

Extending TAM for Online Learning Systems: An Intrinsic Motivation Perspective

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Abstract: To get a better understanding of user behavior towards online learning systems, the technology acceptance model (TAM) was extended to include an intrinsic motivational factor. An online survey posted on a campus BBS was conducted to collect research data with a total of 121 usable responses. The results support the motivational model and show that the explained variance of online learning system use behavior is 71.3% higher than that of the original TAM explanation.

Key words: technology acceptance model (TAM); intrinsic motivation; online learning system

Introduction

In the past decade, the widespread use of Internet technologies has had significant impact on every aspect of people's lives. The pace of transformation in the education industry has speeded up, with more and more educational institutions realizing the potential impact of using the Internet and web technologies in the classroom as part of the learning environment^[1]. The advantages of web-based learning systems (WLSs) have been widely recognized and accepted. Research suggests that technology-mediated learning environment affords more study flexibility and broader accessibility^[2], improves students' performance^[3] and their evaluation of the learning experience^[4], and leads to higher computer self-efficacy^[1]. In addition, it provides benefits to academic institutions in terms of cost reductions and increased revenues^[5].

User acceptance and usage are important measures of any information system (IS) success^[6]. Without

consideration on student involvement, even the best developed system cannot be successful. Similarly, a successful WLS should be widely adopted with active participation from students. To investigate determinants of individuals' behaviors towards information technologies, various theoretical models have been developed (the theory of reasoned action, the technology acceptance model, the theory of planned behavior, the motivational model, self-efficacy theory, and the big five theory). The technology acceptance model (TAM) is widely used in the IS literature to explain individuals' information technology (IT) usage behavior^[7]. However, the belief-intention-behavior chain embedded in TAM emphasizes notions of instrumentality, focusing mainly on functional or extrinsic motivational drivers while ignoring an individual's subjective feelings of joy, pleasure, and positive holistic experience with IT usage^[8]. Motivation theorists argue that the reason individuals perform actions is not only because of external interests but for their intrinsic needs such as happiness, enjoyment, and curiosity^[9,10]. Researchers suggest that extrinsic and intrinsic motivators jointly determine the adoption of new technologies. Therefore, we postulate that incorporating both into the TAM may

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enhance explanation and prediction of student WLS acceptance and usage.

Although many studies have examined user acceptance and usage behavior towards new technologies, most were conducted in developed countries and thus, on the whole may not reflect the adoption process in different cultural environments^[11,12]. While the rate of e-learning system usage in higher education has been steadily increasing in China for the past decade, research using Chinese subjects is needed to better understand Chinese student technology acceptance behavior.

The objective of this study is to examine what factors contribute to learners' acceptance behavior with WLS from both extrinsic and intrinsic perspectives. The WLS conception used in this study follows Alavi and Leidner^[13] "an environment in which the learner's interactions with learning materials (reading, assignments, exercises, etc.), peers, and/or instructors are mediated through advanced information technologies." The factors were investigated using a research model based on the TAM and intrinsic motivation theory.

1 Research Model and Hypotheses

1.1 Technology acceptance model

In the TAM, Davis^[14] proposed that the influence of other variables on technology acceptance is mediated by two individual beliefs: perceived ease of use (PEOU) and perceived usefulness (PU). The actual system usage is determined by the users' behavioral intention (BI), which is jointly determined by the users' attitudes towards using the system and their perceived usefulness of the system^[15]. The validity of the TAM has been demonstrated for various information technologies, work environment, and end-users^[7]. Many previous Internet technologies related behavioral studies have used the belief-attitude-intention-behavior chain represented by the TAM formulation to successfully predict users' online acceptance behavior^[2,5,8,16-19].

In this work PU is defined as the degree to which an individual believes that using a WLS would increase his or her performance in the course and PEOU refers to the degree to which an individual believes that using a WLS would be free of cognitive effort. This theoretical TAM basis was evaluated using the following hypotheses:

H1 Perceived ease of use has a positive influence on the perceived usefulness of the WLS.

H2 Perceived usefulness has a strong positive influence on the behavioral intention of the WLS usage.

H3 Perceived ease of use has a strong positive influence on the behavioral intention of the WLS usage.

1.2 Intrinsic motivation

Motivation theorists argue that motivation formulates the mechanism of human behavior and action. When a person is unmotivated, he or she will feel no impetus or inspiration to act. Indeed, they distinguish motivation into two broad classes, intrinsic motivation and extrinsic motivation, according to the different reasons or goals to perform an action^[20]. While extrinsic motivation refers to the performance of an activity because it leads to instrumental rewards that are distinct from the activity itself, Davis et al.^[10] defined intrinsic motivation as the performance of an activity for no apparent reinforcement other than the process of performing that activity per se. The TAM mainly emphasizes the extrinsic perspective while lacking factors related to human and social change processes^[2]. With this dichotomy, researchers only fairly recently began to address the role of intrinsic motivation in studies to include more non-instrumental factors into the TAM to provide a broader view and a better explanation of IT adoption^[5,8,16,17,21]. Researchers have found that people will spend more time and effort on a task and have increased exploratory behavior and greater acceptance of information technology when tasks create a high level of intrinsic motivation^[9,22,23].

Many studies use enjoyment to represent intrinsic motivation in discussions of how intrinsic motivators influence individuals' IT acceptance behavior^[10,16,24-26]. In this study, enjoyment refers to the extent to which the activity of using the WLS is perceived to be enjoyable in its own right, apart from any performance consequences that may be anticipated. Venkatesh et al.^[26] suggested that intrinsically motivated computer users may tend to lower the perception of the difficulty associated with using a new technology because enjoyment decreases the perception of effort on the use. Consistent with prior studies, we believe that there is a positive relationship between enjoyment and behavioral intention.

H4 Enjoyment has a positive influence on the

behavioral intention of the WLS usage.

According to the TAM, behavior intention will finally lead to actual usage. Moreover, a critical review of TAM results has revealed that there is a significant, positive relationship between behavioral intention and usage with 10 out of 11 empirical studies showing its validity^[7]. Thus, we hypothesize H5 as follows:

H5 Behavioral intention with the WLS usage has a positive influence on actual usage.

Figure 1 represents the theoretical model used in this study. This model integrates an intrinsic motivator (enjoyment) into the TAM as a predictor of intention to use the WLS.

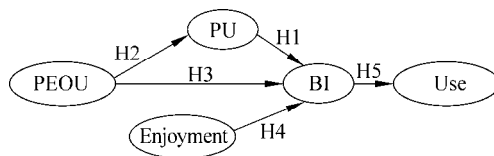


Fig. 1 Research model

2 Research Methodology

2.1 Data collection

A survey was used at a business college located in a south-central province to collect research data. The students taking a core business course were required to use a WLS to help them understand content material and rehearse for questions that may appear on the mid-term and final exams. All the students were asked to fill out the research questionnaire voluntarily posted on a campus BBS. A total of 121 users completed responses to all the measures.

2.2 Instruments

All the items used to measure the constructs were adapted from prior studies with modifications to fit the specific context of this WLS. Both the perceived

usefulness and the ease of use were measured using four items from Davis et al., with two items used to measure behavioral intention^[27]. Enjoyment was measured using the scale adapted from Davis et al.^[10] All items were evaluated on a five-point Likert-type scale with anchors from “strongly disagree” to “strongly agree”. The usage was adapted from Teo et al.^[18] including the frequency of WLS usage and duration of use.

3 Data Analyses

The partial least squares (PLS) approach using a PLS-graph^[28] with multiple indicator structural equation analyses was used to analyze both the measurement model and the structural model.

Table 1 shows that the reliabilities of all the constructs were above 0.7 except for the actual usage and that the composite reliability is significantly higher than 0.5, which represents an acceptable level for exploratory research. The measurement model in the PLS was assessed in terms of item loadings and the convergent and discriminant validity. To establish the discriminant validity, the average variance extracted (AVE) should be greater than 0.50 and the square root of every AVE in the AVE analysis should be much larger than any correlations among any pair of latent constructs. In Table 1, the AVEs of all the variables are above the acceptable level in this study. Also, the discriminant validity of the measures (the degree to which items differentiate among constructs or measure distinct concepts) was assessed by examining the correlations between the latent variable scores and the measurement items. Items should load more strongly on their own theoretically assigned constructs than on other constructs in the model^[29]. The factor loadings in Table 2 show that all constructs have adequate levels of convergent and discriminant validity.

Table 1 Inter-construct correlations and composite reliability

Variable	Cronbach's α	Composite reliability	Actual usage	PEOU	BI	PU	Enjoyment
Usage	0.601	0.821	0.836				
PEOU	0.858	0.904	0.411	0.838			
BI	0.789	0.906	0.371	0.725	0.91		
PU	0.889	0.924	0.391	0.726	0.796	0.867	
Enjoyment	0.864	0.918	0.413	0.728	0.783	0.83	0.888

Table 2 Factor structure matrix of loadings and cross-loadings

Variable	Actual usage	PEOU	BI	PU	Enjoyment
Frequency	0.9400	0.4014	0.3849	0.3791	0.4010
Duration	0.7337	0.272	0.2032	0.2645	0.2788
PEOU1	0.3855	0.8267	0.5685	0.5514	0.5942
PEOU2	0.4100	0.8573	0.6487	0.6459	0.6508
PEOU3	0.2632	0.8266	0.5919	0.6568	0.5876
PEOU4	0.3304	0.8671	0.6369	0.5905	0.625
BI1	0.3458	0.6884	0.9254	0.7439	0.7807
BI2	0.3343	0.6409	0.9093	0.7151	0.6518
PU3	0.3082	0.6495	0.6705	0.8844	0.6904
PU4	0.2767	0.6300	0.7535	0.8975	0.7409
PU1	0.3745	0.6321	0.6575	0.8336	0.7303
PU2	0.4116	0.6275	0.698	0.8808	0.7401
Enjoyment1	0.3698	0.6513	0.6778	0.7065	0.8697
Enjoyment2	0.3472	0.5926	0.7193	0.7696	0.9033
Enjoyment3	0.3930	0.7135	0.7065	0.7509	0.9126

The structural model in the PLS was assessed by examining the path coefficients (standardized β). The t statistics were also calculated to assess the significance of these path coefficients. In addition, R^2 was used to indicate the overall predictive ability of the model.

The path coefficients from the PLS analysis are shown in Fig. 2. The belief-attitude-intention chain was also found in this WLS context. PEOU demonstrates significant, positive impacts on BI ($\beta=0.232, p<0.01$) and PU ($\beta=0.732, p<0.001$) while PU posited a significant direct effect on BI ($\beta=0.380, p<0.01$). A positive, strong relationship was then found between BI and actual usage ($\beta=0.362, p<0.001$). The link between enjoyment and BI was also significant ($\beta=0.302, p<0.05$). PU, PEOU, and enjoyment jointly explained 71.3% of the variance in BI. The entire explained variance of actual WLS usage was 13.1% for this research model.

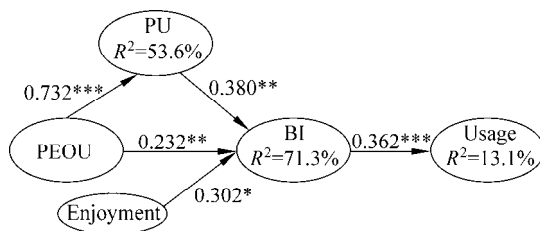


Fig. 2 Model parameters for the research model (*, $p<0.05$; **, $p<0.01$; ***, $p<0.001$)

4 Discussion and Implications

4.1 Primary findings

This study includes a motivational perspective into the TAM and postulates PU and enjoyment as the key drivers. The results show that PEOU has a significant impact on learners' acceptance behavior towards using a WLS and helps students accept the importance of the system to their study performance. In addition, enjoyment is found to play an essential role as a predictor to BI which increases when a student enjoys interaction with the WLS.

This study is one of several recent studies^[2,18,30] to empirically investigate users' acceptance of e-learning system, especially in China. Additionally, this study validates the perspective of intrinsic motivation to explain individuals' IT acceptance behavior^[8]. The results show that both types of motivations significantly influence individual behavior. This study theoretically and empirically supports the inclusion of intrinsic motivation for a better understanding of behaviors towards WLS.

One of the findings is inconsistent with prior research. Recent studies using subjects from developed countries frequently show that the direct effect between PEOU and BI is not significant^[2,18,30,31]. Another Chinese study also found that PEOU only influences the usage of e-learning systems through PU^[30].

According to Venkatesh et al.^[32], the lack of related experience with a new system should raise the importance of PEOU until users gain familiarity when instrumentality concerns overshadow concerns about the system's ease of use. This implies that in the current situation, Chinese students' experience on the Internet and computer-mediated environments lag behind their counterpart in developed countries.

4.2 Implications for e-learning researchers and practitioners

The findings demonstrate that the core formulation of the TAM is valid in the Chinese setting. Since the TAM holds across cultures, this will allow Chinese researchers to apply findings from previous research to local studies. This study provides an empirical study that can be used internationally by universities who want to internationalize their programs and use their own e-learning systems to support programs abroad via network technologies^[22]. Also, the results show the importance of enjoyment as an antecedent to e-learning systems in education and validate the effect of enjoyment in this context. Future research can use this result to investigate its extensions such as cognitive absorption^[8]. For practitioners, the results show that they should improve the technology quality of the e-learning systems from the e-learners' perspective. Solutions such as convenient system interfaces, stability of content delivery, and fast system connections reduce users' cognitive effort burden which increases usage^[22]. Instructors should strategically adjust their instructional method by embedding playful ingredients in the virtual learning environment to foster fun and interest in the learning process. Additionally, instructors and system designers should make full use of the system capability to enhance the content quality and to provide rich and useful course material. Students are more likely to use e-learning systems if they find the system can facilitate their learning process and improve learning effectiveness.

4.3 Limitations and conclusions

As previously reported, the findings of this research must be considered in light of its limitations. First, the usage measures used in this study were self-reported because it was not practical to objectively log student behavior. Second, this study only used student

responses regarding their behavior. Thus, the general validity of the findings should be treated with caution, especially when applied to other organizations such as companies.

This study was motivated by the need to develop an acceptance-performance model for online learning environments in China. The findings validate the TAM as a basis for this new model and support the value of enjoyment in acceptance behavior. Thus, a successful e-learning system should integrate the components of both utility and fun.

References

- [1] Piccoli G, Ahmad R, Ives B. Web-based virtual learning environments: A research framework and a preliminary assessment of effectiveness in basic IT skills training. *MIS Quarterly*, 2001, **25**(4): 401-426.
- [2] Lee M K O, Cheung C M K, Chen Z. Acceptance of Internet-based learning medium: The role of extrinsic and intrinsic motivation. *Information & Management*, 2005, **42**(8): 1095-1104.
- [3] Alavi M. Computer-mediated collaborative learning: An empirical evaluation. *MIS Quarterly*, 1994, **18**(2): 159-174.
- [4] Hiltz S R. Teaching in a virtual classroom. *International Journal of Educational Telecommunications*, 1995, **1**(2): 185-198.
- [5] Saadé R, Bahli B. The impact of cognitive absorption on perceived usefulness and perceived ease of use in on-line learning: An extension of the technology acceptance model. *Information & Management*, 2005, **42**(2): 261-386.
- [6] DeLone W H, McLean E R. Information system success: The quest for the dependent variable. *Information Systems Research*, 1992, **3**(1): 60-95.
- [7] Legris P, Ingham J, Colletette P. Why do people use information technology? A critical review of the technology acceptance model. *Information & Management*, 2003, **40**(3): 191-204.
- [8] Agarwal R, Karahanna E. Time flies when you're having fun: Cognitive absorption and beliefs about information technology usage. *MIS Quarterly*, 2000, **24**(4): 665-694.
- [9] Malone T W. Toward a theory of intrinsically motivating instruction. *Cognitive Science*, 1981, **5**(4): 333-369.
- [10] Davis F D, Bagozzi R P, Warshaw P R. Extrinsic and intrinsic motivation to use computers in the workplace. *Journal of Applied Social Psychology*, 1992, **22**(14): 111-132.
- [11] Straub D W, Keil M, Brenner W H. Testing the technology

- acceptance model across cultures: A three country study. *Information & Management*, 1997, **33**(1): 1-11.
- [12] Anandarajana M, Igarria M, Anakwe U P. IT acceptance in a less-developed country: A motivational factor perspective. *International Journal of Information Management*, 2002, **22**(1): 47-65.
- [13] Alavi M, Leidner D E. Research commentary: Technology-mediated learning—A call for greater depth and breadth of research. *Information Systems Research*, 2001, **12**(1): 1-10.
- [14] Davis F D. Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 1989, **13**(3): 319-340.
- [15] Davis F D, Bagozzi R P, Warshaw P R. User acceptance of computer technology: A comparison of two theoretical models. *Management Science*, 1989, **35**(8): 982-1003.
- [16] Heijden H V D. Factors influencing the usage of websites: The case of a generic portal in the Netherlands. *Information & Management*, 2003, **40**(6): 541-549.
- [17] Moon J W, Kim Y G. Extending the TAM for a worldwide-web context. *Information & Management*, 2001, **38**(4): 217-230.
- [18] Teo T S H, Lim V K G, Laia R Y C. Intrinsic and extrinsic motivation in Internet usage. *Omega*, 1999, **27**(1): 25-37.
- [19] Yi M Y, Hwang Y. Predicting the use of web-based information systems: self-efficacy, enjoyment, learning goal orientation, and the technology acceptance model. *International Journal of Human-Computer Studies*, 2003, **59**(4): 431-449.
- [20] Deci E L. *Intrinsic Motivation*. New York: Plenum, USA, 1975.
- [21] Hsu C L, Lu H P. Why do people play on-line games? An extended TAM with social influences and flow experience. *Information & Management*, 2004, **41**(7): 853-868.
- [22] Choi D H, Kim J, Kim S H. ERP training with a web-based electronic learning system: The flow theory perspective. *International Journal of Human-Computer Studies*, 2007, **65**(3): 223-243.
- [23] Igarria M, Parasuraman S, Baroudi J J. A motivational model of microcomputer usage. *Journal of Management Information Systems*, 1996, **13**(1): 127-143.
- [24] Atkinson M A, Kydd C. Individual characteristics associated with world wide web use: An empirical study of playfulness and motivation. *The DATA BASE for Advances in Information Systems*, 1997, **28**(2): 53-62.
- [25] Venkatesh V, Speier C. Computer technology training in the workplace: A longitudinal investigation of the effect of mood. *Organizational Behavior and Human Decision Processes*, 1999, **79**(1): 1-28.
- [26] Venkatesh V, Speier C, Morris M G. User acceptance enablers in individual decision making about technology: Toward an integrated model. *Decision Sciences*, 2002, **33**(2): 297-316.
- [27] Ajzen I, Fishbein M. *Understanding Attitudes and Predicting Social Behavior*. Englewood Cliffs, NJ, USA: Prentice-Hall, 1980.
- [28] Chin W W. PLS — Graph user's guide version 3.0. <http://www.pubinfo.vcu.edu/carma/Documents/OCT1405/PLSGRAPH3.0Manual.hubona.pdf>, 2006.
- [29] Gefen D, Straub D. A practical guide to factorial validity using PLS-graph: Tutorial and annotated example. *Communications of the Association for Information Systems*, 2005, **16**(5): 91-109.
- [30] Raaij E M V, Schepers J J L. The acceptance and use of a virtual learning environment in China. *Computers & Education*, 2006, **50**(3): 838-852.
- [31] Saadé R. Web-based educational information system for enhanced learning, EISEL: Student assessment. *Journal of Information Technology Education*, 2003, **2**: 267-277.
- [32] Venkatesh V, Morris M G, Davis G B, Davis F D. User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 2003, **27**(3): 425-478