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Pacific Asia Conference on Information Systems (PACIS)

6-18-2013

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GAIN AND LOSS IN SYSTEM SWITCHING: A BEHAVIORAL ECONOMICS VIEW TO UNDERSTAND THE JOINT EFFECTS OF SYSTEM USAGE PERFORMANCE ON USER SATISFACTION

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Abstract

Information systems acceptance has long been an interesting topic for both researchers and managers. It is necessary to understand user's attitudes and behaviors toward an information system so as to evaluate the consequence of system implementation. Different from previous research, this study investigates user acceptance toward a newly introduced system from a behavioural economics perspective. Specifically, the study targets the effects of system usage outcomes on user satisfaction in a mandatory context where an old system is replaced by a new one. Based on the Prospect Theory, we argue that users evaluate the new system according to their perceptions from a value function, comparing their current system usage status with a reference point in terms of gain and loss. By describing a three-stage system switching process, this study unpacks how the usage outcomes of both the old and the new system and their contrasts affect perceived value toward the new system, which positively predicts user satisfaction. The system usage performances related to both the old and the new system are incorporated in the research model. Their joint effects, the main and the interacting effects, on user satisfaction with the new system are explicitly explored and explained. Findings of the study enable firms to better understand a system switching process and to design more effective managerial interventions for improving new system acceptance.

Keywords: system usage performance, user satisfaction, mandatory context, switching process, prospect theory

1 INTRODUCTION

Information systems (IS) are prevalently adopted in organizations. More and more firms are relying on information technology/systems to coordinate work routines and to improve work efficiency. A successful IS implementation can increase a firm's competitiveness (Rai and Tang 2010) as well as its innovation capacity (Tambe et al. 2012). In contrast, user's dissatisfaction or resistance to a system might result in a failure of implementation (Lapointe and Rivard 2005), and the negative sentiments are shown to adversely affect job-related outcomes (Morris and Venkatesh 2010; Hsieh et al. 2012). It is therefore important to understand user's attitudes and behaviors toward a system so as to improve their system acceptance. With rapid development of information technology, many firms upgrade their old systems for more advanced functions and mandate their employees use the new systems in working contexts. In this case, users have experience of both the old and the new system. The different experience of using the two generation systems can shape their evaluation, and further, satisfaction with the new system.

A large number of previous studies focus on understanding IS acceptance, including pre-adoption intention and post-usage behavior, with behavioral intention and usage as dependent variables. However, most of them investigate the contexts where users are free to adopt a system or not. Moreover, there is very little research examining how factors of an old system affect user acceptance of a new one. Kim and Kankanhalli (2009) propose that switching benefits/costs compared to the old system can influence user resistance to the new system. Even so, they do not include a direct impact from the old system. One exception is the recent research by Polites and Karahanna (2012). They explicitly study the inhibiting effect of incumbent system habit on behavioral intention to accept the new system. The model is empirically validated in a voluntary context where the incumbent and the new system supporting file sharing are coexisting and available for use. Starting from this motivation, our study aims to understand user satisfaction with a new system in a mandatory working context, where an old system is switched to a new system. Experiencing both the old and the new system makes the mechanisms underlying user acceptance more complex. It is thus necessary to refine our understanding about how user satisfaction is differentially influenced by the two generations of information systems during the system switching process.

A behavioral economics view is employed to predict the impacts of usage outcomes from both the old and the new system on user satisfaction. Based on the Prospect Theory (Kahneman and Tversky 1979), individuals make decisions of a prospect with a value function and decision weights. The value function is defined by a reference point and the magnitude of change related to observed outcomes. For a sure prospect, namely, when system switching and usage are mandatory, the risky weights are already given and therefore can be excluded in the analysis. If so, the value function edited with gain and loss in system usage outcomes becomes the main component in interpreting user's evaluation of the new system, where the outcome of using the old system works as a reference point. Prior research has indicated that user satisfaction is positively influenced by perceived value (Kim and Kankanhalli 2009). Therefore, the system usage outcomes related to both the old and new systems can predict user satisfaction with the new systems based on the mechanism in value perception. In the study, we follow this line of logic to investigate how system usage performances of both the old and the new system can jointly affect user satisfaction with the new system. Here, user satisfaction represents the overall affective and cognitive assessment of IS usage experience (Au et al. 2008), and system usage performance is conceptualized as an outcome of system usage experience. More importantly, the perceived value function is non-linear with decreasing marginal value and is generally steeper for losses than for gains (Kahneman and Tversky 1979). As a result, the effect of system usage performance may be interdependent so that the system usage outcome associated with the old generation can interact with the outcome associated with the new generation in influencing user satisfaction with the new system. Our study explores not only the main effect but also the interacting

effect among system usage performances related to both the old and the new system with theorems in the prospect theory.

In particular, we consider three stages constituting a system switching process, namely an old system is switched to a new generation. In the first stage, individuals use the old system with steady system usage performance. When a new system is just introduced, employees will experience a transitory stage where they are learning about the new system following a learning curve (Zangwill and Kantor 1998). Finally, a new steady level of system usage performance is reached again. According to the prospect theory, the contrasts of outcome in each stage associated with both the old and the new system will be coded as gain and loss in forming user's perceived value, which in turn, positively predicts their satisfaction with the new system. In this study, we incorporate system usage performance of both the old and the new system, and investigate their joint impacts on user satisfaction with the new system in the last stage. The research model will be empirically validated in a context where (1) users are mandated to use the information system for daily duty and (2) the old system is switched to the new system with no parallel running. A longitudinal study will be conducted to collect data in three stages of the system switching process.

This study contributes to the literature in several ways. First, it brings in a behavioral economics perspective to study IS acceptance. That is, users evaluate a new system based on their perceived gain and loss in system usage outcomes. Second, by incorporating the factors associated with both the old and the new system, their joint effects, namely the main and the interacting effects, of system usage performance on user satisfaction with the new system are explicitly explored and explained. Third, a three-stage system switching process is described so that it will generate insights for firms to understand the role of each stage in system switching, and thereby design effective managerial interventions to improve the new system acceptance.

The study is still in progress. In the next section, we introduce the theoretical background focusing on user acceptance in mandatory contexts and the behavioral economics view. The research hypotheses are developed in section three. In section four, we introduce our future research plan with empirical analysis. The final section presents the potential contribution.

2 THEORETICAL BACKGROUND

There are two related streams of literature in our study. One is from IS literature, user acceptance of information technology/systems. We especially focus on the differences between voluntary context and mandatory context. The other is from economics literature, the Prospect Theory. We introduce the behavioral economics perspective to explain the mechanism in perception of system value.

2.1 IS Acceptance in Mandatory Contexts

Much prior research has focused on understanding IS acceptance. Davis (1989) applies the Theory of Reasoned Action (TRA) (Fishbein and Ajzen 1975) in a voluntary IS context and introduces two beliefs, perceived usefulness and perceived ease of use, to predict user acceptance. Venkatesh and Davis (2000) extend this model by including normative belief as an additional determinant of behavioural intention. Perceived behavioral control is further incorporated (Taylor and Todd 1995) based on the Theory of Planned Behavior (TPB) (Ajzen 1991). Venkatesh et al. (2003) propose UTAUT which further elaborates the predictors of behavioral intention and usage. Recently, the model is extended to a consumer context with another three predictors (Venkatesh et al. 2012). Unlike previous research, this study attempts to understand user acceptance toward a new system in a mandatory context, where the new system is introduced to replace an old system. Different from voluntary contexts, in mandatory contexts, investigating behavioral intention becomes no longer meaningful when organizations force users to work with the system (Delone and Mclean 1992). Instead, the questions of whether and how system usage behavior would affect user satisfaction deserve more considerations (Melone 1990).

For this reason, user satisfaction with the new system is employed as the dependent variable, which reflects the extent to which systems can adequately fulfil user's task needs (Au et al. 2008; Gelderman 1998). Bhattacherjee and Premkumar (2004) define user satisfaction as a positive emotional state resulting from IS usage experience. Hsieh et al. (2012) suggest that employees may differ in their satisfaction when the use of system satisfies their individual work needs in different extents. When system usage is mandatory, user satisfaction captures the mental acceptance of the system, and can engender significant behavioral consequences (Wang et al. 2008). Brown et al. (2002) also report that user satisfaction has a unique and potentially critical role in influencing system success when an organization mandates usage. Therefore, it is important to understand user satisfaction with a system in mandatory contexts.

In this study, we investigate how the behavioral outcomes, i.e. system usage performances, can jointly affect user satisfaction with a new system during a mandatory system switching process. We apply the prospect theory to model the mental calculus of a system switch by including the factors related to both the old and the new system.

2.2 Prospect Theory Applied in System Switching Process

The Prospect Theory (Kahneman and Tversky 1979) describes the process of decision making by incorporating psychological concepts into economics. In contrast to the expected utility theory, it develops an alternative model with value and weighting functions, and posits that "value is assigned to gains and losses rather than to final assets and probabilities are replaced by decision weights" (Kahneman and Tversky 1979, p.273). On one side, value function is defined on deviations from a reference point so that the magnitude of change (positive or negative) from that reference point is treated as gain or loss. The value function is established on the evaluation of the change rather than of the absolute value. Moreover, it is "generally concave for gains and convex for losses, and steeper for losses than for gains" (p. 279). In other words, individuals are more sensitive to loss than to gain so that the magnitude of increase in gain is perceived as less valuable than the same magnitude of decrease in loss. The marginal value of both gains and losses generally decreases with their magnitude. Thaler (1985) extends the value function with mental coding of multiple gains and losses. On the other side, decision weights measure the desirability of prospects, not merely the likelihood of events. In general, the decision weights are lower than the corresponding probabilities, except in the range of low probabilities.

According to the Prospect Theory, individuals usually make decisions in two phases. In the first editing phase, they code outcomes with perceptions of gain and loss, relative to a reference point. In the second phase, the edited prospects are evaluated and the prospect of highest value is chosen. As for a certain prospect, individual's overall utility function reduce to the value function of the certain event because the decision weights are already given and equal to one for that certain event (p. 276). Therefore, when users are forced to use a new system switched from an old generation, the decision weight of adopting the new system is actually certain (no other choice). Their overall utility toward the new system is then simplified to the perceived value of using the system, and is determined by gain and loss in outcomes deviating from a reference status (i.e. the outcome of using the old system). In our research context, although users do not need to make any risky decision about system adoption, their evaluations of system usage outcomes based on the gain and loss in value function will affect their satisfaction with the new system, which has been verified to positively correlate with perceived value from the value function.

In real life, the reference point is usually a status to which one has adapted. Tversky and Kahneman (1981) employ the notion of a psychological account as a reference outcome, and propose that people generally evaluate acts in terms of a minimal account, which can reflect their intuition and simplify evaluation with reduced cognitive strain. In this study, we employ the steady performance of using the old system as the reference point to evaluate the value of the new system, because previous research

has shown that the usage of an incumbent system in a steady status is mentally efficient and occurs outside of awareness (Polites and Karahanna 2012).

In the next section, we apply the theorem of value function in the prospect theory to explore the impacts of system usage performances on user satisfaction during a mandatory system switching process.

3 HYPOTHESES DEVELOPMENT

We consider three stages in a system switching process, namely, a pre-switch stage with steady usage of the old system (T1); a transition stage with increasing learning of the new system (T2); and a post-switch stage with steady usage of the new system (T3). Corresponding system usage performances in the three stages are included as the antecedents of user satisfaction with the new system in the last stage, when the consequence of the new system implementation is steady enough to be evaluated. We begin with explaining the main effect of system usage performance in each stage, and further incorporate their interacting effects.

3.1 Main Effect

According to the prospect theory, the value of a prospect is determined based on deviations from a reference point. The magnitude of positive change from that reference point is treated as the gain, while the magnitude of negative change is coded as the loss. In consequence, not only the outcomes of an event but also the reference status can simultaneously contribute to the perceived value. As mentioned in the above section, in our research context, the steady performance of using the old system with less mental demanding should serve as the reference point in value determination. Outcomes of using the new system are compared with this reference point, so that the system usage performances related to both the old and the new system may have effects on users' perceived value of the new system, which in turn, positively predicts user satisfaction with the new system.

3.1.1 Impact of Old System (T1)

There is little IS research examining how factors related to an old system affect users' response to a new system. Kim and Kankanhalli (2009) suggest that individuals prefer to maintain their current status so that switching cost has a negative effect on the new system implementation. Polites and Karahanna (2012) directly examine the habit of choosing an incumbent system, and find that it can inhibit user's intention to accept a new system. In that case, habit is a consequence of performing tasks repeatedly when behaviors are "overlearned" in a stable context (Deci 1980). With the prospect theory applied, the value function is increasing from loss to gain. A higher reference point will reduce the positive differences and thus cause a lower value perception, comparing to a relatively lower reference point. In other words, the reference status in the value function has a negative impact on users' evaluation of a prospect. We therefore posit that the referencing performance of using the old system may have a negative impact on users' perceived value, and further, their satisfaction with the new system.

H1: Usage performance of an old system has a negative impact on user satisfaction with a new system.

3.1.2 Impact of New System (T2/T3)

In contrast, a higher outcome deviating from the reference point can have a positive impact on value determination. The more gains achieved, the higher value will be perceived. As a result, a higher performance achieved when using the new system might enhance users' perceived value as well as their satisfaction with the new system. Previous IS research has suggested a similar pattern. When a stable stage of using the new system is formed (T3), usage behavior becomes habitual with well-learned action sequences (Polites and Karahanna 2012). Guinea and Markus (2009) propose that

system usage habit plays an important role in explaining IS continuing usage. If so, individuals who have better performances in the stable stage are more likely to feel satisfactory with the new system. Moreover, a recency effect might occur such that the steady performance of using the new system can have a more salient effect on user satisfaction in the long term.

However, comparing to the impact of system usage performance in the steady stage, the performance of using the new system in the transitory stage (T2) is less stable and may have a weaker impact on user satisfaction finally. When a new system is just introduced, users have little experience on how to apply the system to fulfil their work needs. Their performance is becoming increasingly automated as a function of the amount of experience (Murray and Haubl 2007). With repetition of work tasks, users are more confident and knowledgeable in using the new system, following a learning curve (Zangwill and Kantor 1998), and will reach a stable status in the long term. As a result, in the presence of a steady performance of using the new system, the impact of system usage performance in the transitory stage may not be salient enough to affect user satisfaction in the long term. Although it is hard to test, we present the null-relationship hypothesis in the transitory stage for theoretical completeness.

H2: Usage performance of a new system in the transitory stage does not have a significant impact on user satisfaction with the new system.

H3: Usage performance of a new system in the steady stage has a positive impact on user satisfaction with the new system.

3.2 Interacting Effect

The value function in the prospect theory is non-linear with decreasing marginal value and is generally steeper for losses than for gains (Kahneman and Tversky 1979), suggesting an interdependent pattern between the prospect outcomes and the reference point on value determination. In other words, in addition to the main effects, the usage performance of the old system may interact with the usage performance of the new system in influencing user satisfaction with the new system.

3.2.1 Interaction between Old System (T1) and New System (T2/T3)

To explore the interacting pattern, we compare the performance of using the new system in both transitory and steady stages with the performance of using the old system, i.e. the reference status. There are two possible situations when gain and loss may occur. In the first case, gains will be obtained when users have a lower performance of using the old system and a higher performance of using the new system in either transitory or steady stage. In the second case, however, users will suffer from losses if they have a higher performance when using the old system but their performance decreases when using the new system. For those who do not experience any deviations of system usage performance between the new system and the old system in the switching process, they should perceive no difference in value as well as in their satisfaction with the new system. Referring to the prospect theory, individuals are more sensitive to loss than to gain (Kahneman and Tversky 1979). The magnitude of increase in gain is perceived as less valuable than the same magnitude of decrease in loss. Therefore, the loss experienced in the second case is perceived more seriously and has a stronger negative impact on user satisfaction with the new system. In other words, the negative impact of usage performance of the old system on user satisfaction will be stronger when users have a relatively lower performance of using the new system in either transitory or steady stage.

H4(a/b): Usage performance of an old system has an interacting effect with usage performance of a new system in the transitory/steady stage, such that the negative impact from the old system on user satisfaction with the new system will be stronger if usage performance of the new system in the transitory/steady stage is lower.

3.2.2 Interaction between Transitory (T2) and Steady (T3) Usage of New System

Regardless of usage performance of the old system, the impact of steady new system usage in T3 may also depend on transitory usage in T2 as additional gain and loss might be achieved when system usage performance in the transitory stage keeps changing with increasing experience of the new system. The worst situation of user satisfaction with the new system would happen when users do not experience any gains from a system switching process. That is, they have a lower level of system usage performance when the new system is just introduced (T2) and cannot recover even in the long term (T3). Referring to the status in T1, users with higher usage performance in T2 but lower usage performance in T3 will be a bit more satisfied with the new system than the former group because they at least obtain some instant gains or do not suffer from losses in T2. Even though, a salient loss from T2 to T3 will inevitably make them frustrated and dissatisfied with the new system. On the contrary, users will be more satisfied with the new system if their usage performance in T3 is higher. However, users with higher usage performance in both T2 and T3 may not be that satisfied comparing to those with lower usage performance in T2 but higher usage performance in T3. Based on the prospect theory (Kahneman and Tversky 1979), we know that the marginal value of gain decreases with its magnitude. Therefore, a limited gain in T3 cannot excite users so much, compared to the situation when a salient gain is obtained from T2 to T3. With the comparison of these four situations, we can posit that

H4(c): Usage performance of a new system in the transitory stage has an interacting effect with usage performance of a new system in the steady stage, such that the positive impact in the steady stage on user satisfaction with the new system will be stronger if usage performance in the transitory stage is lower.

4 EMPIRICAL ANALYSIS AND RESEARCH PLAN

4.1 Data Collection

This study is still in progress. We are working on data collection in a mandatory system switching context, where an old system is replaced by a new system with more advanced technology and comprehensive functions. A longitudinal study will be conducted by tracking each user's response in the system switching process. We will collect data at three time points: before the switching (T1), just after the switching (T2), and a long term later (T3). A measure of "system usage habit", adapted from Polites and Karahanna (2012), will be adopted to check whether user's steady performance of using the system is formed in T1 and T3. The constructs, like user satisfaction, system usage performance, etc. will be measured through a survey questionnaire in each stage. Considering that users evaluate the system based on their perceptions of gain and loss in usage outcomes, we employ a self-reported measure to capture user's perception about the extent to which using the system can help them fulfil the work needs. The actual system usage performance will also be recorded for checking robustness.

In addition to the system usage performance, we will include individual's cognitive beliefs (e.g. perceived usefulness, perceived ease of use, and subjective norm etc.) toward the new system as well as individual characteristics (e.g. self-efficacy, propensity to resist change, prior working experience, and gender etc.) into the research model, and evaluate whether the joint effects of system usage performance can exist beyond these control factors. The constructs related to cognitive beliefs of the new system will be measured in the first two stages, and individual characteristics will be collected in the first stage. Only those participants who complete surveys in all the three stages will be included in the analysis. We will further compare their demographic information to ensure there is no significant response bias.

4.2 Empirical Estimation

We will empirically validate the hypotheses using a regression model, where user satisfaction with the new system in T3 is treated as the dependent variable, and corresponding system usage performances

in the three stages are incorporated as the independent variables. The interaction terms between the system usage performances in the three stages will be created as well. The regression model is specified as follows:

$$Sat_i = \beta_0 + \beta_1 Per_{it1} + \beta_2 Per_{it2} + \beta_3 Per_{it3} + \beta_4 Per_{it1} \times Per_{it2} + \beta_5 Per_{it1} \times Per_{it3} + \beta_6 Per_{it2} \times Per_{it3} + \Gamma X_i + \varepsilon_i$$

Here, i denotes each user; Sat_i denotes user satisfaction with the new system in T3; Per_i denotes system usage performance in each stage; X_i denotes a series of control variables like cognitive beliefs and individual characteristics. ε_i is the error term that captures the unobservable heterogeneity for each user and is assumed to follow a normal distribution.

After checking the reliability from survey measures, we will calculate the average score for each construct. The data will be mean-centered to create the interaction terms. The VIF score will also be examined for checking multi-collinear issue.

To test the hypotheses, H1 will be supported if β_1 is proved to be negative. Similarly, H3 will be supported if β_3 is proved to be positive. However, the non-effect relationship in H2 cannot be simply accepted even if β_2 is proved to be non-significant. We will further check the power of data analysis to support the argument. H4 (a/b) can be supported if the interaction coefficients β_4 and β_5 are positive. That is, the negative effect of system usage performance toward the old system can be alleviated if the usage performance toward the new system in the transitory/steady stage is higher. Finally, H4(c) will be supported if β_6 is proved to be negative.

5 POTENTIAL CONTRIBUTIONS

This study investigates user satisfaction with a newly introduced system from a behavioural economics perspective. That is, users evaluate a new system based on the value function with gain and loss in system usage outcomes. We theorize a system switching process with three stages in which system usage behavior changes from a stable level of using the old system to a transitory stage of learning the new system, and finally reaching a new stable level of using the new system. System usage performances related to both the old and the new system are incorporated in the model, and the main and interacting effects are explored based on the Prospect Theory. We will empirically validate the research model in a mandatory system switching project. The study has both theoretical and practical implications. It will help firms to understand the role of system usage performance related to both the old and the new system in each stage and to evaluate the consequence of the new system implementation, namely, whether user satisfaction with the new system is improved in the long term. Firms can thereby design effective managerial interventions to facilitate change management in the system switching process.

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