to test our model. After the revision of the measures based on this pilot study, we will administer our cross-sectional survey to users in user organizations.

Data Collection

Preliminary, exploratory data collection has started with 22 semi-structured interviews in the case organization. Semi-structured interviews have been defined as interviews in which pre-formulated questions are used, but not strictly adhered. New questions can emerge during the conversation (Myers 2009). The case organization’s management initiated a major new release of the PIM and a change of the company hosting the ES. We interviewed different types of system users, such as content managers, team leaders, managers, and the technical department responsible for servicing the system before, during, and after the accompanying period of change. We aimed to get an integrated view of the user adaptation to the deliberate initiative by interviewing a set of people over the course of the adoption and adaptation phase for eight months. However, it was not entirely possible since not all professionals were available for the intermediate round of interviews. The interviews were conducted in person and transcribed. Interviews lasted typically between 45–60 minutes. The first eight interviews were conducted before the introduction of the new release, the six intermediate interviews six weeks after the release, and a final series of eight interviews four months after the introduction of the new release. The first interview series started with an assessment of the current system version at the time and with an assessment of the typical adaptation of user with regard to the system. Furthermore, we asked for users and managers’ expectations regarding the introduction of a new PIM system release. The second round of interviews shortly after the introduction included questions whether the expectations had been met and to which extent. It also included questions about the user adaptation and the adaptation process necessary to deal with the new system shortly after introduction. The third round of interviews included a final round of questions whether the expectations had been met as well as questions regarding the adaptation and the adaptation mechanisms. Furthermore, at each step of the data collection process we asked users about the amount and kind of organizational support that they received.

Data Analysis

The research approach of this study is a mixed-method approach. Initially, we conducted a preliminary explorative case study in a longitudinal form. This allowed us to analyze the patterns of adaptation that occur after gradual changes and to develop an initial understanding of adaptation cycles. For the analysis of the case study we followed the principles for conducting the critical-realist research in information systems by Wynn and Williams (2012) and drew on the methodological implications of critical realism for multi-method research presented by Zachariadis et al. (2013). The resultant contributions of a critical-realist study can be classified as type II theories (Gregor 2006), which provide explanations for the occurrence of a phenomenon in a social system (Wynn and Williams 2012). AtlasTI was used for coding the qualitative data. We used a grounded theory-like approach for coding of the data and we started with open coding of the interviews transcripts. These open codes are descriptive and merely allow a categorization of constructs identified in the interview transcripts. The developed categories were intensively compared and contrasted with each other. In a second phase we conducted axial coding to refine the interpretation of the categories and proper-
ties. At this stage we also controlled for a possible researchers’ bias in the categorization process be cross-checking the categorizations of the codes with an independent student assistants categorization of a sample of three examples for each category. The categorization was very similar. During the research process for the case study, we examined possible theoretical explanations for the observations during the longitudinal case-study research process. This led us to the identification of the theoretical link between ASU and EU and the new effort moderators for task-technology adaptation behavior in terms of effort and the influence of perceived technology characteristics. Hence, we now aim to conduct a quantitative study based on the insights gathered from the case and additional literature research and to develop a generalizable model (Mayring 2001). Thus, the ideas for the hypotheses development are grounded in the interview data and observations. Their formulation and further investigation, however, are derived from theory.

Preliminary Findings and Expected Contributions

The analysis of the interviews provided instrumental insights for the design of the quantitative study presented in this paper. We identified the newly introduced moderators in the ASU model during the case study. First, the level of user motivation in the form of task-technology adaptation behavior has a strong influence on user adaptation in general (Barki et al. 2007). Thus, a user’s willingness and ability to make use of adaptive system features will strongly influence an individual’s EU of an ES after an IT event. Furthermore, users will employ different adaptation strategies for each adaptation cycle depending on the situation. Second, we also identified that technology characteristics play an important role for the necessity and ability of an individual user’s adaptation. If a technology is inflexible, users are forced to adapt themselves to a much greater extent. Often users choose to work with the system differently to deal with the characteristics of the technology and adapt their work practices. For instance, in the case organization users adapted and effectively redesigned their routine queries of the PIM to deal with the changed technology characteristics of the system. Moreover, we observed that users aim to restore or gain a maximum level of EU from their individual point of view. They engage in adaptation behaviors of their own and trigger organizational adaptation efforts (e.g. writing tickets) because of the urge to work more effectively. This particular finding leads us to address the relationship of EU and ASU in one adaptation cycle, depended upon the different triggers of novel situations, discrepancies, and deliberate initiatives. Prior research has been based on the assumption that ES implementation projects are essentially disruptive and lead to changes to the technology as well as the work environment and the task (e.g. Bala and Venkatesh 2013). However, we have found evidence that even scheduled events that have no influence on the task cause significant disruptions and adaptation efforts. In our future research, we will assess mainly cases of new introductions and evaluate the relationship between ASU and EU. Nevertheless, we will aim to identify deliberate initiatives that we can include in our list of cross-sectional cases in order to re-test the hypotheses that these are positively related with ASU (Sun 2012). We assume that there is a difference in the amount of ramifications for the individual users’ use of the system. Significant need for user adaptation can also be related to a deliberate initiative depending on the amount and kind of changes. The analysis of cases will be limited to one adaptation cycle and the relationship to different triggers for each observed individual adaptation. For data analysis, we currently aim to conduct a cluster analysis to establish relationships between different triggers and levels of ASU and EU, as well as the learning styles, and the explanatory value of moderators for the relationships in the model.

We expect to provide an evaluated model of the effect of ASU on EU on the level of FIU to the research community. Such an evaluation also includes an adaptation of the concept of EU to the level of FIU. The extension of the nomological network of the concept of EU by an integration of the effect of ASU on EU is the main theoretical contribution of this paper. In addition, we also aim to extend the nomological net with the moderation of that effect by learning styles. Avenues for future theorizing will be opened if we are able to extend the nomological net in such a way. For instance, it would be possible to address the antecedents of EU. This could involve the potential triggers for change and particularly the effect of deliberate initiatives on EU. Our work will add to an increased awareness in such a way that the negative ramifications of IT changes on EU can be reduced. A sense-making process is a prerequisite for adaptation. Efficiency can only occur when routines are allowed to kick in. This makes it necessary to determine the right balance between phases of ambiguity, which requires innovative use, for instance ASU, and routine use situations (Henfridsson 2000). Our work will help organizations to analyze the adaptation efforts that their employees will have to perform when an ES changes. As an extension of these findings, practitioners will find a theoretical motivation to introduce less disruptive, gradual, and manageable change. Furthermore, it will allow them to ensure the ongoing productivity of a user organization through enabling ASU and therefore subsequent EU.
References


