Self-Efficacy as an Antecedent of Cognition and Affect In Technology Acceptance

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Abstract

There is a growing recognition that additional explanatory variables are needed to understand an individual's technology acceptance. The study of self-efficacy as an external variable provides further insights into the process and should substantially increase the explained variance of the theoretical model. The results from the survey showed that self-efficacy influenced cognition perceptions and emotional reactions. Specifically, self-efficacy was found to play a substantive role in shaping individuals' attitudes via a cognitive route (perceived usefulness and ease of use) and an affective one (pleasure and dominance). However, the absence of a significant effect of self-efficacy on the third dimension of affect (arousal) was surprising. The research makes important contributions to scholarly research and has implications for managers.

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There is a growing recognition that additional explanatory variables are needed to understand an individual's technology acceptance. The technology acceptance model (TAM) has been used in explaining technology acceptance in workplaces. TAM originated in the management information systems (MIS) discipline and has recently been applied to consumer adoption of technology (Childers et al. 2001; Dabholkar and Bagozzi 2002). Specifically, in consumer research, TAM has been augmented mainly to integrate affect in order to compensate for the model's focus on cognition.

Besides the omission of affect, the evidence indicates that self-efficacy could influence the process of adoption especially in the consumer context. Self-efficacy (beliefs about one's ability to perform a particular behavior) represents an important individual trait (Bandura, 1977). Because high technology innovations are often viewed as complex, confidence in one's ability to handle them can exert an important influence on the emotional and cognitive responses of individuals to innovations. Thus, examining the role of self-efficacy as an antecedent to cognition and affect would appear to be useful to more fully understanding consumer acceptance of new technology.

Specifically, this paper represents one of the first studies to investigate the importance of self-efficacy as an antecedent to cognition and affect in the consumer adoption of high-tech context. In doing that, three main research questions will be addressed. First, does self-efficacy play an important role in shaping the effect of cognition in high technology adoption? Second, does self-efficacy play an important role in shaping the influence of affect in high technology adoption? Third, do cognition and

affect mediate the effect of self-efficacy on attitude toward adoption? This study will examine these questions, draw some important conclusions, and provide managerial implications.

Although many studies have been done to investigate the effect of self-efficacy in other contexts (e.g., MIS), no research to date has investigated the role of self-efficacy as an antecedent to cognition and affect especially in the consumer adoption of high-tech context. The present study attempts to fill this void.

Literature Review

Social cognitive theory is a well-accepted model of individual behavior and is often used to explain a variety of performance-related behavior patterns. Social cognitive theory (SCT) suggests that cognition and the environment influence each other in a dynamic way. The theory incorporates two specific expectations: *outcome expectations* and expectations related to a concept called *self-efficacy*. Outcome expectation explains the behavior of people in completion of specific tasks. According to outcome expectations, individuals tend to undertake behaviors they believe will help them to perform their tasks better. Self-efficacy relates to an individual's belief in one's capability to perform a specific task. The following section discusses the theory of self-efficacy and its role as an external factor in TAM, most particularly how it functions as an antecedent not only to cognition but also to affect.

Theory of Self-Efficacy

The theory of self-efficacy is nearly thirty years old and is based on the work by Bandura and his colleagues in the area of SCT. Bandura defines self-efficacy as,

"people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performance" (Bandura 1977, 1986). Self-efficacy is concerned with judgments of what one can do with whatever skills one possesses. The central idea of self-efficacy is that the personal belief one has in one's self is the basis for actions by individuals. Hence, self-efficacy plays a critical role in self-motivation because it can influence decisions about what behaviors to undertake and the amount of effort and persistence exhibited in attempting those behaviors (Barling and Beattie, 1983).

Self-efficacy as an External Factor

When Davis et al. (1989) formulated TAM, they suggested that future research should test various external factors to understand why people accept or reject technology. They proposed that some external factors such as an individual's characteristics or organizational factors would influence technology acceptance behavior indirectly by affecting beliefs and affect (Szajna, 1996). For instance, in a recent study in a technology context, visual orientation as an external variable was found to have a positive effect on consumer beliefs in using technological devices (Bruner and Kumar, 2005).

Self-efficacy is another construct that would appear to hold promise as an important external factor of TAM. In the context of technology adoption, self-efficacy can be viewed as an individual's self-confidence in the ability to use an innovation to achieve a desired behavior (Pedersen, 2003). Self-efficacy should play an important role in high-technology adoption because consumers with greater self-efficacy with respect to a product would be expected to develop more positive attitudes towards it. Research studies that have focused on the effect of self-efficacy on computer usage and in the

context of management information systems (MIS), confirm its influence on user's acceptance of technology (Venkatesh, 2000).

Self-Efficacy as an Antecedent of TAM

Davis (1989) postulated a set of external or antecedent variables that might influence *perceived ease of use* and *perceived usefulness*, the two key beliefs in the model. Later research extended TAM in the workplace environment using computer self-efficacy as an antecedent (Compeau and Higgins, 1995) and found the construct to be one of the main antecedents of the perceived cognitive effort associated with computer technology usage.

In the context of adoption of high technology innovations, self-efficacy is particularly related. The more individuals have confidence in their abilities to master or using technological innovations, the more they will perceive and reap the benefits from such technology. Compeau, Higgins, and Huff (1999) found that computer self-efficacy influences outcome expectations. These outcome expectations are similar to perceived usefulness (Davis 1989) and are derived largely from positive benefits (outcomes) associated with performing a specific task. In a recent study of mobile devices, Lee, Kim, and Chung (2003) found that self-efficacy significantly influences perceived usefulness and thereby plays a critical role in user acceptance of the technology.

The complexity of innovations has long been recognized as a factor affecting the rate of adoption (Rogers, 1995), and this is a particular concern for high tech products (Ellen, Bearden, and Sharma 1991; Rosen and Weil 1995; Sinkovics et al. 2002). The ease of use consideration is important for potential adopters, possibly reflecting perceptions of their own self-efficacy with respect to learning how to use the technology

(Davis et al., 1989). Given that perceived ease of use is defined in terms of effort, individuals generally perceive a technology to require less effort to use as they gain more knowledge and confidence through direct experience with the technology. Once skills are improved with experience, the task becomes less dependent on cognitive resources (known as the learning curve), thus leading individuals to perceive the task and technology to be easier than when they first started. As such, the concept of perceived self-efficacy seems applicable in this context. Existing empirical evidence supports this view of technology acceptance. For instance, Venkatesh and Davis (1996) found that computer self-efficacy acts as a determinant of perceived ease of use of a particular system. Further, Venkatesh (2000) found that an individual's efficacy was the strongest determinant of system-specific perceived ease of use. Agarwal, Sambamurthy, and Stair (2000) also found that the judgments of self-efficacy serve as key antecedents of the perceived cognitive effort for ease of use that is associated with technology usage.

Most of the above mentioned research studies have specifically focused on computer self-efficacy (CSE) and how it helps technology adoption process. Each of these studies has demonstrated the usefulness of CSE in the area of computer technology and its adoption. However, there are relatively few studies that have examined self-efficacy as it pertains to adoptions of technological product in the consumer context. With these few studies, evidence show that shows that self-efficacy plays a crucial role in determining technology acceptance (Dabholkar and Bagozzi, 2002; Ellen et al. 1991). For instance, higher self-efficacy attenuated the relationship between ease of use and attitude of using technology-based self-service (Dabholkar and Bagozzi 2002). Further, Ellen et al. (1991) confirmed that individuals with high self-efficacy had less resistance to

changing of technological innovations. Thus, it is expected that consumers who possess high perceived self-efficacy are more likely to form positive perceptions about the use of technology. From this assertion, perceived self-efficacy appears to represent an important antecedent of the perceived usefulness and ease of use of a new technology.

The present study builds on the research on previous studies and addresses a few more related interactions between self-efficacy and consumer acceptance of technology. Thus, the research model (Figure 1 in Appendix) is proposed and the following hypotheses will be tested:

[Figure 1 About Here]

H1: The greater one's self-efficacy with regard to a high technology innovation, the higher the perceived usefulness of that innovation.

H2: The greater one's self-efficacy with regard to a high technology innovation, the higher the perceived ease of use of that innovation.

Self-Efficacy as an Antecedent of Affect

TAM has received a great deal of empirical support as a tool for predicting intentions to use technology. The model was originally developed to understand workplace adoption of new technology where users have limited choices and/or are under mandatory usage of technology. However, this is not the case in the consumer context where potential users are typically free to adopt or reject at their own discretion. Not only is the consumer's usage intention potentially influenced by cognition but it is quite possible that it is heavily shaped by affect as well. It is well accepted in consumer behavior that people might be inclined to accept or reject products for non-cognitive reasons, e.g., simply because they do not like it (e.g., Hirschman and Holbrook 1982; Batra and Ahtola 1991). Yet, TAM has largely ignored the role of affect, most likely due

to its origins in organizational behavior. It seems reasonable to consider, therefore, that the inclusion of affect in TAM could improve its predictability, especially when applied to consumer contexts.

A widely accepted theory of affect is Mehrabian-Russell's (1974) PAD (pleasure, arousal, and dominance) paradigm. Several decades of research have shown that the various combinations of these dimensions can adequately represent the diverse human emotional reactions to stimuli. In marketing, PAD has been successfully employed to measure emotional responses to a wide variety of stimuli (e.g., retail settings, advertising responses, product-consumption experiences, etc.).

Self-efficacy judgments can have a substantial influence on the affective responses of the individuals. This is expected since individuals will tend to enjoy behaviors they feel they are capable of performing and to dislike those they do not feel comfortable with (Igbaria and Iivari, 1995). Mastery attained through direct experience is a powerful source of confidence in performing the task that can counterbalance the negative emotional effect of an uncomfortable or unsuccessful task. Several studies support this theoretical contention. For instance, self-efficacy with respect to computer technology has been found to exert a significant positive influence on affect (pleasure) and a significant negative influence on anxiety (dominance). Specifically, individuals with high self-efficacy tend to derive more enjoyment and experience less anxiety in the adoption of new technology (Compeau and Higgins, 1995; Compeau, Higgins and Huff, 1999).

Perceived efficacy has long been considered to be an important precursor to playfulness and fun (Csikszentmihalyi, 1975; Webster and Martocchio, 1992). This is

motivated by the theory of “optimal flow” which suggests that skills lead individuals to engage in an activity in a more enjoyable state (Csikszentmihalyi, 1990; Hoffman and Novak 1996). Playfulness and fun are related to the pleasure dimension. Playfulness has been introduced in MIS and found to have strong correlation with experience and self-efficacy (Webster and Martocchio, 1992).

Arousal can be influenced by self-efficacy because individuals tend to be more positively aroused (i.e., excited, enthusiastic) when they feel they have related skills or are capable of performing a specific task. For instance, Bandura (1977) and Henry and Stone (1994) found that self-competence positively influenced susceptibility to self-arousal. Similarly, Gist and Mitchell (1992) suggested that a sense of personal efficacy in mastering challenges is apt to generate greater interest in the activity, producing emotional arousal.

As previously noted regarding the dominance dimension, individuals can either have a feeling of control (positive) over a stimulus/situation or, in contrast, feel they are being controlled (negative). For instance, Gist and Mitchell (1992) suggested that self-efficacy is strongly related to perceived control over the causes of performance. Similarly, Taylor and Todd (1995) found that self-efficacy is a significant determinant of perceived behavioral control (dominance). In the literature, both studies by Ghani and Deshpande (1994) and Novak, Hoffman, and Yung (2000) found that self-efficacy was a significant positive antecedent to control. As might be expected, individuals who have more confidence in their abilities tend to demonstrate lower levels of anxiety (Johnson and Marakas, 2000). This is because anxiety may function as a source of information relevant to feelings of self-efficacy, judgments of mastery and self-determination. In the

context of computer technology, Kinzie et al. (1994) confirmed that anxiety has a strong negative relationship with self-efficacy. Another study found that individuals who have higher levels of anxiety also had less experience or capability (Heinssen, Glass and Knight, 1987) apparently because individuals experience anxiety when performing behaviors they do not feel competent to perform (Stumpft at al., 1987).

Given what is known from theory and past studies about self-efficacy and affect, the following hypotheses are proposed:

H3: The higher a consumer's self-efficacy with regard to a specific technological innovation, the greater the pleasure in adopting the product.

H4: The higher a consumer's self-efficacy with regard to a specific technological innovation, the greater the arousal in adopting the product.

H5: The higher a consumer's self-efficacy with regard to a specific technological innovation, the greater the feelings of dominance in adopting the product.

H6: The relationship between self-efficacy and attitude is mediated by cognition (perceived usefulness and perceived ease of use) as well as affect (pleasure, arousal, and dominance).

The Overall Contribution of Self-Efficacy

Although it is expected that self-efficacy influences cognition and affect (as explained above), ultimately it may be more important to be concerned about its impact on TAM as a whole. Given this, the final question to be addressed in this study asks if incorporating self-efficacy into TAM as an external variable substantially improves the explanatory power of the model. This can be tested by comparing the variance explained by TAM alone to the variance explained with self-efficacy included. Thus:

H7: The proposed research model (model with self-efficacy) fits the data better than the model without self-efficacy.

Methodology

A survey was used to collect data. Subjects were drawn from students enrolled in a junior-level business course at a major Midwestern U.S. university taken by a wide variety of majors. Personal Digital Assistants (PDA) with the *Pocket PC* operating system were used as the focal innovation. A pretest (n = 40) was conducted to confirm the suitability of using PDAs in the study. Seven-point Likert scales (1= *strongly disagree* to 7 = *strongly agree*) were used. The pretest results indicated that the PDA was viewed as high technology (mean = 5.48, $\sigma = 1.01$) and an innovative product (mean = 5.53, $\sigma = 1.08$).

In the survey, subjects performed two different tasks (utilitarian and hedonic) in order to make sure that they had cognitive and affective experiences to draw upon as they developed attitudes towards the focal innovation. The utilitarian task involved subjects finding available time to schedule for a meeting time. After that, subjects were to look for and to obtain some contact information (e.g., telephone number and e-mail address) from the address book. In contrast, the hedonic task involved the subjects engaging in some simple entertainment activity (e.g., watching a movie clip). Two-hundred-and-sixty students were involved in the study over a period of three weeks. However, 30 questionnaires were excluded from the analysis due to subjects who either perceived a PDA as not being a high technology or not an innovative product. Of the remaining 230 participants, 52 percent were females, and 48 percent were males. About 64% of the sample was between the ages 21 and 30.

All theoretical constructs were operationalized using previously developed multi-item scales. In particular, the measure of self-efficacy involved asking respondents to

indicate their perceptions of their skills and capabilities in using the PDA (adapted from Pedersen, 2003). Other scales including perceived usefulness, perceived ease of use, and attitude towards the act were based on those used by Bruner and Kumar (2005). Scales to measure emotion (PAD) were taken from the original work by Mehrabian and Russel (1974). Table 1 shows the scales that were employed in this study.

[Table 1 About Here]

Structural equation modeling (SEM) using EQS was used to test the model. Raw data were used as an input and the program analyzed the covariance matrix calculated from the raw data by using Maximum Likelihood (ML) estimation. The overall model was tested using a two-step structural equation modeling approach (Anderson and Gerbing, 1988). Further, the overall model fit was assessed using multiple fit criteria (e.g., CFI, IFI, NNFI, RMSEA, RMR, and SRMR).

Analyses and Results

Internal consistency reliability greater than 0.8 is typically considered to be good and levels of 0.7 to 0.8 are considered acceptable (e.g., Peterson 1994). The construct reliabilities greater than 0.5 are desirable (Hair et al. 1998). Based on this, the reliabilities for all of the scale's used in this study were acceptable with most being very good (Table 2). Further, as shown in Table 3, the average variance extracted (AVE) for each construct ranged from .50 to .77, exceeding the recommended level of 0.50 and providing some evidence of the scales' convergent validities (Fornell and Larcker, 1981). In support of each scale's discriminant validity (Table 3), the squared correlation between each pair of constructs was less than the variance extracted by the indicators measuring the respective constructs (Fornell and Larcker, 1981). Further, the overall model fit of the structural

model (Figure 1) was examined. The incremental fit indices,CFI, IFI, and NNFI, were 0.94, 0.94, and 0.93, respectively. The absolute fit indices of RMSEA, RMR, and SRMR were 0.05, 0.05, and 0.08, respectively. Thus, these statistics indicate a good fit between the model and the data (Bryne, 2001; Hu and Bentler, 1999).

[Tables 2 and 3 About Here]

Support was found for most of the hypotheses. In support of H1 and H2, the effect of self-efficacy on perceived usefulness ($\beta = .08$, $p<.01$) and perceived ease of use ($\beta = .28$, $p<.01$) were significant. In addition, the effect of self-efficacy on affect was significant for pleasure ($\beta = .15$, $p<.01$) and dominance ($\beta = .14$, $p<.05$), thus validating H3 and H5, respectively. Hypothesis 4, which posited self-efficacy's impact on arousal, was not supported ($\beta = .01$, p = n.s.). Thus, self-efficacy was shown to exert a significant positive influence on the two cognitive components of TAM and on two of three dimensions of affect (pleasure and dominance).

The possible mediating effect of cognition and affect on the relationship between self-efficacy and attitude was also tested. In this mediation test, two models were compared. The first model (model 1) was the one in which all paths from self-efficacy to cognition and affect were free to vary but the direct path from self-efficacy to attitude was constrained. In contrast, the other model (model 2) was the one where all paths from self-efficacy to cognition and affect were constrained but the direct path from self-efficacy to attitude was free to vary (Appendix). Model 2 is nested within the other model (model 1).

A $\chi 2$ difference test was performed to compare model 1 with model 2. A $\chi 2$ difference test is statistically significant which suggests that the mediation model (model

1) provides the best fit for the data ($\Delta \chi 2 = 43.19$, Δ d.f. = 4, $p < .001$). Thus, the test provided support for the mediational roles of cognition and affect on the relationship between self-efficacy and attitude (H6). Further, it is important to note that the direct effect of self-efficacy on attitude was insignificant ($\beta = .02$, $p > .05$), suggesting that this variable only influences attitude indirectly through cognition and affect, as originally conceptualized.

Finally, to compare the model with and without self-efficacy (H7), two models (the proposed model vs. the model without self-efficacy) were compared. The proposed model was estimated first. Next, the model was reestimated by constraining all paths from self-efficacy as an antecedent to cognition and affect to '0'. The result suggests that the proposed model (model with inclusion of self-efficacy) provides a significantly better fit to the data than the model without self-efficacy ($\chi 2 = 59.63$, Δ d.f. = 5 $p < .001$), thus supporting H7. Moreover, the variance explained of the proposed model (model 1) increased by approximately 18% compared to what was explained by the model without self-efficacy included (model 2).

Discussion

The purpose of this study was to examine in a consumer context the effect of self-efficacy on the cognitive and affective aspects of technology acceptance. In general, the findings provided support for self-efficacy's role in the proposed model. Specifically, self-efficacy was found to be a positively influence on perceived usefulness, ease of use, pleasure, and dominance. In other words, the more confident and comfortable consumers feel with a high tech product, the more likely they view it as useful, consider it to be easy to use, enjoy using it, and feel in control of it. A stronger relationship was found between

self-efficacy and perceived ease of use than for perceived usefulness, pleasure, and dominance. This means that self-efficacy judgments play their biggest role for consumers in shaping their perceptions about how quickly its operation can be learned and how simple it is to use.

Interestingly, self-efficacy had no significant effect on arousal. This seems to mean that judgments of one's product-related skills do not drive feelings of excitement with regard to innovative technology. The absence of a significant effect of self-efficacy on arousal was unexpected. A possible reason for the insignificant result could be a task-by-subjects interaction that was not anticipated. Specifically, the tasks which subjects had to perform might not have been challenging enough to induce arousal. Since participants in the present study were college students who tend to be familiar with and interested in high technology consumer products (Foxall and Goldsmith, 1994; Colkin, 2002), they might not (as a group) have considered the tasks to be very complicated, i.e., they were not easily wowed. Had the task been more exciting or if sample had included more subjects who were less comfortable with technology, the hypothesized relationship might have been supported. Given this, the hypothesis is viewed as worthy of review in future studies.

The direct effect of self-efficacy on attitude was not found to be significant. Instead, the results of this study showed that the influence of self-efficacy on attitude was mediated by cognition and affect. In sum, self-efficacy was found to play a substantive role in shaping individuals' attitudes via a cognitive route (perceived usefulness and ease of use) and an affective one (pleasure and dominance) as suggested by comparing the proposed model with and without self-efficacy.

Contributions and Implications

TAM provides a framework for understanding how external factors influence acceptance or rejection of new technology. Social cognitive theorists have also suggested that behavior, cognition, and the environment all influence each other in a dynamic fashion. The present study adds to our understanding of the external influences on technology acceptance by providing strong evidence that self-efficacy plays an important role. Although it was previously known that individuals are inclined to adopt technological products depending upon their beliefs about the product (e.g., usefulness and ease-of-use), this study shows that a belief about something *besides the product* also plays a key role: it is the *confidence* consumers have in their own abilities to understand and effectively use a new piece of technology. The benefit of adding the self-efficacy as the external variable to the model was substantial, increasing the variance explained by approximately 18% compared to what was explained without self-efficacy included.

This study also showed that self-efficacy influences attitudes about adoption not just through cognition but through affect as well. This means that there is justification for revising TAM, especially when it is applied to consumer contexts. Future studies could examine the relative impact of affect on attitudes compared to cognition. It seems reasonable to assume that there are some types of decisions that consumers *think* themselves through and in those cases cognitions (ease-of-use and usefulness) probably play the greatest role. However, there are likely to be many situations where consumers *feel* their way into decisions and in those cases affective reactions to the product may play a larger role than cognition. While self-efficacy's effect on pleasure and dominance dimensions were the most salient in this study, the robustness of this finding is worthy of

re-examination in other studies to determine if the significance of the relationship varies depending on such things as the person, the product, and the task or, instead, if one or more of the relationships is consistently stronger in shaping usage attitudes.

The findings also have relevance for practitioners. The results of the study can be useful in introducing technological innovations, especially those that are complex and difficult master with the likelihood of raising the anxiety levels of consumers. One strategic implication is that marketers of technologically innovative products should realize that the consumer market is composed of people with a wide range of self-efficacy. Given that, it might make the most sense to aim initially at those consumers who are thought to have high self-efficacy. Although it is yet to be confirmed, innovators and/or gadget lovers would appear to have the knowledge and confidence to figure things out for themselves or to track down the help they need. They may also have identifiable demographic characteristics as well as known shopping and media habits. Since they would already believe in themselves the issue would then become convincing them about the product's attributes such as usefulness and ease-of-use.

However, it is likely that for any one technological innovation the majority of people may have only moderate or low efficacy. In those cases, it does not matter how useful a product is if consumers do not believe they have the abilities necessary to utilize the product. For example, there may be many consumers who have the requisite abilities but not the confidence to use them. In those cases, the communication should probably focus most on how straightforward and painless the product is to use. Specifically, ads should feature '*testimonials*' from users like those in the target market discussing how simple it was to learn to use the product and how their fears were unfounded, featuring

such statements as *"if I can do it, so can you."* Also, it may be that for this segment "seeing is believing," suggesting that '*demonstrating'* the ease of using the product would be extremely important to do in commercials, in stores, and at websites.

However, there are also going to be segments that, indeed, lack the requisite ability to use the product. Although ways of teaching them what they need to know might be possible via user manuals, tech support, training/tutorial sessions, and interactive websites (e.g., coaching through online step-by-step product guide tour), it may not be cost effective for any single company to provide such education. In those cases, such targets would not be very attractive.

Directions for Future Research

Additional research is needed to shed light on ways to improve consumers' self-efficacy. Indeed, self-efficacy is a subjective evaluation of perceived ability or skill to successfully perform a specific task and may not necessarily reflect actual competence. Thus, more research is needed to find out what variables and circumstances enhance consumers' sense of their abilities, especially to overcome their technological anxiety (e.g., fear, uncertainty, and doubt) often associated with high tech products.

Future research studies may consider different groups with which to study self-efficacy as an external variable. College students are ideal for initial studies of technology driven products due to their confidence and inclination to accept new technology. The question is, however, to what extent could the study's results be reproduced with other groups, many of whom are expected to have higher anxiety levels with regard to the use of technical innovations? In particular, the aging of the American population raises the importance of understanding how the self-efficacy of middle-aged

and elderly segments can be enhanced (Marquie et al. 2002). Another area of future research may focus on examining the impact of other variables (e.g., gender, means of learning) on self-efficacy.

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TABLE 1

Questionnaire Items and Reliabilities

Self-efficacy*

1. I am able to use it without the help of others.
2. I have the necessary time to make it useful to me.
3. I have the knowledge and skills required to use it.
4. I am able to use it reasonably well on my own.

Usefulness*

1. It helped me be more effective.
2. It helped me be more productive.
3. It saved me time to use it.
4. It required the fewest steps to accomplish what I wanted to do with it.
5. It made the task I wanted to accomplish easier to get done.

Ease of Use*

1. It was easy to use.
2. I learned to use it quickly.
3. It was simple to use.
4. I easily remember how to use it.
5. It was easy to learn to use it.

*(Likert-type items anchored by 1 = Strongly Disagree; 5 = Strongly Agree)

Pleasure**

1. Happy/Unhappy
2. Pleased/Annoyed
3. Satisfied/Unsatisfied
4. Contented/Melancholic
5. Hopeful/Despairing
6. Relaxed/Bored

Arousal**

1. Stimulated/Relaxed
2. Excited/Calm
3. Frenzied/Sluggish

4. Jittery/Dull
5. Wide-awake/Sleepy
6. Aroused/Unaroused

Dominance**

1. In Control/Cared For
2. Controlling/Controlled
3. Dominant/Submissive
4. Influential/Influenced
5. Autonomous/Guided
6. Important/Awed

**(Likert-type items from 1 to 5 points)

Attitude-Toward-the-Act

Overall, how would you describe your experience. For me, using the _____ to _____ is:

1. bad / good (1 = bad; 5 = good)
2. negative / positive (1 = negative; 5 = positive)
3. unfavorable / favorable (1 = unfavorable; 5 = favorable)
4. unpleasant / pleasant (1 = unpleasant; 5 = pleasant)

TABLE 2

Reliabilities of the Scales

Scales	Reliability (α)	Construct Reliability
Self-efficacy	.91	.82
Perceived Usefulness	.90	.85
Perceived Ease of Use	.92	.86
Pleasure	.82	.75
Arousal	.78	.72
Dominance	.76	.70
Attitude-Toward-the-Act	.93	.85

TABLE 3
Discriminant Validity Matrix*

Construct	SE	PU	PEU	PL	ARO	DOM	ATT
Self-Efficacy	**.77**	.19	.27	.11	.10	.05	.12
Perceived Usefulness	.03	**.60**	.57	.43	.26	.45	.53
Perceived Ease of Use	.07	.32	**.69**	.38	.18	.37	.39
Pleasure	.01	.18	.14	**.53**	.42	.40	.51
Arousal	.01	.07	.03	.18	**.54**	.42	.45
Dominance	.00	.20	.14	.16	.18	**.50**	.41
Attitude	.01	.28	.15	.26	.20	.17	**.74**

*Diagonal elements (bold) represent the average variance extracted for each construct. The numbers above the diagonal elements are the correlations between the constructs. The numbers below the diagonal elements are the shared variances (or squared correlations) among constructs. For discriminant validity, diagonal elements should be larger than off-diagonal elements.

Appendix

Figure 1

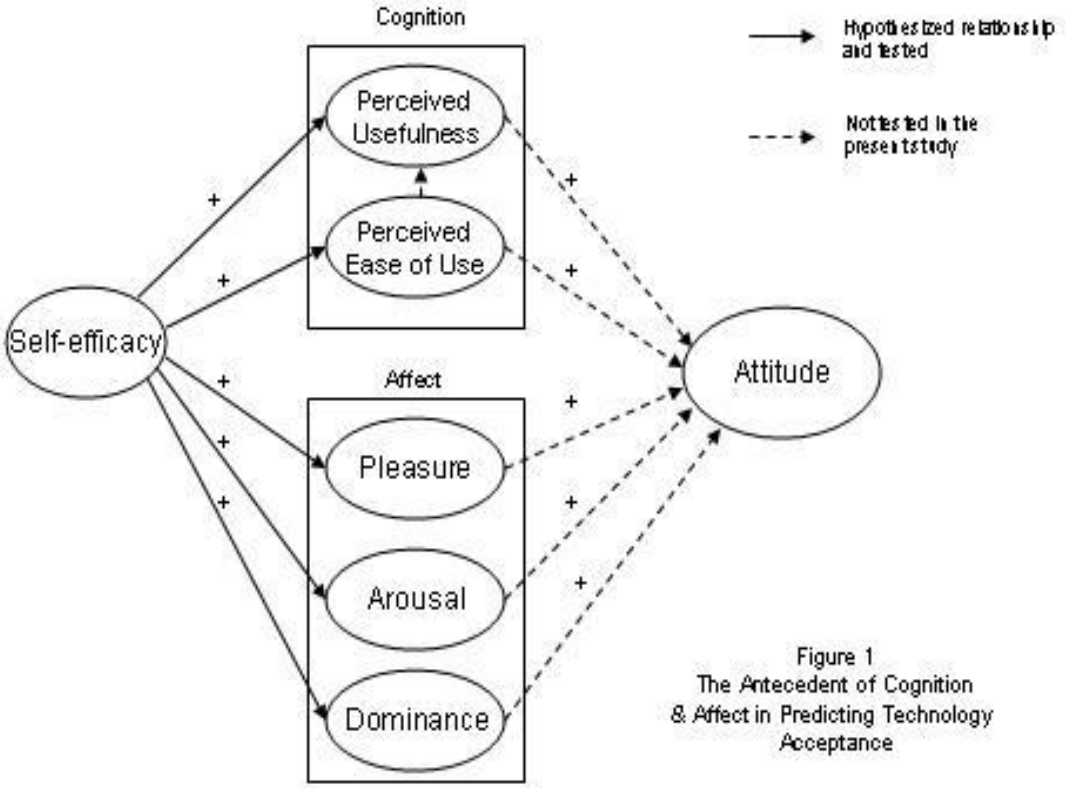

Figure 1
The Antecedent of Cognition & Affect in Predicting Technology Acceptance

Appendix
Hypothesis 6 - Model Comparison: Model 1 & Model 2