December 2002

PREDICTING THE USE OF WEB-BASED INFORMATION SYSTEMS: INTRINSIC MOTIVATION AND SELF-EFFICACY

Yujong Hwang
University of South Carolina

Mun Yi
University of South Carolina

Predicting the Use of Web-Based Information Systems: Intrinsic Motivation and Self-Efficacy

Yujong Hwang and Mun Y. Yi
University of South Carolina
yujongh@yahoo.com   myi@moore.sc.edu

Abstract

This study applies recent findings in the intrinsic motivation and computer self-efficacy research to Technology Acceptance Model in order to predict the use of web-based information systems. One hundred nine subjects participated in the study, which was conducted in a field setting with Blackboard system, a web-based class management system. A survey was administered at the beginning of the study and the actual use of the system was captured by the Blackboard system over eight weeks. The results largely support the proposed model, highlighting the important roles of perceived enjoyment, learning goal orientation, and self-efficacy in determining the actual use of the system.

Introduction

Technology Acceptance Model (TAM) has become established as a parsimonious yet powerful model for predicting user acceptance of technology. TAM, introduced by Davis (Davis, 1989; Davis et al., 1989), has been studied in more than 100 studies focusing on the validation of the model across different settings (see Lucas & Spitler, 1999 for a recent review). TAM theorizes that an individual's actual system usage is determined by behavioral intention, which is in turn determined by perceived usefulness and perceived ease of use. TAM posits that the impact of other external variables on behavioral intention is fully mediated by these two beliefs. Recent findings in the intrinsic motivation and self-efficacy research indicates that enjoyment, goal orientation, and self-efficacy also play important roles in determining a person's behavioral intention and actual behavior. Given that the web is a richer environment than any other traditional information technology in meeting various personal needs such as education, communication, entertainment, shopping, and work, we expect these intrinsic motivational and self-efficacy variables play critical roles in influencing individual's decision to use a web-based technology. The goal of the present study is to examine the effects of those variables on TAM in a web-based system usage context.

Research Model and Hypothesis

Figure 1 presents the proposed research model. TAM originally included attitude as a mediator between the personal belief constructs and behavioral intention (Davis et al., 1989), but later dropped it from the model because it was found to be a weak mediator (Davis et al., 1992; Venkatesh & Davis, 2000). In consistent with the change, the proposed model does not include the attitude construct. The proposed model includes three new theoretical constructs that can significantly influence the existing variables of TAM. The specific elements of the model and related hypotheses are further detailed below.

Application-Specific Self-Efficacy

Social cognitive theory (Bandura, 1977, 1986) posits that people are driven neither only by inner forces, nor simply by external stimuli. Instead, human behavior is explained via a model of triadic reciprocality in which behavior, cognitive and personal

factors, and environmental events all operate interactively as determinants of each other. A key regulatory mechanism in this dynamic relationship that affects human behavior is self-efficacy, people's judgments of their capabilities to perform certain activities. The theory postulates that "psychological procedures, whatever their form, serve as means of creating and strengthening expectations of personal efficacy (Bandura, 1977), which in turn determines what actions to take, how much effort to invest, how long to persevere, and what strategies to use in the face of challenging situations. Many empirical studies have validated this proposition in a wide variety of settings such as employee attendance management (Frayne & Latham, 1987), complex decision making (Wood & Bandura, 1989), computer skill acquisition (Gist et al., 1989; Mitchell et al., 1994), and user acceptance of technology (Venkatesh, 2000; Agawal et al., 2000).
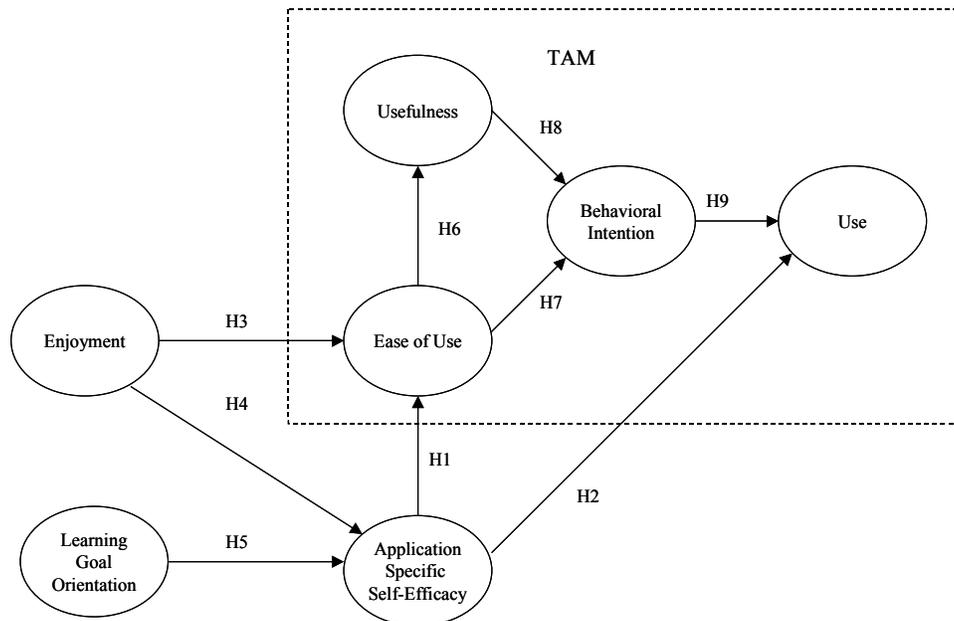

Figure 1. Proposed Research Model

According to Marakas et al. (1998), computer self-efficacy (CSE), perception of one's capability to use a computer, is a multi-level construct, operating at two distinct levels: at the general computing level (general CSE) and at the specific application level (application-specific self-efficacy). General CSE is defined as an individual judgment of efficacy across multiple computer domains and application-specific self-efficacy is defined as an individual perception of efficacy in using a specific application or system within the domain of general computing. Prior research on user acceptance of technology focused on examining the effects of general CSE on perceived ease of use (e.g., Venkatesh & Davis, 1996; Venkatesh 2000), exploring its role as an anchor for the subsequent development of ease of use perceptions. Recently, Agarwal et al. (2000) proposed a model with both general CSE and application-specific self-efficacy to find a stronger relationship between specific CSE and ease of use (β = .428) than between general CSE and ease of use (β = .198), empirically demonstrating more direct and powerful effect of application-specific self-efficacy on the ease of use perception. This indicates that users regard the system easier to use when their self-percepts of efficacy with regard to the target system are higher and that application-specific self-efficacy is a more powerful determinant of ease of use than general CSE. Consistently, we relate application-specific self-efficacy to ease of use in the model and hypothesize that:

> *H1: Application-specific self-efficacy will have a positive effect on ease of use.*

Social cognitive theory posits self-efficacy as a direct determinant of individual's behavior. Compeau et al. (1999) found significant relationship between CSE and usage behavior. They used self-reported usage frequency and duration in the survey. However, a study measuring usage behavior objectively (for example, by measuring actual system access frequency) can rule out the possible biasing effects of selective recall (Davis et al., 1992). Consequently, we measure actual use of the system and hypothesize that:

> *H2: Specific CSE will have a positive effect on the actual use of the system.*

Enjoyment

Enjoyment refers to the extent to which the activity of using a computer system is perceived to be personally enjoyable in its own right aside from the instrumental value of the technology (Davis et al., 1992). Prior research proposed enjoyment as a determinant of behavioral intention (Davis et al., 1992) and as a determinant of ease of use (Venkatesh, 2000). According to Davis et al. (1992), "extrinsic motivation refers to the performance of an activity because it is perceived to be instrumental in achieving valued outcomes that are distinct from the activity itself" (1992). In contrast, "intrinsic motivation refers to the performance of an activity for no apparent reinforcement other than the process of performing the activity per se". Davis et al. classified enjoyment as a type of intrinsic motivation and perceived usefulness as a type of extrinsic motivation. Venkatesh (1999) compared two training methods (traditional training vs. game-based training) and found the training method with a component aimed at enhancing intrinsic motivation to induce higher ease of use perceptions. Later, Venkatesh (2000) conceptualized enjoyment as an antecedent of ease of use, whose effect increases over time as users gain more experience with the system. However, the specific effect of enjoyment on ease of use has been largely overlooked in a web-based context. Moon and Kim (2001) examined a conceptually similar but distinct intrinsic motivation construct, playfulness, as an antecedent of WWW usage, suggesting a significant effect of intrinsic motivation in determining the use of web-based information systems. Building upon these findings, we hypothesize:

> *H3: Perceived enjoyment will have a positive effect on perceived ease of use.*

Emotional arousal is an important source of the self-efficacy formation (Bandura, 1986). People partly rely on their state of physiological arousal in forming judgments of their level of anxiety or vulnerability to stress. Further, it has been shown that anxiety experienced by subjects in relation to task performance situation tend to generate further anxieties through the process of anticipatory self-arousal (Sarason, 1975). Consequently, we hypothesize that:

> *H4: Perceived enjoyment will have a positive effect on application-specific self-efficacy.*

Learning Goal Orientation

The role of different goal orientation in learning and achievement has been a focus of current research in achievement motivation and self-regulated learning, particularly the role of mastery or learning and performance goals (Ames, 1992; Dweck and Leggett, 1988; Pintrich, 2000; Pintrich and Schunk, 1996). In the normative models of goal orientation, learning goals make students focus on learning and mastery of content, and have been related to a number of adaptive outcomes, including higher levels of efficacy, task value, interest, positive affect, effort and persistence, learning strategies, as well as better performance (Pintrich, 2000). In contrast, performance goals cause students to concern about their ability and performance relative to others, and focus the students on goals of doing better than others or avoiding looking incompetent or less able in comparison to others. Individuals with a performance goal orientation tend to hold an entity theory about their ability. They view ability as fixed, uncontrollable personal attribute. In contrast, individuals with a learning goal orientation tend to hold an incremental theory about their ability. They view ability as a malleable attribute that can be developed through effort and experience. Individuals with a high learning goal orientation pursue an adaptive response pattern in which they persist, escalate effort, engage in solution-oriented self-instruction, and report enjoying the challenge. With a performance goal orientation, individuals pursue a maladaptive response pattern in which they withdraw from the task, make negative ability attributions, and report decreased interest in the task. In this normative view of performance goals, performance goals are generally seen as less adaptive in terms of subsequent motivation, affect, strategy, use, and performance (Ames, 1992; Dweck and Leggett, 1988; Pintrich, 2000; Pintrich and Schunk, 1996; Urdan, 1997). In terms of valence, research has shown that learning oriented individuals react to challenges with positive affect, pride, and intrinsic motivation (Dweck and Leggett, 1988). The more challenging a task becomes, the more it is perceived as an opportunity to build competence. Therefore, we hypothesize that:

> *H5: Learning goal orientation will have a positive effect on application-specific self-efficacy.*

Ease of Use, Usefulness, and Behavioral Intention

TAM posits that behavioral intention is a significant determinant of actual system use, and that behavioral intention is determined by two salient beliefs, perceived usefulness and perceived ease of use. Further, perceived ease of use is a determinant of perceived usefulness because, assuming other things being equal, users consider a system more useful when it is more effort-free. These relationships have been examined and supported by many prior studies (Davis, 1989; Davis et al., 1989; Venkatesh & Davis, 1996; Venkatesh and Davis, 2000). The present study revalidates those relationships in a web-based context with the following hypotheses:

H6: Ease of use will have a positive effect on usefulness.

H7: Ease of use will have a positive effect on behavioral intention.

H8: Usefulness will have a positive effect on behavioral intention.

H9: Behavioral intention will have a positive effect on actual system use.

Method

Blackboard system was the target system of the study. Blackboard system is a web-based comprehensive class management system accessible via the Internet. Students typically use the system to check class assignment or announcement, communicate with their classmates, and retrieve their grade. They can also use the system to access course materials or take a test. One hundred nine students from three introductory information systems classes at a large state university in the U.S. voluntarily participated in the study. The same instructor, who was unaware of the research hypotheses, taught the three classes. The usage of the Blackboard system was voluntary to the students. The survey was administered in September 2001, two weeks after the introduction of the system. Blackboard system is user-friendly technology, thus the two-week trial period was enough to be familiar with the system. Actual usage data was gathered from the introduction of the system to the consecutive eight weeks. Most of the constructs in the research model were measured with the items adopted from prior research. The scale items of enjoyment, learning goal orientation, and application-specific (Blackboard system) self-efficacy are shown in Appendix.

Results

A path-analytic approach using ordinary least-squares method (Cohen & Cohen, 1983) was employed to test the proposed model. As shown in Figure 2, all the hypotheses were supported. All the paths proposed by TAM were supported. Over and above the effect of behavioral intention, however, application-specific self-efficacy had a significant effect on actual use. As theorized, enjoyment and application-specific self-efficacy were significant determinants of ease of use. Enjoyment and learning goal orientation also influenced ease of use perception via their effects on application-specific self-efficacy. The model explained substantial variance of ease of use (Adjusted $R^2 = .51$) and moderate variance of behavioral intention (Adjusted $R^2 = .29$) and actual use (Adjusted $R^2 = .14$).
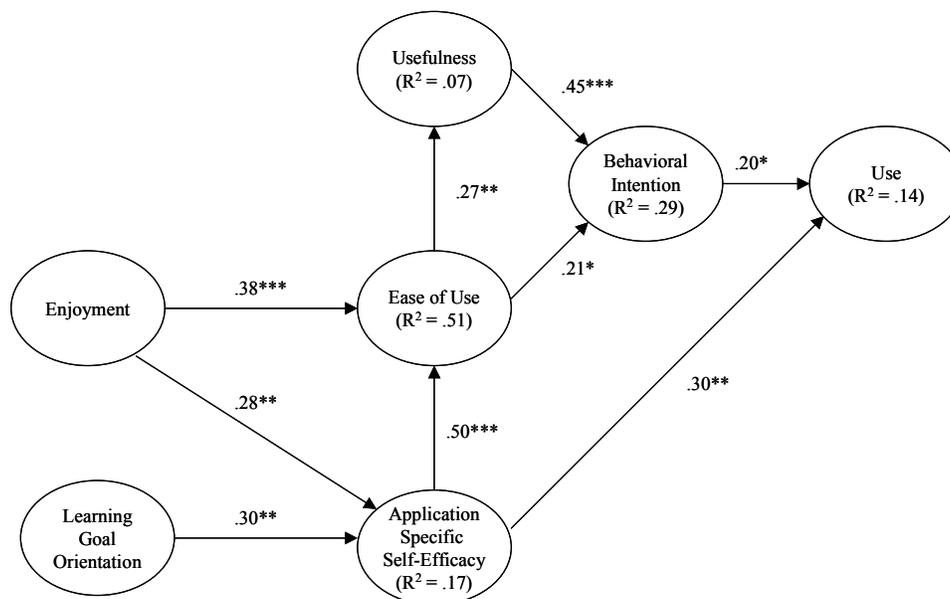

Figure 2. Model Testing Result

Discussion

The results of the study clearly point out the important roles of intrinsic motivational and self-efficacy variables such as enjoyment, learning goal orientation, and application-specific self-efficacy play in influencing the decision to use a web-based technology and subsequent actual use. The model illuminates the underlying relationships between these motivational variables and the existing TAM variables, providing insights into how the acceptance and use of web-based information systems can be further facilitated. As application-specific self-efficacy has been found to be a strong determinant of ease of use and actual use, developing users' confidence in using the specific application seems critical. The findings identify two important sources for enhancing individual confidence in using a web-based system: enjoyment and learning goal orientation. Enjoyment and learning goal orientation were found to have significant effects on application-specific self-efficacy, indicating that users who enjoy using a system and who are oriented toward learning and mastery of content are more likely to develop a higher sense of confidence. Learning goal orientation had a significantly positive effect on application-specific self-efficacy. Finally, enjoyment had a significant direct effect on ease of use. For a successful acceptance of technology, researchers and practitioners should actively pursue various ways to facilitate and encourage people to enjoy their use of web-based information systems.

References

Agarwal, R., Sambamurthy, V. and Stair, R.M. "Research Report: The Evolving Relationship Between General and Specific Computer Self-Efficacy - An Empirical Assessment," *Information Systems Research* (11:4), 2000, pp. 418-430.

Amez, C. "Classroom: Goals, Structures, and Student Motivation," *Journal of Educational Psychology* (84), 1992, pp. 261-271.

Bandura, A. *Social Learning Theory*, Prentice-Hall, Englewood Cliffs, NJ, 1977.

Bandura, A. *Social Foundations of Thought and Action: A Social Cognitive Theory*, Prentice-Hall, Englewood Cliffs, NJ, 1986.

Brett, F.J. and VandeWalle, D. "Goal Orientation and Goal Content as Predictors of Performance in a Training Program," *Journal of Applied Psychology* (84), 1999, pp. 863-873.

Cohen, J. and Cohen, P. *Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences*, Lawrence Erlbaum Associates, Hillsdale, New Jersey, 1983.

Compeau, D., Higgins, C.A. and Huff, S. "Social Cognitive Theory and Individual Reactions to Computing Technology: A Longitudinal Study," *MIS Quarterly* (23:2), 1999, pp. 145-158.

Davis, F.D. "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology," *MIS Quarterly* (13:3), 1989, pp. 319-339.

Davis, F.D., Bagozzi, R.P. and Warshaw, P.R. "User Acceptance of Computer Technology: A Comparison of Two Theoretical Models," *Management Science* (35:8), 1989, pp. 982-1002.

Davis, F.D., Bagozzi, R.P. and Warshaw, P.R. "Extrinsic and Intrinsic Motivation to Use Computers in the Workplace," *Journal of Applied Social Psychology* (22), 1992, pp. 1111-1132.

Dweck, C.S. and Leggett, E.L. "A Social Cognitive Approach to Motivation and Personality," *Psychological Review* (95), 1988, pp. 256-273.

Frayne, C.A. and Latham, G.P. "Application of Social Learning Theory to Employee Self-Management of Attendance," *Journal of Applied Psychology* (72:3), 1987, pp. 387-393.

Gist, M.E., Schwoerer, C. and Rosen, B. "Effects of alternative training methods on self-efficacy and performance in computer software training," *Journal of Applied Psychology* (74:6), 1989, pp. 884-891.

Johnson, R.D. and Marakas, G.M. "The Role of Behavior Modeling in Computer Skill Acquisition - Toward Refinement of the Model," *Information Systems Research* (11), 2000, pp. 402-417.

Lucas, H.C. and Spitler, V.K. "Technology Use and Performance: A Field Study of Broker Workstations," *Decision Sciences* (30), 1999, pp. 291-311.

Marakas, G.M., Yi, M.Y. and Johnson, R.D. "The Multilevel and Multifaceted Character of Computer Self-Efficacy: Toward Clarification of the Construct and an Integrative Framework for Research," *Information Systems Research* (9:2), 1998,

Mitchell, T.R., Hopper, H., Daniels, D., George-Falvy, J. and James, L.R. "Predicting Self-Efficacy and Performance during Skill Acquisition," *Journal of Applied Psychology* (79:4), 1994, pp. 506-517.

Moon, J. and Kim, Y. "Extending the TAM for a World Wide Web Context," *Information & Management* (38), 2001, pp. 217-230.

Printrich, P. "Multiple Goals, Multiple Pahtways: The Role of Goal Orientation in Learning and Achievement," *Journal of Educational Psychology* (92), 2000, pp. 545-555.

Printrich, P. and Schunk, D.H. *Motivation in Education: Theory, Research, and Applications*, Prentice Hall, Englewood Cliffs, NJ, 1996.

Sarason, I.G. *Anxiety and Preoccupation*, Hemisphere, Washington, DC, 1975.

Urdan, T. "Achievement Goal Theory: Past Results, Further Directions," *Advances in Motivation and Achievement* (10), 1997, pp. 99-141.

Venkatesh, V. "Creation of Favorable User Perceptions: Exploring the Role of Intrinsic Motivation," *MIS Quarterly* (23), 1999, pp. 239-260.

Venkatesh, V. "Determinants of Perceived Ease of Use: Integrating Control, Intrinsic Motivation, and Emotion into the Technology Acceptance Model," *Information Systems Research* (11:4), 2000, pp. 342-365.

Venkatesh, V. and Davis, F.D. "A Model of the Antecedents of Perceived Ease of Use: Development and Test," *Decision Sciences* (27:3), 1996, pp. 451-481.

Venkatesh, V. and Davis, F.D. "A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies," *Management Science*, (46:2), 2000, pp. 186-204.

Wood, R. and Bandura, A. "Impact of Conceptions of Ability on Self-Regulatory Mechanisms and Complex Decision Making," *Journal of Personality and Social Psychology* (56:3), 1989, pp. 407-415.

Appendix

Enjoyment measurement items (Adopted from Davis et al., 1992)

    I would have fun using the Blackboard system.
    Using the Blackboard system would be pleasant.
    I would find using the Blackboard system to be enjoyable.

Learning Goal Orientation measurement items (Adopted from Brett and VandeWalle, 1999)

    I am willing to select a challenging work assignment that I can learn from.
    I often look for opportunities to develop new skills and knowledge.
    I enjoy challenging and difficult tasks where I'll learn new skills.
    ISFor me, developing my work ability is important enough to take risks.
    I prefer to work in situations that require a high level of ability and talent.

Specific CSE measurement items (Adopted from Johnson and Marakas, 2000)

    I believe I have the ability to …
        download the file from the Blackboard system to my floppy disk.
        send e-mail using the Blackboard system.
        make my website with the Blackboard system.
        use the Blackboard system to communicate information to others.
        check my Grade using the Blackboard system.
        the favorite Website link on the Blackboard system.
        publish my personal information in the Blackboard system.
        use check the announcement in the Blackboard system.
        take a test using the Blackboard system.