2011 International Conference on Innovation, Management and Service
IPEDR vol.14(2011) © (2011) IACSIT Press, Singapore

Investigating the Factors Affecting Students' Continuance Intention to Use Business Simulation Games in the Context of Digital Learning

Yi-Wen Liao[1] , Yi-Shun Wang[2]

[1] Department of Information Management, Chai Nan University of Pharmacy & Science
[2] Department of Information Management, National Changhua University of Education

Abstract. Business simulation games have become a viable instructional option in recent years due to its support of learning motivation. Previous studies have pointed out that computer games could improve students' motivation to learn, but these studies have mostly targeted teachers or students in higher education and are lack about students' continuance usage models. Thus, the purpose of this study was to investigate how to use business simulation games in a digital learning environment, to provide students with an assisted-learning environment to improve students' learning satisfaction and continuance usage intention. This research adopted the flow theory, expectation confirmation theory, and theories of motivation as its theoretical base. A research design was developed, and the research model will be empirically tested by a survey with business simulation games in the digital learning contexts. A survey was conducted to evaluate the learning effect of applying the business simulation games in digital learning environment and to understand students' responses, attitudes and continuance usage intention towards business simulation games. The results of this study could provide a reference for the designers to develop a business simulation game system and the design of its contents to the business simulation game systems.

Keywords: Business Simulation Games, Game-based learning (GBL), Expectation Confirmation Theory (ECT), Flow theory, Motivation theory, Continuance Intention

1. Introduction

Game-based learning (GBL) has emerged as a general name for the use of games in education (Begg et al., 2005). Some technology-enabled instructional tools such as business simulation games (Tao & Yeh, 2009) have become emergent trends in Taiwan over the last few years. In the existing literature, there is a close relation between educational simulation games and learning. For example, Tao et al. (2009) discovered that educational simulation games can increase the motivation to learn. Cheng et al. (2011) and Kebritchi et al. (2010) specifically indicated that games increase the students' internal motivation as well as their learning performances. Interestingly, Prensky (2003) and Gomez et al. (2010) pointed out that from the perspective of successful learning, motivation is an indispensable condition and that games just happen to provide such a condition. In their experiment, Schwabe and Goth (2005) and Huang et al. (2010) applied games in their learning activities, which not only increase the motivation of the students but also increase the opportunity for them to interact with each other. Although the decision to use business simulation games is made by the teacher, the students' perception is equally important in promoting the inclusion of business simulation games in classrooms for three reasons. To understand the intention of the challenged Taiwanese college students to continue using business simulation games, the main objective of this study is to construct an appropriate research model to empirically test experienced students' perceptions of Taiwan's status-quo business simulation games and their future intention to continue use these games in the digital learning context. The researcher analyzed students' motivation in playing simulation games and the effect of using business simulation games on their learning satisfaction, and then studied the continuance usage intention from students' perspective.

2. Literature Review

2.1. Game-based learning

The term game-based learning has emerged as a general name for the use of games in education (Begg et al., 2005; Vasiliou & Economides, 2007). Game-based Learning (GBL) is the use of computer games to enhance teaching and learning. Game-based learning enables learners to perform tasks and have experiences which would otherwise be difficult due to cost, time, safety and other reasons. Educational games for learning are computer game applications destined to engage students in educational experiences for achieving specific learning goals and outcomes. Most studies indicate that games can effectively support learning (Sandford et al., 2006; Squire, 2006; Huang et al., 2010; Kebritchi et al., 2010; Tao et al., 2009; Huizenga et al., 2009). Beer game is one of the most popular games in supply chain education that has introduced the problem. Those agents are: maker, wholesaler, distributor and retailer. Beyond of those agents, incorporated by the students, it exists a raw material vendor and a customer for the final product, both incorporated by a monitor or facilitator. The approached subject is typical of planning and control of supplies. Through this simulation, it tries to show interdependence of the actions taken by the participants how these interfere in the conduction of the business of the chain as a whole in a horizon of time that extrapolates the present.

2.2. Theoretical Background

In general, many theories and models from different domains may contribute to the intention to continue using business simulation games. To set a cornerstone for a common understanding before constructing the research model, related background theories and information based on literature analysis and interview results are briefly summarized in this section to serve as a common ground. These are the Expectation Confirmation Theory (ECT), flow theory, and educational theories of Motivation, and Taiwan's business simulation games.

3. Research model and hypotheses

Based on the foregoing theoretical underpinnings, as the focus is on the experienced students' intention to continue using digital business simulation games in future classes, expectation confirmation theory (ECT) is the targeted base model and motivation and flow theory as its theoretical base. A research design was developed, and the research model will be empirically tested by a survey with business simulation games in the digital learning contexts. This research model (Figure 1) was therefore an extension of the original ECT based on individuals' intrinsic motivation theory. Perceived playfulness and learning motivation, the extended part of the model, were the construct of interest and learning intrinsic motivation. When people get involved in an activity for higher learning motivation, pleasure and enjoyment, this is their intrinsic motive and it should increase the likelihood that they would reuse the business simulation games in the future.

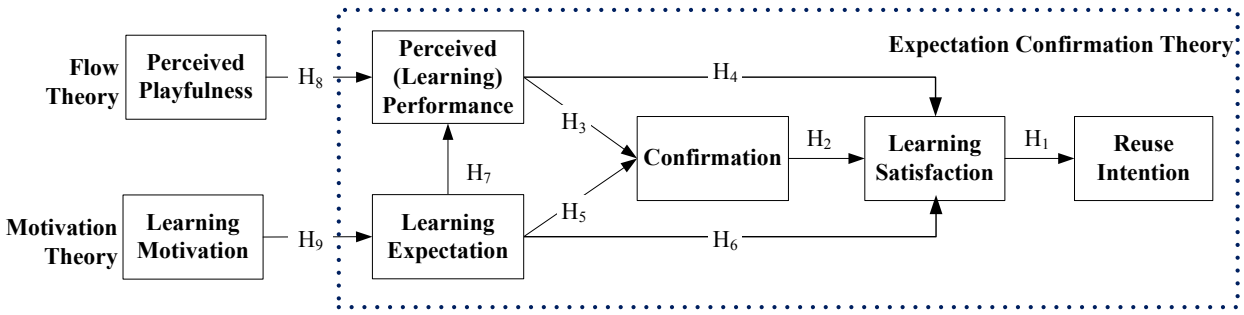


Fig1: Continuance use of game-based learning model

4. Method

4.1. Measures

The survey questionnaire consists of two parts. The first records the respondents' demographic data, and the second concerns respondents' perceptions of each construct in the research model. All measures for each

construct were taken from previously validated instruments and modified based on the GBL context. For instance, the measures for learning motivation were adapted from Gomez et al. (2010), Duncan and McKeachie (2005), and Tao et al., (2009). The measures for perceived playfulness were taken from Webster and Martocchio (1992) and Moon and Kim (2001). The measures for learning performance were taken from Premkumar and Bhattacherjee (2008), Tao et al., (2009), and Gomez et al. (2010). Measures for learning expectation were taken from Bhattacherjee(2001a). The measures for confirmation were selected from Bhattacherjee(2001a; 2001b), Premkumar and Bhattacherjee (2008), and Tao et al., (2009). Measures for learning satisfaction were taken from Bhattacherjee(2001a), Bhattacherjee et al.(2004), Jin (2009), and Tao et al., (2009). Finally, items adapted from Bhattacherjee(2001a), Bhattacherjee et al.(2004), Premkumar and Bhattacherjee (2008), and Jin (2009) will be used to measure continuance intention to use business simulation games in the context of digital learning.

4.2. Sample

The questionnaire consisted of two major parts including a portion for the respondent's basic data and another for the responses to our research constructs. The basic data portion recorded the subject's demographic information (e.g., gender, age, highest education, computer experiences, and so forth). The second part recorded the subject's perception of each variable in the model. It includes items for each construct. All items are measured via a 7-point scale ranging from 1 (strongly disagree) to 7 (strongly agree). To make the results generalizable, data used to test the research model will be gathered from a large sample of students in Taiwan. Respondents will be asked to participate in the survey.

4.3. Sample

In order to test the content validity, the initial questionnaire was pre-tested on nine doctoral students, and five graduate students majoring in e-commerce to check the suitability of the wording and format. Furthermore, a pilot test was conducted on 20 college students to validate the instrument. Both of the tests with slightly changes in wording were made. Empirical data for this study was collected via an Internet survey. Messages advertising the survey were posted for 2 weeks at public forums. Data used to test the research model was gathered from a sample of 381 respondents in Taiwan. Respondents were asked to participate in a survey. Willing respondents were first introduced to the definition of digital contents services purchase intention as defined in this study. Respondents then self-administered the questionnaire and were asked to circle the response that best described their level of agreement with the statements. Detailed descriptive statistics of the respondents' characteristics are shown in Table 1. In terms of the respondents, 39.4% were male, and their age distributions were as follows: under 20 (62.7%), and over 20 (37.3%). About respondents' computer experience, 8.14% of the respondents were below 4 years, 43.6% respondents were between 4 and 8 years, and 48.3% respondents were over 8 years.

5. Data analysis and results

5.1. Reliability and validity of instruments

Reliability and convergent validity of the factors were estimated by composite reliability and average variance extracted (see Table 1). The interpretation of the composite reliability is similar to that of Cronbach's alpha, except that it also takes into account the actual factor loadings rather than assuming that each item is equally weighted in the composite load determination. Campbell and Fiske (1959) proposed two aspects of construct validity: convergent and discriminant validity. Both the coefficients of composite reliability and average variance extracted (AVE) were tested for convergent validity. The AVE indicates what percentage of the variance of the construct any individual item explains. The average variances extracted (AVE) were all above the recommended threshold of 0.50 (Hair et al., 1992), which means that more than one-half of the variances observed in the items were accounted for by their hypothesized factors (see Table 2). Consequence, examine with composite reliability and AVE verified that a high convergent validity existed in the constructs.

Table 1. Results of AVE

Constructs	*Cronbach's Alpha*	*Composite Reliability*	*Average Variances Extracted (AVE)*	*AVE^(1/2)*
Learning Motivation (LM)	0.858	0.903	0.670	0.836
Perceived Playfulness (PP)	0.915	0.934	0.702	0.838
Learning Expectation (EXP)	0.906	0.941	0.843	0.918
Perceived Learning Performance (PLP)	0.928	0.954	0.875	0.935
Learning Confirmation (LC)	0.889	0.931	0.819	0.905
Learning Satisfaction (LS)	0.881	0.927	0.808	0.899
Continuance Intention (CI)	0.901	0.938	0.834	0.913

Discriminant validity is the degree to which measures of different concepts are distinct. To examine discriminant validity, this study compared the shared variance between factors with the average variance extracted of the individual factors (Fornell and Larcker, 1981). This analysis indicated that the shared variances between factors were lower than the average variance extracted of the individual factors, thus confirming discriminant validity (see Table 2). In summary, the measurement model demonstrated adequate reliability, convergent validity, and discriminant validity.

Table 2. Correlation between constructs

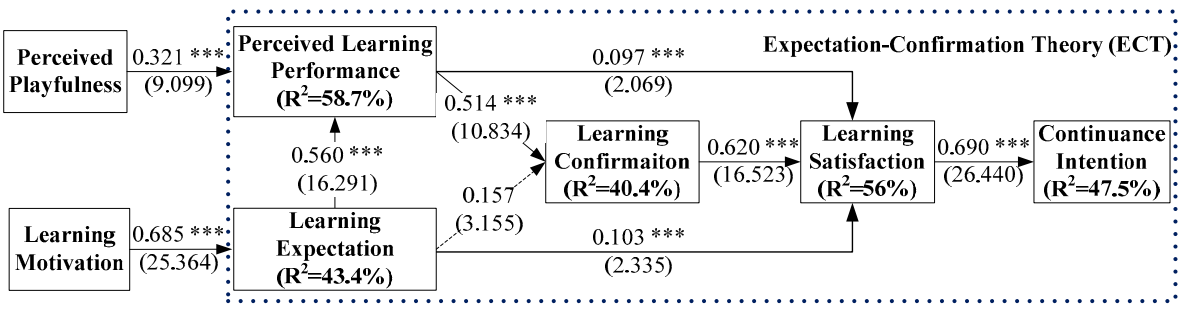
	CI	*EXP*	*LC*	*LM*	*LS*	*PLP*	*PP*
CI	0.834350						
EXP	0.596250	0.842560					
LC	0.732925	0.542181	0.818748				
LM	0.568224	0.772346	0.520459	0.699553			
LS	0.775197	0.516935	0.742053	0.502346	0.807903		
PLP	0.708628	0.586774	0.715551	0.522528	0.654371	0.874748	
PP	0.695413	0.480638	0.666943	0.547290	0.761032	0.639427	0.702284

CI：Continuance Intention； EXP：Learning Expectation；LC：Learning Confirmation；LM：Learning Motivation；PLP：Perceived Learning Performance；PP：Perceived Playfulness

Diagonal elements are the average variance extracted (AVE).
Off-diagonal elements are the shared variance.

5.2. Hypothesis test

Figure 1 illustrates the results of the research model with non-significant paths as dotted lines, and the standardized path coefficients between the constructs. Most of the hypotheses (H1, H2, H3, H4, H6, H7, H8 and H9) were significant in PLS prediction, except for learning expectation toward learning confirmation (H5).



*p<0.05, **p<0.01, ***p<0.001

Fig. 2. Hypotheses testing results.

Figure 2 shows the results of the multiple regression analyses. First, perceived playfulness (b =0.321, p<0.001) and learning expectation (b =0.560, p<0.001) are significantly related to perceived learning performance (R2=58.7%). Next, learning motivation (b =0.685, p<0.001) is significantly related to learning expectation (R2=43.4%). Thus, H7, H8 and H9 are supported. Perceived learning performance (b =0.514, p<0.001) is significantly related to perceived learning performance (R2=40.4%), but learning expectation (b =0.157, p<0.001) is not significantly related to perceived learning performance. Thus, H3 is supported, except for H5. Besides, perceived learning performance (b =0.097, p<0.001), learning confirmation (b =0.620, p<0.001), and learning expectation (b =0.103, p<0.001) are significantly related to perceived learning satisfaction (R2=56%).Finally, learning satisfaciton (b =0.690, p<0.001) is significantly related to continuance intention. Thus, H1 are supported. Overall, H1, H2, H3, H4, H6, H7, H8 and H9 are supported, except for H5.

6. Discussions and Conclusions

With the proliferation of business simulation games usage in educational contexts, developing a better understanding of students' continuance usage intention behavior through simulation games has become an important topic for practitioners and academics. This research represents a careful and systemic effort to incorporate elements from different distinct theories (expectation confirmation theory, theories of motivation and flow) as part of an integrated model within the context of the business simulation games continuance usage intention. This study aimed at determining relevant, complete explanations of game-based learning continue usage intentions and adopted expectation confirmation theory, and theories of motivation and flow as its theoretical base to explore the cause-and-effect relationship between an individual's perceived beliefs and business simulation games continue usage intentions.

The results of this study have shed light on some important issues related to students' continuance usage intention toward business simulation games in context of digital learning. Thus, business simulation games vendors should ensure that they provide adequate utilitarian value to students instead of focusing on just one of aspects in their simulation games development. Online vendors also should design their business simulation games systems to meet students' needs for improving learning performance in the digital learning environment, providing enough information about the products they sold, and also have fun when using the simulation games systems. Additionally, satisfaction could be a decisive factor affecting continuance usage intentions of the students. Thus, managers of game-based learning contexts need to monitor the satisfaction of their students with their simulation games systems to compete in the games systems market.

The findings of this study can enhance our understanding of students' continuance intention toward business simulation games in the digital learning environment, and provide several prominent implications for game-based learning research and practice.

7. Reference

[1] Begg, M., Dewhurst, D., and Macleod, H. (2005). Game-Informed Learning: Applying Computer Game Processes to Higher Education, Innovator, Journal of Online Education, 1(6).

[2] Bhattacherjee, A. (2001a). Understanding information systems continuance: An expectation-confirmation model. *MIS Quarterly*, 25, 351-367.

[3] Bhattacherjee, A. (2001b). An empirical analysis of the antecedents of electronic commerce service continuance. Decision *Support Systems*, 32, 201-214.

[4] Bhattacherjee, A., Perols, J., and Sanford, C. (2008). Information technology continuance: A theoretic extension and empirical test. *Journal of Computer Information Systems*, 49, 17-26.

[5] Chang, C. H. (2001). *Educational psychology*. Taipei: Tung-Hwa Publishing.

[6] Cheng , C.K., Paré , D.E., Collimore, L.M., Joordens, S. (2011). Assessing the effectiveness of a voluntary online discussion forum on improving students' course performance. *Computers & Education* ,56, 253–261.

[7] Chien, T. C., Chang, T. C. T., Chen, Z. H., and Chan, T. W. (2008). Enhancing Pupils' Concept of Leading Teamwork through Digital Game Approach, *International Conference on Computers in Education*, 767-772.

[8] Churchill, G. A., and Surprenant, C. (1982). An investigation into the determinants of consumer satisfaction. *Journal of Marketing Research*, 24, 491-504.

[9] Fornell, C. D., and Larcker, F. (1981). Evaluating structural equation models with unobservable variables and measurement errors. *Journal of Marketing Research*, *18(2),* 39-50.

[10] Ghani., J.A., Supnick., R. and Rooney, P., The experience of flow in computer-mediated and in face-to-face group, in: J.I. DeGross, I. Benbasat, DeSanctis, Beath (Eds.), in: *Proceedings of the Twelfth International Conference on Information Systems*, New York, December 1991.

[11] Gomez, E.A., Wu, D., and Passerini, K. (2010). Computer-supported team-based learning: The impact of motivation, enjoyment and team contributions on learning outcomes, *Computers & Education,* 55, 378-390.

[12] Hair, J. F., Anderson Jr., R. E., Tatham, R. L., and Black, W. C. (1998). *Multivariate data analysis with readings* (5th ed.). NJ: Prentice Hall.

[13] Hoffman., D.L., and Novak.,T.P. (1995). Marketing in hypermedia computer-mediated environments: conceptual foundations, http://ecommerce.vanderbilt.edu/research/ papers/html/manuscripts/cmepaper/cme.conceptual.foundations.html.

[14] Huang, W.H., Huang, W.Y., Tschopp, J. (2010). Sustaining iterative game playing processes in DGBL: The relationship between motivational processing and outcome processing, *Computers & Education*, 55, 789-797.

[15] Huizenga, J., Admiraal, W., Akkerman, S., and Dam, G.T. (2009). Mobile game-based learning in secondary education: engagement, motivation and learning in a mobile city game, *Journal of Computer Assisted Learning*, 27,. 332-344.

[16] Jin, X.L.K. (2009). Understanding the Sustainability of Online Question Answering Communities in China: The Case of – Yahoo! Answers China. *Doctor of Philosophy*, City University of Hong Kong, August 2009.

[17] Kebritchi, M., Hirumi, A., and Bai, H. (2010). The effects of modern mathematics computer games on mathematics achievement and class motivation. *Computers & Education*, 55, 427-443.

[18] Liu, R. L. (2006). How do students successfully learn? Discuss the lifting of education quality from college students' learning outcomes and school satisfaction. e*Paper of Integrated Higher Education Database Systems in Taiwan*, 4.

[19] Oliver, R. L. (1980). A cognitive model for the antecedents and consequences of satisfaction decisions. *Journal of Marketing Research*, 17, 460–69.

[20] Premkumar, G., and Bhattacherjee, A. (2008). Explaining information technology usage: A test of competing models. *Omega*, 36, 64–75.

[21] Prensky, M. (2003). ACM Computers in Entertainment, *Digital game-based learning*. 1, 1-4.

[22] Schwabe, G., and Goth, C. (2005). Mobile learning with a mobile game: Design and motivational effects. *Journal of Computer Assisted Learning*, 21(3), 204-216.

[23] Squire, K. (2006). From content to context: digital games as designed experiences. *Educational Researcher*.

[24] Tao, Y.H., Cheng, C.J., and Sun, S.Y. (2009). What influences college students to continue using business simulation games? The Taiwan experience., *Computers & Education*, 53(3), November, 929-939.

[25] Vasiliou, A., and Economides, A.A. (*2007)*. Game-based learning using NANETs. In N. Mastorakis and ph. Dondon (eds.) *Proceedings of the 4th WSEA/ASME International Conference on Engineering Education* (EE'07). 154-159.