

The role of experience and innovation characteristics in the adoption and continued use of e-learning websites

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Abstract

With the advent of e-learning technologies in the past decade, the accessibility of training, teaching, and learning has drastically increased. The challenge for the education enterprise now is how to attract learners to their e-learning services. In this study, a technology adoption model is developed to predict the users' intention of adoption and their continued use behavior. The results show significant evidence in support of the hypothesis. The findings indicate that perceptions of relative advantage and compatibility are significantly related to users' intention to use e-learning. Also, the intention is significantly related to their actual use of e-learning. Furthermore, the technology adoption of learners with prior e-learning experience is different from those without prior e-learning experience. These findings may contribute to deeper understanding of e-learning users' perceptions in terms of adoption and continued use behavior.

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1. Introduction

E-learning has grown into a revolutionary way of learning due to the rapid development of information and communication technologies (Cappel & Hayen, 2004). The technological innovations have made training, teaching, and learning over the Internet possible, which is so-called Web-based instruction (WBI) in education and training fields (Lee, 2001). E-learning has received considerable attention as a means of providing alternatives to traditional face-to-face, instructor-led education (Douglas & Van Der Vyver, 2004). IDC, the IT intelligence analyst puts the total global e-learning market at \$8 billion and set to grow to \$13 billion in the next five years (Flood, 2006). In Taiwan, the Institute for Information Industry (III) reported that the domestic market for e-learning services has grown from \$17 million in 2001 to \$209 million in 2005 (UDN, 2006). With the continuous growth of the e-learning market, however, there is a lack of discussion on the individuals' behavior in the adoption and continued use of e-learning.

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E-learning, by this definition, can be considered an information technology (IT) innovation for many learners. According to Tornatzky and Fleischer's (1990) definition, innovation is "the situationally new development and introduction of knowledge-derived tools, artifacts, and devices by which people extend and interact with their environment" (p. 10). Colleges, universities, and private training companies are converting more and more courses online. With a PC connected to the Web, e-learning allows students to attend courses anywhere at any time. Before the telecommunication technologies became easily accessible, distance learning was delivered using mail correspondence. For interactivity, learners would have to mail back the assignments to receive feedback from the instructor or go to the tutoring center for face-to-face interaction experience. Today, e-learning (or Web-based learning) has made distance learning highly interactive. Students may obtain an intimate learning experience without attending a brick-and-mortar facility.

Many of the prior research on e-learning are concerned with learning effectiveness and performance. David and Glen described the results of a designed experiment to measure the learning effectiveness of making all the text's multiple choice questions with answers, available to off-campus students enrolled in the database unit in an e-learning environment. The approach improves performance on the final examination not only on the multiple choice questions but also on the theory questions (Douglas & Van Der Vyver, 2004). James and Roger investigated the users' previous online learning experiences, satisfaction, perceived effectiveness and quality of the online learning units in an online self-paced independent study courses as a project within a traditional, instructor-led graduate course (Cappel & Hayen, 2004). Huang and Cappel evaluated the use, satisfaction, and perceived benefits of online learning games (Huang & Cappel, 2005). Robert, Kimberly, and Jean sought to examine the effects of cognitive load on performance outcomes of students using computer-based instruction. The performance of students in a cooperative group interacting in a computer-based instructional environment was compared to the performance of students working alone (Fuller, Vician, & Brown, 2006). However, few previous studies have investigated how the users' perceptions of innovation characteristics influence the use of e-learning.

This study focuses on individual users' perceptions of innovation characteristics (PCI) of e-learning as explanatory and predictive variables for their adoption and continued use behavior. Two specific questions therefore guided this research: First, can the perception variables of innovation characteristics (PCI) predict individual's intention to use an e-learning website? While some studies have used innovation characteristics to explain users' acceptance behavior in specific contexts successfully (Jurison, 2000; Van Slyke, Belanger, & Comunale, 2004; Ilie, Van Slyke, Green, & Lou, 2005; Lin & Lee, 2006), few research have been done in relation to e-learning adoption factors. The second research question is whether the technology adoption model of learners experienced in e-learning is different from inexperienced learners. While PCI variables are examined against the adoption of e-learning of inexperienced users and the continued use of the experienced users, it is expected that perceptions differ or change with experience (Fazio, 1989).

2. Theoretical background and research model

For research in technology adoption, the technology acceptance model (TAM) has received considerable attention. This model proposes two key beliefs in the adoption of technology: perceived usefulness (PU) and perceived ease of use (PEU). While TAM focuses on the technology adoption process, later innovation research further distinguish between initial adoption of innovation and continued/sustained use of innovation (Rogers, 1983). This study proposes a theoretical framework for user adoption behavior of e-learning based on the theory of perceptions of innovation characteristics (PCI). Both e-learning adoption behavior and continued use will be discussed.

2.1. Perceptions of innovation characteristics

Rogers (1983) identified attributes of innovation that are key to acceptance behavior including relative advantage, complexity, compatibility, trialability, and observability. Based on the work of Rogers and others, Moore and Benbasat (1991) expanded the innovation characteristics into seven constructs and developed an instrument to measure the perceptions. The constructs include relative advantage, ease of use, compatibility, image, result demonstrability, visibility and trialability.

Rogers' and Moore and Benbasat's first construct of PCI, relative advantage, is similar to the concept of perceived usefulness of TAM (Davis, Bagozzi, & Warshaw, 1989). Relative advantage presents the degree to which a potential adopter views the innovation as offering an advantage over previous ways of performing the same task. The second construct, ease of use, which is also part of the TAM, is similar to definition to Rogers' concept of complexity (Rogers, 1983) and captures the degree to which a potential adopter considers use of the target system to be relatively free of effort (Davis, 1993).

Moore and Benbasat's construct of compatibility is inline with Rogers': "the degree to which an innovation is perceived as being consistent with the existing values, needs, and past experiences of potential adopters." Moore and Benbasat (1991) indicated that the image construct, which is as part of relative advantage in Rogers' framework, can independently predict innovation use. The image construct refers to the perception when using an innovation in terms of enhancing the social status of the potential adopter. Further, Rogers' attribute of observability is divided into two constructs of result demonstrability and visibility, which refers to "the tangibility of the results of using an innovation" and "the extent to which potential adopters see the innovation as being visible in the adoption context" respectively. Finally, trialability indicates the perception of potential adopters of an opportunity to try the innovation before committing to its use.

2.2. Perceptions of innovation characteristics and intention of use

Researches in PCI indicate that individuals' perceptions about the characteristics of an innovation significantly affect their acceptance behavior. Such discussion on perceptions has been persistent in research literature in system use (Moore & Benbasat, 1991; Davis, 1993) and use intentions (Agarwal & Prasad, 1997; Van Slyke, Lou, & Day, 2002; Van Slyke et al., 2004; Lin & Lee, 2006; Ilie et al., 2005).

Innovation characteristics researches often include a hypothesized relationship between user perceptions and use. There are also inconsistent empirical studies regarding the significance of perceptions. For example, Van Slyke et al. (2002) used Rogers' diffusion of innovation theory to investigate users' intention in using a specific groupware application (Lotus Domino) discussion database. The findings indicate that perceptions of relative advantage, complexity, compatibility and result demonstrability are significantly related to users' intention to use the application. Lin and Lee (2006), in a study of a knowledge management system implementation, examined how perceived innovation characteristics affect the intention to encourage knowledge sharing. In total 154 senior executives in Taiwan were included in the survey to test the relationship between perceived innovation characteristics and intention. The results showed that perceived relative advantage, compatibility, and complexity positively affected the intention to encourage knowledge sharing.

Based on the constructs Moore and Benbasat (1991) proposed, Van Slyke et al. (2004) studied factors that may impact consumers' decision to engage in Web-based shopping and found that perceived compatibility has the strongest impact on intention of use, followed by perceived complexity, relative advantage and image. Ilie et al. (2005) added to the understanding of instant messaging adoption and use by examining gender differences in perceived innovation characteristics. Different patterns were discussed in their study. For females, perceived ease of use and visibility were significant predictors of intention to use; for males, perceived relative advantage, ease of use, and result demonstrability were significant.

These studies confirmed the innovation characteristics identified by Rogers (1983) as well as Moore and Benbasat (1991). They explained technology adoption behavior in specific technology contexts, but the results of salient perception factors were inconsistent. Tornatzky and Klein (1982), in a meta-analysis of innovation characteristics research, found that only three innovation characteristics - perceived relative advantage, perceived complexity, and perceived compatibility - are consistently related to innovation adoption.

Few studies have addressed the adoption of e-learning in the perspective of perceived innovation characteristics. As an innovative learning method, the adoption of e-learning involves the adoption of information technology and change of learning approach. Learners have more control over selection of learning topics in comparing to learning in the traditional classrooms. Therefore, this research represents an attempt to use diffusion of innovation perspective (2003) to understand factors that may impact the intention to use online e-learning.

2.3. Prior experience, Perceptions of innovation, and Intention to use

Studies have shown that prior experience can change intention of adoption or continued use of innovation. For example, Web shoppers' intention to continue shopping online is affected by past Web-shopping experience and past experience with the Web (May So, Danny Wong, & Sculli, 2005). Agarwal and Prasad (1997) focused on individual perceptions as explanatory and predictive variables of users' World Wide Web acceptance and continued use behavior. Their study results indicated that the innovation characteristics of visibility, compatibility, and trialability are relevant in explaining acceptance behavior. For continued use behavior, their study suggested that only advantage and result demonstrability were relevant innovation characteristics. Agarwal and Prasad also suggested that there were differences in perceived characteristics between acceptance and continued use of innovation.

Based on the above review of literature, an adoption model for e-learning users is proposed. Given that the learners experienced in e-learning are different from inexperienced learners. The hypotheses are formulated as below to address the difference between e-learning users' innovation adoption and continued use:

H1: The perceptions of innovation characteristics of Web-based e-learning are positively related to users' intention to adopt or continue to use e-learning.

H1a: The perception of ease of use is positively related to user's intention about e-learning adoption/continued use.

H1b: The perception of relative advantage is positively related to user's intention about e-learning adoption/continued use.

H1c: The perception of compatibility about using a Web e-learning system is positively related to user's intentions about e-learning adoption/continued use.

H1d: The perception of trialability is positively related to user's intentions about e-learning adoption/continued use.

H1e: The result demonstrability is positively related to user's intention about e-learning adoption/continued use.

H1f: The perception of visibility of the innovation is positively related to user's intention about e-learning adoption/continued use.

H1g: The perception of image is positively related to user's intention about e-learning adoption/continued use.

H2: The user's intention is positively related to the actual use of a Web-based e-learning system.

H3: The effect of perceived innovation characteristics on user's intention to use Web-based e-learning is different between learners with and without previous e-learning experience.

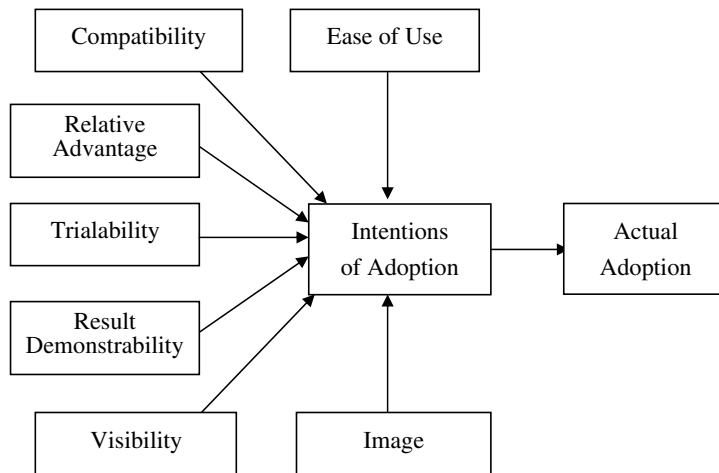
2.4. The research model

Fig. 1 represents the proposed research model drawn from the constructs of perceived innovation characteristics, intention of adoption and continued use, and the role of experience in adoption and continued use of innovation as discussed above. The research model is empirically tested in this study. In this model, perceived innovation characteristics comprise of seven user perceptions—ease of use, relative advantage, compatibility, trialability, result demonstrability, visibility and image. It is proposed in this model that prior experience be a potential determinant of e-learning website use as the independent variable for this study. The definitions of the constructs are provided in Table 1 and discussed in the subsequent discussions.

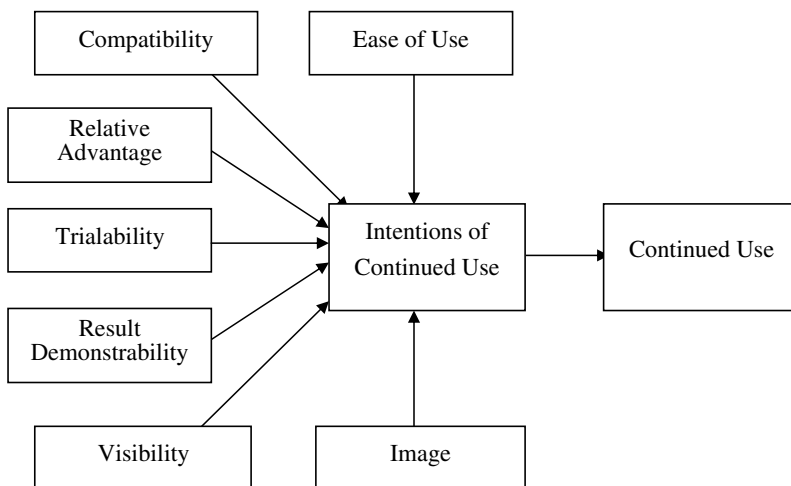
3. Research methodology

3.1. Characteristics of the sample and study context

To test the research model, an e-learning website was chosen as a representative of the innovation of e-learning. A survey was conducted on students who were enrolled in a project management (PM) course at



The Technology Adoption Model for Users without Prior Experience



The Technology Adoption Model for Users with Prior Experience

Fig. 1. The research model.

a comprehensive university in Taiwan. Digital materials related to conducting PM on Microsoft Project 2003 were developed and students can refer to them on the e-learning website.

The system used in the experiments was designed explicitly for this research. It ran on a Pentium IV PC with a 15" monitor. Subjects used Internet Explorer 6 to browse the teaching materials stored on a university server. With this configuration, retrieval of information, including video clips, was almost instantaneous. The e-Learning website development was using the Wisdom Master. Developed by SUN NET Technology Corporation, Wisdom Master is one of the most popularly used platforms of Learning Management System (LMS) in Taiwan. Wisdom Master is also the first software in Taiwan that meets the highest standard (RTE3) of the SCORM 1.2. The synchronous mode of teaching is not always superior to the asynchronous mode (Palvia, 2000). A majority of e-learning is conducted in an asynchronous mode (Douglas & Van Der Vyver, 2004). Therefore, we developed e-learning system with the asynchronous mode. With the high-resolution monitor employed, subjects could clearly see the facial expressions of the people in the video clips on the e-learning website.

Subjects received a one-hour, hand-on demonstration on using e-Learning website before the course actually began. Subjects can use the e-learning web system free through connecting Internet from anywhere at any

Table 1
Research variables and definitions

Research variables	Definition
Ease of use	Degree to which an innovation is considered by a learner as relatively easy to use and understand
Relative advantage	Degree to which an innovation is considered as superior to its predecessor
Compatibility	Degree to which an innovation is considered as compatible with existing values, beliefs, experiences and needs of learners
Trialability	Based on learners' perceptions of the degree to which an innovation can be used on a trial basis before confirmation of the adoption must occur
Result demonstrability	Degree to which the results of using an innovation are perceived to be tangible
Visibility	The perception of the actual visibility of the innovation itself as opposed to the visibility of outputs
Image	The perception that using an innovation helps enhance or improve the social status of users
Intention of adoption	Degree to which a learner without prior experience of e-learning intends to switch over to the innovation or increases his use in the future
Intention of continued use	Degree to which a learner with prior experience of e-learning intends to switch over to the innovation or increases his use in the future
Actual adoption	Degree to which a learner without prior experience of e-learning uses the e-learning website actually.
Continued use	Degree to which a learner with prior experience of e-learning uses the e-learning website continuously.
Prior experiences	Whether learners have experiences in e-learning websites

time. After they finished the 4-week course free, the students were asked to complete a questionnaire survey. Completion of the survey was voluntary and could be done outside class. A total of 137 surveys were completed. The age range of the sample was 20–30 years old. Of the 137 respondents, 59 were females (43%) and 78 were males (57%). Among these respondents, 41 did not have any previous e-learning experience.

3.2. Instrument development

The survey questionnaire included a combination of items derived from earlier studies and newly developed items. Moore and Benbasat's (1991) questionnaire of scales of perceptions of innovation characteristics was used as the foundation for the development of the survey instrument. It included a total of 25 items with each scale consists of a minimum of two items. Additionally, the intention of adoption and intention of continued use were assessed using two items constructed following the recommendations of Davis et al. (1989). The actual adoption and continued use were measured using two items similar to those in Davis (1993). As indicated by Davis, such self-reported measures are reasonable indicators of relative system use. Respondents scored on a seven-point Likert-type scale with the end points being "strongly disagree" and "strongly agree", except for items intended to collect demographic data.

3.3. Measures

The constructs of reliability and validity of the instrument were evaluated. Table 2 shows the number of items comprising each scale: the reliability reported by Moore and Benbasat (1991) for the scale and Cronbach's alpha for scale reliability obtained for the samples. Factor reliabilities, as represented by Cronbach's

Table 2
Scale reliabilities

Scale	Number of items	Moore and Benbasat reliability	Reliability from our sample
Ease of use	4	0.84	0.86
Relative advantage	5	0.90	0.94
Compatibility	3	0.86	0.91
Trialability	2	0.71	0.82
Result demonstrability	4	0.79	0.87
Visibility	2	0.83	0.94
Image	3	0.79	0.96
Use intention	3		0.94
Actual use	2		0.81

Table 3
Summary statistics and factor loadings for all constructs

Construct	Item	Mean	Standard deviation	Factor loadings	Explained variance
Ease of use	V6	4.8012	1.1738	0.766	70.80%
	V7			0.865	
	V8			0.874	
	V9			0.857	
Compatibility	V10	4.6374	1.0710	0.897	86.12%
	V11			0.945	
	V12			0.941	
Image	V13	3.9737	2.0090	0.951	93.09%
	V14			0.962	
	V15			0.962	
Result demonstrability	V16	4.9561	0.6844	0.917	80.16%
	V17			0.897	
	V18			0.872	
	V19			0.853	
Visibility	V20	4.7851	1.4688	0.945	94.97%
	V21			0.951	
Triability	V22	4.5702	1.1259	0.924	85.37%
	V23			0.924	
Relative advantage	V24	4.6857	1.1066	0.908	78.05%
	V25			0.927	
	V26			0.941	
	V27			0.889	
	V28			0.794	
	V29			0.833	
Use intention	V30	4.8012	1.1738	0.949	90.78%
	V31			0.944	
	V32			0.945	
Actual use	V33	4.5789	2.2895	0.919	84.50%
	V34			0.919	

alpha in Table 2, were between 0.81 and 0.94 for each factor. Reliability from the sample showed a reasonable level of reliability ($\alpha > 0.70$) (Cronbach, 1970).

Factor analysis also confirmed that the construct validity of the scales could be measured adequately. Using the principal components method with varimax rotation, construct validity was examined. Table 3 reports the factor loadings and explained variance for each of the factors. Bagozzi and Yi (1988) suggested that factor loadings for each item should be over 0.6 to be valid. The factor loadings for all items exceeded 0.7 in this study, which indicated that the individual items had discriminant validity.

4. Analysis and results

Pearson correlation coefficients for all research variables are shown in Table 4. Although Table 4 indicates that most user perceptions are significantly correlated with each other, an examination of the variance inflation factors indicated that the multicollinearity was not significant (Meuter, Jo Bitner, Ostrom, & Brown, 2005). Hence, residual analysis was also conducted to verify the assumptions underlying stepwise regression analysis. Stepwise regression enters independent variables into the regression equation one at a time, starting with the independent variable that best predicts the dependent variable. Independent variables are entered into the equation until adding the next best predictor does not significantly improve the explanatory power of the equation. All assumptions were confirmed.

The next step in the analysis was to test the significance of the individual terms in the model. These tests correspond to H1 – H2. The null hypotheses tested, the t statistic, and significance level are listed in Table 5 and illustrated in Fig. 2, as is whether the hypothesis was supported ($\alpha < 0.05$). The result for use intentions of all subjects indicate that the innovation characteristics of relative advantage ($\beta = 0.470$,

Table 4
Pearson correlation coefficients

	Ease of use	Compatibility	Image	Result demonstrability	Visibility	Trial.	Rel. Adv.	Use Intent	Actual Use
Ease of use	1.000								
Compatibility	0.635***	1.000							
Image	0.303***	0.429***	1.000						
Result demonstrability	0.459***	0.335***	0.346***	1.000					
Visibility	0.057	0.301***	0.198**	0.239**	1.000				
Trialability	0.406***	0.496***	0.136	0.402***	0.287***	1.000			
Relative advantage	0.525***	0.434***	0.268***	0.534***	0.241***	0.531***	1.000		
Use intention	0.465***	0.598***	0.339***	0.470***	0.154	0.457***	0.641***	1.000	
Actual use	-0.244	-0.033	-0.054	0.000	0.040	-0.070	0.003	0.169*	1.000

* $p < 0.1$.
 ** $p < 0.05$.
 *** $p < 0.01$.

Table 5
Regression analysis of the technology adoption model of e-learning website

Hypothesized significant	R-square	Beta
(a) Intention = relative advantage	0.411	0.641***
Intention = relative advantage + compatibility	0.536	0.470***
relative advantage		0.393***
+ compatibility		0.169*
(b) Actual use = use intentions	0.346	

* $p < 0.1$.
 ** $p < 0.05$.
 *** $p < 0.01$.

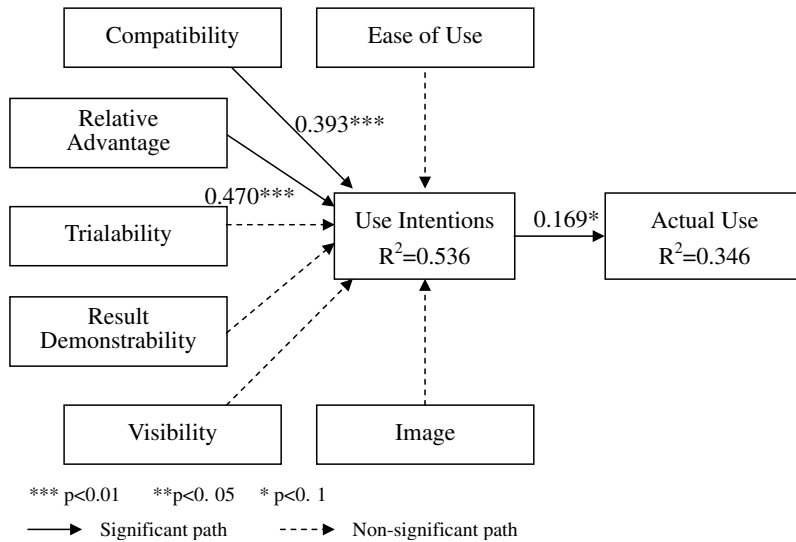


Fig. 2. Technology adoption model of e-learning website.

$p < 0.01$), and compatibility ($\beta = 0.393, p < 0.01$) are relevant in explaining intentions. The two variables account for 53.6% of the variance in intentions to use. User intentions ($\beta = 0.169, p < 0.1$) are related to their actual use of a web learning system. The variable explains 34.6% of the variance in actual use.

Both hypotheses about relative advantage (H1b) and compatibility (H1c) were supported, while those related to ease of use (H1a), trialability (H1d), result demonstrability (H1e), visibility (H1f) and image (H1g) were not supported. Relative advantage has the strongest impact on use intentions, followed by perceived compatibility.

Figs. 3 and 4 graphically illustrate the significant relationships found in our study. For users with prior experience of using e-learning, compatibility ($\beta = 0.580, p < 0.01$) and result demonstrability ($\beta = 0.331, p < 0.01$) significantly and directly influence the intention of continued use. Both variables account for

Table 6
Regression analysis of the technology adoption model for users with prior experience

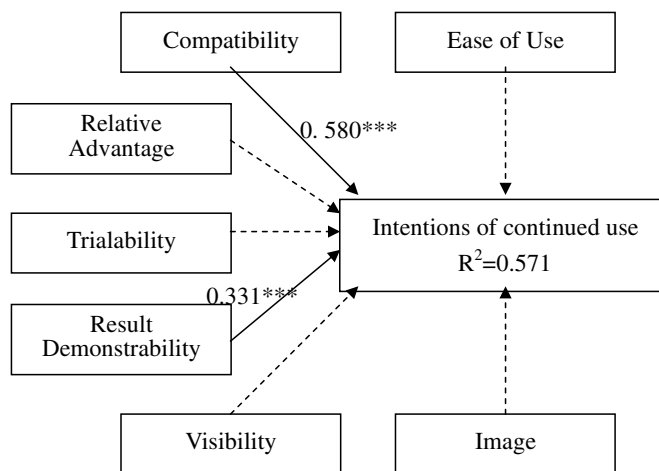
Hypothesized significant	R-Square	Beta
(a) Intention = compatibility	0.479	0.697***
Intention = compatibility + result demonstrability	0.571	
compatibility		0.580***
+ result demonstrability		0.331***

* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

Table 7
Regression analysis of the technology adoption model for users without prior experience

Hypothesized significant	R-square	Beta
(a) Intention = relative advantage	0.674	0.828***
Intention = relative advantage + image	0.761	
relative advantage		0.852***
+ image		0.305***
intention = relative advantage + image + compatibility	0.794	
relative advantage		0.839***
+ image		0.265***
+ compatibility		0.200**

* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.



*** $p < 0.01$ ** $p < 0.05$ * $p < 0.1$
 ———> Significant path - - - -> Non-significant path

Fig. 3. Technology adoption model for users with prior experience.

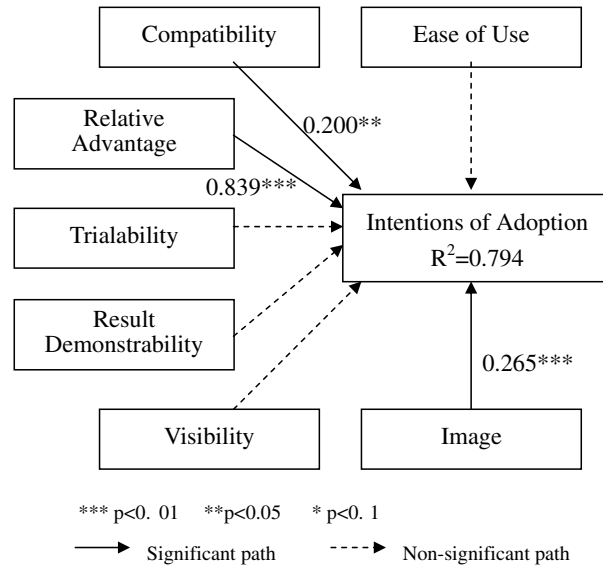


Fig. 4. Technology adoption model for users without prior experience.

57.1% of the variation in the intention of continued use. Perceived compatibility is a better predictor than result demonstrability (Table 6).

However, for users with no previous experience using e-learning websites, compatibility ($\beta = 0.200$, $p < 0.05$), image ($\beta = 0.265$, $p < 0.01$), and relative advantage ($\beta = 0.839$, $p < 0.01$) had a significant, direct effect on intention of adoption. These three variables explain 79.4% of the variation in intention of adoption. Relative advantage has the strongest impact on intention of adoption, followed by perceived compatibility and image (Table 7).

The research models with only significant paths are included, and Beta coefficients are also provided in the Figs. 3 and 4. For those with and without e-learning experience, our study shows the impact of perceived innovation characteristics on intentions to use e-learning website were different. The hypotheses about users' prior experience (H3) are thus supported.

5. Conclusion and discussion

The results of the investigation indicate a relationship between user perceptions of the characteristics of the e-learning website and their intention to use the technology. More specifically, users' perceptions of the relative advantage and compatibility of the e-learning website exhibit significant relationships with their adoption intention. The results are generally consistent with prior research about other technology adoption. Relative advantage and compatibility have received the most consistent support as factors that influence adoption and use of an innovation in other contexts (Van Slyke et al., 2002; Van Slyke et al., 2004; Lin & Lee, 2006). Notably, examination of the relative strengths of the associations between the individual perception variables and adoption intention clearly indicate that perceived relative advantage and compatibility can explain much of the variation in adoption intention. In other words, for web-learning learners, the perceptions of the relative advantage and compatibility of web learning are better predictors than other perception constructs.

The differences in the perceptions–intention relationship for learners with and without experience in e-learning website make an argument for the consideration of an experience component associated with the technology use model. In this study, previous e-learning experiences, compatibility and result demonstrability have a significant, direct effect on user's intention of continued use. However, for users without previous experience of using e-learning, compatibility, image and relative advantage have a significant, direct effect on user's intention of adoption. When learners have more experience with e-learning, the impact of perceived innovation characteristics on intentions to use web learning are different from that of inexperienced learners. Information obtained from experience over a period of time undoubtedly has the potential to modify future intentions of using web learning.

The current research can lead to several further studies. First, the dependent construct here represents behavioral intention of initial adoption and continued use. It would be valuable that studies can be conducted to understand potential implications experience gained over time has for the technology use model. A second concern is that the model tested here has been empirically assessed in only one conducting context. The generalizability of the results reported here is not known beyond the current sample, e-learning context and richness antecedents. However, the proposed research model provides explanations and predictions to understand learners' behavior. Based on this understanding, system platform manager and education institution can determine how to improve the learners' initial intention and continued use of e-learning websites.

Appendix. Items and scales

Ease of use

1. My interaction with the e-learning website is clear and understandable.
2. I believe it would be easy to get the e-learning website to do what I want it to do.
3. I believe the e-learning website would be easy to use.
4. Learning to use the e-learning website would be easy for me.

Relative advantage

5. Using the e-learning website would make it easier to do my work/learning.
6. Using the e-learning website would help me to accomplish tasks more quickly.
7. Using the e-learning website would improve the quality of the work/learning I do.
8. Using the e-learning would give me greater control over my work/learning.
9. Using the e-learning would enhance my effectiveness in the MIS program and/or my work.

Compatibility

10. Using the e-learning website would be compatible with all aspects of my work/learning.
11. I think that using the e-learning website would fit well with the way I like to work/learn.
12. Using the e-learning website would fit into my work-style/learning-style.

Trialability

13. I would be permitted to use the e-learning website on a trial basis long enough to see what it could do.
14. Before deciding to use the e-learning website, I would be able to properly try it out.

Result demonstrability

15. I would have no difficulty telling others about the results of using the e-learning website.
16. I believe I could communicate to others the consequences of using the e-learning website.
17. The results of using the e-learning website would be apparent to me.
18. I would have difficulty explaining why using the e-learning website may or may not be beneficial.

Visibility

19. In the school and/or my workplace one sees the e-learning website a lot.
20. The e-learning website is not very visible in the school and/or my workplace.

Image

21. People who use the e-learning website have more prestige than those who do not.

22. People who use the e-learning website have a high profile.
23. Using the e-learning website is a status symbol.

Intentions to use

24. I intend to increase my use of the e-learning website for work/learning in the future.
25. I intend to use the e-learning website in the future for my work/learning.
26. For future work I would use the e-learning website.

Actual use

27. I use the e-learning website a lot to learn.
28. I use the e-learning website frequently to learn.

References

- Agarwal, R., & Prasad, J. (1997). The role of innovation characteristics and perceived voluntariness in the acceptance of information technologies. *Decision Sciences*, 28(3), 557–582.
- Bagozzi, R. P., & Yi, Y. (1988). On the evaluation of structure equations models. *Academic of Marketing Science*, 16, 76–94.
- Cappel, J. J., & Hayen, R. L. (2004). Evaluating e-learning: A case study. *Journal of Computer Information Systems*, 44(4), 49–56.
- Cronbach, L. J. (1970). *Essentials of psychological testing*. New York: Harper and Row.
- Davis, F. D. (1993). User acceptance of information technology: System characteristics, user perceptions and behavioral impacts. *International Journal of Man-Machine Studies*, 38(3), 475–487.
- Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management Science*, 35(8), 982–1003.
- Douglas, D. E., & Van Der Vyver, G. (2004). Effectiveness of e-learning course materials for learning database management systems: An experimental investigation. *Journal of Computer Information Systems*, 44(4), 41–48.
- Fazio, R. H. (1989). On the power and functionality of attitudes: the role of attitude accessibility. In A. R. Pratkanis, S. J. Breckler, & A. G. Greenwald (Eds.), *Attitude structure and function*. Hillsdale: Lawrence Erlbaum Associates.
- Flood, G. (2006). Make it specific. *Human Resources*, 64–66.
- Fuller, R. M., Vician, C., & Brown, S. A. (2006). E-learning and individual characteristics: The role of computer anxiety and communication apprehension. *Journal of Computer Information Systems*, 46(4), 103–115.
- Huang, Z., & Cappel, J. J. (2005). Assessment of a web-based learning game in an information systems course. *Journal of Computer Information Systems*, 45(4), 42–49.
- Ilie, V., Van Slyke, C., Green, G., & Lou, H. (2005). Gender differences in perceptions and use of communication technologies: A diffusion of innovation approach. *Information Resources Management Journal*, 18(3), 13–31.
- Jurison, J. (2000). Perceived value and technology adoption across four end user groups. *Journal of End User Computing*, 12(4), 21–28.
- Lee, M.-G. (2001). Profiling students' adaptation styles in Web-based learning. *Computers & Education*, 36(2), 121–132.
- Lin, H.-F., & Lee, G.-G. (2006). Effects of socio-technical factors on organizational intention to encourage knowledge sharing. *Management Decision*, 44(1), 74–88.
- May So, W. C., Danny Wong, T. N., & Sculli, D. (2005). Factors affecting intentions to purchase via the internet. *Industrial Management & Data Systems*, 105(9), 1225–1234.
- Meuter, M. L., Jo Bitner, M., Ostrom, A. L., & Brown, S. W. (2005). Choosing among alternative service delivery modes: An investigation of customer trial of self-service technologies. *Journal of Marketing*, 69, 61–83.
- Moore, G. C., & Benbasat, I. (1991). Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information Systems*, 2(3), 192–222.
- Palvia, S. C. (2000). Effectiveness of asynchronous and synchronous modes for learning computer software for endusers: An experimental investigation. *Journal of Computer Information Systems*, 41(2), 99–109.
- Rogers, E. M. (1983). *Diffusion of innovations*. New York: The Free Press.
- Tornatzky, L., & Fleischer, M. (1990). *The processes of technological innovation*. New York: Lexington Books.
- Tornatzky, L. J., & Klein, K. J. (1982). Innovation characteristics and innovation adoption-implementation: A meta-analysis of findings. *IEEE Transactions on Engineering Management*, 29(1), 28–45.
- UDN (2006). E-learning market grow fast in global Chinese market. Available online at: <http://udn.com/NEWS/NATIONAL/NAT4/3120102.shtml> (accessed 21 March 2006).
- Van Slyke, C., Belanger, F., & Comunale, C. (2004). Factors influencing the adoption of web-based shopping: the impact of trust. *Database for Advances in Information Systems*, 35(2), 32–46.
- Van Slyke, C., Lou, H., & Day, J. (2002). The impact of perceived innovation characteristics on intention to use groupware. *Information Resources Management Journal*, 15(1), 5–12.