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Qinyu Liao
Mississippi State University

JP Shim
Mississippi State University

Xin Luo
Mississippi State University

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Qinyu Liao
Mississippi State University
Ql15@msstate.edu

J. P. Shim
Mississippi State University
jshim@cobilan.msstate.edu

Xin Luo
Mississippi State University
Xl96@msstate.edu

ABSTRACT

An increasing number of courses are being delivered via the web. Some of the materials are developed by faculty and some by other entities such as textbook publishers. The students' acceptance of web-based learning environment is important because of its increasing use. A variety of factors from the students, technology and instructor sides have been studied in previous research efforts to enhance the understanding of the course efficacy, learning effectiveness, and student acceptance of this new teaching and training regime. In this study, a non-voluntary web-based IS course will be investigated using the Unified Theory of Acceptance and Use of Technology (UTAUT) so as to understand factors contributing to students' acceptance of web-based learning environment.

Keywords

web-based learning, software training, student acceptance

INTRODUCTION

The Internet and web-based technologies are opening up new ways in which students learn and professional training is conducted. Nua Internet Surveys (www.nua.ie) expects the number of colleges and universities offering web-based courses to increase from 1,500 in 2000 to 3,300 in 2004. International Data Corporation reported a prediction of 33 percent increase in the number of online learners between 1998 and 2000. In professional training, Barron (1999) expected that the web-based training industry would be worth $15 billion a year by the year 2000.

The most marketed benefit of the web-based learning and training is the anytime/anywhere learning environment. It eradicates the barriers of time and geographical location. Accordingly, students can communicate and collaborate without being present at the same time and place. They can manage their own time and study in their own space in an interactive way, such as monitoring their progress while engaged in learning, determining where to spend extra effort within a training program to learn the material, or determining which material requires more practice. For organizations, web-based training is more easily duplicatable, distributable, updatable, trackable and doable at any time. The ability to transport learning programs electronically all over the world, make changes as often as needed, centrally and at minimal cost, and track training results electronically is what drives many organizations to make the initial investment (Boisvert, 2000).

Yet the results that studies obtained from web-based learning researches are mixed. While web-based learning environment provided flexibility in time, space and distance, and was well received by students in general (Eklund and Eklund, 1996), many students reported feeling isolated, lack of motivation or lack of support and feedback, which consequently led to drop out of the web course (Kum, 1999). The benefit provided by web-based learning and training environment may not be fully realized due to poor acceptance by users.

This paper will use the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh, Morris, Davis and Davis, 2003) as the theoretical framework to understand factors affecting students' acceptance of the web-based learning environment. The understanding of use and non-use can help institutions and organizations in selecting systems for students' learning and staff training.

LITERATURE REVIEW

Over the past decade, a number of researchers have studied web-based learning. Among them, Hirt and Limayem (2000) stated that previous studies on Web-based learning mainly focused on the learning outcomes and learning process, but rarely explored the factors affecting students' adoption and usage. Boettcher (1999) suggested four stages for web-associated learning, the web-present stage, the web-enhanced stage, the web-centric stage, and the web-based stage. In the web-based stage, the Internet is the exclusive medium for instruction (Boettcher, 1999; Driver, 2000; Driver, 2002). Most of the previous studies involved the early stages of web learning, where the Internet was adopted as a supporting tool for classroom teaching. Systems most frequently used are WebCT and Blackboard (Landry, Adams, and Dill, 2003; Lu, Yu and Liu, 2003; Schrottner and Tabatabaei, 2003).

In this study, an exclusive web-based learning system provided by the publisher is used. This is important for two reasons. First, as more universities and organizations are using web-based environment in course delivery, vendor/publisher-provided programs can provide more versatile and flexible products. Faculty could be freed from in-house development of course materials and concentrate more on the lecture delivery (Boisvert, 2000). Another reason is that as a growing number of web-based software programs are available in the market, more companies are using ready-made programs for their staff training (Boisvert, 2000). It's important to know how these programs are received by the trainees and to understand better the elements contributing to the successes and failures of the web-based learning systems.

The technology acceptance model (TAM) (Davis, 1989) has been frequently used to analyze the acceptance and use of technology based on the technology's ease of use and its perceived usefulness. It has been extended to study web-based education technology acceptance by incorporating different external variables such as faculty factors (Schell, 2001), social cognitive factors (Liaw, 2002), computer background (Landry, Adams and Hill 2003), and organization factors (Martins and Kellermanns, 2001). Prior TAM studies have found weaker utility for explaining students' intentions in the context of education and learning. Perceived usefulness was found to have a significant positive influence on intentions to use, but perceived ease of use did not. This suggests the need to integrate additional variables in the model for the education context (Saadé, 2003; Cheung et al. 2001).

RESEARCH MODEL AND RESEARCH PROPOSITIONS

The newly developed UTAUT further extended the TAM model by including a number of factors such as facilitating conditions, social influence, gender, age, experience, voluntariness of use (Venkatesh, Morris, Davis and Davis, 2003). According to this model, computer usage was directly affected by performance expectancy, effort expectancy, and social influence and indirectly affected by intention and facilitating conditions. Significant moderating influences of experience, voluntariness, gender and age were confirmed as integral features of the model.

This model was employed to study students' adoption of web-based learning environment. Because the system used in this study is non-voluntary, the student group was homogeneous for age and the study was a one time cross-sectional investigation. The model is tested without the moderators for simplicity reason. Figure 1 shows the research model. In the education context, the easier the students perceive the usefulness of the web-based course, the more useful it is perceived to be. The stronger social influence towards it is, the better the attitude towards it. The better the facilitating conditions are and the more useful the students' view the web-based course, the higher their intention of using it. Therefore, the propositions are:

H1: There is a significant positive influence of performance expectancy on intention to use the system.

H2: There is a significant positive influence of effort expectancy on intention to use the system.

H3: There is a significant positive influence of social influence on intention to use the system.

H4: There is a significant positive influence of facilitating conditions on system usage.

H5: Behavioral intention will have a significant positive influence on system usage.

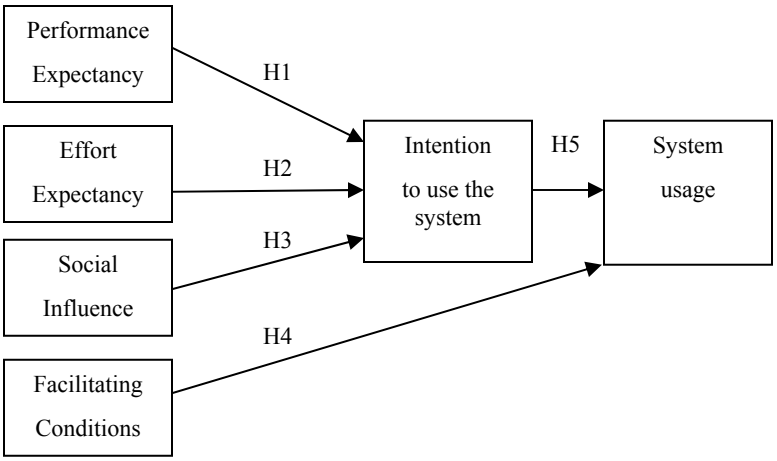


Figure 1. Research Model (adapted from Venkatesh et al. 2003)

RESEARCH METHOD

Setting and Procedure

The purpose of the course is hands-on computer training on the basic concepts of word-processing, spreadsheets, and database management using Microsoft Office Suite. The software includes two layers, one for system navigation panel and the other for learning engine for rehearsing content domain knowledge. Students can access course materials, assessment with immediate feedback, marks-to-date grade book as well as communication systems via the web either on or off campus.

Although a lab instructor was available to provide guidance and answer questions during the training sessions throughout the semester, the class is considered exclusively web-based for several reasons. First, the students were only required to physically attend the lab for the first day briefing on how to access the online modules and communication tools as well as two in-class web-based exams. Second, less than 5 percent of the students came to the lab during the semester. Most of them were students who didn't have computers and Internet facilities at home to work on. This non-voluntary and exclusive web-based learning environment is similar to those obtained by large corporations using web-based training systems.

Measures

Validated constructs adopted from Venkatesh et al. (2003) were operationalized such that the wording was changed to account for the context of the study. Measures of each dimension were phrased as questions on a seven-point Likert scale, ranging from 1-strongly disagree to 7-strongly agree. All measures were assessed for content validity using expert judges. Problematic items were modified as necessary. Specific items in the measurement scales are not presented here due to space constraints, and are available from the authors.

Sample

A self-administered questionnaire was distributed in class to students registered in an introductory undergraduate MIS course before the end of the semester at a major southern university. The survey was anonymous. 172 usable questionnaires were collected. Table 1 presents the demographic information of the subjects who participated in the survey.

RESULTS

The validity, reliability and model testing were examined using LISREL VIII (Jöreskog and Sörbom, 1993).

As shown in table 2, the scale reliability coefficients, Cronbach's alpha, were assessed for the data collected. All the coefficients are above the generally acceptable cutoff of 0.70 (Nunnally, 1967; Hair et al., 1998). Use behavior was not assessed for reliability because of the single indicator used. All other constructs exhibit a high degree of internal consistency as the composite reliability of the constructs ranges from 0.73 to 0.97.

Another reliability measure, square model correlation (SMC), reflects the overall amount of variance in the items accounted for by the latent constructs. All the SMCs, except for two in social science and one in facilitating conditions are greater than 0.5 (Garver and Mentzer, 1999).

Variables	Sample Composition	Percentage
Gender	Male	43%
	Female	33%
	not reported	24%
Age	<20	73%
	21-30	23%
	31-40	1%
	41-50	1%
	>51	1%
	not reported	2%
PC ownership	No PC	5%
	PC & Internet	82%
	PC only	9%
	not reported	4%
Web-based course experience	0	19%
	1	47%
	2	21%
	3	3%
	>4	6%
	not reported	3%

Table 1. Sample Demographics

Convergent and discriminate validity were evaluated using factor loadings (Bollen, 1989). In this study, the convergent and discriminate validity do not reveal any problem. All items have loading above 0.78 except two items in the construct social influence (0.60 and 0.67) and one item in the construct facilitating condition (0.52). The data can be seen in Appendix A.

Figure 2 shows the estimated path coefficients, as well as the associated t-values of the research model. Path significances are indicated with the corresponding asterisk. As presented in Figure 2, the model fit statistics were χ^2 (d.f.=141, N=172) = 415.98, p<0.00, RMSEA=0.105, and CFI=0.92>0.9 (Browne and Cudeck, 1993). Overall, the statistics demonstrated a marginally adequate fit of the model to the data. The model had adequate predictive power. It accounts for 50% of the variance in behavior intention and 95% of the variance in use behavior.

Contructs	Cronbach's α
Performance expectancy	0.93
Effort expectancy	0.91
Social influence	0.85
Facilitating condition	0.73
Behavior intension	0.97

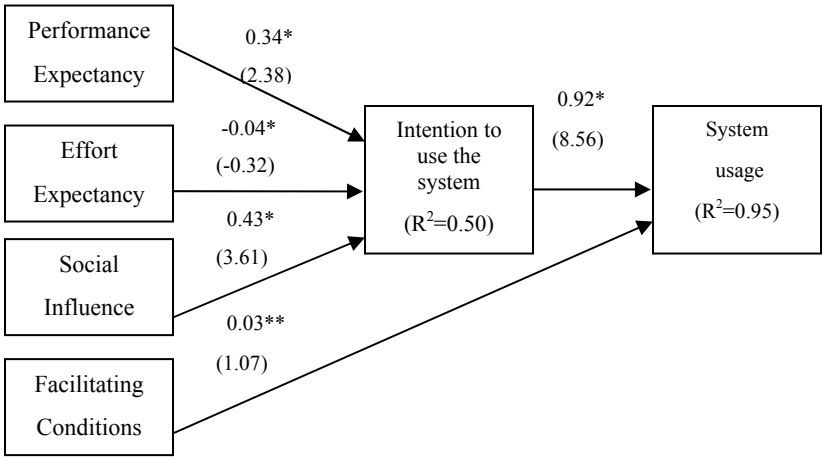
Table 2. Reliability Coefficient

The *t*-values for performance expectancy, social influence and intention to use the system were 2.38, 3.16 and 8.56 respectively which indicated statistical significance but their *p* values only showed a marginal significance (p<0.1). The interesting finding was that of facilitating conditions. Its *t*-value was only 0.03 and well below the cutoff value of 2 but its *p* value (<0.05) was significant. Effort expectancy was negatively related to intention to use but the relationship was non-significant for both *t*-value (-0.32) and *p*-value (<0.1).

The data suggested that performance expectancy and social influence had more significant impact on behavior intention than effort expectancy did. Facilitating conditions show significant impact on use behavior.

DISCUSSION AND CONCLUSION

Our preliminary findings indicate that UTAUT can be used to evaluate the users' acceptance of web-based learning environment. The non-significant impact of effort expectance in determining user behavior intention is a finding similar to those from previous studies. The study shows that social influence and facilitating condition could be new variables that augment the previous studies on web-based learning using TAM.



*p<0.1, **p<0.05

Note: *t*-values of the estimated coefficients are in parentheses

Figure 2. Standard Path Coefficients for the Model

It has been suggested by prior studies that social influence is important in the early stage of technology use in a mandatory setting because the users have to depend on others opinion and experience when they are relatively ill-informed about the system (Agarwal and Prasad, 1997; Hartwick and Barki, 1994; Karahanna, 1999; Taylor and Todd, 1995a; Thompson, 1994; Venkatesh and Davis, 2000). A possible explanation for this is that although the web-based learning environment provides an easy technology for students to access course materials and progress with the training at their own pace, the social learning atmosphere created by the instructor and the students over the web-environment can affect their perception of the learning experience, which, in turn, can influence their acceptance and adoption of the training system. Taylor and Todd (1995b) acknowledged facilitating condition as a core component of perceived behavioral control. The wide-spread use of the Internet could contribute to the low yet significant impact of the facilitating condition construct. The quality of network connection can affect the learning experience because of the amount of video and audio content carried. Web-based learning environments that facilitate better communication amid students, support easy interaction with the instructor(s) and ensure stable network connectivity can be more acceptable to students and trainees.

An important contribution of this paper is the study of exclusive web-based learning environment. Although a university setting is used, the result can provide insights for corporations where more ready-made web-based programs will be used for staff training and job aid. LISREL VIII was used for the model analysis and evaluation. This provides an alternative test for the UTAUT.

A limitation of this study is the omission of the moderators from the original UTAUT model. Although the group studied is homogeneous in age and the system is non-voluntary, researches have shown that there are differences in students' acceptance and learning effectiveness regarding computing experience, gender and ethnicity (Lu, 2002; Gefen and Straub, 1997). These could be investigated for future lines of research.

In conclusion, this research attempts to test the UTAUT in a web-based learning environment to assess factors contributing to students' acceptance. As more and more companies and organizations are embarking on the web-based training arena, the findings could help them in choosing training strategies and improving user acceptance of those learning environment.

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Appendix A

Indicators	Performance Expectancy	Effort Expectancy	Social Influence	Facilitating Condition	Behavior Intention
PE1	0.80				
PE2	0.94				
PE3	0.93				
PE4	0.86				
EE1		0.80			
EE2		0.93			
EE3		0.94			
EE4		0.78			
SI1			0.90		
SI2			0.91		
SI3			0.60		
SI4			0.67		
FC1				0.78	
FC2				0.84	
FC4				0.52	
BI1					0.92
BI2					0.98
BI3					0.98