



Elucidating usage of e-government learning: A perspective of the extended technology acceptance model

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ARTICLE INFO

Available online 25 August 2011

Keywords:

E-government

E-government learning

E-learning

Technology acceptance model

ABSTRACT

Learning is critical to both economic prosperity and social cohesion. E-government learning, which refers to the government's use of web-based technologies to facilitate learning about subjects that are useful to citizens, is relatively new, relevant, and potentially cost-effective. This work proposes and verifies that the technology acceptance model (TAM) can explain and predict usage of e-government learning. The TAM examines how perceived ease of use and perceived usefulness and their antecedents influence intention and usage of a system. This study identifies antecedents that account for individual differences, thereby enhancing the explanatory power of the built model. A survey is used to collect data from users of an e-government learning website in Taiwan. Structural equation modeling is employed to examine the fit of the data to the model. From a theoretical point of view, this research extends the TAM to e-government learning and identifies the perceived e-government learning value and perceived enjoyment as antecedents of usage of e-government learning. This study also provides directions for future research and approaches to promote e-government learning.

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1. Introduction

Many institutions, such as the World Bank, the United Nations, Europe's Information Society DG, and the American Customer Satisfaction Index, evaluate e-government progress using various methods and indices (Fitsilis, Anthopoulos, & Gerogiannis, 2010). For example, the World Bank analyzes e-government effectiveness based on service delivery, information, transparency and anti-corruption, and efficient government purchasing. The United Nations provides an e-government assessment model that contains indices that measure e-government readiness, e-service provisions, e-service stages, and e-participation. Academics have examined e-government success using various perspectives. For instance, King's (2007) Customer Relationship Management (CRM) progressive strategic framework showed that e-government CRM projects should have three primary goals – improving accessibility, organizational transformation, and service delivery innovation. These evaluation models and studies examined the many facets of e-government efficiency and effectiveness. Some evaluation models, such as that used by the Information Society DG,

recognize the importance of e-learning services (Anthopoulos, Gerogiannis, Fitsilis, & Kameas, 2010). However, none of these evaluations and studies addressed the needs and motivations of individuals from a learning perspective. Learning, i.e., acquiring new knowledge and skills, is critical to both economic prosperity and social cohesion. Learning from e-government websites is a relatively new, relevant, and potentially cost-effective educational model; thus, the factors that encourage learning from e-government websites deserve to be scrutinized.

E-government learning refers to government's use of Web-based technology to facilitate learning about subjects that are useful to citizens. This definition includes both government websites with educational contents and public portals with educational content. For example, the website of a tax agency can provide tax code, information, and forms and allows citizens to e-file their income taxes. Additionally, the agency may publish information about court cases, the pros and cons of alternatives when filing taxes, and tax planning, and use software to clarify tax codes and help citizens e-file their income taxes, thereby reducing the need for citizens to hire tax experts or purchase tax-related books and software. Governments should replace their command-and-control mandate with the principle of shared value (Porter & Kramer, 2011). For example, if the effort required to fill out tax forms by citizens and that of tax agencies collecting taxes were minimized, the entire country would benefit. Governments can also establish online schools to teach citizens about subjects commonly taught in conventional educational institutions, such as algebra, accounting, and politics, to enhance

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public education effectiveness; they can also teach subjects usually not offered by educational institutions such as negotiation and crisis management (Anthopoulos et al., 2010) for life-long learning.

E-government learning, as compared with e-learning initiated by private institutions, has several advantages. First, many countries spend a fair amount of Gross Domestic Product (GDP) on education. If a very small percentage of this expenditure were allocated to build e-learning websites that are free to all citizens, all citizens with Internet connections would be able to learn these subjects. This is a cost-effective method of raising the educational level of a country. Second, since e-learning initiated by governments is free, those in remote areas or in low-income brackets would be able to improve themselves and increase their potential for earning higher wages, thus leveling a nation's income distribution. Third, a governmental agency has a pivotal role in providing information and educating its citizens about subjects related to that agency. For example, when a citizen wants to learn about environmental protection, where can that individual find this information? One of the first sources should be the Environmental Protection Agency website. If such a site can provide sufficient information about environmental protection and deliver this information in an interesting way, citizens would be able to learn about environmental protection and may then take action to alleviate pollution. Society's needs are enormous, ranging from environmental protection, nutrition, health, and raising the young generation. The more citizens learn about such subjects, the better off a country will be. Governments should take the initiative in educating its citizens about issues important to the nation and its citizens.

To improve the effectiveness of knowledge sharing and lifelong learning, Taiwan's government established various Web-based learning portals. For instance, the Lifelong Learning Portal, established by the Central Personnel Administration, Executive Yuan, is targeted at Taiwanese civil servants with the goal of improving their job-related skills. Another government Web-learning body is the Bureau of Foreign Trade (BOFT), which aims to provide learners with knowledge about international business regulations, overseas governmental policies, international business analysis, and trade opportunities. SME Online University, developed by the Small and Medium Enterprise Administration, Ministry of Economic Affairs, is an e-learning website for small and medium enterprises (SMEs). This site has over 800 free online courses organized in five categories – information technology, finance, marketing and channel management, general knowledge, and human resources. According to the website, the SME Online University has served over 300,000 SME employers and employees since it was first launched in 2003. Although e-government learning is both valuable to and accepted by many citizens, those using the SME Online University account for only 5% of all potential learners in Taiwan. Understanding citizen motivation and intention to learn from e-government websites and the issue of promoting website usage warrant investigation.

This study applied the technology acceptance model (TAM) (Davis, 1989; Davis, Bagozzi, & Warshaw, 1989) to explain e-government learning site usage. The TAM, adapted from the theory of reasoned action (TRA) (Ajzen & Fishbein, 1980), has been utilized as the theoretical basis for numerous empirical studies of user acceptance of information technology (King & He, 2006; Turner, Kitchenham, Brereton, Charters, & Budgen, 2010). The primary objective of the TAM is to determine why performance improvements are often inhibited by user unwillingness to accept new technology (Davis, 1989). Thus, the TAM is the most promising model for understanding learner motivation and to promote utilization of the e-government learning website. However, e-government learning is relatively new and learners may differ from user groups in previous studies. Factors affecting acceptance of e-government services likely vary with technology, context, and users (Moon & Kim, 2001). Thus, existing variables in the TAM cannot fully capture learner motives, calling for identification of additional motivational factors. As Venkatesh and

Davis (1996, p. 473) argued: "In order to be able to explain user acceptance and use, it is important to understand the antecedents of the key TAM constructs, perceived ease of use and usefulness".

The goals of this study are to investigate the factors influencing e-government learning acceptance, to build an extended TAM model for e-government learning, and to test the resulting model empirically. Specifically, the objectives of this study are as follows:

- (1) Propose a new construct – perceived e-government learning value – and to empirically test its relationship with perceived usefulness of e-government learning.
- (2) Identify the individual difference variable – perceived enjoyment – and to examine its relationship with perceived ease of use.
- (3) Examine the causal relationships among TAM variables leading to e-government learning website usage.
- (4) Investigate the relative importance of each determinant in influencing e-government learning website usage.

To achieve these objectives, this study answers the following research questions:

- (1) Is *perceived e-government learning value* a valid construct? Does it affect perceived usefulness in e-government learning?
- (2) Does *perceived enjoyment* influence *perceived ease of use* in e-government learning?
- (3) Do casual relationships exist among TAM variables and use of e-government learning site?
- (4) Among predictive factors, which factors have a relatively significant impact on the use of the e-government learning site?

The contributions of this study are fourfold. First, the study enhances the current understanding of e-government learning determinants. This study identifies perceived e-government learning value and perceived enjoyment as antecedents of e-government learning site usage. Second, this study advances the theoretical development of behavior formation regarding citizens' usage of e-government learning websites. Third, this study provides empirical support for the effects of external factors on attitude, which lead to intention to use and actual usage. Finally, this study reveals the relative importance of each antecedent variable in influencing attitude, behavioral intention, and actual usage of the e-government learning site. Study results also have implications for practitioners implementing effective strategies to motivate citizens to accept and use the e-government learning website.

2. Background and literature review

This section first discusses e-government learning. Since this study uses the TAM as its theoretical framework for analysis and students of the SME Online University are the study subjects, research related to the TAM is reviewed and, finally, the SME Online University is described.

2.1. E-government learning

Both e-learning and e-government have been studied extensively in the literature. E-learning is the use of Web-based technologies to facilitate learning, freeing learners from the limitations of time and space and allowing learners to learn at their own pace (Sun, Tsai, Finger, Chen, & Yeh, 2008). E-learning is typically initiated by educational institutions for students, corporations for employees, or governments for civil servants and citizens, usually for governmental service processes. E-government refers to a government's use of Web-based technologies to enhance the delivery of government services and information to citizens, employees, business partners, and other governmental entities (Layne & Lee, 2001). What is lacking in

literature and practice is e-government learning, which we define as a government's use of web-based technologies to facilitate learning about subjects that are useful to citizens. Many citizens are interested in learning about a wide assortment of subjects — entrepreneurship, reducing air and water pollution, and baby care, to name just a few. Courses in some subjects can be offered by government-sponsored online universities, while others can be offered by e-government. One main issue is to have the ever-increasing use of e-government learning sites, which warrants an understanding of learner motivation.

Rosenberg (2001) defined learning as the way “people acquire new skills or knowledge for the purpose of improving their performance” (p. 4). Providing learning activities via a Web-based medium is distributed among social and educational environments and can directly enhance learner experiences (Deek & Espinosa, 2005). Distributed learning is an instructional paradigm based on learner needs and the application of electronic tools to facilitate learning. The customers for a governmental organization providing information and training are learners. These learners may compare their experiences using other commercial websites with those when utilizing governmental websites. Hence, Web features and customer values experienced on business websites are important factors affecting learner evaluations of governmental websites.

Chiu, Hsieh, and Kao (2005) categorized customer concerns when customers search for product information in the following five factors: (1) connectivity; (2) information quality; (3) interactivity; (4) playfulness; and (5) learning. Huang and Shyu (2008) argued that the values a learner looks for from an e-government website are (1) informativeness, (2) connectivity, (3) playfulness, (4) friendliness, and (5) responsiveness. Informativeness, considered as the most significant value (Ducoffe, 1996), means that information on a website meets various information needs and is useful. Particularly, educators require relevant and stimulating materials to teach students and support research (Sepic & Kase, 2002). Connectivity is the ability of customers to access relevant websites (Chiu et al., 2005; Huizingh, 2000). Prior investigations have characterized playfulness as an intrinsic motivator for learners to engage in Web-based learning (Lee, Cheung, & Chen, 2005). The decision to acquire knowledge through virtual learning environments is determined partly on a rational calculation of benefits. However, website visitors need a virtual learning environment that attracts their attention by being fun, enjoyable, and pleasurable. Users are mostly likely to visit a website repeatedly when their visits are enjoyable. Huizingh (2000) and Chiu et al. (2005) found that customers often attribute entertainment to account for their involvement with websites. Similar to a service encounter in the physical world, friendliness is a measure of a website's ease of use. Website content and accessibility can be assessed in terms of “irritation” versus “entertainment” (Wan, 2000). Knowledge-based e-governmental websites generally allow visiting, browsing, and querying, present search results, and have clear and easy-to-follow instructions for e-services. Responsiveness, which is defined as willingness to assist customers (Wan, 2000; Watson, Pitt, & Kavan, 1998), can be measured by the duration of time needed to reply to a customer's inquiries. However, the responsiveness of an e-government learning site can also be measured by new course offerings related to the latest practical knowledge or information changes in macro environments such as new regulations, policies, and business/training opportunities.

The goal of education is to develop mature thinkers who can acquire and utilize knowledge (Marzano et al., 1988). For instance, Anderson (1977) and Rumelhart (1980) stressed the importance of “searching for meaning” in cognition. To this end, model learners actively work to combine new information with what is already known, select important facts, make inferences from the information given, and think strategically about their own learning (Marzano et al., 1988). The 21 thinking processes derived by Marzano et al. (1988) can be categorized into the following three learning dimensions:

knowledge acquisition and integration; knowledge extension and refinement; and, meaningful application of knowledge.

Based on learner values and in consideration of learning dimensions already discussed, this study integrates two novel antecedent variables, *perceived e-government learning value* and *perceived enjoyment*, into the proposed TAM. Perceived e-government learning value, representing the dimensions of informativeness, connectivity, and responsiveness, refers to the benefits of using a website. Perceived enjoyment, representing the dimensions of playfulness, friendliness, and responsiveness, refers to the process of website use. Perceived e-government learning value is an extrinsic motivator while perceived enjoyment is an intrinsic motivator.

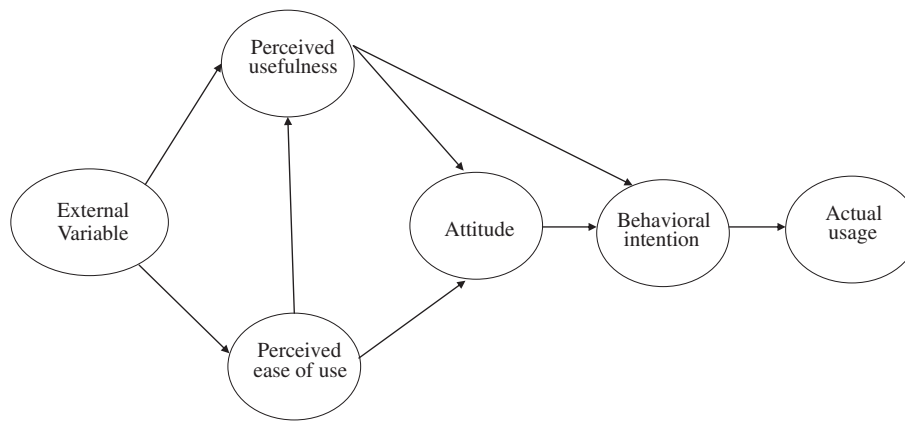
Both online university and e-government websites can employ strategies to enhance perceived e-government learning value. For example, citizens interested in environmental protection would likely be interested in learning how to reduce or eliminate product packaging and reduce air and water pollution. The website of an environmental protection agency can offer useful and interesting information about those topics. Furthermore, the agency can offer accomplished learners certificates based on learning achievement. These certificates would enhance learner employability, thereby enhancing perceived e-government learning value.

2.2. Learner acceptance of e-government learning

Understanding the factors related to and predicting e-government learning usage are extremely important for successful e-government learning. Explanation and prediction of behavior are major purposes of psychological theories. Some of the most useful theories are the theory of reasoned action (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975), social cognitive theory (Compeau & Higgins, 1995; Hill, Smith, & Mann, 1987), and the TAM (Davis, 1989, 1993). Comparisons of the TAM with other theoretical models have yielded favorable results (Davis et al., 1989; Hong, Thong, & Tam, 2006). Originally developed by Davis (1989), the TAM is a robust tool for measuring new technology adoption by users (Agarwal & Prasad, 1999; Davis, 1989; Doll, Hendrickson, & Deng, 1998; King & He, 2006; Segars & Grover, 1993). Over the years, the TAM has been validated by various applications and extensions, including Web-based information systems (van der Heijden, 2003; Yi & Hwang, 2003), Internet banking (Wang, Wang, Lin, & Tang, 2003), electronic tax filing systems (Chang, Li, Hung, & Hwang, 2005; Wang, 2003), and e-commerce (Henderson & Divett, 2003; van Dolen & de Ruyter, 2002). As e-government learning is novel, examining e-government learning using the TAM model is appropriate.

Fig. 1 shows the TAM, which consists of six constructs, namely external variables, perceived usefulness, perceived ease of use, attitude, behavioral intention, and actual usage. Fig. 1 also shows the causal flow from beliefs, attitudes, and intentions to behaviors. User behavior is determined by behavioral intention, which is affected by attitude and perceived usefulness. Perceptions of usefulness and ease of use of a technology determined attitude (Adams, Nelson, & Todd, 1992; Davis, 1989; Davis et al., 1989; Mathieson, 1991). External variables, depending on technology, context, and users, influence perceptions of usefulness and ease of use.

The TAM posits that two behavioral beliefs, perceived usefulness and perceived ease of use, are fundamental factors for predicting user acceptance, and that the effects of external variables on intention are mediated by these two beliefs (Adams et al., 1992; Davis, 1989; Davis et al., 1989; Mathieson, 1991). Perceived usefulness is defined as an individual's perception that using a new technology will enhance or improve her/his performance (Davis, 1989, 1993). Based on this definition, perceived usefulness in this study is a user's perception that e-government learning will enhance their job performance. Strengthening this belief creates a positive attitude toward e-



Source: Davis, et al. (1989, p.985)

Fig. 1. Technology acceptance model.

government learning, thereby increasing user intention to use e-government learning sites.

Perceived ease of use is defined as an individual's perception that using a new technology will be effort-free (Davis, 1989, 1993). Based on this definition, perceived ease of use in this study represents the perception that e-government learning websites are user-friendly. Perceived ease of use has been shown to affect perceived usefulness. Moreover, both perceived usefulness and perceived ease of use are affected by external variables and have a positive effect on attitude (Hu, Chau, Sheng, & Tam, 1999; Venkatesh, Speier, & Morris, 2002; Wang et al., 2003).

Although the TAM is applicable to various technologies (Adams et al., 1992; Chin & Todd, 1995; Doll et al., 1998), it has been criticized for not providing adequate information concerning opinions of individuals about novel systems (Burton-Jones & Hubona, 2006; Mathieson, 1991; Moon & Kim, 2001). Davis (1989, p. 985) observed that external variables enhance the ability of the TAM to predict acceptance of future technologies. In other words, constructs in the TAM must be extended by incorporating additional factors. These additional factors depend on the target technology, users, and the context (Moon & Kim, 2001). Wang et al. (2003) noted that variables related to individual differences play vital roles in technology implementation. Additionally, empirical research using the TAM has identified strong relationships between individual differences and IT acceptance (Agarwal & Prasad, 1999; Venkatesh, 2000).

The initial issues associated with e-government include technological factors such as accessibility, connection, Internet familiarity, and credibility. A few e-government studies have extended the TAM by adding such variables as subjective norms, self-efficacy, and facilitating conditions (Wang, 2003; Yi & Hwang, 2003). However, as technology advanced, the problem of adopting e-government shifted toward knowledge sharing from learner perspectives. A relatively more complex learning and thinking process associated with user-perceived value may become an important determinant for e-government success. The shift from a transaction-based citizenry to a knowledge-based citizenry has created requirements specific to e-governmental knowledge-sharing platforms. This calls for the use of distinctive antecedent variables, such as *perceived e-government learning value* and *perceived enjoyment*, when examining technology adoption behavior in the e-government learning environment.

2.3. The SME Online University in Taiwan

The SME Administration, a governmental agency under the Ministry of Economic Affairs, is responsible for helping Taiwan's

SMEs. Improving knowledge of workers at SMEs is one of its primary missions. Most businesses in Taiwan are SMEs, with over 1 million businesses employing over 6 million workers. The SME Administration thus serves an economically vital community in Taiwan.

Taiwan's SME Online University is the first e-government learning website for SMEs in Asia. Anyone who can access the Internet can enroll as a student. Enrollment and courses are free. The government allocates roughly US\$1.2 million to the university annually. This funding is mainly used to purchase network bandwidth, e-learning platform services, and e-learning course licenses. The university currently offers 800 online courses in five categories; the number of courses offered and categories they're offered in is always increasing. Most courses are 60-minute video lectures in Mandarin combined with PowerPoint transparencies. In addition to these courses, 80 videos of business speeches delivered by celebrities are currently available.

The SME Online University can customize e-learning programs to meet the varying training requirements of individual SMEs. When requested by a company, the university sends a consultant to the company to help define its training needs. Based on a company's needs, the consultant creates a virtual learning platform for the company and uploads selected courses. The company can monitor the learning progress of each employee via this platform. Companies can also upload training materials. For instance, a company can upload training materials to the platform to train new employees residing in various locations in Taiwan, thereby reducing training costs.

To enhance learner interest, the university's platform is interactive and the university offers awards and passports for life-long learning. When logging into a course, a student can find out who is also taking the course and can chat with classmates after they respond positively to a chat request. This interactivity creates a social learning environment. Tutors are available online during pre-announced periods to answer student questions. Students can also host discussions on the platform. To encourage participation in online discussions, awards of NT\$100 (about US\$3.1) are occasionally given to students chosen randomly who join discussions. The passport for life-long learning keeps the records of each student taking courses offered by the university. The university gives certificates to students after they complete a course.

3. Research model and hypotheses

The proposed TAM has two external variables, namely, perceived e-government value and perceived enjoyment (Fig. 2). These two constructs may significantly affect other variables in the TAM.

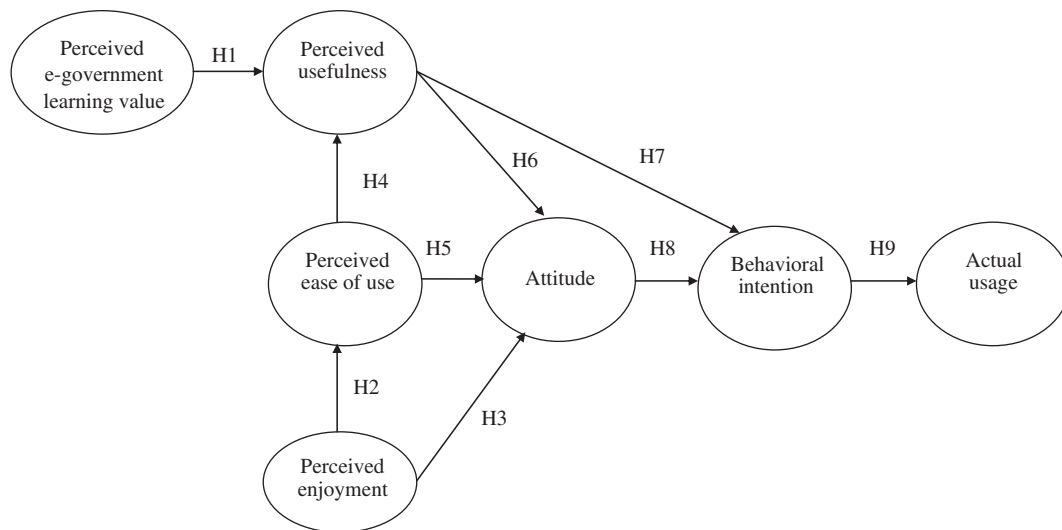


Fig. 2. Proposed extended TAM.

Additionally, other relationships between constructs in the original TAM are also presented (Davis et al., 1989; Venkatesh & Davis, 2000). The following sections discuss in detail all hypotheses concerning the relationships among variables in the TAM.

3.1. Effect of perceived e-government learning value

Perceived value can be considered a net benefit resulting from an overall assessment of a trade-off between benefits and costs of using a service or product. If a consumer perceives benefit or value in the quality of a product or if a service exceeds its cost, the consumer is likely to use that product or service (Kotler & Keller, 2008). In examining the acceptance of hotel front-office systems, Kim, Lee, and Law (2008) demonstrated that perceived value positively influenced attitudes toward using hotel front-office systems. Perceived e-government learning value is the user-determined value of using e-government learning websites. E-government learning is valuable because it helps users obtain and integrate knowledge, accumulate and organize knowledge, and apply knowledge. Furthermore, e-government learning in Taiwan is free. Citizens, via e-government learning websites, can earn certificates, thereby improving their employability. Consequently, perceived e-government learning value is a critical factor of individual differences affecting user behaviors.

Notably, perceived e-government learning value has not been tested previously. This construct is similar to benefits used in the study by López-Nicolás, Molina-Castillo, and Bouwman (2008), who integrated diffusion theory with the TAM and used perceived status benefits and perceived flexibility benefits as two antecedent variables of perceived usefulness. In innovation diffusion literature (Rogers, 2003), relative advantage, along with four other characteristics – complexity, compatibility, trialability, and observability – positively affected innovation diffusion speed. As the relative benefit of a new technology increased, the speed at which a new technology was accepted by users increased. Among these five characteristics, relative advantage was related to the extrinsic motivator, perceived usefulness, while the other four characteristics were related to ease of use. López-Nicolás et al. (2008) showed that perceived status benefits and perceived flexibility benefits positively affected perceived usefulness of mobile data services. Users who perceive e-government learning value as high understand benefits relative to cost, resulting in a strong perception of its usefulness. In other words, a perceived e-government learning value positively affects the perceived usefulness of e-government learning.

Therefore, we propose that perceived e-government learning value is a direct antecedent of perceived usefulness.

H1. Perceived e-government learning value positively affects perceived usefulness.

3.2. Effect of perceived enjoyment

Individuals engage in activities because these activities foster enjoyment and pleasure (Teo & Lim, 1997). Davis, Bagozzi, and Warshaw (1992) defined perceived enjoyment as “the extent to which the activity of using the technology is perceived to be enjoyable in its own right, apart from any performance consequences that may be anticipated” (p. 113). In this study, perceived enjoyment is the extent to which an individual finds e-government learning intrinsically enjoyable or interesting. Perceived enjoyment is considered an intrinsic motivator, significantly influencing user acceptance of a system.

Prior studies of technology acceptance behavior examined the effect of perceived enjoyment on perceived ease of use (Venkatesh, 2000; Venkatesh et al., 2002; Yi & Hwang, 2003). Early studies using the TAM identified a causal flow from perceived ease of use to an intrinsic motivator such as perceived enjoyment (Davis et al., 1992). However, Venkatesh (2000) found that perceived enjoyment enhanced perceived ease of use and intention of use. The link between perceived enjoyment and perceived ease of use strengthened as user's gained experience with a training system. In predicting the use of Web-based information systems, Yi and Hwang (2003) found that perceived enjoyment positively affected perceived ease of use. New technologies that are considered enjoyable are less likely to be difficult to use. If a user of an e-government learning system were to perceive the interaction with a system enjoyable, this user is very likely to perceive that system as easy to use.

Because most people enjoy virtual experiences such as watching a film or playing computer games, educators have designed educational games to enhance e-learning enjoyment (Barab, Thomas, Dodge, Carteaux, & Tuzun, 2005; Jenkins, Klopfer, Squire, & Tan, 2003). Sancho, Torrente, and Fernandez-Manjon (2009) showed that multi-user virtual environments integrated into a learning management system can enhance the motivation of college students in learning computer programming and reduce the dropout rate. E-learning can also enhance the effectiveness of lifelong training for demanding learners who have to negotiate and manage crises in unfamiliar

environments (Anthopoulos et al., 2010). Anthopoulos et al. (2010) described an information system in which learning occurs in a virtual world presented as a three-dimensional (3D) videogame. Thus, learning enjoyment can increase the strength of the perception of ease of use and improve attitudes toward e-government learning. Thus, the following hypothesis is proposed:

H2. Perceived enjoyment positively affects perceived ease of use.

A causal relationship exists between perceived enjoyment and attitude. When users see e-government learning as enjoyable, the stimulus of happiness enhances their attitude toward using e-government learning sites. Venkatesh and Davis (2000) found that perceived enjoyment indirectly influenced users in the adoption of a system. Other studies showed that attitudinal outcomes, such as happiness, pleasure, and satisfaction, resulted from enjoyable experiences (Childers, Carr, Peck, & Carson, 2001; Yu, Ha, Choi, & Rho, 2005). For example, Davis et al. (1992) found that enjoyment affected adoption of specific word processing and graphics programs. Childers et al. (2001) found that perceived enjoyment positively influenced attitude toward e-shopping. Yu et al. (2005) noted that consumer-perceived enjoyment of TV commerce (t-commerce) positively affected attitude toward t-commerce use. Moon and Kim (2001) demonstrated that intrinsic motivation positively influenced attitude toward Web use. These findings indicate that enjoyment is highly correlated with positive user attitudes. In the current context, a user with a high rate of perceived enjoyment would likely have a very positive attitude toward using e-government learning sites. Thus, the following hypothesis is proposed:

H3. Perceived enjoyment positively affects a user's attitude toward e-government learning.

3.3. Perceived ease of use, perceived usefulness, attitude, and behavioral intention

The TAM delineates the causal relationships between perceived usefulness, perceived ease of use, attitude, and behavioral intention to explain user acceptance of new technologies. Perceived ease of use has been empirically verified by many studies as a predictor of perceived usefulness (King & He, 2006). When all other factors are equal, users likely consider a technology useful when they perceive it as easy to use (Bruner & Kumar, 2005; Hu et al., 1999; Igbaria & Iivari, 1995). Attitude toward using a given technology is an overall evaluation that predicts a user's likelihood of adopting the emerging technology. Previous research indicated that attitude was influenced by both perceived ease of use and perceived usefulness (Childers et al., 2001; Dabholkar & Bagozzi, 2002; Davis, 1989, 1993; Mathieson, 1991). In the TAM, behavioral intention is influenced by both perceived usefulness and attitude. This relationship has been examined and supported by many studies (Adams et al., 1992; Davis et al., 1992; Hu et al., 1999; Venkatesh & Davis, 1996, 2000). Finally, actual usage is determined by behavioral intention. Those relationships are well established in TAM literature. For meta-analyses, see King & He (2006) and Turner et al. (2010). This study revalidates those relationships in an e-government learning context. Thus, the following hypotheses are proposed:

H4. Perceived ease of use positively affects perceived usefulness.

H5. Perceived ease of use positively affects a user's attitude.

H6. Perceived usefulness positively affects a user's attitude.

H7. Perceived usefulness positively affects behavioral intention.

H8. Attitude positively affects a user's behavioral intention.

H9. Behavioral intention positively affects actual usage.

4. Research methodology

A survey was conducted to collect data from students of the SME Online University. This section first explains the rationale behind choosing these university students and describes the sample characteristics. Measurement instruments are then explained.

4.1. Study context and sample

The SME Online University students were chosen for several reasons. First, most enterprises in Taiwan are SMEs. Promoting and enhancing quality lifelong learning for SME employees is very important for the economic growth in Taiwan. Second, SMEs in Taiwan usually lack sufficient budgets for training employees. Thus, SMEs rely on the SME Online University to enhance employee knowledge and skills. Third, most SME Online University students come from different enterprises and disciplines; thus, this sample can be more representative of general users of e-government learning sites than users of other sites.

The SME Online University students can communicate with each other when online for the same course at the same time. Users were asked to participate in the survey and were rewarded with a McDonald's gift certificate worth NT\$50 (about US\$1.55) as a token of appreciation. Once they agreed to take part in this study, a questionnaire was emailed. Among the 371 questionnaires collected, 64 were eliminated for incompleteness, resulting in 307 useful responses. Tables 1 and 2 show sample characteristics.

The reasons students gave for using the SME Online University include self-improvement (93%), convenient for learning (64%), helpful for improving job performance (55%), easy to navigate the website (30%), and required by employer (19%) as learning on the SME Online University can be credited as learning hours in the civil servant life-long learning program which requires participation by civil servants.

4.2. Measurements

Except the items for e-government learning value, the items used to construct each variable were adopted from previous studies (Table 3) to ensure content validity. Participants responded to statements on a 7-point Likert-type scale ranging from 1 for "strongly disagree" to 7 for "strongly agree." The questionnaire consisted of 22 items for seven constructs.

Perceived e-government learning value was measured by four items created by this research (Table 3). The four items, based on learning dimensions, were as follows: "The value of the SME Online University is that it helps me obtain and integrate knowledge"; "The value of the SME Online University is that it helps me accumulate and organize knowledge"; "The value of the SME Online University is that it helps me gain in-depth knowledge"; and "The value of the SME Online University is that it helps me apply knowledge." Perceived enjoyment was measured by four items from Moon and Kim (2001), Yi and Hwang (2003), and Yu et al. (2005). Perceived usefulness was measured using four items from Davis (1989, 1993). Perceived ease of use was measured using three items from Davis (1989, 1993), Venkatesh and Davis (1996), and Yang (2005). Attitude was measured using three items from Davis et al. (1992) and Hu et al. (1999). Behavioral intention was assessed by three items from Davis et al. (1992) and Hu et al. (1999). Actual usage was measured by two items from Igbaria et al. (1995).

5. Analysis and results

5.1. Reliability, and convergent and discriminant validity of scales

First, the internal consistency of constructs, the Cronbach's alpha, was calculated. The reliability coefficients for the seven constructs

Table 1
Research variables.

Variable	Description	Type	Items	Source	Questionnaires
PE	Perceived enjoyment	Independent	4	Moon and Kim (2001); Yi and Hwang (2003); Yu et al. (2005)	(PE1) E-government learning makes me feel good. (PE2) E-government learning is interesting. (PE3) I have fun using the e-government learning site. (PE4) I forget about time when using the e-government learning site.
PEV	Perceived e-government learning value	Independent	4	Created by this research	(PEV1) The value of the SME Online University is that it helps me obtain and integrate knowledge. (PEV2) The value of the SME Online University is that it helps me accumulate and organize knowledge. (PEV3) The value of the SME Online University is that it helps me gain knowledge in depth. (PEV4) The value of the SME Online University is that it helps me apply knowledge.
PU	Perceived usefulness	Independent/dependent	4	Davis (1989, 1993)	(PU1) Using the e-government learning site saves me much time. (PU2) E-government learning enhances my job effectiveness. (PU3) E-government learning is useful in my life. (PU4) The SME Online University offers a lot of choices for information and learning.
PEOU	Perceived ease of use	Independent/dependent	3	Davis (1989, 1993); Venkatesh and Davis (1996); Yang (2005)	(PEOU1) Using the e-government learning site does not require a lot of mental effort. (PEOU2) The e-government learning site is clear and understandable. (PEOU3) The e-government learning site is easy to use.
ATT	Attitude	Independent/dependent	3	Davis et al. (1992); Hu et al. (1999)	(ATT1) In my opinion, using the e-government learning site is very desirable. (ATT2) I like to use the e-government learning site. (ATT3) I have a positive evaluation of the e-government learning site.
BI	Behavioral intention	Independent/dependent	3	Davis et al. (1992); Hu et al. (1999)	(BI1) I intend to use e-government learning whenever possible. (BI2) If I were asked about my opinion of e-government learning, I would say something favorable. (BI3) In the future, I intend to use e-government learning routinely.
AU	Actual usage	Dependent	2	Igbaria et al. (1995)	Average hours of usage per day Average frequency of usage

(0.97 for perceived e-government learning value; 0.93 for perceived enjoyment; 0.94 for perceived usefulness; 0.89 for perceived ease of use; 0.95 for attitude; 0.94 for behavioral intention; and 0.73 for actual usage) exceeded the suggested 0.7 cut-off value (Table 4) (Hair, Black, Babin, Anderson, & Tatham, 2006; Nunnally, 1978). Therefore, all constructs had acceptable reliability.

The data were subjected to confirmatory factor analysis (CFA) to ensure convergent and discriminant validity. The CFA results (Table 4) demonstrated a good fit with $\chi^2 = 349.42$, $df = 204$, normed- $\chi^2 = 1.71$, goodness-of-fit index (GFI) = 0.91, adjusted goodness-of-fit index (AGFI) = 0.88, comparative fit index (CFI) = 0.99, and root-mean-square error of approximation (RMSEA) = 0.048. The CFA showed that the indices exceeded their respective acceptance levels as suggested by previous research (Bollen, 1989; Hair, Black, Babin, Anderson, & Tatham, 2006; Joreskog & Sorbom, 1993). Thus, the measurement model fits the data well.

To ensure convergent validity, standardized loadings and the squared multiple correlation (SMC) for the measurement variables and the constructs were investigated (Bollen, 1989; Hair et al., 2006). The t -values for standardized loadings in measurement variables for

the constructs were all highly significant ($p < 0.01$). All SMC values were > 0.5 , accounting for more than 50% of variation of the items (Hair et al., 2006); thus, convergent validity was established. Furthermore, average variance extracted (AVE) (Fornell & Larcker, 1981) were calculated to evaluate whether a measurement variable represented the related construct. The AVE of all constructs (0.89 for perceived e-government learning value; 0.75 for perceived enjoyment; 0.78 for perceived usefulness; 0.79 for perceived ease of use; 0.86 for attitude; 0.87 for behavioral intention; and 0.59 for actual usage) exceeded the suggested 0.5 cut-off value (Fornell & Larcker, 1981; Hair et al., 2006). Overall, these analytical results showed convergent validity for each construct.

The composite score for each construct, computed by averaging scores across items, was used to calculate means, standard deviations, and correlations among the constructs. Table 5 shows the correlations, ranging from 0.17 (behavioral intention and actual usage) to 0.90

Table 2
Respondent characteristics.

Variable	Category	Number of respondents	Percentage
Age	Under 20	1	0.4%
	21–25	27	8.8%
	26–30	51	16.6%
	31–35	67	21.8%
	36–40	62	20.2%
	Over 41	99	32.2%
Sex	Male	159	51.8%
	Female	148	48.2%
Education	High school	37	12.0%
	College	220	71.7%
	Graduate school	50	16.3%
Usage	Within 3 months	85	27.7%
	3–6 months	63	20.5%
	6 months–1 year	57	18.6%
	Over 1 year	102	33.2%

Table 3
Average hours of daily use, frequency of usage, and reasons for usage.

	Number of respondents	Percentage
Hours of daily use		
Under 0.5 h	131	42.7%
0.5–1 h	107	34.9%
1–2 h	41	13.3%
2–3 h	17	5.5%
Over 3 h	11	3.6%
Frequency		
Less than 1 time per month	44	14.3%
Once per month	48	15.6%
Several times per month	124	40.4%
Several times per week	61	19.9%
Once each day	16	5.2%
Several times per day	14	4.6%
Reason		
Self-improvement	284	93%
Convenient to use for learning	197	64%
Helpful for improving job performance	168	55%
Easy to navigate the website	93	30%
Demanded by employer	58	19%
Others	10	3%

Table 4
Results of measurement model analysis.

Scale items	Standardized loadings	t-values	SMCs	AVE
Perceived enjoyment ($\alpha = 0.93$)				0.75
PE1	0.92	– ^a	0.84	
PE2	0.92	37.48	0.85	
PE3	0.91	26.10	0.84	
PE4	0.77	17.96	0.59	
Perceived e-government learning value ($\alpha = 0.97$)				0.89
PLV1	0.95	– ^a	0.90	
PLV2	0.95	36.77	0.91	
PLV3	0.95	35.20	0.90	
PLV4	0.93	33.37	0.87	
Perceived usefulness ($\alpha = 0.94$)				0.78
PU1	0.91	– ^a	0.82	
PU2	0.90	25.44	0.82	
PU3	0.87	23.34	0.77	
PU4	0.85	24.20	0.79	
Perceived ease of use ($\alpha = 0.89$)				0.79
PEOU1	0.79	– ^a	0.63	
PEOU2	0.97	17.06	0.75	
PEOU3	0.90	17.92	0.81	
Attitude ($\alpha = 0.95$)				0.86
ATT1	0.93	– ^a	0.86	
ATT2	0.93	29.95	0.87	
ATT3	0.93	30.53	0.87	
Behavioral intention ($\alpha = 0.94$)				0.87
BI1	0.93	– ^a	0.86	
BI2	0.91	27.21	0.83	
BI3	0.96	27.17	0.91	
Actual usage ($\alpha = 0.73$)				0.59
AU1	0.81	– ^a	0.65	
AU2	0.72	4.11	0.51	

Model fit statistics: $\chi^2 = 349.42$, $df = 204$, normed- $\chi^2 = 1.71$, GFI = 0.91, AGFI = 0.88, RMSEA = 0.048, CFI = 0.995.

Note: All items were measured on a 7-point Likert-type scale from “1 (strongly disagree)” to “7 (strongly agree)”. AVE = (\sum squared standardized loadings)/(\sum squared standardized loadings + \sum item measurement error). GFI = goodness-of-fit index, AGFI = adjusted goodness-of-fit index, RMSEA = root-mean-square-error of approximation, CFI = comparative fit index, SMC = squared multiple correlation, AVE = average variance extracted.

^a This path was fixed to one to identify the corresponding parameters.

(attitude and behavioral intention). No confidence interval of the correlations contained the value of 1.0 (Anderson & Gerbing, 1988; Bagozzi, 1995). Furthermore, in the structural model (estimated later), no confidence interval of the structural correlation between constructs included the value of 1.0 (Joreskog & Sorbom, 1993). Therefore, the discriminant validity was acceptable.

5.2. The structural equation model and hypotheses testing

The structural equation model (SEM) was estimated using LISREL software (Joreskog & Sorbom, 1993) to examine relationships among constructs. Fig. 3 and Table 6 show analytical results ($\chi^2 = 381.44$,

Table 5
Descriptive statistics and correlations among composite scores for constructs.

Constructs	Mean	SD	1	2	3	4	5	6
1. Perceived enjoyment	5.17	1.03	1.00					
2. Perceived e-government learning value	5.44	1.06	0.82	1.00				
3. Perceived usefulness	5.39	1.03	0.79	0.86	1.00			
4. Perceived ease of use	5.15	1.08	0.77	0.74	0.74	1.00		
5. Attitude	5.49	1.08	0.82	0.88	0.88	0.77	1.00	
6. Behavioral intention	5.67	1.05	0.75	0.86	0.86	0.72	0.90	1.00
7. Actual usage	2.46	1.02	0.24	0.22	0.22	0.19	0.19	0.17

Note: All items were measured on a 7-point Likert-type scale from “1 (strongly disagree)” to “7 (strongly agree)”. Composite scores were obtained by averaging item scores of that construct. All correlations are significant at the 0.01 level (2-tailed). SD = Standard Deviation.

$df = 213$, normed- $\chi^2 = 1.79$, CFI = 0.99, GFI = 0.90, AGFI = 0.87, NFI = 0.99, NNFI = 0.99, PGFI = 0.696, CN = 205.805, and RMSEA = 0.051), indicating that the data fit the model reasonably well (Bentler, 1995; Bentler & Bonnet, 1980; Hoelter, 1983; Joreskog & Sorbom, 1993). The signs of all structural paths but one were consistent with hypothesized relationships. Although the path from perceived ease of use to attitude was negative, it was small and not significant. Except for actual usage, the model accounted for a large portion of variation (R^2) of the other four endogenous variables (86.5% variance of perceived usefulness; 78.2% of the variance of perceived ease of use; 91.3% of the variance of attitude; and 88.5% of the variance of behavioral intention). The R^2 of actual usage was only 5.3%.

Fig. 3 and Table 6 also show path coefficients for each path in the model. The relationship between perceived e-government learning value and perceived usefulness was highly significant ($\beta = 0.71$, $p < 0.001$). Thus, H1, i.e., perceived e-government learning value positively affects perceived usefulness, is supported. As the degree to which a user believed that SME Online University help them gain knowledge, integrate knowledge and apply knowledge increased, the degree to which the user considered e-government learning useful increased. The path coefficient from perceived enjoyment to perceived ease of use was highly significant ($\beta = 0.88$, $p < 0.001$), supporting H2. Perceived enjoyment positively affected perceived ease of use, which is in agreement with analytical results from Yi and Hwang (2003) and Venkatesh (2000). The path coefficient from perceived enjoyment to attitude was 0.37 and highly significant, supporting H3. Consistent with previous research (Childers et al., 2001; Davis et al., 1992; Yu et al., 2005), perceived enjoyment positively affected attitude. Perceived ease of use had a significant effect on perceived usefulness ($\beta = 0.26$, $p < 0.001$), supporting H4. This is consistent with findings obtained by previous studies. King and He (2006), in a meta-analysis, showed that average β from perceived ease of use to perceived usefulness was 0.479.

Notably, perceived ease of use did not affect attitude; thus, H5 was not supported ($\beta = -0.02$, $p > 0.1$). The influence of perceived ease of use on attitude was fully mediated by perceived usefulness. King and He (2006), in a meta-analysis, determined that the average path coefficient from perceived ease of use to attitude was 0.179 (median, 0.152), indicating that many studies found this path insignificant. In fact, of the 67 studies that reported test results for the core TAM, the path was insignificant at $\alpha = 0.05$ level in 30. Thus, this study's finding is consistent with many previous studies. To continue to use university services, users must find the university useful, not just easy to use. Perceived usefulness had a significant effect on attitude ($\beta = 0.63$, $p < 0.001$), supporting H6. This finding is similar to that obtained by Kim et al. (2008), who found that perceived usefulness affected attitude toward using hotel front-office systems. Perceived usefulness had a significant effect on behavioral intention ($\beta = 0.41$, $p < 0.001$), supporting H7. This is similar to meta-analysis results obtained by King and He (2006), who found that the average path coefficient from perceived usefulness to behavioral intention was 0.487.

Behavioral intention affects actual usage significantly ($\beta = 0.23$, $p < 0.001$), supporting H8. Users who have a strong intention to use the university would access university websites more frequently and stay longer than those with weak intention. The magnitude of the path coefficient is similar to that reported by Yi and Hwang (2003), who found that the path coefficient from behavioral intention to usage was 0.19. A meta-analysis by Turner et al. (2010) found that most studies including usage in their model showed that behavioral intention affected actual usage.

5.3. Relative importance of antecedent variables

To determine the relative importance of variables in influencing actual usage, this study examined direct and indirect effects in the model (Table 6). Perceived e-government learning value affected

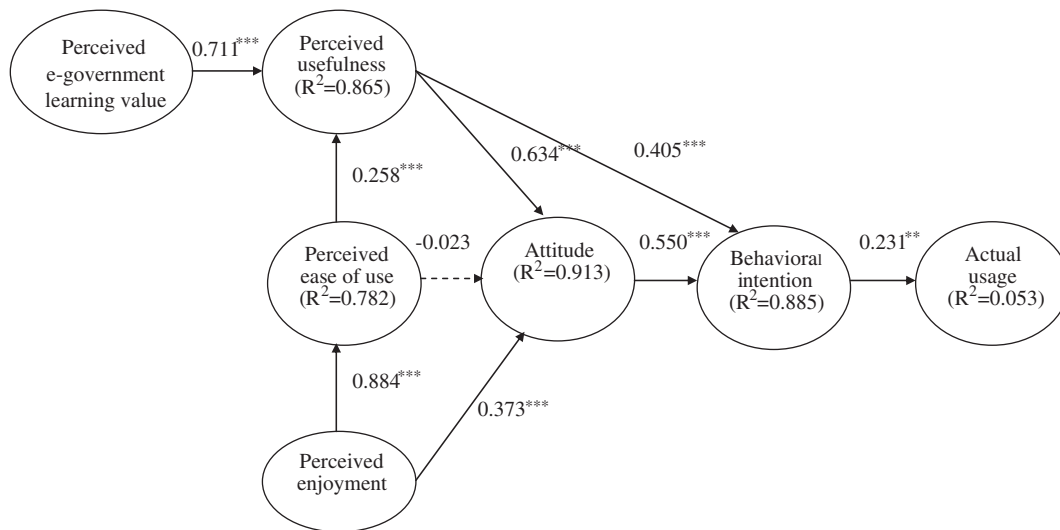


Fig. 3. Structural equation model analysis and hypotheses testing. Model fit statistics: $\chi^2 = 381.44$, $df = 213$, normed- $\chi^2 = 1.79$, GFI = 0.90, AGFI = 0.87, RMSEA = 0.051, CFI = 0.995. GFI = goodness-of-fit index, AGFI = adjusted goodness-of-fit index, RMSEA = root-mean-square-error of approximation, CFI = comparative fit index. Solid line: significant paths, Dotted line: non-significant paths. **Significant at $p < 0.01$. ***Significant at $p < 0.001$.

attitude (0.450) and behavioral intention (0.536) positively via perceived usefulness. Perceived usefulness affected actual usage (0.174) positively via attitude and behavioral intention. Attitude affected actual usage (0.127) positively via behavior intention. Perceived enjoyment affected perceived usefulness (0.228) positively via perceived ease of use.

The direct effect of perceived ease of use on attitude was not significant (-0.023); however, the indirect effect via perceived usefulness on attitude was significant (0.164). Therefore, perceived usefulness fully mediated the relationship between perceived ease of use and attitude. These findings are supported by Davis (1989), who demonstrated that perceived ease of use was an antecedent of

perceived usefulness. The direct effect of perceived usefulness on behavioral intention was also significant (0.405), as was the indirect effect via attitude on behavioral intention (0.349). Therefore, attitude had a partial mediating role between perceived usefulness and behavioral intention. Empirical results also showed that perceived enjoyment positively affected attitude (0.124) via perceived ease of use and perceived usefulness. Therefore, these two constructs – perceived ease of use and perceived usefulness – partially mediated the perceived enjoyment in influencing user attitudes toward using e-government learning websites.

Analytical results also show that the two external variables, perceived e-government learning value and perceived enjoyment,

Table 6
Structural equation model analysis and hypotheses testing results.

Hypothesized paths	Direct effects		Indirect effects	Total effects	Hypothesis testing
	Path coefficients	t-values			
H1 Perceived e-government learning value → Perceived usefulness	0.711	12.86***		0.711***	Supported
H2 Perceived Enjoyment → Perceived ease of use	0.884	14.97***		0.884***	Supported
H3 Perceived Enjoyment → Attitude	0.373	4.24***	0.124*	0.497***	Supported
H4 Perceived ease of use → Perceived usefulness	0.258	4.78***	0.124*	0.258***	Supported
H5 Perceived ease of use → Attitude	-0.023	-0.34	0.164**	0.140*	Not Supported
H6 Perceived usefulness → Attitude	0.634	9.42***		0.634***	Supported
H7 Perceived usefulness → Behavioral intention	0.405	4.19***	0.349***	0.754***	Supported
H8 Attitude → Behavioral intention	0.550	5.72***		0.550***	Supported
H9 Behavioral intention → Actual usage	0.231	2.98**		0.231**	Supported
Perceived e-government learning value → Attitude			0.450***	0.450***	
Perceived e-government learning value → Behavioral intention			0.536***	0.536***	
Perceived e-government learning value → Actual usage			0.124**	0.124**	
Perceived Enjoyment → Perceived usefulness			0.228***	0.228***	
Perceived Enjoyment → Behavioral intention			0.366***	0.366***	
Perceived Enjoyment → Actual usage			0.085**	0.085**	
Perceived ease of use → Behavioral intention			0.182**	0.182**	
Perceived ease of use → Actual usage			0.042*	0.042*	
Perceived usefulness → Actual usage			0.174**	0.174**	
Attitude → Actual usage			0.127**	0.127**	
R ² (Perceived ease of use)	0.782				
R ² (Perceived usefulness)	0.865				
R ² (Attitude)	0.913				
R ² (Behavioral intention)	0.885				
R ² (Actual usage)	0.053				

Goodness fit statistics: $\chi^2 = 381.44$, $df = 213$, normed- $\chi^2 = 1.79$, GFI = 0.90, AGFI = 0.87, RMSEA = 0.051, CFI = 0.995.

Note: GFI = Goodness-of-fit index, AGFI = adjusted goodness-of-fit index, RMSEA = root-mean-square-error of approximation, CFI = comparative fit index. Total effect = direct effect + indirect effect.*Significant at $p < 0.05$. **Significant at $p < 0.01$. ***Significant at $p < 0.001$.

positively affected behavioral intention (0.536 and 0.366, respectively) via perceived ease of use, perceived usefulness, and attitude. These two external variables also positively affected actual usage (0.124 and 0.085, respectively) via perceived ease of use, perceived usefulness, attitude, and behavioral intention. Perceived e-government learning value had a larger effect on behavioral intention and actual usage than did perceived enjoyment. Therefore, to encourage acceptance of e-government learning, the SME Online University should focus more on enhancing e-government learning value than on perceived enjoyment. Furthermore, the total effect of perceived usefulness on behavioral intention (0.754) was much higher than that of the effect of perceived enjoyment on behavioral intention (0.366) and the effect of perceived ease of use on behavioral intention (0.182), suggesting that promoting perceived usefulness and any of its antecedents is an effective way to enhance acceptance and use of e-government learning websites.

6. Discussion

Analytical results indicate that perceived e-government learning value influenced perceived usefulness and perceived enjoyment affected perceived ease of use. Perceived ease of use also affected perceived usefulness, which in turn influenced both attitude and behavioral intention. Finally, behavioral intention affected actual usage. The proposed model provides insights into how acceptance and use of the e-government learning websites can be further facilitated.

The construct of perceived e-government learning value consisted of the three learning dimensions – obtaining and integrating knowledge, accumulating, organizing and refining knowledge, and applying knowledge. This construct is strongly related to perceived usefulness, indicating that users use the e-government learning websites to improve themselves. The university has to provide rich and relevant information in a straightforward and efficient manner. Additionally, the university can present topical issues through business events and seminars on a continual basis. The university can also provide an e-learning service similar to one-stop e-government (Dias & Rafael, 2007; Glassey, 2004). The website can show the date on which course information was updated so that learners can determine course timeliness. For knowledge extension and refinement, the website can provide real case studies of best practices and experience sharing among students. For meaningful knowledge applications, the university can solicit and reward responses from learners about actual use of knowledge obtained from its websites. The most up-to-date information can also enhance the perception of e-government learning value. For example, all companies listed on the Taiwan Stock Exchange will be required to report their financial statements based on the IFRS (International Financial Reporting Standards) by 2013. Companies listed on the exchange are exerting considerable effort to meet this requirement. If the university were to develop courses related to the IFRSs, e-government learning value would be enhanced greatly.

In this study, perceived enjoyment was a significant determinant of perceived ease of use and attitude. Based on simple correlation, perceived ease of use was highly related to attitude ($r = 0.77, p < 0.01$) (Table 5). In the structural model in which perceived enjoyment existed, perceived ease of use no longer had a significant direct effect on attitude, indicating that perceived enjoyment was a stronger predictor of attitude than perceived ease of use, and that the proportion of attitude variance accounted for by perceived ease of use beyond that accounted for by perceived enjoyment was not significant. This result indicates that the university should focus on enhancing perceived enjoyment more than improving perceived ease of use. The university can present courses more actively and lively. This is consistent with the conclusion by Richard (2005), who determined that entertainment influences site involvement and attitude toward a site. At this moment, the university website provides discussion rooms. The university can

also add real-time news and virtual communities to reduce user boredom and enhance user interest in learning since a perceived lack of a sense of community was a challenge facing e-learners (Song, Singleton, Hill, & Koh, 2004). Blogs and discussion forums can also be used to involve users in knowledgeable interactivity. Social network sites such as Facebook can also be used to improve learning. Bandura (1977) posits that people learn from others via observation, imitation, and modeling. By using online social networks, students can meet new acquaintances and maintain close relationships with old friends, thereby expanding their interaction with peers and ability to learn about new environments. Yu, Tian, Vogel, and Kwok (2010) showed that online social network engagement on Facebook by university students was positively related to their learning outcomes, including cognitive, affective, and skill-based domains. Furthermore, current course materials consist of lectures and PowerPoint presentations. In the future, the university should adopt game-like materials to improve learning enjoyment.

One important finding in this study is concerned with the determinants of attitude, behavioral intention, and actual site usage. Perceived enjoyment and perceived usefulness positively influenced attitude, and perceived usefulness had a relatively greater impact. Furthermore, perceived usefulness influences behavioral intention directly. These findings make sense since users intend to learn something useful, not just enjoy themselves by visiting the university site. This finding differs from that obtained by Yu et al. (2005), who found that enjoyment played a key role in electronically mediated commerce when using an interactive television. The difference in contexts between the two studies shows that different variables play key roles in influencing behavioral intention. Most studies found that perceived usefulness strongly impacted behavioral intention, while the influence of perceived ease of use on behavioral intention was mostly via perceived usefulness (King & He, 2006). This finding was reasonable since most TAM studies investigated acceptance in the context of job-related environments, not entertainment environments. To promote e-government learning, the government should attempt to enhance e-government learning value, which can increase perceived usefulness and behavioral intention.

The relationship between behavior intention and actual usage was significant. However, the strength of this relationship, though comparable to that in previous studies (Yi & Hwang, 2003), was lower than that of most relationships between other model constructs. This indicates that many factors, such as availability of time, connection speed, or other external factors, may moderate the relationship between behavioral intention and actual usage or influence actual use directly (Burton-Jones & Hubona, 2006). Future studies are needed to explore the effects of those and other possible variables.

This study has some limitations that point to directions for future study. First, perceived e-government learning value and perceived enjoyment in this study are antecedent factors affecting perceived usefulness and perceived ease of use. The influence of other variables such as computer self-efficacy, perception of external control, or other psychological variables such as learning goal orientation vs. performance goal orientation (Yi & Hwang, 2003), on perceived usefulness and perceived ease of use in the context of e-government learning can be tested by further research. Furthermore, factors suggested by other theories such as subjective norm and trust may or may not directly influence behavioral intention. Additionally, researchers may identify other antecedent variables that influence attitude and behavioral intention.

Second, perceived enjoyment may change over time. Venkatesh (2000) argued that as experience increases, system use may become more routinized, less challenging, and less discovery-oriented, leading to low perceived enjoyment. However, perceived enjoyment with e-government learning seems to rely less on the system itself, depending instead on content and activities put forth by the university. For continual acceptance and use of the e-government

learning site, maintaining and increasing perceived enjoyment is extremely important. How perceived enjoyment changes with increased experience in using the e-government learning site on the one hand and promotional activities from an e-government learning website on the other hand deserve exploration.

Third, limitations related to measurement must be mentioned. All scales in this study, except the scale for perceived e-government learning value, were validated by previous research. Although the scale for perceived e-government learning had high reliability and validity in this study, further work should validate the scale and its role in other learning context in TAM research.

Fourth, actual system use can be measured using objective or subjective tools. Objective measures record user behaviors. This is the real usage TAM variables attempt to predict or correlate. Subjective usage measures are based upon the opinion of each individual subject, usually obtained via a questionnaire. As a surrogate of real usage measurement, subjective measurement is less accurate than real usage measurements. Turner et al. (2010), in a meta-analysis, concluded that the TAM variables – perceived usefulness, perceived ease of use, and behavioral intention – are stronger predictors of usage when the usage measure is subjective than when it is objective. This is understandable since subjective measurement items were quite often answered by respondents on the same questionnaire measuring TAM variables. This measurement method is prone, however, to creating common method bias (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003), selective recall, and inaccurate estimation, which contaminate the relationships among TAM variables and usage. In this study, actual usage was measured with a subjective tool. The power of the TAM in predicting actual usage in the e-government learning context may be validated further in future studies by objectively measuring usage.

Fifth, this study was conducted in Taiwan with Taiwanese subjects of the study. Straub, Keil, and Brenner (1997) conducted a study showing that the TAM model fit data from the U.S. and Switzerland well, but not data from Japan. Their research raised the question of TAM applicability across cultures. However, this study and many studies conducted in countries outside Northern America demonstrated that TAM is applicable in many nations, including Taiwan (Chang et al., 2005; Wang, 2003) and Korea (Kim et al., 2008; Yu et al., 2005). How cultural dimensions affect acceptance of a particular technology is an important but under-addressed subject. Understanding this would help managers predict acceptance of a particular technology in one culture via outcomes from another culture before introducing the technology.

7. Conclusions

The goals of this study were to investigate the factors influencing acceptance of e-government learning websites, to construct an extended TAM model for e-government learning, to test the model empirically, and determine the relative importance of factors in influencing usage of the e-government learning site. We proposed and validated perceived e-government learning value and perceived enjoyment as antecedent factors influencing acceptance of e-government learning. The extended TAM model for e-government learning was built and tested empirically. Perceived e-government learning value and perceived usefulness were identified as more important than perceived enjoyment and perceived ease of use in influencing actual use of the e-government learning site. Implications for e-government learning and directions for future studies were provided.

Acknowledgments

The authors gratefully acknowledge the editor and anonymous reviewers for their constructive comments and suggestions that were instrumental in improving this paper. The authors also would like to

thank the National Science Council of Taiwan for financially supporting this study under Contracts No. NSC 97-2410-H-009-026. Jing-Ya Tzeng is appreciated for her data collection.

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