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“I’ll use IT the way I feel like it” – The influence of user emotions on ERP usage

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"I'll Use IT the Way I Feel Like it" – The Influence of User Emotions on ERP Usage

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ABSTRACT

Due to the growing importance of complex information systems (IS) such as Enterprise Resource Planning (ERP), organizations spend millions of dollars to IS implementations. Implementation of ERP triggers a wide range of end user behaviors, which are strongly tied to ERP's success and benefits. Despite the progress that has been made in understanding the acceptance and resistance towards voluntary IS usage, less is known about the role of end user behaviors in mandatory IS usage context. Drawing from coping theory and human-material agency perspective, this paper argues that users can show different behaviors in their ERP usage depending on how they feel about the ERP. Thus, we investigate the influence of both negative and positive emotions of users on their behaviors and how these behaviors affect usage satisfaction and frequency of the ERP. We develop a theoretical framework that classifies user behaviors into two distinct types: end user maneuver, and counterproductive work behavior. The role of these user behaviors on the relationship between both positive and negative emotions and ERP usage is studied through a survey of 271 ERP end users in the U.S. The results show that user behaviors positively mediate the relationship between emotions and ERP usage.

Keywords: ERP, Enterprise Resource Planning, Emotions, Coping, User Behaviors, Human-Material Agency

INTRODUCTION

Due to the rising importance of information systems (IS) for productivity, profitability, and competitive advantage (e.g., Altinkemer, Ozcelik, & Ozdemir, 2011; Dedrick, Gurbaxani, & Kraemer, 2003), organizations have been investing in complex IS such as enterprise resource planning (ERP) systems. ERP is a prepackaged software that integrates all business functions in organizations under a single database to optimize business processes and reduce operating costs

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(Kerimoglu, Basoglu, & Daim, 2008; Seymour, Makanya, & Berrangé, 2007; Stevenson, 2015). A recent "Global ERP Software Market - Size, Industry Analysis, Trends, Opportunities, Growth and Forecast, 2013-2020" report (Chaudhari & Ghone, 2015) by Allied Market Research states that the global ERP market is expected to reach to $41.69 billion and occupy around 57% of the software market by 2020.

Despite the well-known benefits of ERP, the implementation process can be a challenge, and using ERP may not fulfill the organizations' expectations (Kerimoglu et al., 2008; Seymour et al., 2007). Past studies show that around 90% of ERP projects have failed or challenged during the implementation (Beatty & Williams, 2006; Beheshti, 2006; Botta-Genoulaz & Millet, 2006; Chen, Law, & Yang, 2009; Holland & Light, 1999; Koh, Gunasekaran, & Rajkumar, 2008). As one of the key success factors, end users play a critical role in ERP implementation (Akkermans & Helden, 2002; Holland & Light, 1999; Somers & Nelson, 2001). Nevertheless, implementors treat ERP as a computer subject rather than a business subject, mainly focus on the technical and financial aspects of the implementation process, and ignore the importance of the human factor (Botta-Genoulaz & Millet, 2006; Kerimoglu et al., 2008). As ERP is a mandatory system, users may not have a choice to use it or not to perform their tasks. ERP requires changes in business processes, organizational structure, work procedures, integration of administrative and operative functions, and standardization of work practices that are enabled by the technology (Hedman & Johansson, 2009). These dramatic changes affect user routine and can trigger emotional reactions (Beaudry & Pinsonneault, 2010) that can lead to different user behaviors depending on how they feel about the ERP (Beaudry & Pinsonneault, 2005; Stein, Newell, Wagner, & Galliers, 2015).

The extant literature has been studying the influence of user emotions on attitudes, ease and intention of use of the new systems, and perceptions (e.g., Beaudry & Pinsonneault, 2010; Bhattacherjee, 2001; Bhattacherjee, Davis, Connolly, & Hikmet, 2018; Venkatesh, 2000). End users can hold both positive and negative emotions simultaneously for different aspects of ERP (Bhattacherjee et al., 2018; Darban & Polites, 2016; Stein et al., 2015). As their routine changes, users will look for different ways to cope with the triggered emotions while doing their tasks. The coping model of user adaptation (CMUA) states that users can manage consequences that are associated with an IS event with cognitive and behavioral efforts (Beaudry & Pinsonneault, 2005). Hence, it is critical to explore the influence of emotions triggered by ERP implementation and how users select to interact with the system.

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User interaction with the new system is defined as user behaviors in the current research. Prior literature has used different approaches to identify user behaviors which have resulted in a broad and inconsistent use of terminology, definitions and labels such as: 1) acceptance behavior (e.g., Venkatesh, 2000; Venkatesh, Morris, Davis, & Davis, 2003), 2) resistance behavior (e.g., Joia, de Macêdo, & de Oliveira, 2014; Kim & Kankanhalli, 2009), 3) adaptation behavior (e.g., Beaudry & Pinsonneault, 2005; Beaudry & Pinsonneault, 2010), 4) workaround behavior (e.g., le Roux, 2014; Röder, Wiesche, Schermann, & Krcmar, 2016), 5) coping behavior (e.g., Beaudry & Pinsonneault, 2005; Stein et al., 2015), and 6) user responses (e.g., Bhattacherjee et al., 2018). Hence, in an attempt to develop a consistent terminology, current research merges these different types of behavioral responses under the roof of "user behaviors".

The literature on user behaviors can be grouped into three main research streams based on user behavior categorization: 1) avoidance/adaptation strategy, 2) acceptance/resistance, and 3) compliance/non-compliance intentions. However, the extant literature mostly focuses on the first two streams and fails to provide a categorization of user behaviors based on compliance/ non-compliance intentions. The current research proposes two types of user behaviors based on the compliance intentions that are triggered by emotions: counterproductive work behavior (CWB) and end user maneuver (EUM). CWB is defined as the voluntary act of an end user to negatively affect the IS usage (Weatherbee, 2010). Behaviors, such as aggression, theft, purposely failing to follow instructions or doing work incorrectly (Fox, Spector, & Miles, 2001), sabotage, avoiding work, and verbal hostility (Spector & Fox, 2002) are accepted as CWB. There is no definition of EUM in the literature, therefore, we define EUM as the voluntary act of an end user to use the features of the IS for purposes other than designers' intentions to improve IS usage. Reinvention, tweaking, and shadow system use can be accepted as EUM (Boudreau & Robey, 2005; le Roux, 2014).

Although the implementation of ERP might be declared successful; the benefits that are realized by the organizations could be limited if end users choose to use only a subset of the ERP features which will lead to efficiency issues in the system usage (Seymour et al., 2007). Prior studies show that initial acceptance of the IS isn't sufficient for overall success and long term viability and ultimate benefits of the IS depend on end users' efficient usage of it (Bhattacherjee, 2001). Furthermore, end user acceptance and usage continuance are inappropriate for the success measurement of mandatory IS (Zhang, Lee, Huang, Zhang, & Huang, 2005). User behaviors are one of the most important reasons why ERP implementations fail (Basoglu, Daim, & Kerimoglu, 2007; Jiang, Klein, & Chen, 2006; Kim & Kankanhalli, 2009; Wu & Marakas, 2006). However, to our knowledge, no study

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has examined the role of user behaviors on the relationship between both positive and negative emotions and IS usage in the context of mandatory systems. Hence, in the current study, we focus on the emotions that a mandatory system (ERP) triggers. Drawing from CMUA and human agency-material agency perspective, we propose a conceptual model for end users' emotions and behaviors during the ERP usage. We aim to investigate the influence of negative and positive emotions of users on their user behaviors and how these behaviors affect the system usage and frequency.

BACKGROUND AND HYPOTHESES DEVELOPMENT

The Role of Emotions on User Behaviors and ERP Usage

When new IS is in use, it can trigger various emotions for users. Emotions are a mental state of readiness that arise in response to the appraisal of an environmental event perceived as relevant and important to an individual's well-being (Bagozzi, Gopinath, & Nyer, 1999; Lazarus, 1982). The event triggers an emotional response when it interrupts a highly organized, ongoing work routine of a user. The interruptions can be categorized as: 1) challenges (opportunities), and 2) threats (Beaudry & Pinsonneault, 2005). Emotions tend to lead to certain behaviors to cope with the existing situation (Bagozzi et al., 1999). In the context of IS, emotions can be defined as mental states caused by the introduction or usage of a new IS system (Darban & Polites, 2016). The implementation and usage of a new IS system can interrupt end users' routine and trigger different emotional reactions (Beaudry & Pinsonneault, 2010). If the interruption is in the form of an opportunity, it triggers positive emotions because challenges are apprised as enhancing the well-being of an individual. On the other hand, threats induce negative emotions since they are evaluated as having negative consequences for the well-being of an individual (Lazarus, 1982). Negative emotions lead to coping behaviors that reduce negative feelings and enhance positive feelings. User behaviors serve as a bridge to close the gap between an individual's interrupted routines and established new routines (Beaudry & Pinsonneault, 2005).

IS literature has explored acceptance and resistance behaviors mainly in the context of attitude toward technology such as perceived usefulness and perceived ease of use. Yet, they ignored emotions. Recent studies showed the importance of emotions in user behaviors (e.g., Bhattacherjee et al., 2018; Darban & Polites, 2016; Stein et al., 2015). Specifically, enjoyment, pleasure, arousal, anxiety, satisfaction, and playfulness (Bhattacherjee, 2001; Kim, Chan, Chan, & Gupta, 2004; Venkatesh, 2000) are defined as emotions that influence perceived ease of use and usage

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intentions of IS. Most of the extant literature focused on one or two of these emotions. Venkatesh (2000) examined how anxiety, enjoyment, and playfulness affect perceived ease of use. They found that anxiety negatively affects perceived ease of use, whereas playfulness and enjoyment positively affect it. Bhattacherjee (2001) studied the impact of end user satisfaction on IS usage continuous intentions and found that user satisfaction positively influences continuous intentions. Kim et al. (2004) explored the importance of pleasure and arousal on attitude toward use and found that both emotions positively affect it. Cenfetelli (2004) categorized emotions as positive and negative emotions and investigated their importance on perceived ease of use. Their results showed that positive emotions increase, and negative emotions decrease the perceived ease of use.

The users might engage in different behaviors to express their satisfaction/dissatisfaction with the implemented IS (Bhattacherjee et al., 2018; Stein et al., 2015). Although such behaviors may lead to harmful consequences, they may also be used to save time (e.g., Boudreau & Robey, 2005), solve problems (e.g., le Roux, 2014), or avoid rules limitation (e.g., Bulgurcu, Cavusoglu, & Benbasat, 2010). Bagayogo et al. (2013) mapped the IS acceptance and resistance behaviors and created a two-dimensional quadrant. The authors put acceptance/resistance on one axis and conformity/non-conformity with IS terms of use on the other. Conformity with IS terms of use is defined as positive behaviors that are aligned with organizational intent of the implementation, whereas non-conformity with IS terms of use represents negative behaviors that deviate from organizational intent of the implementation. Bagayogo et al. (2013) defined four quadrants as: 1) acceptance and conformity with IS terms of use, 2) acceptance and non-conformity with IS terms of use, 3) resistance and conformity with IS terms of use, and 4) resistance and non-conformity with IS terms of use. In an attempt to create an ontology for user behaviors, Röder et al. (2016) categorized them under 14 types (workaround, shadow system/IT/work, resistance, reinvention, non-compliance, employee/workplace deviance, system misuse, decoupling/loose coupling, rule breaking, fraud, computer abuse, tweaking, non-conformity). However, they did not categorize these based on the underlying user intentions. Thus, drawing from the Bagayogo et al. (2013)'s quadrant, we grouped these 14 user behaviors under two main behaviors based on the underlying intention of users. Since we focus on the mandatory IS usage, the acceptance/resistance behavior of users was unsuitable for the current study. Instead, we used their compliance/non-compliance intentions for our categorization. If the intention of user behavior is positive (conformity with IT terms of use) such as tweaking or reinvention, it is counted as EUM. On the other hand, if the underlying intension of the user behavior is negative and aims to cause harm (non- conformity with IT terms of use) such as computer abuse or rule breaking, it is categorized under CWB.

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Coping Theory

Scholars use different theories to understand the relationship between user acceptance and implementation success, such as the theory of planned behavior (TPB) (Hung, Tang, Chang, & Ke, 2009; Truong, 2009; Yaghoubi, Kord, & Shakeri, 2010), the unified theory of acceptance and use of technology (UTAUT) (Anderson, Schwager, & Kerns, 2006; Seymour et al., 2007; Venkatesh et al., 2003), and the technology acceptance model (TAM) (Autry, Grawe, Daugherty, & Richey, 2011; Chung, Skibniewski, & Kwak, 2009; Youngberga, Olsenb, & Hauser, 2009). However, since these theories assume that the use of systems is voluntary, they are unsuitable for measuring user acceptance of a mandatory IS (Bhattacherjee et al., 2018; Seymour et al., 2007). Prior literature on resistance in mandated IS usage offers a more appropriate theoretic lens based on coping theory to examine user behaviors in mandated IS usage (Bhattacherjee et al., 2018). Thus, we utilize coping theory and CMUA to examine the relationship between both positive and negative emotions and IS usage in the context of mandatory IS.

Previous literature defines coping as "cognitive and behavioral efforts exerted to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person" (Lazarus & Folkman, 1984, p. 141) It is a cognitive process that performed when an individual is faced with a disruptive event like the implementation of a new IS. The cognitive processing occurs in two steps: 1) primary and 2) secondary appraisal (Beaudry & Pinsonneault, 2005). In the first step (primary appraisal) users evaluate the consequence and relevance of the disruptive event. In other words, newly implemented IS will be evaluated and determined as an opportunity or threat. An event can be perceived as an opportunity and a threat at the same time (Lazarus & Folkman, 1984). Therefore, if users see the new IS as an opportunity, they will try to learn and use it in their daily tasks. However, if the new IS is considered a threat, users will try to avoid using it as much as possible. An IS that is perceived as both opportunity and threat may lead users to mixed coping behaviors such as using it in a different way than its original design. In the second step (secondary appraisal), users evaluate their control over the disruptive event and available coping tools for dealing with the event. If users feel that they have control over the functions and features of new IS, they will engage in problem-focused coping. However, if users feel that they have limited control or no control over the functions and featured of new IS, they will engage in emotion-focused coping. While, problem-focused coping aims to directly manage the disruptive event, emotion-focused coping aims to change perceptions of a user towards the consequences of an event or reduce emotional distress (Beaudry & Pinsonneault, 2005; Lazarus & Folkman, 1984).

Recent studies in the literature have utilized the coping theory to investigate the effect of emotions on user behaviors. Beaudry and Pinsonneault (2005) studied user responses to new IS implementation. Drawing from coping theory, the authors developed CMUA and categorized user adaptation behaviors under four patterns: 1) benefits maximizing, 2) benefits satisficing, 3) disturbance handling, and 4) self-preservation. It is argued that if end users appraise new IS as an opportunity and have control over it, they engage in benefits maximizing; however, if they don't have control over it, they engage in benefits satisficing. On the other hand, when users appraise new IS as a threat, yet have control over it, they engage in disturbance handling; but when they perceive no control over new IS, they engage in self-preservation. Rho and Ryu (2011) explored the appropriation and avoidance behaviors for an IS in the context of cybersecurity. The authors concluded that problem-focus coping leads to appropriation, while emotion-focused coping leads to avoidance. Guo, Shao, and Zuo (2012) investigated the mediating role of cognitive theory on the relationship between emotions and IS usage. They concluded that positive emotions such as happiness and excitement are related to opportunity appraisal, whereas negative emotions such as anxiety and anger are related to threat appraisal. Finally, Bhattacherjee et al. (2018) offered a taxonomy of user responses in the context of mandated IS usage. In line with the coping theory, they classified end user responses as engaged, compliant, reluctant and deviant. However, these studies did not investigate how these emotions impact user behaviors such as EUM and CWB.

Drawing from coping theory and CMUA, one can argue that changes in the workplace environment like the implementation of a new IS may trigger strong emotions for users. Users appraise changes to decide whether these changes enhance or hurt their well-being. Changes that are deemed as an opportunity that enhance the well-being of users induce positive emotions. In this opportunity situation, users might choose to follow benefit maximization (problem focused coping). This coping strategy will lead to EUM to deal with the new system and to find a way to adapt. A user filled with positive emotions is more likely to engage in EUM. In contrast, when the users don't have much control over the new IS implementation and usage, they perceive the change as a threat and believe it hurts their well-being. Therefore, such changes induce negative emotions. In this threat situation, end users might choose to follow self-preservation (emotion-focused coping) and they are more likely to engage in CWB. Thus, we hypothesize that:

H_1: Positive emotions will positively influence end user maneuver.
H_2: Negative emotions will positively influence CWB.

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Human and Machine Agencies

Human agency is defined as the people's ability to act for forming and realizing goals that matter to them (Alkire, 2005; Leonardi, 2011; Rose, 1998). It suggests that people are free to engage with technologies in different ways (Boudreau & Robey, 2005). This freedom creates a social change. A human agency perspective suggests that people's work is not determined by the technologies they employ (Leonardi, 2011). People have the option, at any moment and within existing conditions and materials, to 'choose to do otherwise' with the technology at hand. They may choose to use the technology minimally or they may improvise use it in unintended ways (Boudreau & Robey, 2005). Thus, social change is determined by the people, not by technology.

Human agency proponents argue that only human has agency. However, there is a body of literature that challenges this approach and empirically shows that non-human entities have agency as well. Previous literature defines this phenomenon as material agency, machine agency, or non-human agency. Leonardi (2011) defines material agency as the capacity of non-human entities to act their own, apart from human intervention. In other words, technologies such as an IS application can perform without human intervention, and technologies can constrain human actions (Boudreau & Robey, 2005). Hence, existing literature suggests a more balanced approach for incorporating both material and human agencies (Boudreau & Robey, 2005; Leonardi, 2011). Orlikowski (1992) defines this co-existence of agencies as the duality of technology and argues that technology is interactively flexible because of the interaction between human and material agencies.

Several studies in the extant literature have used human agency perspective to investigate the user acceptance/resistant behavior in the IS implementation context. Boudreau and Robey (2005) explored the role of human agency on ERP acceptance in a large government agency. The authors found that users initially chose to avoid using ERP as much as possible. However, after a while, users started using ERP through reinvention. Leonardi (2011) investigated the relationship between human agency and material agency in a flexible routine and technology environment. The results indicated that users decide how to react based on the perception of the technology. If they evaluate technology as a constraint, they switch to another technology. Nevertheless, if end users perceive technology as applicable and useful, they change their routines. Finally, Nevo, Nevo, and Pinsonneault (2016) investigated the patterns of reinvention in the IS usage context. The authors determined that reinvention behaviors can be categorized as performance-oriented and mastery-oriented behaviors. However, the extant literature has not explained how EUM and CWB affect the IS usage in the mandatory IS context. CWB and

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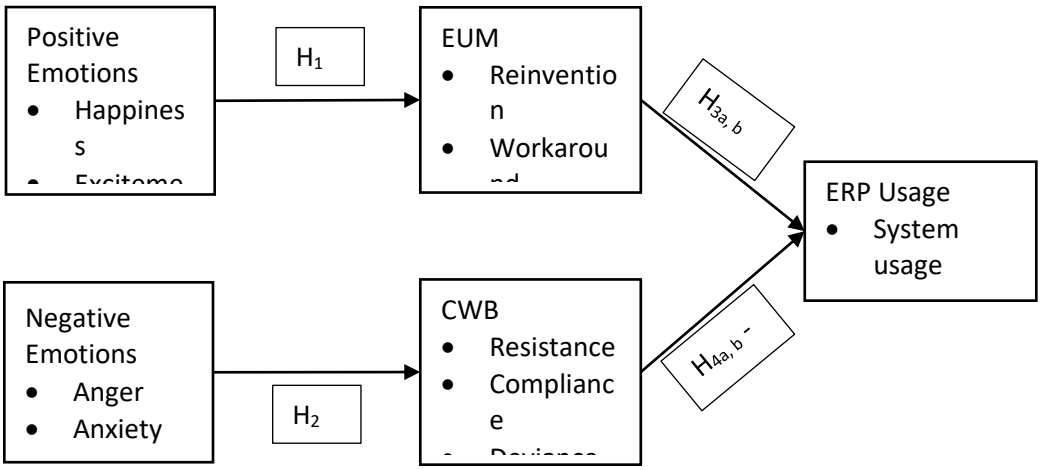
EUM, as user behaviors, will influence the end users' ERP usage in terms of satisfaction and efficiency. Even though users have no option to opt of from using the ERP, their usage behaviors might differentiate depending on how they feel about the changes caused by ERP implementation. If users see the ERP as an opportunity, they will be more willing to use it. In this case, they might engage in EUM in order to be more comfortable with the changes in their routine. Yet, these behaviors will be triggered by the positive emotions about the ERP and eventually should increase users' system usage and their usage frequency. In contrast, when the ERP is perceived as a threat, end users can engage in CWB. CWB, triggered by negative emotions, will intend to sabotage the system usage. Consequently, CWB should decrease users' system usage and their usage frequency. Thus, in line with the literature and drawing from human-material agencies we hypothesize:

H_{3a}: End user maneuver will positively influence ERP system usage.
H_{3b}: End user maneuver will positively influence ERP usage frequency.
H_{4a}: CWB will negatively influence ERP system usage.
H_{4b}: CWB will negatively influence ERP usage frequency.

Figure 1: illustrates the proposed framework.



Theoretical Framework

METHODOLOGY

Sampling Procedure and Data Collection

A questionnaire is developed to test the proposed framework. End users of ERP in the U.S are defined as the target population. Qualtrics panel is used to require eligible respondents. The respondents received a nominal fee to complete the survey. Identifying an adequate sample size is important to ensure the statistical power of the test for the proposed model. Prior literature offers two different approaches for determining a sample size: (1) power analysis (Cohen, 1988) or (2) 10 times rule of thumb (Hair, Hult, Ringle, & Sarstedt, 2014). Power analysis recommends using 0.15 for effect size, a level of 5% for the alpha, and a minimum 80% power (Cohen, 1988; Hair et al., 2014). Alternatively, the 10 times rule of thumb specifies that the minimum sample size needs to be equal to the larger of: (1) 10 times the largest number of formative indicators used to measure a single construct, or (2) 10 times the largest number of structural paths directed at a construct in the structural model. Using the recommended criteria, power analysis suggests a minimum sample of 187 whereas 10 times rule of thumb recommends 100 sample. Therefore, the survey was distributed to 300 random respondents.

The questionnaire included an introduction section explaining the purpose of the study and screening questions to eliminate respondents that do not use ERP. Respondents were asked to complete the survey based on their ERP usage experiences. Data results were screened per two criteria. First, if the reported demographics of a respondent was illogical (e.g., when respondent's tenure and/or years of ERP experience was subtracted from their age the result was less than 18, which indicated he must have started working before age of 18), the respondent was disregarded and replaced with a new respondent by Qualtrics. Second, if the response time was less than 120 seconds, the case was disregarded and replaced. After data screening, only 271 responses were deemed usable (effective response rate of 90.33%). 51.29% of respondents were male. Most of the respondents had a bachelor's degree (40.22%). The average age was 37.01 and majority of the respondents were in the age group of 28-37 (46.49%), and the average ERP experience was 5.70 years and most of the respondents had 1 to 5 years of experience with ERP (60.89%). All respondents were employed in companies that are in the post implementation stage. Additionally, most organizations had 1000 or more employees (59.41%) and they were either an IT (25.83%) or a manufacturing company (15.50%). Table 1 summarizes the descriptive profiles of the respondents.

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Measurement of Constructs

The six constructs of the study are: 1) negative emotions, 2) positive emotions, 3) CWB, 4) EUM, 5) ERP system usage, and 6) ERP usage frequency. Each construct is measured using multi-item, seven-point, Likert scales. Measurement items of all variables are adapted from existing validated scales of the extant literature. Negative emotions were measured as anger and anxiety. Anger was measured using one item from Beaudry and Pinsonneault (2010) and three items from Darban and Polites (2016). Furthermore, anxiety was measured using one item from Beaudry and Pinsonneault (2010), and four items from Compeau, Higgins, and Huff (1999). In addition, positive emotions were measured as happiness and excitement, and the measures were adapted from Beaudry and Pinsonneault (2010) (one item each) and Darban and Polites (2016) (three items each). See Appendix A for detailed items.

Table 1: Descriptive Profiles of the Respondents

Descriptive Characteristics	n	%	Descriptive Characteristics	n	%
Age			*Gender*		
18-27	38	14.02	Male	139	51.29
28-37	126	46.49	Female	131	48.34
38-47	69	25.46	*Education*		
48-57	23	8.49	High School	35	12.92
58-67	15	5.54	Two-year Collage	49	18.08
Position			Bachelor's Degree	109	40.22
Senior Manager	86	31.73	Master's Degree	63	23.25
Middle Manager	68	25.09	Doctoral Degree	15	5.54
Technical	34	12.55	*Industry*		
Professional Staff	45	16.61	Manufacturing	42	15.50
Administrative	27	9.96	Baking-Finance	24	8.86
Other	11	4.06	Information Technology	70	25.83
Tenure			Healthcare	29	10.70
01-05	112	41.33	Government	13	4.80
06-10	92	33.95	Utility	6	2.21
11-15	42	15.50	Academic-Education	23	8.49
16-20	15	5.54	Wholesale-Retail	33	12.18
>20	10	3.69	Other	31	11.44
ERP Experience			*Organization Size*		

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01-05	165	60.89	≤100	7	2.58
06-10	77	28.41	0101-0500	22	8.12
11-15	22	8.12	0501-1000	81	29.89
16-20	7	2.58	1001-5000	83	30.63
			>5000	78	28.78

There are various types of CWB, however, these behaviors can be categorized into three main types: 1) resistance, 2) compliance and 3) deviance. Prior literature attempts to measure these behaviors individually. We used the resistance scales developed by Kim and Kankanhalli (2009) and Joia et al. (2014) to create a second order CWB construct. The authors each offered four items to measure resistance behavior against IS usage. These two scales were combined to investigate the resistance to ERP. Furthermore, compliance was measured using three items developed by Bulgurcu et al. (2010). Finally, deviance was measured with five items adapted from Zhang, Luo, Liao, and Peng (2015). Like CWB, EUM also can be broken into subcategories. Two main categories that the prior studies defined are reinvention and workaround behaviors. To measure the second order EUM construct, six items from Sun (2012) and 11 items from le Roux (2014) were used. Two separate constructs were used to measure ERP usage. 30-item scale developed for end user system-use by Doll and Torkzadeh (1998) were adapted to measure ERP system usage. Further, ERP usage frequency was measured with three item scale developed by Rajan and Baral (2015). Finally, demographics questions such as gender, age, education, prior ERP experience, and tenure in current position were asked as control variables.

RESULTS

Partial least square (PLS), which is a latent structural equation modeling technique, is used to analyze the data in this study. We choose PLS because it aids the theory development process and it is applicable for research seeking to determine key drivers of a construct through causal-predictive testing (Chin, 1998; Hair, Ringle, & Sarstedt, 2011). Further, PLS is capable of providing robust analysis with smaller sample sizes (Chin, 1998). PLS analysis is conducted in two steps: 1) assessment of the measurement model and 2) assessment of the structural model. The proposed model conceptualizes positive emotions, negative emotions, CWB, and EUM as HOCs, where each construct has two LOCs. As all LOCs are treated as sub-dimensions of their respective HOC, they are modeled to be reflective in the measurement. Additionally, ERP system usage and usage frequency are used as dependent variables in the model. Finally, gender, age, prior ERP experience, tenure in current position and education are used as control variables.

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Measurement Model

The strength of the measurement model can be established through measures of reliability and validity. Therefore, the reliability and validity of each construct and measures were assessed before testing the hypothesized relationships in Figure 1. Analysis conducted using Smart-PLS 3.2.1. Outer loadings were examined for reliability check. Four items (Workaround 1, 2, 6, and 7) were dropped from the model due to low loadings (below 0.70). Furthermore, the compliance construct was excluded from the model as its items did not load on to the high order construct (HOC) of CWB. Remaining eight low order constructs (LOCs) with a total of 43 items, and ERP usage with 30 items and usage frequency with three items were used in the model.

Measurement reliability was tested using the composite reliability scores. All scores were above the recommended threshold (0.70), indicating no reliability issues (Hair et al., 2014). In addition, the analysis of average variance extracted (AVE) was used to confirm the convergent validity of constructs. The results indicated that all AVE values were higher than 0.50, which established the convergent validity of all constructs. Table 2 illustrates the construct reliability and validity scores.

Table 2: Construct Reliability and Validity Scores

	Composite Reliability	Average Variance Extracted
Positive Emotions	0.974	0.825
Happiness	0.963	0.868
Excitement	0.959	0.854
Negative Emotions	0.969	0.774
Anger	0.966	0.876
Anxiety	0.951	0.794
EUM	0.965	0.680
Reinvention	0.969	0.837
Workaround	0.929	0.651
CWB	0.964	0.674
Resistance	0.980	0.859
Deviance	0.966	0.850
System Usage	0.982	0.651
Usage Frequency	0.857	0.667

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Finally, Fornell and Larcker (1981)'s internal consistency measure was used to test the discriminant validity. The analysis showed that the square root of AVE value for each HOC or latent variable was greater than its highest correlation with any other HOC or latent variable. The results provide support for the discriminant validity between HOC and latent variables (Table 3). In addition to validity and reliability test, full collinearity variance inflation factor (VIF) values were investigated to test common method variance. As Kock (2015) recommends, full collinearity VIF values were below 3.3 (highest = 2.392), which indicates no common method variance issue.

Table 3: Fornell and Larcker's Internal Consistency of Constructs

	1	2	3	4	5	6
(1) Positive Emotions	0.909					
(2) Negative Emotions	-0.181	0.880				
(3) EUM	0.260	0.651	0.825			
(4) CWB	0.082	0.734	0.762	0.821		
(5) System Usage	0.662	-0.114	0.199	-0.006	0.807	
(6) Usage Frequency	0.475	0.028	0.275	0.105	0.519	0.817

Structural Model

The explanatory power of the structural model can be determined by R^2 values and the significance levels of the path coefficients (Chin, 1998). Hence, adjusted R^2 value was analyzed to evaluate the explained variance of an endogenous variable (CWB, EUM, ERP system usage, and usage frequency) by all the exogenous variables (positive and negative emotions) with a path to it. The R^2 values of 0.25, 0.50, and 0.75 for an endogenous variable was considered weak, moderate, and substantial respectively (Hair et al., 2011). The R^2 value for CWB was moderate (R^2 = 0.582) and EUM, ERP system usage and frequency were weak (R^2 = 0.064, 0.169, 0.182, respectively). Further, effect sizes of the significant path coefficients were used to test the relative importance of each exogenous variable as a predictor of its related endogenous variables. To do that, f^2 was assessed. Recommended thresholds to assess f^2 values were 0.02 for a small effect, 0.15 for medium effect, and 0.35 for large effect (Hair et al., 2014). Based on these thresholds, the results indicate that the effect of negative emotions on CWB was large (f^2 = 1.396) and the effect of positive emotions on EUM was small (f^2 = 0.073). Further, the effect of CWB on ERP system usage and usage frequency, as well as the effect of EUM on the same constructs were all small (f^2 = 0.042, 0.035, 0.097, 0.089, respectively).

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Subsequently, the significance level of the path coefficients in the structural model was evaluated through running the bootstrapping routine with 500 resamples (Hair et al., 2014). The results suggest that the effect of positive emotions on EUM (β = 0.260, p = 0.000) as well as the effect of negative emotions on CWB (β = 0.734, p = 0.000) are positive and significant, which supports hypothesis 1 and 2. Similarly, results of the study indicate that CWB negatively influences ERP system usage (β = -0.293, p = 0.000) and usage frequency (β = -0.263, p = 0.000), whereas EUM positively influences ERP system usage (β = 0.436, p = 0.000) and usage frequency (β = 0.417, p = 0.000). Thus, hypotheses 3a,3b, 4a, and 4b are all supported. The results also reveal that measuring positive emotions with happiness (β = 0.980, p = 0.000), and excitement (β = 0.979, p = 0.000), and negative emotions with anger (β = 0.961, p = 0.000) and anxiety (β = 0.970, p = 0.000) is appropriate. Further, reinvention and workaround (β = 0.964, 0.959, p = 0.000, 0.000, respectively) are dimensions of EUM, and resistance and deviance (β = 0.943, 0.789, p = 0.000, 0.000, respectively) are dimensions of CWB (Figure 2).

Analysis of control variables show that tenure has significant impact on ERP system usage (β = 0.176, p = 0.003) and usage frequency (β = 0.169, p = 0.008), age only affects ERP usage (β = 0.177, p = 0.003), whereas prior ERP experience only affects usage frequency (β = 0.204, p = 0.002). On the other hand, gender and education have no significant impact on either ERP system usage (β = 0.031, 0.015, p = 0.584, 0.809, respectively), nor usage frequency (β = 0.089, 0.047, p = 0.104, 0.446, respectively).

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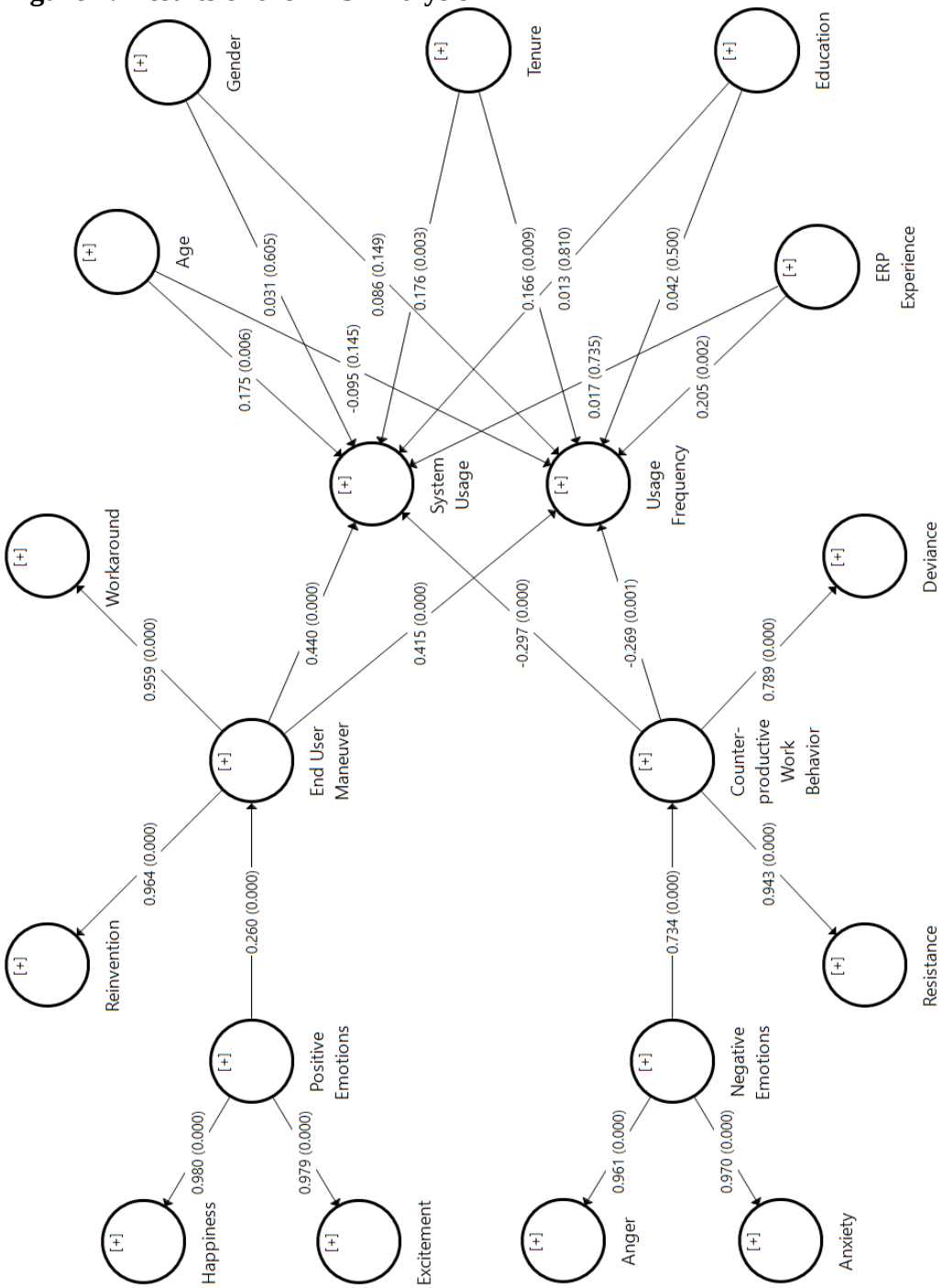
Figure 2: Results of the PLS Analysis



DISCUSSION AND CONCLUSION

Organizations spend millions of dollars to implement complex IS such as ERP, which plays an increasingly important role in today's competitive business environment. Understanding how end users decide to use a mandatory system like ERP is a vital need in the IS field. In the extant literature user behaviors have been regarded as crucial for successful implementation of ERP (Akkermans & Helden, 2002; Holland & Light, 1999; Somers & Nelson, 2001). End user behaviors can be heavily influenced by users' emotions as a result of the IS implementation (Guo et al., 2012). Most of the previous research on emotions in IS usage has focused on acceptance of IS in voluntary settings (e.g., Bagayogo et al., 2013; Beaudry & Pinsonneault, 2005). Therefore, this study focuses on the emotions of end users triggered by ERP implementation and aims to understand how these emotions influence user behaviors and ultimately system usage and frequency of a mandatory IS (ERP). To capture the users' feelings about ERP, most commonly used two positive (happiness and excitement) and two negative (anger and anxiety) emotions are adopted from the extant literature (e.g., Beaudry & Pinsonneault, 2010; Darban & Polites, 2016; Guo et al., 2012). Further, two types of user behavior based on end users' compliance intentions: end user maneuver (EUM) and counterproductive work behavior (CWB) are developed and used as a mediator of the relationship between the end user emotions and ERP usage (system usage and frequency). Drawing from the coping and human-material agency theories, six hypotheses are proposed, and results of the data analysis suggest that all are strongly significant. Results of the research show that end user behaviors positively mediate the relationship between emotions and ERP usage.

The results reveal that positive emotions are positively related to EUM; however, it only explains 6.4% of its variance. This suggests that positive emotions lead users to reinvent the ERP functions and/or use workarounds to cope with the changes in their work routines caused by ERP implementation. However, the low R_2 indicates that positive emotions are not the only or main reason for end users to engage in EUM. One could argue that users that have positive feelings against the new IS may not feel the need to engage in EUM to use it. Previous literature shows that users engage in coping behaviors to adapt to the changes in their routines as a result of the new IS implementation (Beaudry & Pinsonneault, 2005), and IS usage increases because of such behaviors even for users happy with the IS (Beaudry & Pinsonneault, 2010). This calls for more research on when and why end users engage in EUM and the role of positive emotions on user behaviors. Our results also show that negative emotions have a direct effect on CWB and explain 58.2%

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of its variance. This indicates that end users that carry negative emotions against the new IS engage in CWB, therefore, negative emotions very critical for CWB initiation. These results are consistent with coping theory and the literature which suggests that users that feel negatively about the new IS will engage in coping behaviors to establish emotional stability and reduce the emotional stress caused by the negative emotions (Lazarus & Folkman, 1984).

The results of the current research indicate that users' system usage and usage frequency of ERP increase when EUM is higher whereas they decrease as a result of increased CWB. EUM and CWB together explain 16.9% and 18.2% of the variance of ERP usage and usage frequency respectively. Although EUM causes ERP functions to be used unintended ways by end users, these behaviors might help users to more comfortably use ERP as they increase end users' system usage and ERP usage frequency. On the other hand, engaging CWB negatively affects user system usage and usage frequency of ERP. These results are consistent with the human-material agency perspective and results of the previous literature. Even if organizations mandate the usage of ERP, users may find different ways to overcome system limitations to use the system unintended ways or relying on alternative means to complete their assigned tasks (Boudreau & Robey, 2005).

This study makes several contributions to the literature. First, it extends IS usage research into a mandatory setting, by combining the coping theory and human-material agencies. We also develop a novel framework to examine how end users cope with the emotions triggered by ERP implementation and how these behaviors affect their ERP usage. Even though prior studies have used each theory to study the user behaviors against new IS implementation, no study to date has combined them to investigate emotions - user behavior - ERP usage relationship. The framework provides a deeper understanding of end user behaviors against new IS usage and their triggers. Second, this study represents a first effort in identifying two important user behaviors (EUM and CWB) based on user compliance intention. While prior literature has yielded significant insights, it suffers from a lack of proper theoretical foundation and use of inconsistent terminology due to the use of different approaches to identify user behaviors. Drawing from the coping theory, this research defines and differentiates EUM and CWB. EUM presents an umbrella for all end user behaviors with compliance intention, whereas CWB represents behaviors with non-compliance intention. These two constructs describe different aspects of user behaviors and together offer a complete view of user behaviors triggered by emotions. Third, the current study contributes to the extant literature by developing a measurement scale for EUM and CWB. Although similar constructs have been used in the prior studies, there is no valid measure for these

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two constructs. We have modified scale items from previous research and empirically tested and validated the validity and reliability of the scale.

Managerial Implications

The current research has several implications for managers. First, the results highlight the importance of emotions on user behaviors in a mandatory ERP implementation and demonstrate the need for managers to understand how users feel about it. During ERP usage, end users can simultaneously have positive and negative feelings for different features of ERP (Bhattacherjee et al., 2018). This creates a unique challenge for managers. They should not assume that users either feel negatively or positively about the ERP. It is unwise for managers to focus only on the feelings of an end user about one section of the ERP and ignore their feelings about the rest. To do so, may lead to unintended consequences. Second, this research highlights the importance of emotions in user behaviors. Thus, this study demonstrates the need for managers to understand how end users feel about ERP. By doing so, managers can take necessary actions that are likely to reduce end users' negative emotions and increase positive emotions to improve ERP usage performance. For example, managers might prepare trainings for reluctant users to inform them regarding the benefits of ERP. Further, managers can have an honest discussion with the users to receive feedback regarding the underlying reasons of negative emotions and provide solutions to overcome these reasons. Third, the results indicate that while EUM positively influences ERP usage, CWB negatively impacts it. Hence, managers may let end users engage in EUM if users feel more comfortable using the ERP in their ways. Yet, managers also must be careful about CWB intentions as it is triggered by negative emotions and it decreases ERP usage. Hence, managers should monitor such behaviors and have policies to avoid them.

Limitations and Future Research

Despite our encouraging findings, we note several limitations and future research avenues with our study. First, the data's cross-sectional structure and the use of only one type of IS (ERP) limits our ability to generalize the results. Second, the retrospective nature of the questionnaire may lead to recall bias. Even though this study follows common practices from similar studies and provided solid anchor points in the survey, requiring respondents to recall the intensity of specific emotions about ERP may lead to recall bias.

One could extend the current research in at least two directions. First, although emotions are experienced individually, they are likely to be influenced by the group and contextual factors such as peer reactions and organizational culture. Therefore,

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future studies should investigate the influence of contextual factors on user emotions. Second, there is a need to study a wider range of emotions and user behaviors. Although happiness, excitement, anger, and anxiety are the most frequency emotions that are measure in IS usage literature, there are other emotions such as joy, fear, trust, etc. Similarly, this study only uses reinvention, workaround, resistance and deviance as user behaviors. However, prior studies showed that there are many other user behaviors such as shadow system use, tweaking, customization, etc. Future studies should investigate the effect of different emotions and user behaviors on IS usage.

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APPENDIX A

Measurement of research constructs (*Items in italic were dropped to improve divergent validity in the final model.*)

Emotions: Please considering your experience using an ERP system and indicate the extent to which you agree/disagree with the following statements below.

Coding	Items	Coding	Items
Positive Emotions		**Negative Emotions**	
HAP1	I feel happy while using ERP.	**ANG1**	I feel angry while using ERP.
HAP2	I am happy that I use ERP.	**ANG2**	Thinking that I am going to use ERP make me feel angry.
HAP3	I feel cheerful about using ERP.	**ANG3**	Using ERP makes me irritated.
HAP4	It is satisfying that I use ERP.	**ANG4**	I am fairly annoyed because I use ERP.
EXC1	I feel excited while using ERP.	**ANX1**	I feel anxious while using ERP.
EXC2	Using ERP is exciting.	**ANX2**	I feel apprehensive about using ERP.
EXC3	It is interesting to use ERP.	**ANX3**	It scares me to think that I could cause data quality issues to destroy a large amount of information by entering wrong data to ERP.
EXC4	Knowing that I use ERP is stimulating.	**ANX4**	I hesitate to use ERP for fear of making mistakes I cannot correct.
		ANX5	ERP is somewhat intimidating to me.

User Behaviors: Please indicate the extent to which you perform each of the behaviors below while using ERP

Coding	Items	Coding	Items
End User Maneuver		**Counterproductive Work Behavior**	
WAR1	*I use software like MS Excel to develop my own reports using data from the ERP.*	**RES1**	I do not comply with the change to the new way of working with the ERP.

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WAR2	*I use software like MS Excel to make calculations using data from the ERP.*	**RES2**	I do not cooperate with the change to the new way of working with the ERP.
WAR3	I use old (legacy) systems because they have features that are not available in the ERP.	**RES3**	I oppose the change to the new way of working with the ERP.
WAR4	I enter specific data, which the ERP did not have fields for, into some other fields.	**RES4**	I do not agree with the change to the new way of working with the ERP.
WAR5	I access the ERP using someone else's username to gain access to data or functionality that I require.	**RES5**	I do not adapt the changes accrued from the ERP.
WAR6	*I send data exported from the ERP to colleagues in other formats (spreadsheet or text).*	**RES6**	I do not cooperate with the development of the new workflow of the ERP.
WAR7	*I receive data exported from the ERP from colleagues in other formats (spreadsheet or text).*	**RES7**	I do not agree with the changes associated with the ERP.
WAR8	I use old (legacy) systems because they support my tasks better than the ERP does.	**RES8**	In general, I resist the ERP.
WAR9	I enter 'dummy' values into required fields in the ERP to complete my tasks.	***COM1***	*I comply with the security requirements of the ERP.*
WAR10	I let a work process continue by phoning, e-mailing or speaking to a colleague as opposed to following the ERP's procedures.	***COM2***	*I protect information and technology resources according to the security requirements of the ERP.*
WAR11	I access the ERP using someone else's username to complete tasks.	***COM3***	*I carry out my responsibilities prescribed in the security requirements of the ERP.*

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RIN1	I use some features in the ERP in ways that are not intended by the developer.	**DEV1**	I intentionally work slower than I could have worked.
RIN2	The developers of the ERP would probably disagree with how I use some features in the ERP.	**DEV2**	I take an additional or a longer break than is acceptable at my workplace.
RIN3	My use of some features in the ERP is likely at odds with its original intent.	**DEV3**	I work on a personal matter instead of work for my company.
RIN4	I invent new ways of using some features in the ERP.	**DEV4**	I purposely do my work incorrectly.
RIN5	I create workarounds to overcome the ERP restrictions.	**DEV5**	I purposely fail to follow instructions.
RIN6	I share my username with someone else.		

System Usage: Please indicate the extent to which you agree/disagree with the following statements below.

Coding	**Items**	**Coding**	**Items**
End User Maneuver		**Counterproductive Work Behavior**	
SUG1	I use the ERP to decide how to best approach a problem.	**SUG16**	I use the ERP to coordinate activities with others in my work group.
SUG2	I use the ERP to help me think through problems.	**SUG17**	I use the ERP to exchange information with people in my work group.
SUG3	I use the ERP to make sure the data matches my analysis of problems.	**SUG18**	I use the ERP to help me manage my work.
SUG4	I use the ERP to check my thinking against the data.	**SUG19**	I use the ERP to monitor my own performance.
SUG5	I use the ERP to make sense out of data.	**SUG20**	I use the ERP to plan my work.
SUG6	I use the ERP to analyze why problems occur.	**SUG21**	I use the ERP to communicate with people who report to me.

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SUG7	I use the ERP to help me explain my decisions.	**SUG22**	I use the ERP to communicate with people I report to.
SUG8	I use the ERP to help me justify my decisions.	**SUG23**	I use the ERP to keep my supervisor informed.
SUG9	I use the ERP to help me make explicit the reasons for my decisions.	**SUG24**	I use the ERP to exchange information with people who report to me.
SUG10	I use the ERP to rationalize my decisions.	**SUG25**	I use the ERP to get feedback on job performance.
SUG11	I use the ERP to help me control or shape the decision process.	**SUG26**	I use the ERP to deal more strategically with internal and/or external customers.
SUG12	I use the ERP to improve the effectiveness and efficiency of the decision process.	**SUG27**	I use the ERP to serve internal and/or external customers.
SUG13	I use the ERP to make the decision process more rational.	**SUG28**	I use the ERP to improve the quality of customer service.
SUG14	I use the ERP to communicate with other people in my work group.	**SUG29**	I use the ERP to more creatively serve customers.
SUG15	My work group and I use the ERP to coordinate our activities.	**SUG30**	I use the ERP to exchange information with internal and/or external customers.

Usage Frequency:

Coding	**Items**	
UFQ1	On average, how much time (in hours) do you spend per day using the ERP for job related work?	
	30 minutes or less	3 to 4 hours
	30 minutes to 1 hour	4 to 5 hours
	1 to 2 hours	More than 5 hours
	2 to 3 hours	
UFQ2	On average how frequently do you use the ERP?	
	Rarely	6 to 8 times a day
	Once a day	8 to 10 times a day
	2 to 4 times a day	More than 10 times a day
	4 to 6 times a day	

UFQ3	How do you consider the extent of your current the ERP use?	
	Very low	Slightly high
	Low	High
	Slightly low	Very high
	Neutral	

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