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Integrating Technology Acceptance Model and Task-technology Fit into Blended E-learning System

Chih-Min Ma, Cheng-Min Chao and Bor-Wen Cheng
Department of Industrial Engineering and Management,
National Yunlin University of Science and Technology,
Taiwan, Republic of China

Abstract: We propose a research framework to examine the determinants of nurse's learning satisfaction in a Blended E-Learning System (BELS) environment based on task-technology fit and the technology acceptance model. The research framework integrates Task-Technology Fit (TTF), computer self-efficacy, the Technology Acceptance Model (TAM) and user satisfaction to hypothesize a theoretical model to explain and predict user's behavioral intention to use a BELS. Self-reporting questionnaires were distributed to local community hospitals, regional hospitals and medical centers in central Taiwan. From the 900 distributed questionnaires, we received 650 completed questionnaires, yielding a response rate of 72.2%. Using Structural Equation Modeling (SEM), the results showed that perceived usefulness is an important factor affecting the behavioral intention to use a BELS. The TTF was expected to directly influence perceived usefulness. The findings provide insight into the factors that are likely to be crucial antecedents for planning and implementing a BELS to enhance nurse's user satisfaction.

Key words: Blended e-learning system, task-technology fit, user satisfaction

INTRODUCTION

Internet commercialization and information technologies have enabled online or electronic learning (e-learning) environments to provide various functions, such as communication, and enhance learner-directed learning (Wu *et al*., 2010). Although, e-learning offers learner flexibility in training time and is convenient and effective for both individual and group learning, certain shortcomings exist. Students may feel isolated from the instructor and most importantly, every learner needs access to a computer and to be equipped with Internet and computer skills. The high costs of system update, maintenance and tutorial support can also be a problem (Abdelaziz *et al*., 2011; Wu *et al*., 2008, 2010). Given e-learning concerns and dissatisfaction, educators are searching for alternative instructional delivery solutions to raise e-learning user satisfaction and effectiveness. Blended E-Learning System (BELS) seems to be a promising alternative learning approach (Graham, 2006).

A BELS is a teaching system combining several learning delivery methods, such as the most common face-to-face classroom with an asynchronous or synchronous online class. The rapidly growing trend of blended learning adoption in higher educational institutes proves the merits of linking technology with traditional face-to-face teaching approaches and solving economic concerns and student needs in a flexible learning time (Lin and Wang, 2012; McKenzie *et al*., 2013; Padilla-Melendez *et al*., 2013). Over the past decade, Information and Communication Technology (ICT) has advanced rapidly and has considerably affected nursing education (Abdelaziz *et al*., 2011). By the integration of ICT into educational training, e-learning has synchronized to promote rapid growth. The BELS is regarded as an effective alternative learning approach. A BELS satisfies nurses' learning needs, but they are restricted by certain factors in the learning environment. Therefore, investigating nurses' behavioral intention to use a BELS can be a critical issue.

For the past two decades, the Technology Acceptance Model (TAM) and Task-Technology Fit (TTF) have been dominant in system usage studies. These two popular theories provide an explanation that is comprehensive and yields great explanatory power (Lee and Lehto, 2013; Narman *et al*., 2012). Previous research has proven perceived usefulness and perceived ease of use to be critical determinants of the acceptance and use of e-learning systems; however, student perceptions in a blended learning setting are seldom

Corresponding Author: Cheng-Min Chao, Department of Industrial Engineering and Management,
National Yunlin University of Science and Technology, Taiwan, Republic of China

investigated (Padilla-Melendez *et al*., 2013; Tselios *et al*., 2011). The TTF has been proven to be applicable to the case of blended learning instruction (Lin and Wang, 2012). Computer self-efficacy and performance expectations have been considered the most relevant human behavior effects of Information System (IS) usage (Compeau and Higgins, 1995; Wu *et al*., 2010). Computer self-efficacy has also been validated as a determinant of IS acceptance and use. User satisfaction is an important factor influencing the success of learning systems and refers to the degree to which users are satisfied and pleased with their first access of an information system (Lee and Lehto, 2013). Based on the literature findings, we introduce the concepts of TTF, computer self-efficacy, user satisfaction and the TAM to investigate factors that encourage learners to use a BELS.

In discussions of BELS, Lin and Wang (2012) introduced the TTF, the IS success model and the TAM (including perceived usefulness) to hypothesize a theoretical model to explain and predict students' intention to continue accessing a BELS. Padilla-Melendez *et al*. (2013) proposed a research model based on the TAM and perceived playfulness to investigate the primary determinants affecting undergraduates' intention to use a BELS. Wu *et al*. (2010) based on social cognitive theory (including computer self-efficacy) to examine the determinants of student learning satisfaction in a BELS environment. Prior research has examined TTF, the TAM, and computer self-efficacy independently in explaining BELS usage. However, no research has theoretically combined these three models. The primary contributions of this research might be its investigation of the integration of TTF, the TAM, computer self-efficacy and user satisfaction in explaining BELS usage behavioral intention and an empirical evaluation of the factors that are critical to affecting this behavioral intention. The findings may help bridge the existing gap between acceptance and continuance streams of BELS usage research and help both hospital managers and academics to better understand users' behavioral intentions.

LITERATURE REVIEW AND RESEARCH HYPOTHESES

Blended e-learning systems (BELSs): Blended learning is an instructional approach that integrates the advantages of e-learning methods with a traditional face-to-face teaching approach. Compared to the traditional face-to-face teaching environment and e-learning, BELSs are undoubtedly new and innovative learning methods. Blended learning is popular because it uses diverse methods and enhances learners' learning outcomes, performance, and satisfaction (Lin and Wang, 2012; Padilla-Melendez *et al*., 2013; Wu *et al*., 2010). Some research indicates that students would feel better supported and more satisfy with faculty interaction in blended learning (Owston *et al*., 2012). According to Wu *et al*. (2010), a BELS is an instructional system that combines multiple learning delivery methods, including most common face-to-face classroom methods with asynchronous or synchronous online learning. Compared to face-to-face teaching methods, learners have flexible learning time in blended learning environments.

Task-technology fit (TTF): TTF attempts to explain how task and technology characteristics affect technology use outcomes (Lee and Lehto, 2013). TTF is based on the notion that a good match of functional capabilities and task requirements leads to higher usage (Narman *et al*., 2012). Technology characteristics have a positive effect on TTF. The task characteristic is linked to the perceived TTF. Combining the TAM with TTF might also provide more explanatory power than the individual use of either the TAM or TTF (Lee and Lehto, 2013). The TAM and TTF offer distinctive explanations of the mechanisms behind user's choices to accept an information system or technology. The research results of Lee and Lehto (2013) indicate that TTF is expected to directly influence perceived usefulness of YouTube. Based on the literature, we propose the following hypotheses:

- **Hypothesis 1:** Task characteristics have a positive effect on TTF to use a BELS
- **Hypothesis 2:** Technology characteristics have a positive effect on TTF to use a BELS
- **Hypothesis 3:** TTF has a positive effect on the perceived usefulness of a BELS

Computer Self-efficacy: Computer Self-Efficacy (CSE) refers to people's perceptions of their capacity to use computers (Compeau and Higgins, 1995). Previous research has shown that enhancing computer self-efficacy improves initiative and persistence, which consequently leads to improved performance or outcome expectation such as attitude and behavior (Wu *et al*., 2010). Previous study results have also shown a causal link between computer self-efficacy and perceived usefulness (Lee and Lehto, 2013; Terzis and Economides, 2011). Nurses with high computer self-efficacy who correctly use BELSs perceive that the system is highly useful which in turn motivates their intention to use BELSs. Thus, computer self-efficacy has an important direct effect on the perceived usefulness and an indirect influence on the behavioral intention to use a BELS. Based on the literature, we propose the following hypothesis:

- **Hypothesis 4:** Computer self-efficacy has a positive effect on the perceived usefulness of BELSs

Technology acceptance model (TAM): The TAM (Davis, 1989) is the most influential and frequently cited model for understanding the acceptance of Information Technology (IT) or Information Systems (Iss) and has been extensively adopted in several empirical studies (Lin and Wang, 2012; Padilla-Melendez *et al*., 2013; Terzis and Economides, 2011). The TAM posits that IT or IS acceptance is primarily determined by two systemic beliefs: Perceived Usefulness (PU) and perceived ease of use (PEOU; Davis *et al*., 1989). Perceived usefulness is "the degree to which a person believes that using a particular system will enhance his/her job performance," and perceived ease of use is "the degree to which a person believes that using the system would be free of effort" (Davis, 1989). In this study, behavioral intention (BI) refers to a nurse's intention to use a BELS. Numerous researchers have provided evidences of the positive effect of perceived usefulness on the behavioral intention to use a BELS (Lin and Wang, 2012; Padilla-Melendez *et al*., 2013). Several previous studies have also shown that perceived ease of use directly influences perceived usefulness and behavioral intention to use (Lee, 2010; Terzis and Economides, 2011). The TAM states that perceived usefulness has a direct effect on user's behavioral intention, and perceived ease of use affects behavioral intention indirectly through perceived usefulness (Davis, 1989). perceived ease of use indirectly affects the behavioral intention to use BELS through its effect on perceived usefulness. Based on the literature, we propose the following hypotheses:

- **Hypothesis 5:** Perceived ease of use has a positive effect on the perceived usefulness of a BELS
- **Hypothesis 6:** Perceived ease of use has a positive effect on the behavioral intention to use a BELS
- **Hypothesis 7:** Perceived usefulness has a positive effect on the behavioral intention to use a BELS

User satisfaction: Nurse training, in which nurses gain job-related knowledge, skills, or attitudes, can be implemented through a BELS. Chen (2010) argued that if users do not perceive IS benefits, they may not use them. Thus, perceived usefulness and user satisfaction are important in motivating nurses to use a BELS. Therefore, the perceived usefulness of information technology or computer technology is an extrinsic motivator of instrumental value (Chen, 2010; Lee, 2010; Venkatesh, 2000). Chen (2010) added the construct of perceived usefulness to the IS success model and theoretically viewed perceived usefulness and user satisfaction as perceived benefits of system use. Chen (2010) also considered perceived usefulness as the only variable that directly influences user satisfaction. For the relationships between perceived usefulness and user satisfaction, Chen (2010) and Lee (2010) empirically testified to the interrelationships. Thus, we propose the following hypothesis:

- **Hypothesis 8:** Perceived usefulness has a positive effect on user satisfaction in the use of a BELS

User satisfaction might have a direct effect on behavioral intention formation. In educational settings, it is considered a prerequisite for user intent to use a learning system. Lee and Lehto (2013) found a positive causal relationship between user satisfaction and the behavioral intention to use YouTube for procedural learning. The satisfaction-intention association reflects that high user satisfaction in an information system increases the probability that a user will use the system. To examine the influence of user satisfaction on behavioral intention, we incorporated the construct into our conceptual framework. Therefore, we propose the following hypothesis:

- **Hypothesis 9:** User satisfaction has a positive effect on the behavioral intention to use a BELS

RESEARCH DESIGN

Instrumentation: We conducted a survey to collect data for this study. The instrument was constructed as a two-part questionnaire. The first part examines respondents' perceptions of TTF (including task characteristics and technology characteristics), TAM (including perceived usefulness, perceived ease of use, and behavioral intention) and computer self-efficacy and uses 5-point Likert scales ranging from (1) strongly disagree to (5) strongly agree. The second part examines respondents' basic information which uses a nominal scale.

Our scale development followed the recommendations of MacKenzie *et al*. (2011) and the standard psychometric scale development procedures suggested by DeVellis (2003). The items of measurement for TTF include task characteristics and technology characteristics. TTF constructs were adapted from several researchers (Lee and Lehto, 2013; Lin and Wang, 2012). TTF, task characteristics and technology characteristics corresponded to five items, four items and three items, respectively. The computer self-efficacy measure included five items based on the recommendations of

Compeau and Higgins (1995), Terzis and Economides (2011) and Wu *et al.* (2010). The items of measurement for TAM constructs were adapted from the measurements developed by Davis (1989), Davis *et al.* (1989), Padilla-Melendez *et al.* (2013) and Terzis and Economides (2011). Perceived usefulness, perceived ease of use and behavioral intention, corresponded to four items, four items and five items, respectively. Finally, the measuring items for user satisfaction were adapted from the measurements developed by Chen (2010), Lee (2010) and Venkatesh (2000) and included five items.

Sample and descriptive statistics: The empirical data were collected using a cross-sectional survey. Research participants were nurses that had taken BELS courses. Our research distributed 900 questionnaires to nine target hospitals (including medical centers, regional hospitals, and district hospitals). All target hospitals selected have implemented BELS courses in Taiwan. In total, 739 questionnaires were returned and 89 incomplete responses were discarded. This yielded 650 valid responses for the statistical analysis and a valid response rate of 72.22% for the initial sample. Among the valid responses, 308 responses were gathered from local community hospitals, 234 from regional hospitals and 108 from major medical centers. The average respondent age was 35.38 years (standard deviation was 7.10 years). Nurses composed 90.3% (587) of the sample population. Responses regarding the formal education of the sample population indicated that 88.0% of respondents have a faculty degree or bachelor degree (Table 1).

Data analysis: This research includes eight variables (including four dependent variables and four independent variables) and each of the constructs comprise four to five measurement items. Thus, the sample of 650 participants in this research was higher than the minimum required sample size and large enough for the PLS technique. We used SEM for PLS data analysis.

Measurement validity: The measurement model was assessed for reliability, individual item loadings, convergent validity and discriminant validity. Three criteria were considered in the process: (a) all item loadings (λ), (b) investigation of reliability coefficients (Cronbach's alpha) and composite reliability coefficients (CR) and (c) Average Variance Extracted (AVE) (Bagozzi and Yi, 2012; Chin, 1998; Fornell and Larcker, 1981; Hair *et al.*, 2010; Joreskog and Sorbom, 2005).

Table 2 shows the indices of reliability and convergent validities for the scale. The Cronbach's α coefficient ranged from 0.718 to 0.858, which suggests a high level of reliability. All constructs displayed a higher Cronbach's α coefficient than the 0.70 benchmark suggested by Hair *et al.* (2010). Composite Reliability (CR) is a set of latent construct indicators that are consistent on their measurement. These CR coefficients ranged from 0.824 to 0.898. The constructs also exhibited a higher CR than the 0.6 benchmark advised by Fornell and Larcker (1981).

Table 1: Distribution of population by position, education and type of hospital (N = 650)

Factor/Level	Frequency	Column percentages
Position	-	100.0
Charge nurse	63	9.7
Nurse	587	90.3
Formal education	-	100.0
Nursing college	20	3.1
Faculty degree/bachelor degree	572	88.0
Master degree or above	58	8.9
Type of hospital		100.0
Medical centers	108	16.6
Regional hospitals	234	36.0
Local hospitals	308	47.4

Table 2: Summary of construct validity and reliability results

Constructs	CR	AVE	Cronbach's α
Task characteristics (TAC)	0.824	0.541	0.718
Technology characteristics (TEC)	0.877	0.704	0.789
Task technology fit (TTF)	0.833	0.801	0.754
Computer self-efficacy (CSE)	0.877	0.589	0.829
Perceived usefulness (PU)	0.884	0.657	0.826
Perceived ease of use (PEOU)	0.894	0.678	0.841
User satisfaction (USA)	0.898	0.637	0.858
Behavioral intention (BI)	0.883	0.602	0.834

CR: Composite reliability, AVE: average variance entraction

Convergent validity was examined using Average Variance Extracted (AVE). In this research, all constructs demonstrated AVE values between 0.541 and 0.801. The value of the average variance extracted for all constructs was above 0.5 which exceeds the limit recommended by Fornell and Larcker (1981). The overall AVE from the constructs demonstrated a satisfactory reliability and validity. In summary, the internal reliability and validity results were acceptable, which enabled us to proceed to an estimation of the structural model.

Hypotheses testing: Given adequate convergent validity and discriminant validity, we proceeded to empirically test the hypotheses. The standardized beta-coefficients from the estimated structural model and the associated t-values for each construct and PLS analysis results are shown in Fig. 1. The components of TTF, task characteristics and technology characteristics are all reported to be important antecedents of TTF to use a BELS (β = 0.608 and 0.192). Therefore, Hypotheses 1 and 2 are supported. In summary, the two constructs, task characteristics and technology characteristics, jointly explain 56.3% of variance in TTF to use a BELS (R^2 = 0.563). Therefore, TTF is a significant determinant of perceived usefulness (β = 0.675). Thus, Hypothesis 3 is supported.

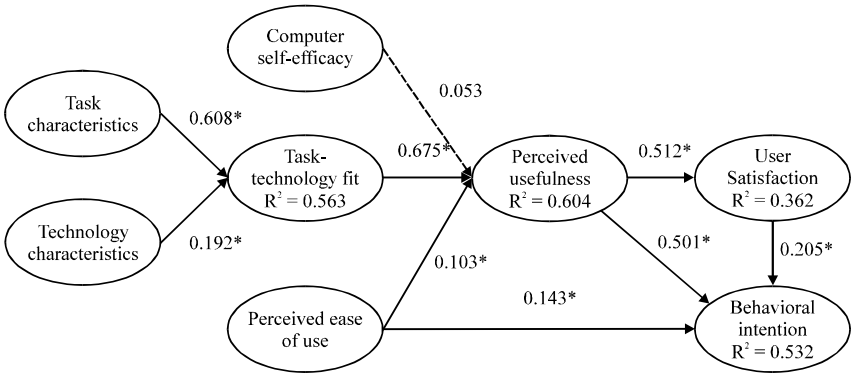

Fig. 1: Structural model results. Value on path: Standardized coefficients (β), R^2: Coefficient of determination and *p<0.05

The computer self-efficacy construct indicated no significant influence on perceived usefulness (β = 0.053). Consequently, Hypotheses 4 is not supported. For the TAM components, perceived ease of use played a critical role in determining perceived usefulness (β = 0.103). Hypothesis 5 is thus supported. In a brief summary, the three constructs, task technology fit, computer self-efficacy and perceived ease of use, jointly account for 60.4% of variance in perceived usefulness of a BELS (R^2 = 0.604). The perceived ease of use shows a significant positive effect on behavioral intention (β = 0.143). Hypothesis 6 is thus supported. Perceived usefulness is a significant determinant of user satisfaction (β = 0.512). Hypothesis 8 is thus supported. Perceived usefulness singly accounts for 36.2% of variance of user satisfaction (R^2 = 0.362). Both perceived usefulness and user satisfaction are reported to be important antecedents of the behavioral intention to use a BELS (β = 0.501 and 0.205, respectively). Hence, Hypotheses 7 and 9 are both supported. In summary, the three constructs of perceived ease of use, perceived usefulness and user satisfaction account for 53.2% of variance in the behavioral intention to use a BELS (R^2 = 0.532).

RESULTS AND DISCUSSION

The empirical results indicated that perceived ease of use, perceived usefulness and user satisfaction have high prediction rates in explaining the behavioral intention to use a BELS. Perceived usefulness is the strongest predictor of behavioral intention, whereas user satisfaction and perceived ease of use are significant but weaker predictors. Consistent with our prediction, perceived usefulness was found to be an immediate predictor of behavioral intention. The results are consistent with previous research (Lee and Lehto, 2013; Lin and Wang, 2012; Padilla-Melendez *et al*., 2013). Most hospitals have adopted learning platforms for nurses to take required yearly professional training. However, nurses normally have heavy duties in their jobs; therefore, if they believe a BELS can help them learn effectively, they are more likely to use a BELS. The empirical results showed that computer self-efficacy does not significantly influence perceived usefulness. These results differ from those of previous research (Lee and Lehto, 2013; Terzis and Economides, 2011) and imply that learners equipped with computer competence are not affected by perceived usefulness of a BELS. Because nurses are unfamiliar with BELSs and unsure of how BELSs might be helpful in their jobs, computer competence is non-significant to perceived usefulness.

The model used in this study showed modest support for intuitive TTF. Our research not only encompasses nurse interactions with the learning system regarding the accomplishment of tasks but also nurse activities that adapt, change, or modify any element of the task-technology-individual context. We investigated the causal relationship between task characteristics, technology characteristics, TTF and perceived usefulness. Computer self-efficacy has a non-significant influence on perceived usefulness. This might be because the measurements of TTF, content richness and vividness clearly specified when and how to use BELS, but self-efficacy did not. The results match the findings of Lin and Wang (2012) that TTF has an effect on the perceived usefulness of a BELS.

Although, this research provides insight into the factors that determines nurses' behavioral intentions to use a BELS, it has several limitations that are likely to provide future research opportunities. First, we investigated nine target hospitals in Taiwan. Each hospital accepted 100 questionnaires. Although, we had a satisfactory response rate, inadequate sample hospitals limited the generalizability of the results. To confirm and

refine our study findings, other types of hospitals should be included as samples. We also did not address the factors contributing to cultural differences. Our research can be extended by considering hospital cultural discrepancies by recruiting more sampling participants from different hospital cultural backgrounds. Although, our research integrates the four theoretical perspectives to propose a new model to explain and predict users' behavioral intention to use a BELS, other external factors might exist. Therefore, future research should endeavor to uncover additional determinants of nurses' behavioral intention or learning performance using a BELS.

CONCLUSION

BELSs have become the most prominent instructional delivery alternative employed in e-learning systems. We present a theoretical model integrating TTF, computer self-efficacy, user satisfaction and the TAM for investigating the key determinants of nurses' behavioral intention to use a BELS. The results provide strong evidence for the nomological validity of each construct and the effects of each construct on behavioral intention. The 0.563 estimate for the TTF construct (R^2 = 56.3%) for these paths provided support for the hypothesized effect of task characteristics and technology characteristics on TTF. The empirical results indicated that TTF and perceived ease of use have high prediction rates in explaining the perceived usefulness of a BELS. The 0.604 estimated for the perceived usefulness construct (R^2 = 60.4%) for the path proved the hypothesized effect of TTF and perceived ease of use on perceived usefulness. The estimated 0.362 user satisfaction construct (R^2 = 36.2%) for the path proved the hypothesized effect of perceived usefulness on user satisfaction. Finally, the estimated 0.523 behavioral intention construct (R^2 = 53.2%) denoted that the user-perceived behavioral intention is both directly and indirectly mediated by perceived usefulness, user satisfaction, and perceived ease of use and perceived usefulness is an important antecedents on the behavioral intention to use a BELS. Therefore, the model has strong explanatory power for determining nurse's behavioral intention to use a BELS.

REFERENCES

Abdelaziz, M., S.S. Kamel, O. Karam and A. Abdelrahman, 2011. Evaluation of E-learning program versus traditional lecture instruction for undergraduate nursing students in a faculty of nursing. Teach. Learn. Nursing, 6: 50-58.

Bagozzi, R.P. and Y. Yi, 2012. Specification, evaluation and interpretation of structural equation models. J. Acad. Market. Sci., 40: 8-34.

Chen, H.J., 2010. Linking employees e-learning system use to their overall job outcomes: An empirical study based on the IS success model. Comput. Edu., 55: 1628-1639.

Chin, W.W., 1998. The Partial Least Squares Approach to Structural Equation Modelling. In: Modern Methods for Business Research, Markoulides, G.A. (Ed.). Lawrence Erlbaum, Mahwah, NJ., USA., pp: 295-336.

Compeau, D.R. and C.A. Higgins, 1995. Computer self-efficacy: Development of a measure and initial test. MIS Quarterly, 19: 189-211.

Davis, F.D., 1989. Perceived usefulness, perceived ease of use and user acceptance of information technology. MIS Quarterly, 13: 319-340.

Davis, F.D., R.P. Bagozzi and P.R. Warshaw, 1989. User acceptance of computer technology: A comparison of two theoretical models. Manage. Sci., 35: 982-1003.

DeVellis, R.F., 2003. Scale Development: Theory and Application. 2nd Edn., Sage Publications Inc., Thousand Oaks, CA., USA., ISBN-13: 9780761926054, Pages: 171.

Fornell, C. and D.F. Larcker, 1981. Evaluating structural equation models with unobservable variables and measurement error. J. Mar. Res., 18: 39-50.

Graham, C.R., 2006. Blended Learning System: Definition, Current Trends, Future Directions. In: The Handbook of Blended Learning: Global Perspectives, Local Designs, Bonk, C.J. and C.R. Graham (Eds.). Pfeiffer, San Francisco, CA., pp: 3-24.

Hair, J.F., W.C. Black and B.J. Babin, 2010. Multivariate Data Analysis: A Global Perspective. 7th Edn., Pearson Education Inc., New Jersey, USA., ISBN: 9780135153093, Pages: 800.

Joreskog, K.G. and D. Sorbom, 2005. LISREL 8.72: A Guide to the Program and Applications. 3rd Edn., Scientific Software International, Inc., Chicago, IL., USA.

Lee, D.Y. and M.R. Lehto, 2013. User acceptance of YouTube for procedural learning: An extension of the technology acceptance model. Comput. Edu., 61: 193-208.

Lee, M.C., 2010. Explaining and predicting users continuance intention toward e-learning: An extension of the expectation-confirmation model. Comput. Educat., 54: 506-516.

Lin, W.S. and C.H. Wang, 2012. Antecedences to continued intentions of adopting e-learning system in blended learning instruction: A contingency framework based on models of information system success and task-technology fit. Comput. Edu., 58: 88-99.

MacKenzie, S.B., P.M. Podsakoff and N.P. Podsakoff, 2011. Construct measurement and validation procedures in MIS and behavioral research: Integrating new and existing techniques. MIS Quarterly, 35: 293-334.

McKenzie, W.A., E. Perini, V. Rohlf, S. Toukhsati, R. Conduit and G. Sanson, 2013. A blended learning lecture delivery model for large and diverse undergraduate cohorts. Comput. Edu., 64: 116-126.

Narman, P., H. Holm, D. Hook, N. Honeth and P. Johnson, 2012. Using enterprise architecture and technology adoption models to predict application usage. The J. Syst. Software, 85: 1953-1967.

Owston, R., D. York and S. Murtha, 2012. Student perceptions and achievement in a university blended learning strategic initiative. Internet Higher Edu., 18: 38-46.

Padilla-Melendez, A., A.R. del Aguila-Obra and A. Garrido-Moreno, 2013. Perceived playfulness, gender differences and technology acceptance model in a blended learning scenario. Comput. Edu., 63: 306-317.

Terzis, V. and A.A. Economides, 2011. Computer based assessment: Gender differences in perceptions and acceptance. Comput. Human Behav., 27: 2108-2122.

Tselios, N., S. Daskalakis and M. Papadopoulou, 2011. Assessing the acceptance of a blended learning university course. Edu. Technol. Soc., 14: 224-235.

Venkatesh, V., 2000. Determinants of perceived ease of use: Integrating control, intrinsic motivation and emotion into the technology acceptance model. Inf. Syst. Res., 11: 342-365.

Wu, J.H., R.D. Tennyson, T.L. Hsia and Y.W. Liao, 2008. Analysis of E-learning innovation and core capability using a hypercube model. Comput. Human Behav., 24: 1851-1866.

Wu, J.H., R.D. Tennyson and T.L. Hsia, 2010. A study of student satisfaction in a blended e-learning system environment. Comput. Educ., 55: 155-164.