A Conceptual Model of eLearning Adoption

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***Abstract*—Internet-based learning systems are being used in many universities and firms but their adoption requires a solid understanding of the user acceptance processes. The technology acceptance model (TAM) has been used to test the acceptance of various technologies and software within an e-learning context. This research aims to discuss the main factors of a successful e-learning adoption by students. A conceptual research framework of e-learning adoption is proposed based on the TAM model.**

Index Terms—Conceptual model, e-learning, e-learning adoption

1. INTRODUCTION

The study of technology adoption has been considered among researchers in the IT community (e.g. Grandon and Pearson, 2004; Vailer *et al.*, 2004). The information systems literature contains multiple models of factors that are associated with IT use or acceptance. The main research streams that have been developed in the area of information technology acceptance studies are the theory of reasoned action (TRA) (Fishbein and Ajzen, 1975), the theory of planned behaviour (TPB) (Ajzen, 1985), the innovation diffusion theory (IDT) (Rogers, 1983), the technology acceptance model (TAM) (Davis, 1986), and the theoretical extension of TAM known as TAM2 (Venkatesh and Davis, 2000).

By building on existing work in the field, this research is, in part, an attempt to continue the cumulative tradition in information systems research. The TAM (Davis, 1989) was chosen as a framework to determine the factors that affect student's adoption of e-learning systems for the following reasons:

1. TAM has empirical evidence in explaining technology acceptance (Hu *et al.*, 1999).
2. Previous research suggested that TAM could be an appropriate model to examine a student's acceptance of learning environment applications over a period of time (Carswell and Venkatesh, 2002; Stoel and Lee, 2003).
3. TAM is one of the most widely used models for IT adoption (Gefen and Straub, 2000; Gefen, 2003; Stoel and Lee, 2003).
4. TAM has been used as a theoretical basis for many empirical studies and has accumulated a great deal of support (Venkatesh and Davis, 2000; Van Slyke *et al.*, 2003).
5. Researchers have employed the TAM model to help understand website usage (Teo *et al.*, 1999; Moon and Kim, 2001) which is an application which has some similarities with (web-based) e-learning.

Davis (1989) stated that the goal of TAM is to provide a basis for tracing the impact of external factors on internal beliefs, attitudes, and intention to use computers. TAM model posits that two particular beliefs, perceived usefulness (PU) and perceived ease of use (PEOU) are of the primary relevance for computer acceptance behaviours. External factors provide the bridge between the internal beliefs, attitudes and intentions represented in TAM and the various individual differences, situational constraints and managerially controllable interventions impinging on behaviour. Researchers have extended TAM by proposing and testing specific factors to its two-use belief constructs (PU and PEOU). As explained by Mathieson (1991: 173), without external factors TAM provides very general information on users' opinions about a system, but does not yield "specific information that can better guide system development". This study followed that line of reasoning and included not only the core determinants of TAM but also other sets of factors that may affect the students' adoption of e-learning systems.

I. EMPIRICAL STUDIES USING TAM IN E-LEARNING

Stoel and Lee (2003) used the TAM model as a framework to study the effect of student experience with web-based learning technologies on their acceptance of those technologies. They suggested that student experience with the technologies might influence their acceptance. The results showed that student experience with the technology positively influenced usage through the perceived usefulness and perceived ease of use. Similarly, Selim (2003) used the TAM model to assess students' acceptance of course websites as an effective learning tool. The results showed that course website usefulness and ease of use proved to be key determinants of the acceptance and usage of course websites as an effective learning tool. Lee *et al.* (2003) used the TAM model to examine the use of integrated communication and engineering design tools in a distributed learning environment. The TAM model was utilized to investigate the attitude formation process. With the TAM model, they were able to demonstrate that students' initial expectations affected the perceptions of attitude and use of the system. Khaled *et al.* (2004) added some external factors (e.g. gender and income) to the TAM model that may be considered in the academic environment. The results showed that gender; traditional vs. non-traditional students' categories, educational background, and classification (full-time vs. part-time) were not significant factors in affecting students' computer usage. However, income, computer knowledge, perceived ease of use, perceived usefulness, computer literacy, and attitudes were significant factors that affected students' computer usage. Pituch and Lee (2006) proposed and tested alternative models that seek to explain student intention to use an e-learning system when the system is used as a supplementary learning tool within a traditional class or a stand-alone distance education method. The models integrated determinants from TAM as well as sys-

tem and participant characteristics cited in the research literature. In addition, their study represents an initial step in highlighting specific system factors that appear to promote system use and identifying how such system factors impact use of an e-learning system for both supplementary learning and distance education purposes. Given the increasing use of e-learning systems, a better understanding and implementation of effective system characteristics will enhance the use and educational value of such a system. In addition, Saadé and Bahli (2005) used an extended version of the TAM, including cognitive absorption (called intrinsic motivation). Their study intended to provide insight for improving the proposed model in the e-learning context. The results provided support for the model as explaining acceptance of an online learning system and for cognitive absorption as a variable, which influences TAM variables. Ngai *et al.* (2007) extended the TAM model to include technical support as a precursor and then investigated the role of the extended model in user acceptance of WebCT. The results showed that technical support has a significant direct effect on perceived ease of use and usefulness, while perceived ease of use and usefulness are the dominant factors affecting the attitude of students using WebCT. In addition, the results indicate the importance of perceived ease of use and perceived usefulness in mediating the relationship of technical support with attitude and WebCT usage.

II. FACTORS AFFECTING STUDENTS' ADOPTION OF E-LEARNING SYSTEMS

Based on the previous discussions, the two constructs, perceived ease of use and perceived usefulness, were the mediating constructs in attitudes towards web-based technology. Perceived ease of use will positively influence perceived usefulness and attitude for the web-based technology, and perceived usefulness will positively influence attitude and intention to use the technology. Attitude will positively influence intention to use, and intention to use will positively influence the actual web-based technology usage. In addition, researcher has looked at other factors influencing the adoption of web-based technology in different industries.

A. Subjective Norm (SN)

Davis *et al.* (1989) believed that in some cases people might use a system to comply with others' mandates rather than their own feelings and beliefs. Adler (1996) stated that social pressure could affect behaviour of individuals in varying degrees in different societies depending on the culture. In terms of technology acceptance, individuals from a collectivist culture may use computers because of the perceived social pressure from superiors and peers. Empirical support for the relationship between social norms and behaviour can be found in many studies (e.g. Tornatsky and Klein, 1982; Venkatesh and Davis, 2000). Individuals can choose to perform a specific behaviour even if they are not positive towards the behaviour or its consequences. The choice depends on how important the individuals think that the important referents believe that they should act in a certain way (e.g. Fishbein and Ajzen, 1975, Venkatesh and Davis, 2000). Unfortunately, early research on the TAM dropped SN as it showed insignificant results in affecting intention. Although, recently Lee (2006) found that the effects of SN significantly influenced perceived usefulness. In the e-learning context, Kim *et al.* (2005) suggested that SN influences the learner's satisfaction with and motivation for e-learning. In addition, the SN was a significant prediction of students' satisfaction (Gunawardena and Zittle, 1997). Frith (2002) found that social factors enhanced students' motivation and satisfaction.

B. Internet Experience (IE)

Research studies suggest that prior experience is important in an individual's acceptance of IT. For example, Igbaria *et al.* (1995) found that prior experience is one of the factors explaining individual differences in technology acceptance research. Additionally, prior experience was found as strongly influencing intention to use and usage of a specific system through perceived ease of use (Agarwal and Prasad, 1999) and through perceived usefulness (Jiang *et al.*, 2000). Igbaria *et al.* (1995) found that computer experience directly and indirectly influences microcomputer usage behaviour through perceived usefulness and perceived ease of use. As O'Cass and Fenech (2003) point out, when Internet users have accumulated sufficient personal experience via their adoption of computer technology, it creates a belief in their ability to use the Internet for learning purposes. Kerka (1999) stated that, in distance learning in Cyber space, learner success depends on technical skills in computer operation and Internet navigation, as well as the ability to cope with technical difficulty. Morss (1999) found empirical evidence that older students, who had more experience of the technology, use the system more than younger students with less experience do in non-WebCT classes. Conrad (2002) found that students who had more experience in e-learning courses were less likely to feel anxious about e-learning. Similarly, Arbaugh and Duray (2002) found that students who had more experience in e-learning course were more likely to be satisfied with e-learning systems. Researches using TAM have proposed that an individual's experiences with a specific technology influence perceptions of ease of use and usefulness of that technology. Selim (2003) suggested that a student's course website use tended to be greater when the site was viewed as being useful and easy to use. Thus, as student experience with a technology increases, they perceive it to be easier to use and more useful, and therefore, are more likely to use it. Based on evidence from prior TAM research, students' experience with web-based learning technology was conceptualized as an exogenous (external) variable. In addition, to explain user beliefs concerning usefulness and ease of use toward e-learning systems, prior experience on the Internet has to be considered.

C. System Interactivity (SI)

Research suggests that system characteristics can influence the intention to use and usage behaviour of the system. For example, Bates (1991) noted that the main advances in distance education would come from technology that allowed increased learner interaction. Two types of interaction would be provided by a web-based learning system: instructor-to-student and student-to-student interactions. Palloff and Pratt (1999: 5) stated, "the key elements of learning processes are the interactions among students themselves, the interactions between faculty and students, and the collaboration in learning that results from these interactions". Some tools are used to facilitate the interactions, such as discussion forums, chat systems, and e-mail. In addition, the interactions can be either

asynchronous or synchronous. In asynchronous discussions, there is no time and space constraint for any party and students are able to engage in discussions on diverse topics with facilitators and peers. The availability of interactive applications such as discussion forums and e-mail facilitate the interactivity. Duffy *et al.* (1998) stated that asynchronous learning environments foster students' information processing and critical thinking by allowing them the time to process their thinking when they post a message in an online environment. Additionally, the asynchronous learning environment is the preferable method for fostering in-depth student-rich interactions (Bonk *et al.*, 1998). There is a significant relationship between interactivity and learning effectiveness. Henson *et al.* (2003) found that asynchronous discussions were effective in facilitating case studies in e-learning classes. Similarly, Mills and Salloway (2001) found that synchronous discussions are effective in e-learning classes. Students often chose different methods such as synchronous and asynchronous to complete different kinds of tasks in e-learning classes. Alhabshi (2002) stated that a web-based learning (WBL) environment should combine both synchronous and asynchronous communication to support various elements such as text, graphics, audio and video messages. Poon *et al.* (2004) found that students' grades are highly correlated with student's interactivity. Because of that, system interactivity is expected to be one of the factors that may affect students' adoption of e-learning systems.

D. Self-Efficacy (SE)

Self-efficacy is a belief in an individual's capability to perform certain behaviours or it is one's personal beliefs about his or her ability to perform certain tasks successfully (Bandura, 1986, 1997). Perceived self-efficacy refers to the beliefs in one's capability to organize and execute the courses of action required to produce a given accomplishment or outcome and originates from various sources including performance accomplishments, vicarious experience, verbal persuasion, and psychological states. Self-efficacy was one of the important beliefs in the social learning theory (Bandura, 1986, 1997). Several studies found that self-efficacy perceptions influenced decisions about what behaviours to undertake, persistence in attempting certain behaviours, and the actual performance attainments of the individual with respect to behaviour (Bandura, 1977; Brown and Inouye, 1978; Iocke *et al.*, 1984; Wood and Bandura, 1989). With respect to Internet-related tasks, self-efficacy can be an important factor in considering whether a new process is adopted (O'Cass and Fenech, 2003). Davis *et al.* (1989) and Venkatesh and Davis (1996) suggested that self-efficacy is an antecedent of perceived ease of use and object use ability. Compeau and Higgins (1995) also found that computer self-efficacy was a significant determinant of behavioural intention to use information technology. Similarly, Hill *et al.* (1987) reported that computer self-efficacy was a significant determinant of behavioural intentions. Dishaw *et al.* (2002: 1024) stated, "self-efficacy constructs have been widely used in the educational literature to study academic performance". Lu and Hsiao (2007) and Rao and Troshani (2007) used computer self-efficacy as a proxy for an individual's internal control in the IT usage context. Lim (2000) stated that computer self-efficacy predicts future participation adult learners web-based distance education. Thong *et al*'s (2002) study of digital libraries concluded that computer self-efficacy, computer experience, and domain knowledge affect perceived ease of use significantly in TAM. Similarly, Agarwal *et al.* (2000) found that self-efficacy is an important determinant of perceived ease of use. In the e-learning context, self-efficacy is interpreted as one's self-confidence in his or her ability to perform certain learning tasks using an e-learning system. For example, students with high sense of an educational self-efficacy believe that they can study using e-learning system. While, students with a low sense of educational self-efficacy believe they cannot study using an e-learning system. A student who has a strong sense of his or her capability in dealing with an e-learning system has a more positive perception of ease of use and usefulness and he or she is more willing to accept and use the system. A student's self-efficacy affects her/his actual behaviour decision or intention toward the educational process as well as their specific educational activities.

E. Technical Support (TS)

Ralph (1991) defined technical support as people assisting the users of computer hardware and software products, which can include hotlines, online support service, machine-readable support knowledge bases, faxes, automated telephone voice response systems, remote control software and other facilities. Technical support is one of the important factors in the acceptance of technology for teaching (Sumner and Hostetler, 1999; Hofmann, 2002; Williams, 2002) and in user satisfaction (Mirani and King, 1994). High levels of organizational support, including management support and information center support, were thought to promote more favourable attitudes about the system among users and information specialists, and lead to greater success for personal computing systems (Igbaria, 1994). Vandenbosch and Higgins (1995) study founded that training and prior computer experiences had a significant impact on system use. Technical support from the university is essential for achieving significant success in applying information technology in learning. In addition, technical support is especially important in the beginning stage of technology adoption. Hadley and Sheingold (1993) noted the importance of the day-to-day help with problems of time, space, supervision, operation, and access must be addressed to accomplish teachers' successful information technology adoption in schools through staff development and technical support. Selim (2003) grouped the e-learning critical success factors within a university environment into four categories: instructors, student, information technology, and university support. Igbaria *et al.* (1997) argued the internal and external personal computing support/training affected the acceptance of personal computing in small firms. E-learning projects that were not successful in achieving their goals did not have access to technical advice and support (Alexander and Mckenzie, 1998; Soong *et al.*, 2001). If technical support is lacking, e-learning will not succeed (Selim, 2003). Selim's (2003) study showed that students indicated that they would register in future e-learning based courses assuring their positive attitude and support to e-learning technology and tools. In addition, technical support is the major contributor to the effectiveness of the web-based learning system. Recently, Ngai *et al.* (2007) extended the TAM to include technical support as a precursor and investigated the role of the extended model in user acceptance of WebCT. The result showed that technical support has a significant direct effect on perceived ease of use and usefulness, while perceived ease

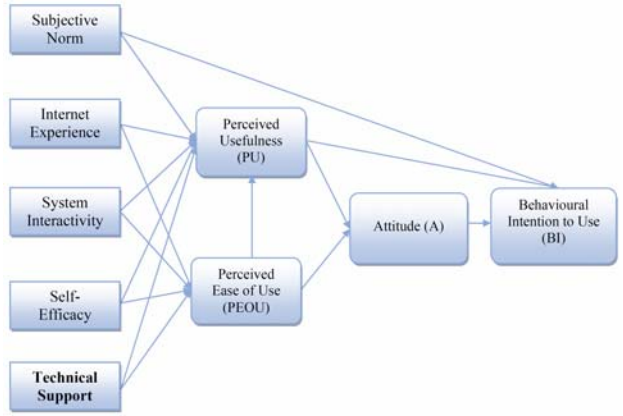

Figure 1. Proposed Model I

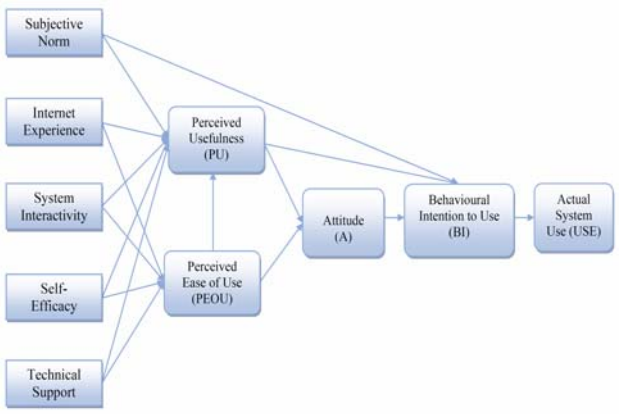

Figure 2. Proposed Model II

of use and usefulness are the dominant factors affecting the attitude of students using WebCT. In addition, the results indicated the importance of perceived ease of use and perceived usefulness in mediating the relationship of technical support with attitude and WebCT usage. In this study, technical support is expected to be one such external factor affecting the acceptance of e-learning systems.

Finally, the extension of the TAM is validated by its highlighting of the strength of the chosen external variables (subjective norm, system interactivity, self-efficacy, Internet experience, and technical support). One of the main results of this study is developing an extended versions of the TAM model in the e-learning context, called Proposed Model I and Proposed Model II (see Figure 1 and Figure 2). TAM posits that two particular beliefs, PEOU and PU are of the primary relevance for computer acceptance behaviours, but in addition, TAM proposed that the more the user perceives a new technology to be easy to use and useful, the stronger will be their attitude towards the technology and greater will be their intention to use the technology (Proposed Model I). TAM postulates that usage is determined by behavioural intention, based on that, this study proposed model II (Proposed Model II, Figure 2) to include actual use of e-learning systems. Proposed Model II has advantages similar to the TAM in that it identifies the significant effect of specific factors on students' intention to use and actual use of information technology. Since the factors in Proposed Model II were not present in the TAM, it might be able to provide a more complete understanding of usage in e-learning contexts.

III. SUMMARY AND CONCLUSION

The main purpose of this paper is to gain an understanding of the existing theories and models in the field of user acceptance and to identify existing evidence that may lend support to the proposed model structure. The literature review provides a background of how users' acceptance has been studied in the IT field in general, and in e-learning field in specific. In addition, this paper provides evidence to choose the baseline model that is used to determine the important factors that may affect students' adoption of e-learning systems. The TAM provides a sound framework for further research of the acceptance of e-learning systems. It posits that perceived usefulness and perceived ease of use mediate the relationship between external variables and behavioural intention to use system. Research indicates that external variables such as subjective norms, Internet experience, system interactivity, self-efficacy and technical support have an influence upon technology acceptance.

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