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THE ROLE OF PERSONAL INNOVATIVENESS AND SELF-EFFICACY IN INFORMATION TECHNOLOGY ACCEPTANCE: AN EXTENSION OF TAM WITH NOTIONS OF RISK

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Abstract

Several research efforts over the last decade have attempted to augment the basic technology acceptance model (TAM) by identifying and testing determinants of the two key predictor beliefs of the model—perceived usefulness and perceived ease of use—and by identifying other extraneous variables that moderate various model relationships. This research is an attempt in the same direction. It addresses some key gaps and inconsistent findings in the TAM literature to further contribute to the refinement of TAM. In this endeavor, this research draws from social cognitive theory (SCT), computer self-efficacy (CSE), technology acceptance model (TAM), and the risk management literature to develop an extended TAM that includes new relationships between the model constructs and personal innovativeness and general and specific computer self-efficacy. The research will be conducted as a survey in the context of the personal digital assistant (PDA) technology.

Keywords: Technology acceptance, computer self-efficacy, personal innovativeness.

INTRODUCTION

The classical technology acceptance model (TAM) (Davis 1989; Davis et al. 1989) is a parsimonious model containing only a few variables, chief among those being two predictor beliefs about the focal technology: perceived usefulness (PU) and perceived ease of use (PEOU). The parsimony of this model, while being its strength, is also its weakness (Venkatesh 2000, pg. 344), and attempts have been made over the last decade to augment and refine this model. While recent papers about TAM strengthen this model in important ways, there are still some gaps in the model. The goal of this research is to address specific gaps in the TAM literature and to contribute to a further refinement of TAM. This is done by integrating TAM with personal innovativeness and self-efficacy constructs and by hypothesizing new relationships among these and other TAM constructs.

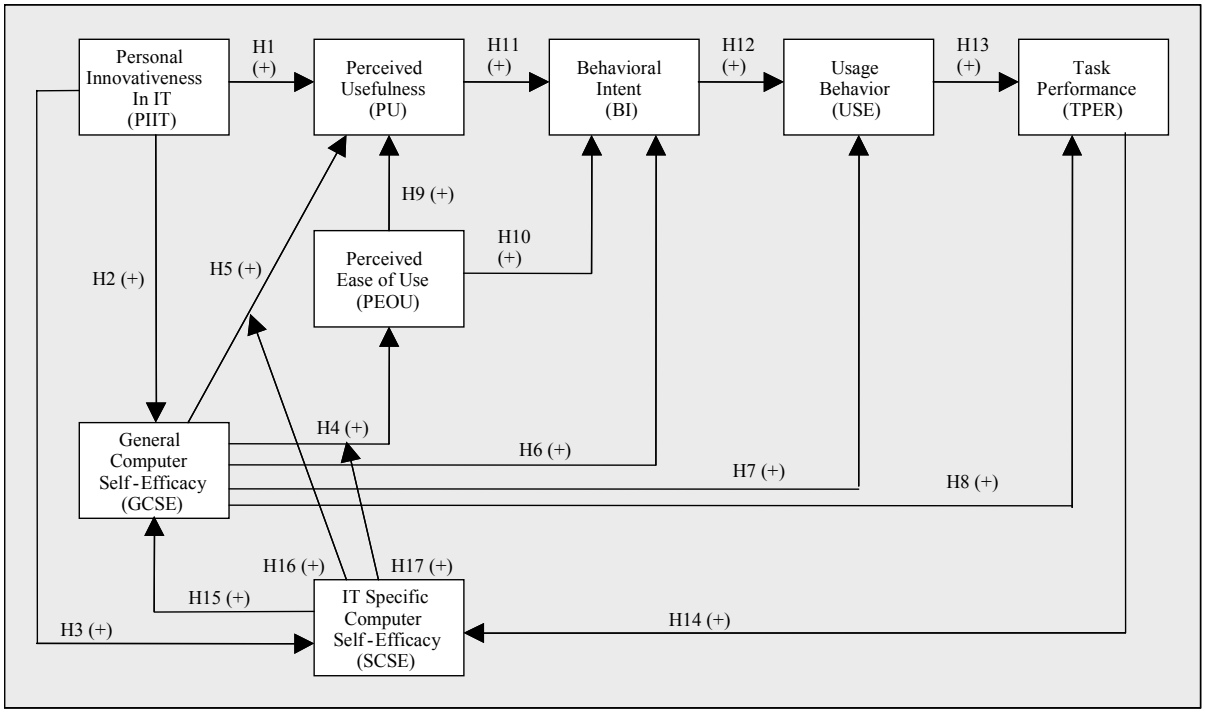

Figure 1. The Research Model: An Extension of TAM with Personal Innovativeness and Computer Self-Efficacy

THEORETICAL FOUNDATIONS

Our research model is shown in Figure 1 and is discussed in the following paragraphs.

Personal Innovativeness in the Domain of Information Technology (PIIT)

Personal innovativeness in the domain of information technology (PIIT) is a recent construct in the innovation adoption literature, defined by Agarwal and Prasad (1998) as a trait-oriented abstract construct that is relatively "invariant across situational considerations." These authors hypothesized that PIIT will moderate the effect of key perceptions about a new IT (relative advantage, ease of use, and compatibility) on the intentions to use a new IT. However, they did not find significant moderation effects except for an interaction effect between compatibility and PIIT on the intention to use a new IT. This inconsistency can be addressed and new relationships for PIIT hypothesized using risk-theoretic approaches, discussed below.

The PIIT construct essentially taps into the risk propensity of individuals with regard to information technology adoption decisions (Agarwal et al. 2000). Risk propensity is "an individual's current tendency to take or avoid risks" and has been conceptualized as an individual trait (Sitkin and Weingart 1995). As mentioned above, PIIT has been similarly conceptualized as an individual trait and it captures an individual's willingness to try out any new information technology (Agarwal and Prasad 1998). The willingness to try out a new information technology reflects the individual's willingness to engage in a risky behavior, because "a technological innovation creates … uncertainty (about its expected consequences) in the mind of potential adopters …" (Rogers 1995, pg. 13), and an event is generally considered to be risky if its outcome is uncertain and may result in a loss (Barki et al. 1993; Keil et al. 2000; Mellers and Chang 1994).

TAM's perceived usefulness (PU) construct (Venkatesh and Davis 2000) can similarly be conceptualized as synonymous to the risk perception construct (Sitkin and Pablo 1992) in the risk literature. Risk perception is "a decision-maker's assessment of the risk inherent in a situation (Sitkin and Pablo 1992). PU has been conceptualized in the literature as outcome expectations (Compeau and Higgins 1995b, pg. 197; Venkatesh 2000, pg. 346) that essentially capture technology adopters' risk perceptions about the uncertain outcomes of usefulness, i.e., risks, of the focal technology being considered for adoption.

Risk literature suggests that risk propensity negatively impacts risk perception (Sitkin and Pablo 1992; Sitkin and Weingart 1995). Recent work in the MIS literature on project risks (Keil et al. 2000) also takes this approach. This is because risk propensity affects the relative salience of situational threat or opportunity leading to biased risk perceptions (Brockhaus 1980; Vlek and Stallen 1980), whereby risk-averse individuals overestimate negative outcomes relative to positive outcomes and vice versa. In consonance with this body of literature, PIIT—a risk propensity with regard to adoption of information technologies (as discussed above)—is hypothesized to affect perceived usefulness, which has been conceptualized here, albeit negatively, as a risk perception pertaining to technology adoption outcomes. In other words, individuals with high PIIT, in their enthusiasm about the new technology, may overestimate the usefulness of the IT under consideration, while those with low PIIT may underestimate the "real" usefulness of the focal IT. Therefore, we hypothesize:

H1: An individual's PIIT will have a positive effect on his/her PU pertaining to the IT under consideration.

PIIT is also expected to positively impact general computer self-efficacy (GCSE) (efficacy across multiple computer application domains; Marakas et al. 1998, pg. 129) because a higher risk-taking propensity with respect to information technologies (ITs) will provide an individual with more opportunities to experiment with new ITs, thereby improving one's GCSE through enactive mastery (Agarwal et al. 2000). Also, just as individuals with high risk propensity make biased judgments about risk scenarios (Brockhaus 1980; Vlek and Stallen 1980), individuals with higher PIIT may simply make biased judgments about their general capabilities with ITs, overestimating their GCSE in the process. Therefore, we hypothesize:

H2: An individual's PIIT will have a positive effect on his/her GCSE.

PIIT is also expected to impact IT specific computer self-efficacy (SCSE). The same arguments that apply for the impact of PIIT on GCSE are expected to also apply for the impact of PIIT on SCSE. The impact of PIIT on Windows 95 self efficacy—a particular SCSE—has also been recently found to be significant in empirical research (Agarwal et al. 2000). Therefore, we hypothesize that:

H3: An individual's PIIT will have a positive effect on his/her SCSE.

General Computer Self-Efficacy (GCSE)

Work recently reported in the MIS literature has divided the computer self-efficacy (CSE) construct into two distinct constructs: general CSE (or GCSE) and specific CSE (or SCSE) (Marakas et al. 1998). GCSE is "an individual's judgment of efficacy across multiple computer application domains … [and] is more a product of a lifetime of related experiences" (Marakas et al. 1998, pg. 129), while SCSE refers to "an individual's perception of efficacy in performing specific computer-related tasks within the domain of general computing" (Marakas et al. 1998, pg. 128). It is important to note that the CSE construct, as has been studied in the MIS literature, closely resembles the notion of GCSE defined above.

Prior to any direct experience with a particular IT, the degree of confidence in one's capabilities with ITs in general, i.e., GCSE, can be expected to shape individual beliefs about how easy or difficult it will be to use the IT in question, i.e., PEOU. Following this argument, GCSE has recently been hypothesized and found to significantly impact PEOU (Venkatesh 2000; Venkatesh and Davis 1996). This relationship has also been tested in other empirical research (Agarwal et al. 2000; Igbaria and Iivari 1995) and has been found to be significant. Consistent with these findings, we hypothesize:

H4: An individual's GCSE will have a positive effect on his/her PEOU pertaining to the IT under consideration.

Social cognitive theory (SCT) suggests that self-efficacy judgments influence outcome expectations because " the outcomes one expects derive largely from judgments as to how well one can execute the requisite behavior" (Bandura 1978, pg. 241). Prior empirical MIS research has investigated the relationship between computer self-efficacy (CSE) and outcome expectations and has found this relationship to be significant (Compeau and Higgins 1995a, 1995b, Compeau et al. 1999; Johnson and Marakas 2000). As discussed above, perceived usefulness (PU) essentially captures outcome expectations pertaining to IT being adopted (Compeau and Higgins 1995b, pg. 197; Venkatesh 2000, pg. 346), and, therefore, it may be expected that CSE will influence PU in the context of technology acceptance. While SCSE, a construct that captures judgments about capabilities with regard to specific computer technologies, may be a better predictor of outcome expectancies with regard to a particular technology, an individual may not possess any SCSE prior to the adoption and use of the focal IT. Thus, prior to IT adoption and use, people may

use their GCSE as an anchor to form beliefs about the usefulness outcomes from the new technology being adopted. However, the relationship between CSE and PU has not been investigated in the TAM literature thus far, and two recent papers extending the TAM model with the determinants of PEOU (Venkatesh 2000) and PU (Venkatesh and Davis 2000) consider self-efficacy to be only a determinant of PEOU and not of PU. To address this gap in the TAM model between GCSE and PU, we hypothesize:

H5: An individual's GCSE will have a positive effect on his/her PU pertaining to the IT under consideration.

The direct link between self-efficacy and behavioral intent (BI) has been investigated in psychology and consumer research literature pertaining to the adoption and use of advanced technologies (Hill et al. 1986, 1987). Two empirical studies show that self-efficacy beliefs directly and significantly predict BI to use advanced technologies, independent of the instrumentality or usefulness beliefs, although the authors do not provide a cogent theoretical justification for such a relationship between self-efficacy beliefs and BI independent of outcome beliefs (Hill et al. 1987). However, since the 1987 study by Hill et al., the direct relationship between CSE and BI has neither been tested in other empirical studies of ITs, nor have the research articles dealing with TAM and self-efficacy in the MIS literature addressed the possibility of such a relationship. Nonetheless, the robust empirical support for a direct relationship between CSE and BI in the two studies in Hill et al. (1987) provides strong justification for further investigation of this relationship in the MIS literature in order that the TAM model can be made more comprehensive. Following the same rationale that we have discussed above pertaining to GCSE and PU—that prior to the actual usage of a focal IT, people may use GCSE as an anchor to shape their PU beliefs—we hypothesize as follows:

H6: An individual's GCSE will have a positive effect on his/her BI for using the IT under consideration.

Self-efficacy beliefs will undoubtedly influence IT usage behavior (USE) mediated by PEOU, PU, and BI, as they are hypothesized to be a determinant of these three key constructs of the TAM model, and empirical support for this mediated influence is found in the psychology and self-efficacy literature (Compeau and Higgins 1995b; Compeau et al. 1999; Hill et al. 1987). However, recent self-efficacy studies in the MIS literature also find empirical evidence for a direct influence of self-efficacy beliefs on USE in addition to the influence on usage behavior mediated through outcome expectations (similar to PU), affect, and anxiety (Compeau and Higgins 1995b; Compeau et al. 1999). The rationale for a direct relationship between self-efficacy and performance of the behavior comes from SCT itself; regardless of other reasons, a person who feels more capable of performing a particular behavior is more likely to perform that behavior than one who feels less capable. However, the most recent papers discussing TAM extensions (Venkatesh 2000; Venkatesh and Davis 2000; Venkatesh and Morris 2000) do not include the relationship CSE –> USE. To address this gap in the TAM model, we hypothesize:

H7: An individual's GCSE will have a positive effect on his/her USE for using the IT under consideration.

Finally, SCT predicts that self-efficacy beliefs will also impact individual performance of behavior, because a person who feels more capable of performing a particular behavior is more likely to perform that behavior in a superior manner. This prediction of SCT—the influence of self-efficacy on task performance (TPER)—has found strong support in a variety of clinical and organizational settings. The direct relationship between CSE and TPER, in addition to other mediated influences of CSE on TPER, has also found strong empirical support in the area of computer and IT usage (Compeau and Higgins 1995a; Gist et al. 1989; Johnson and Marakas 2000). Marakas et al. have also recently conceptualized CSE as a predictor of TPER, but their conceptualization suggests that SCSE leads to specific task performances. While SCSE may be undoubtedly be a better predictor of TPER with respect to particular computer-related tasks, GCSE is "a product of a lifetime of related experiences" (Marakas et al. 1998, pg. 129). We believe such an overall CSE— GCSE—provides a bundle of general computer capabilities that should improve task performance with respect to specific, but computer-related, tasks. Therefore, we hypothesize:

H8: An individual's GCSE will have a positive effect on his/her TPER with respect to the tasks being performed using the IT under consideration.

Perceived Ease of Use (PEOU), Perceived Usefulness (PU), and Behavioral Intent (BI)

The relationships PEOU –> PU (H9), PEOU –> BI (H10), PU –> BI (H11), and BI –> USE (H12) have been investigated in numerous TAM studies since they were first proposed in 1989 (Davis 1989; Davis et al. 1989), and have now become well established as part of technology acceptance models. Hypotheses pertaining to these relationships are shown in the research model in Figure 1 but they are not discussed in this paper any further.

Usage Behavior (USE)

The relationship between USE and task performance (TPER) essentially captures the relationship between system use and individual performance in DeLone and McLean's (1992) IS success model and the link between utilization and performance impacts in Goodhue and Thompson's (1995) task-technology fit model. It posits that, ceteris paribus, a higher degree of usage of the focal IT will lead to higher individual performance and vice versa. Therefore, we hypothesize:

H13: An individual's usage of the IT under consideration will have a positive effect on his/her TPER with respect to the tasks being performed using the particular IT.

Task Performance (TPER)

Task performance is expected to positively impact SCSE through "enactive mastery" (Bandura 1977a; Bandura 1977b) and thus we hypothesize:

H14: An individual's TPER with respect to the tasks being performed using the particular IT will have a positive effect on the individual's SCSE.

IT Specific Computer Self-Efficacy (SCSE)

SCSE is expected to contribute to the shaping of an individual's GCSE consistent with Marakas et al.'s conceptualization. Therefore:

H15: An individual's SCSE will have a positive effect on the individual's GCSE.

Individuals with a high degree of SCSE may also be expected to form inflated perceptions about their capabilities with respect to using the focal IT, thereby over-estimating PEOU and PU, in the same manner that individuals with a high risk propensity make biased judgments about risk scenarios (Brockhaus 1980; Vlek and Stallen 1980). Therefore, we hypothesize:

H16: An individual's SCSE will moderate the relationship between GCSE and PEOU in a positive direction.

H17: An individual's SCSE will moderate the relationship between GCSE and PU in a positive direction.

RESEARCH METHOD

This research will be conducted using the survey research method. The technology to be studied in this research is the personal digital assistant (PDA) technology. This technology has started becoming popular and mainstream recently, both in business- and personal-use domains, and it is no longer limited to business users in mobile- or field-oriented jobs. Data will be collected from graduate business students—both users and non-users of the PDA technology. We expect to have approximately 200 subjects available for this research at two business schools. Data will be analyzed using PLS.

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