# FACTORS INFLUENCING ATTITUDES TOWARD BLENDED E-LEARNING USING LEARNING MANAGEMENT SYSTEMS: A CASE STUDY IN A UNIVERSITY IN THAILAND

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**Abstract**

The purpose of this study was to investigate the major influencing factors on attitudes of university students in Thailand toward a blended e-learning system (BELS). This study applied a survey method to collect data from 249 students who studied the subject "Computer for Studies and Works" using BELS. The findings confirm that many factors derive from the existing Teaching Acceptance Model (TAM) model and new findings were also discovered as such; (a) learners' experiences and knowledge required for using BELS can stimulate learners to be more confident to execute all BELS activities; whereas (b) learners' confidence and experience of using BELS do not lead to learners' positive or negative feelings of using BELS; (c) the flexibility of BELS did not cause learners to have better control on BELS activities; and (d) the learners seem to believe that BELS is a useful learning tool when they were encouraged by other people. System developers, academic professionals, and other practitioners are anticipated to draw some benefits from these findings in order to develop and implement BELS in a way that helps increase learners' positive attitude and performance achievement.

***Keywords:*** Blended e-learning; Technology Acceptance Model; attitude; perceived usefulness

## Introduction

Advanced technologies, particularly Internet networking, and information have become principal resources for most industries (Brown and Adler, 2008). An educational area is also not exempt from technological influence. They bring challenges to both teachers and students to adapt from a face-to-face learning environment to an online learning experience. E-learning is a means of delivering training, education, and knowledge compilation via networked interactive and distributed technologies (Fry, 2001). Servage (2005) described e-learning as an instructional substance or learning practiced conveyed from electronic technology. E-learning suggests several advantages over the traditional face-to-face learning environment. It allows individual instructor flexibility to decide and update online lessons. Students can flexibly access lesson content and exams without time constraints and geographical barriers. Asynchronous communication is more concise and more flexible. Learning management system (LMS) has been used to promote an e-learning environment. LMS is an information system used to support online teaching-learning that allows teachers to create course content and other valuable information to be delivered online for students. Aydin and Tirkes (2010) described that LMS's aim is to manage the learners' performance in which teachers can track and observe the progress of students' performance through LMS. It has become an important tool for today's education system because it supports effective learning and transparent features. However, many previous studies have described several drawbacks of e-learning such as it requires high startup costs for assembling multimedia content and high maintenance costs for updating the system. Some other studies found e-learning difficult to comprehend and utilize, lacking the framework to encourage students to learn, deficient of social interaction and direct communication between the learners and instructors, and especially requiring a high level of individual learner discipline (Kinshuk and Yang, 2003; Bouhnik and Marcus, 2006; Yang and Liu, 2007; Wu et al., 2008).

Blended e-learning system (BELS) was initiated to compromise the strength of traditional face-to-face and e-learning environment with synchronous and/or asynchronous online learning. Rovai and Jordan (2004) explained that BELS is a combination of online and actual classroom

instruction, which were supported by many experts (Graham and Bonk, 2006; Stubbs et al., 2006; Akkoyunlu and Soylu, 2006). BELS also incorporates several forms of learning material such text, audio, video, CD ROM, CAI, forums and online discussions, online quizzes and assignments, and e-mails. BELS offers several advantages such as instructional richness, flexibility of materials, assessments and content revision; encouraging teachers and learners interaction, as well as cost-effectiveness (Osguthorpe and Graham, 2003). BELS also provides flexibility for using various resources as well as interactive communication between teachers and students in the classroom (Yuen, 2010). BELS helps reduce time spend and situational barriers, and can empower high quality interaction between teachers and learners (Jeffrey et al., 2014). Some studies specify that BELS causes a decreasing number of dropout rates in tertiary education while improving learning outcomes (Ferriman, 2013; Yang et al., 2013).

The Thai government has announced one of the most important national strategies as the digital Thailand (Thailand 4.0), which emphasizes the adoption of technologies in all industries in order to encourage the nation's innovation and sustainable competitive advantages (Wongwuttiwat and Lawanna, 2018). The same study also indicated that the educational system is a prerequisite for driving and achieving the digital Thailand strategy. E-education technologies such as e-learning, e-books, LMS, and especially BELS should be a primary basis to support the digital Thailand in the area of education. Therefore, in order to reinforce BELS adoption in Thailand, the learner acceptance of technology and major influencing factors should be examined. Consequently, this study intends to examine the main factors that influence students' attitude toward BELS using a recognized Technology Acceptance Model (TAM). Accordingly, this study concentrates on the following four related research questions:

Q1. Which factors have influenced student's attitude toward blended e-learning using LMS?
Q2. What are the relationships of these factors found in question 1?
Q3. Which factors have significant causal effect on the attitude toward blended e-learning using LMS?
Q4. What are the theoretical and practical implications of the factors found in question 3?

## Literature Review and Hypothesis Development

The literature has drawn from the finding of several previous studies associated with the use of LMS and blended e-learning system (BELS) in various different nations. These previous studies indicated various factors influence the technology acceptant models (TAM) and these important factors are used to develop and examine the theoretical model and hypotheses related to students' attitude toward BELS, of a private university in Thailand.

### Overview of Previous Studies

Table 1 exhibits a number of previous studies related to LMS and blended e-learning conducted both inside and outside Thailand. The findings of these studies are used to draw the proposed theoretical research model of this study.

**Table 1:** Previous Studies Related to LMS and Blended E-Learning

| Project Focus | Reference |
|---|---|
| The perception of learning styles in a blended e-learning system | Al-Azawei et al. (2017) |
| The effects of blends e-learning based on students' learning and learning achievement | Lee and Hung (2015) |
| The use of LMS to facilitate the teaching learning processes | Fathema et al. (2015) |
| The application of TAM for understanding academics' intention to use LMS | Alharbi and Drew (2014) |
| An analysis and evaluation of e-learning systems from the perspective of students in Ireland and Vietnam | Tran and Glowatz (2014) |
| The application of TAM in a blended learning scenario focusing on perceived playfulness and gender differences | Padilla-Meléndez et al. (2013) |
| The factors influencing teachers intention to use multimedia instruction resources | Mao and Hu (2013) |
| The factors affecting students' intentions to use WBI in college | Chen et al. (2013) |
| The factors affecting online 3D virtual world | Ali et al. (2013) |
| The effects of quality antecedents on e-learning | Cheng (2012) |

**Table 1:** Continued

| Project Focus | Reference |
|---|---|
| The determination of students' acceptance on a learning management system | Fidani and Idrizi (2012) |
| The factors influencing Business Administration students' acceptance of Moodle technology | Escobar-Rodriguez and Monge-Lozano (2012) |
| The determinant of e-learning acceptance factors | Tselios et al. (2011) |
| The influencing factors on the intention of e-learning system usage in the hospital | Chuo et al. (2011) |
| The determinant of perceived enjoyment and attitude of teachers toward the intention to use technology | Teo and Noyes (2011) |
| The analysis of student's satisfaction toward BELS | Wu et al. (2010) |
| The factors influencing students' acceptance of BELS | Liao and Huang (2009) |
| The effect of Digital Literacy on E-Learning in Higher Education | Kanthawongs et al. (2016) |
| Blending E-Learning for Postgraduate Research-Article Writing | Tuntinakhongul and Muangnakin (2015) |
| The factors that determine the students' intention to use eLearning | Punnoose (2012) |

Table 1 presents several previous studies which used explanatory, quantitative analyses, collected data by questionnaires. TAM was applied as a theoretical basis for these studies except for Fidani and Idrizi (2012) and Wu et al. (2010). Only a few LMS and BELS related research works have been found in Thailand. Therefore, this study intends to investigate the important factors influencing students' attitude toward BELS by implementing LMS. These important factors need to be analyzed before LMS is completely adopted on a full scale by higher education institutes in Thailand.

## Model Variables

### Technology Acceptance Model (TAM)

Davis et al. (1989) proposed TAM as a model used to measure user acceptance of technology. Basically, TAM has been used to examine various

variables, considered as external factors that may influence perceived usefulness, perceived ease of use, and finally attitudes toward using technology which is the focus of this study. This study aimed to determine university students' attitude toward BELS. Therefore, the theoretical model for this study will concentrate on the three main variables of TAM: 1) Perceived Usefulness, to determine the stage of an individual deeming that employing a specific system would help increase his or her performance; 2) Perceived Ease of Use, referred to as individual feels free to effectively use a particular system with effortless for both physical and mental; and 3) Attitude, denotes as an optimistic or pessimistic behavior of individuals (Davis et al., 1989). Davis (1985) identified that both perceived ease of use and also perceived usefulness were sufficient enough for predicting the attitude toward the use of a system.

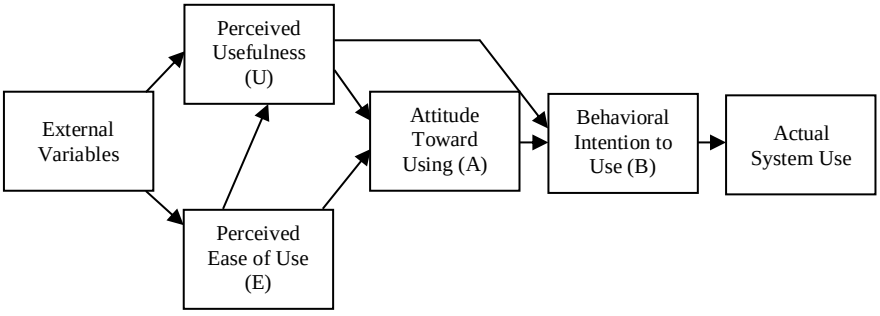


**Figure 1:** Technology Acceptance Model (Source: Davis et al., 1989)

Venkatesh and Davis (1996) disclosed that external variables such as user training, user participation, and system characteristics could affect perceived ease of use and perceived usefulness. According to TAM, some earlier e-learning acceptance studies indicated that both perceived ease of use and perceived usefulness have a significant direct effect on attitudes toward e-learning usage (Tselios et al., 2011; Alharbi and Drew, 2014; Tran and Glowatz, 2014; Fathema et al., 2015). Whereas Wu et al. (2008), Liao and Huang (2009), and Tuntinakhongul and Muangnakin (2015) identified that perceived ease of use and perceived usefulness had a positive influence on the attitude of students toward the use of BELS. The studies of Chen et al. (2013) and Teo and Noyes (2011) claimed that perceived usefulness was influenced significantly by

perceived ease. The findings also directed that the levels of perceived ease of use and perceived usefulness were important.

Accordingly, hypotheses H1 - H3 were conveyed:

H1: Perceived Ease of Use has a significant positive direct effect on Attitude toward Using BELS.

H2: Perceived Usefulness has a significant positive direct effect on Attitude toward Using BELS.

H3: Perceived Ease of Use has a significant positive direct effect on Perceived Usefulness.

**Perceived Enjoyment** denotes to the level of individual enjoyment as using a particular technology to perform activities apart from performance expected (Davis et al., 1992). Venkatesh (1999) insisted that learners who enjoyed the training seem to perceive that the system is easy to use. Cheng (2012) explored that users' perception of system ease at use has a positively significant and direct effect on perceived enjoyment. Chen et al. (2013), Cheng (2012), and Teo and Noyes (2011), all indicated that learners' enjoyment perception has a significant consequence on perceived usefulness. Moreover, Cheng (2012) also pointed out that perceived enjoyment also has a positively and significantly direct influence on attitude of using system. Ali et al. (2013) considered computer playfulness as perceived enjoyment.

Consequently, the subsequent three hypotheses were formulated:

H4: Perceived Ease of Use has a significant positive direct effect on Perceived Enjoyment.

H5: Perceived Enjoyment has a significant positive direct effect on Attitude Toward Using.

H6: Perceived Enjoyment has a significant positive direct effect on Perceived Usefulness.

In order to examine BELS, Cheng (2012) and Chen et al. (2013) suggested that researchers should extend TAM to include information quality, system quality, and social factors; these factors lead to e-learning acceptance.

**Information Quality** refers to the measurement on correctness, updated, inclusiveness, relevance, and steadiness (DeLone and McLean, 2003). For e-learning, course content quality and quantity were determined as information quality (Lee, 2006; Lee et al., 2009) or quality of designed course

(Liu et al., 2010). For e-learning, Leflore (2000) found that the quality of subject content caused a significant effect on enjoyment perception, perceived usefulness, and also perceived ease of use. These findings were supported by many studies such Cheng (2012) and Ahn et al. (2007). The mentioned consequences imply that at a time learners have perceived online subject contents are abundant, modernized, learner-focused, appropriate in design course, and more flexible, they will find those online courses content are useful and easy to use (Liu et al., 2010; Lee et al., 2009; Lee, 2006; Lee et al., 2005; and Leflore, 2000). Even more, if online content has been designed to fit learners' desires, they will enjoy using the system (Choi et al., 2007 and Ahn et al., 2007).

Subsequently, three hypotheses were expressed as the following:

H7: Content Feature has a significant positive direct effect on Perceived Usefulness.

H8: Content Feature has a significant positive direct effect on Perceived Ease of Use.

H9: Content Feature has a significant positive direct effect on Perceived Enjoyment.

**System Quality** encompasses many characteristics used to measure the quality of a particular system, including: an ease of system usage, system flexibility, trustworthiness, contained quality data, as well as system integration (DeLone and McLean, 2003).

**System Function** discusses the perceived system ability that allows the learners flexibility of accessing system procedures and assessment resources. A study of Pituch and Lee (2006) found that the system functionality has a positive relationship with perceived usefulness. A study of Cheng (2012) indicated that system functionality has a significant and positive direct effect on perceived enjoyment, perceived ease of use, and perceived usefulness. These results reveal that learners who experience good quality of e-learning systems will perceive than more enjoyable, easier to use, being useful. These are the consequences of system functions quality and content features supported by the studies of Pituch and Lee (2006) and Hong et al. (2002). Concerning BELS, a variety of content formats are available to support different learners preference which could be referred to as system functionality (So and Brush, 2008; Pituch and Lee, 2006).

Accordingly, the subsequent four hypotheses were conveyed:

H10: System Function has a significant positive direct effect on Content Feature.

H11: System Function has a significant positive direct effect on Perceived Usefulness.

H12: System Function has a significant positive direct effect on Perceived Ease of Use.

H13: System Function has a significant positive direct effect on Perceived Enjoyment.

**Self-Efficacy** refers to the judgment of each individual learner to determine his/her own capability to manage and operate the system according to the indesignated performance (Bandura, 1986). Fathema et al. (2015), Tran and Glowatz (2014), and Mao and Hu (2013) discovered that perceived self-efficacy has significantly influenced perceived ease of use and system usefulness. In a BELS context, Wu et al. (2010) found that computer self-efficacy has a positive and significant relationship with performance expectations, ands performance expectation is considered as perceived usefulness for TAM. The same author described that learners who have computer self- efficacy often have a better control on BELS, and obviously perceive the usefulness and worthiness of the systems.

Accordingly, the subsequent two hypotheses were initiated:

H14: Self-Efficacy has a significant positive direct effect on Perceived Usefulness.

H15: Self-Efficacy has a significant positive direct effect on Perceived Ease of Use.

**Computer Anxiety** deals with the level of anxiety of individual learner's when facing or executing computer technology (Chuo et al., 2011). Learners who are not familiar with computer systems maybe afraid of doing things which can cause computer destruction. It also indicated that computer anxiety is a substantial determinant for perceived ease of use and perceived usefulness. Chen et al. (2013) also investigated that computer anxiety has a great influence on self-efficacy.

Subsequently, the following three hypotheses were expressed:

H16: Computer Anxiety has a significant negative direct effect on Self-Efficacy.

H17: Computer Anxiety has significant negative direct effect on Perceived Usefulness.

H18: Computer Anxiety has significant negative direct effect on Perceived Ease of Use.

**Compatibility** involves the extent to which innovation of a system is being reliable with the standing values and past experiences of the potential learners (Moore and Benbasat, 1991). A study of Escobar-Rodriguez and Monge-Lozano (2012) exposed that system compatibility obtained a positive significantly relationship with perceived ease of use.

Accordingly, the subsequent hypothesis was initiated:

H19: Compatibility has a significant positive direct effect on Perceived Ease of Use.

**System Response** can be defined as the extent to which an individual learner observes that computer can react quickly, consistently, and sensibly (Pituch and Lee, 2006; Bailey and Pearson, 1983). Pituch and Lee (2006) also indicated that if a system can provide fast feedback, then that system is recognized to have perceived usefulness, which was supported by a study of Cheng (2012).

Accordingly, the subsequent hypothesis was framed:

H20: System Response has a significant positive direct effect on Perceived Usefulness.

**Interactivity** is an defined as the communication between teachers and students and among the students themselves, as well as the collaboration occurring in each learning process (Pituch and Lee, 2006; Palloff and Pratt, 1999). Cheng (2012) investigated that system interactivity has a significant effect toward perceived enjoyment, perceived ease of use, and also perceived usefulness. Wu et al. (2010) found that interactivity has a significant and positive relationship with learning climate. Pituch and Lee (2006) described that the flexibility of instructions and inter-collaboration mechanisms, considered as interactive learning, could help strengthen an e-learning approach.

Therefore, the subsequent three hypotheses were introduced:

H21: Interactivity has a significant positive direct effect on Perceived Usefulness.

H22: Interactivity has a significant positive direct effect on Perceived Ease of Use.

H23: Interactivity has a significant positive direct effect on Perceived Enjoyment.

**Social Factor** deals with a personal incorporation of a referred group's values or beliefs and relationships that each individual has with other people in a particular social environment (Thompson et al., 1991). Human interaction is increasingly involved with online cooperation and collaboration, virtual societies, and especially instant message in BELS environment (Graham and Bonk, 2006). Collaborative learning and social interactions are important antecedents of e-learning instruction (Francescato et al., 2006; Johnston et al., 2005).

**Social Influence** refers to the extent to which an individual learner is encouraged that he/she should utilize the system (Khechine et al., 2014). The studies of Fidani and Idrizi (2012) detected that social influence has a significant relationship with attitude. Furthermore, Chen et al. (2013) also illustrated that social influence causes a significant effect toward self-efficacy.

Therefore, the subsequent two hypotheses were suggested:

H24: Social Influence has a significant positive direct effect on Self-Efficacy.

H25: Social Influence has a significant positive direct effect on Attitude Toward Using.

## Theoretical Model

Figure 2 displays the research theoretical model which was constructed from the reviewed variables and their causal relationships, described in the research hypotheses and exhibited in the figures as H1 to H25.

In the theoretical model, all 12 variables are separated into 6 exogenous independent variables in which no causes appeared, and 6 endogenous variables in which at least one variable appeared as a suggested cause. These 12 variables are classified into five categories: Information Quality; System Quality; Social Factor; TAM Constructs variables (Perceived Ease of Use, Perceived Usefulness, and Attitude toward Using); and lastly an external variable (Perceived Enjoyment).

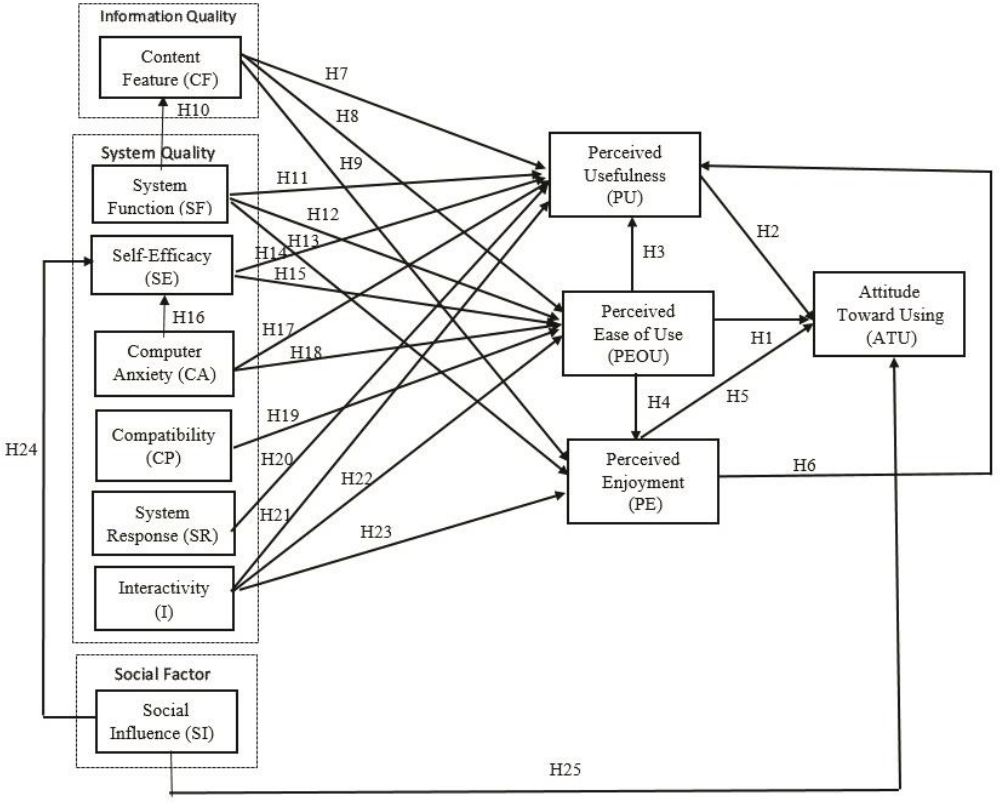


**Figure 2:** Theoretical Model

## Research Design and Methodology

This research intended to develop theoretical knowledge and practice related to the important factors that could motivate the attitude of BELS' learners. This study was partially descriptive and mainly exploratory. This study utilized a survey for data gathering and used descriptive statistical techniques for data analysis. Structural equation modeling (SEM) techniques were also employed to analyze and develop a research theoretical model.

The unit of analysis was an individual students aged around 18 years and having experience using blended e-learning for at least 3 months. The approximately population was 700 students who were studying the subject Computer for Studies and Works in Siam University, Thailand. A probability sampling method was used to determine the minimum sample size of at least 248 respondents (https:// www.surveysystem.com/sscalc.htm). Questionnaires were randomly distributed to 280 students of which 249 were returned accounted as a 89.25 percent response rate.

As can be seen in the Appendix, a self-administered structured questionnaire was designed into two parts. Part 1 presented questions concerning personal characteristics of individual respondents. Part 2 included questions involving the 12 variables addressed in the theoretical model presented in Figure 2.

Each latent variable is determined by several indicators and each indicator is also evaluated using a 5-point Likert scale. The names and symbols of each variable and indicator are displayed in Table 2.

**Table 2:** Variables Model Measurement

| Variable (Symbol) | Indicators | Current Measurement |
|---|---|---|
| Content Feature (CF) | CF1, CF2, CF3 | Wu et al. (2010) |
| System Function (SF) | SF1, SF2, SF3, SF4, SF5, SF6 | Wu et al. (2010); Pituch and Lee (2006) |

**Table 2:** Continued

| Variable (Symbol) | Indicators | Current Measurement |
|---|---|---|
| Self-Efficacy (SE) | SE1, SE2, SE3 | Wu et al. (2010); Liaw (2008) |
| Computer Anxiety (CA) | CA1, CA2, CA3, CA4 | Chen et al. (2013) |
| Compatibility (CP) | CP1, CP2, CP3, CP4 | Escobar-Rodriguez and Monge-Lozano (2012) |
| System Response (SR) | SR1, SR2, SR3 | Pituch and Lee (2006); Bailey and Pearson (1983) |
| Interactivity (I) | I1, I2, I3 | Wu et al. (2010) |
| Social Influence (SI) | SI1, SI2, SI3, SI4, SI5 | Khechine et al. (2014) |
| Perceived Usefulness (PU) | PU1, PU2, PU3, PU4 | Alharbi and Drew (2014); Liaw (2008) |
| Perceived Ease of Use (PEOU) | PEOU1, PEOU2, PEOU3 | Park (2009) |
| Perceived Enjoyment (PE) | PE1, PE2, PE3 | Chen et al. (2013) |
| Attitude Toward Using (ATU) | ATU1, ATU2, ATU3 | Park (2009) |

The questionnaire was designed for English and Thai languages and was determined by a focus group of ten BELS users. The advised alteration was incorporated in a modified version of the questionnaire. Afterwards, they were forwarded to a pilot study employing 20 participants. Their comments were integrated into the final version of questionnaires. However, the Thai version was employed and distributed to the target respondents.

## Data Preparation and Primary Analysis

### Data Preparation

Data were gathered form 280 respondents, which accounted as 40 percent of the entire population, 700 students. A random 10 percent of the gathered questionnaires were inspected to check data entry correctness in SPSS worksheet and there was no errors found. However, 22 of them contained missing values for some indicators and the other 9 contained an outlier, they were all taken out. Accordingly, the final sample size remained 249 which still fulfilled the required sample size of 248 as described above. The detail of respondent profile is summarized in Appendix Table A1.

The construct validity for measuring the 12 latent variables in the theoretical model was examined using principal component factor analysis. To satisfactory construct validity, the measure of indicator must have factor loading not less than 0.4 in magnitude on only the factor stand for the latent variable which it intended to measure, and the latent variable must not have an eigenvalue less than 1 (Straub et al., 2004).

The final values of factor analysis are illustrated in Appendix Table A2. The indicators CF1, CF2, and CF3 for Content Feature and PE1, PE2, and PE3 for Perceived Enjoyment were removed because they were loaded onto other factors or they did not load significantly onto any factors. As a consequence, nine Content Feature and Perceived Enjoyment hypotheses were removed from the theoretical model. The remaining hypotheses are displayed in Figure 3.

Cronbach alpha coefficients were used to determine the internal consistency reliability of the latest indicators of each latent variable as also revealed in Appendix Table A2. Referring to George and Mallery (2003), it was confirmed that these measured reliability coefficients are all acceptable (0.7 to less than 0.8). The results of these analyses lead to the modified theoretical model shown in Figure 3.

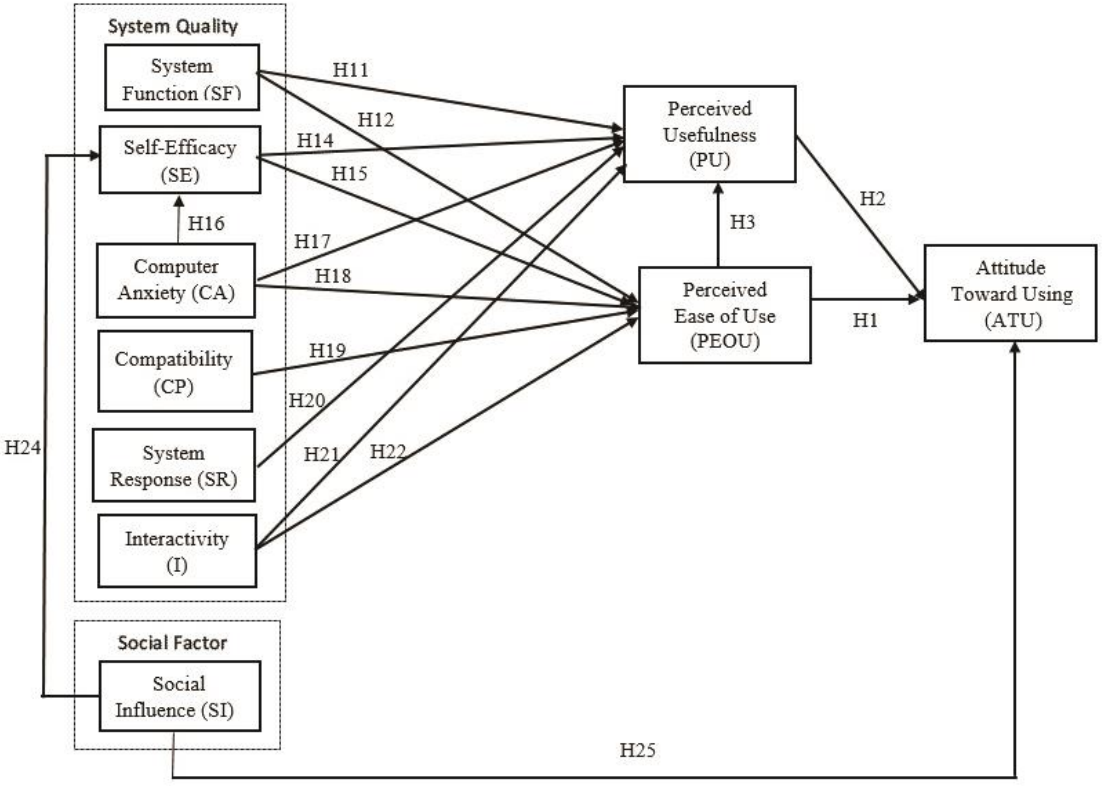


**Figure 3:** Revised Theoretical Model

**Respondents' Profile**

The respondents' profile from part 1 of the questionnaires was summarized: 76.3 percent were female; the majority of 85 percent were aged between 18-20 years; 97 percent were freshman; and all respondents have had experienced using BELS for at least 3 months. It is evident that all respondents are qualified, thus information provided can be ensured for validity and reliability for further analysis.

**Descriptive Preliminary Analyses**

Descriptive statistics values for each indicator are displayed in Appendix Table A3. A single interval scale measurement is used to determine each variable. It is noted that for all model variables and indicators, the magnitudes of skewness and kurtosis values are in a range of satisfactory limits of 3 and 7, respectively, as indicated by Kline (2005).

T-tests were employed to determine the difference between the mean values of each variable included in a model, and the neutral value (3) for the 5-point scale of measurement. The results of T-tests exhibited that the mean values of each variable were significantly greater than neutral ($p < 0.05$). This means that overall respondents had a positive opinion and feeling on BELS.

The correlations among model variables are presented in Appendix Table A4; ten correlations were statistically significant and may be included in the theoretical model Figure 3. The ten plausible causal effects were suggested by significant correlations: System Function (SF) → Self-Efficacy (SE), Compatibility (CP) → Self-Efficacy (SE), Interactivity (I) → Self-Efficacy (SE), Social Influence (SI) → Perceived Usefulness (PU), Compatibility (CP) → Perceived Usefulness (PU), System Function (SF) → Attitude Toward Using (ATU), Self-Efficacy (SE) → Attitude Toward Using (ATU), Compatibility (CP) → Attitude Toward Using (ATU), System Response (SR) → Attitude Toward Using (ATU), and Interactivity (I) → Attitude Toward Using (ATU). Even a significant correlation between two variables does not commit a significant causal

effect; they often introduce significant causal relationships. Thus, these correlations will be further examined.

From the Figure 4, it is noted that:

(a) *, ** or *** indicate that the unstandardized effect is statistically significant at a level of 0.05, 0.01, or 0.001, respectively;

(b) Standardized path coefficients with absolute values < or = 0.1 are represented as "small" (S) effect; absolute values between 0.1 to 0.5 are represented as "medium" (M) effects, and absolute values > or = 0.5 are "large" (L) effect (Cohen, 1988).

The analyses and development of a theoretical model using SEM techniques were executed by AMOS 20 following Kline's (2005) suggestion. The results show that the 5 medium direct effects may be removed from the model: System Function (SF) → Perceived Ease of Use (PEOU), Self-Efficacy (SE) → Perceived Usefulness (PU), Computer Anxiety (CA) → Perceived Ease of Use (PEOU), System Respose (SR) → Perceived Usefulness (PU), and Interactivity (I) → Perceived Usefulness (PU). Moreover, ten significant correlations among variables mentioned at the above are candidates to be incorporated into the modified theoretical model. Thus, these 15 direct effects were optional in the model and formed a hierarchy of $2^{15} = 32{,}768$ models which were analyzed by Specification Search Facility of AMOS. According to Kline (2005), the model with the lowest Normed Chi-square (NC) value is selected as the final model shown in Figure 5.

From Figure 5, the first value addressed unstandardized effects and statistical significance are standardized effects and their magnitude. The ultimate final model's fit statistics are revealed in Table 3.

**Model Analysis and Development**

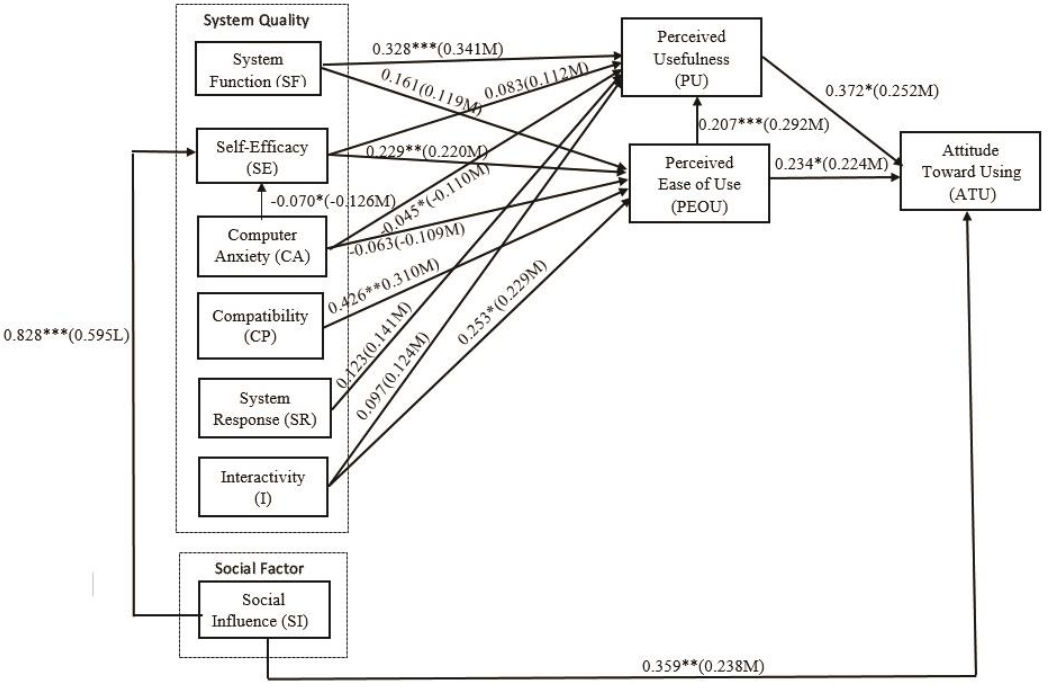


**Figure 4:** Analysis of Direct Effects of the Revised Theoretical Model

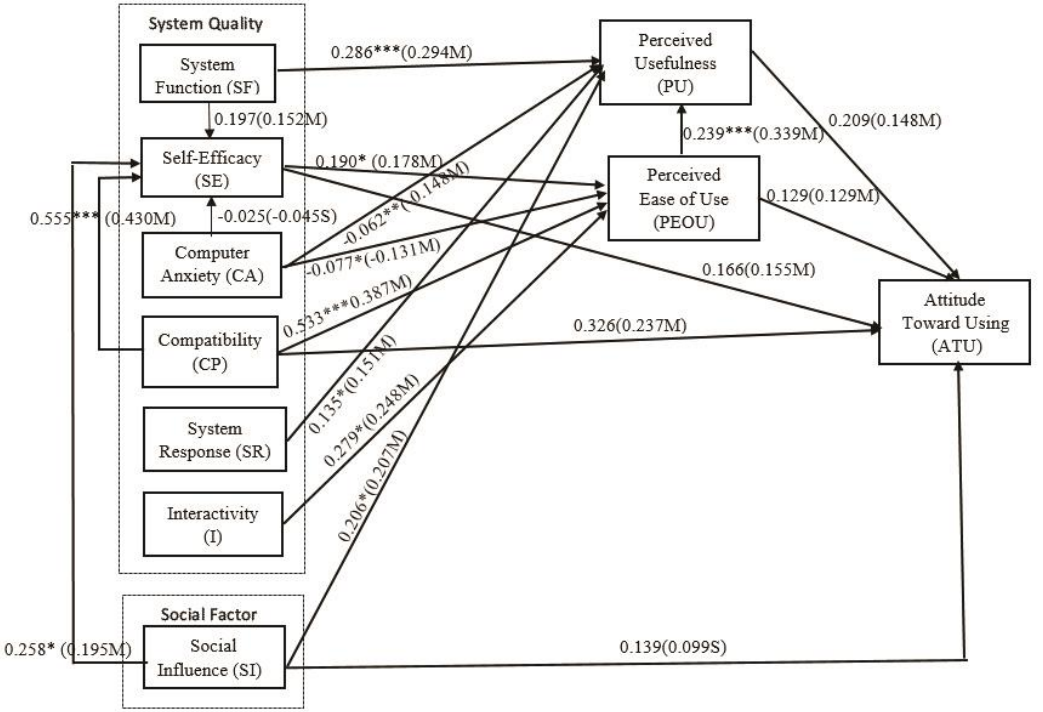


**Figure 5:** The Final Model

**Table 3:** Fit Statistics for the Final Model

| Model | N | NC ($\chi^2$/df) | RMR | GFI | AGFI | NFI | CFI | RMSEA |
|---|---|---|---|---|---|---|---|---|
| Final Model | 249 | 728.642/527 = 1.383 | 0.022 | 0.861 | 0.834 | 0.842 | 0.950 | 0.039 |
| | | **$R^2$:** SE (46 percent) , PEOU (50 percent), PU (67 percent), ATU (40 percent) | | | | | | |

*Note $R^2$ :* the proportion of the variance of each endogenous variable.

The full analysis of all effects of the ultimate model is demonstrated in Appendix Table A5. Cohen and Cohen (1983) suggested the used of heuristic to determine the statistical significance of indirect effects.

## Discussion

This part demonstrates the interpretation of the results found from this study. This discussion includes the theoretical and practical contributions, the new discoveries, as well as the limitations of this study.

## Causal Effects Interpretation

Table 4 reports the manner of effects of each variable incorporated in the theoretical model according to the overall direct and indirect effects of variables.

**Table 4:** Summary of the Total Effects of the Final Model

| Variable | Intervening Variable | | | Dependent Variable |
|---|---|---|---|---|
| | Self-Efficacy | Perceived Usefulness | Perceived Ease of Use | Attitude Toward Using |
| System Function | Medium, positive, only direct | Medium, positive, mainly direct | Small, positive, only indirect | Small, positive, only indirect |
| Computer Anxiety | Small, negative, only direct | Medium, negative, mainly direct | Small, negative, mainly direct | Small, negative, only indirect |
| Compatibility | Medium, positive, only direct | Medium, positive, only indirect | Medium, positive, mainly direct | Medium, positive, mainly direct |

**Table 4:** Continued

| Variable | Intervening Variable | | | Dependent Variable |
|---|---|---|---|---|
| | **Self-Efficacy** | **Perceived Usefulness** | **Perceived Ease of Use** | **Attitude Toward Using** |
| System Response | Nil | Medium, positive, only direct | Nil | Small, positive, only indirect |
| Interactivity | Nil | Small, positive, only indirect | Medium, positive, only direct | Small, positive, only indirect |
| Social Influence | Medium, positive, only direct | Medium, positive, mainly direct | Small, positive, only indirect | Medium, positive, mainly direct |
| Self-Efficacy | Nil | Small, positive, only indirect | Medium, positive, only direct | Medium, positive, mainly direct |
| Perceived Ease of Use | Nil | Medium, positive, only direct | Nil | Medium, positive, mainly direct |
| Perceived Usefulness | Nil | Nil | Nil | Medium, positive, only direct |

## Effects on the Dependent and Intervening Variable

**Attitude Towards Using** is a dependent variable which represents a person's positive or negative feeling about using BELS. All variables which have a medium effect on attitude towards BELS are addressed here in the order of descending scores: Compatibility (0.387M), Self-Efficacy (0.187M), Perceived Ease of Use (0.179M), Social Influence (0.166M) and Perceived Usefulness (0.148M). The indirect effects of Compatibility, Social Influence, System Function, and Computer Anxiety on Attitude are mediated by Self-Efficacy, Perceived Ease of Use and Perceived Usefulness. The indirect effects

of Self-Efficacy and Interactivity on Attitude are mediated by Perceived Ease of Use and Perceived Usefulness. Furthermore, the indirect effects of Perceived Ease of Use and System Response on Attitude are mediated by only Perceived Usefulness. Effects due to System Function, Computer Anxiety, Interactivity, and System Response are small and not statistically significant at level 0.05 or less.

**Perceived Ease of Use** is presented as utilizing BELS would be effortless both physically and mentally. This matter is realized by students who feel that they have the capability and sufficient experience to organize and execute BELS. Compatibility, Interactivity, and Self-Efficacy, all have a statistically significant medium direct effect on Perceived Ease of Use, whereas Computer Anxiety causes only small direct effect on Perceived Ease of Use. System Function has only small and indirect effect on Perceived Ease of Use.

**Perceived Usefulness** defined as the level of belief of utilizing BELS would improve his or her task achievement. Perceived Ease of Use, System Function, Social Influence, and System Response have positive and medium direct effect on Perceived Usefulness, except for Compatibility that has all the same conditions but indirectly caused by Perceived Usefulness. Computer Anxiety shows a medium, negative, and direct effect on Perceived Usefulness.

**Self-Efficacy** is the individual's judgment on capability to accomplish the needed course activities. Computer self-efficacy helps reduce learning obstacles. Learners with a higher computer self-efficacy seem to do better controlling BELS, and can easily obtain the usefulness of the system. Compatibility, Social Influence, System Function, each maintain a medium and positive direct effect on Self-Efficacy, while the effect of Compatibility and Social Influence are statistically significant. Computer Anxiety has only a small and negative direct effect on Self-Efficacy.

**Effects of Exogenous Independent Variables**

**System Function** refers as BELS facilities are easy to access and for assessment. System Function causes a positive and medium direct effect on

Perceived Usefulness and Self-Efficacy. It has a small positive but indirect effect on Attitude through Perceived Usefulness, Self-Efficacy, and Perceived Ease of Use. Moreover, it also has a positive, small, but indirect effect on Perceived Ease of Use which is mediated by Self-Efficacy. However, none of these effects are statistically significant except for Perceived Usefulness.

**Computer Anxiety** referred to as a personal anxiety occurs when facing or executing with computer. This variable obtains a negative and medium direct influence on Perceived Usefulness. The same manners are applied to Self-Efficacy and Perceived Ease of Use, but the influence is rather small. Attitude Toward Using BELS received a negative and small indirect effect from Computer Anxiety via Self-Efficacy, Perceived Ease of Use, and Perceived Usefulness. However, these effects are not statistically significant except for Perceived Usefulness.

**Compatibility** considered as an innovation is perceived reliable with the existing and past experiences of the learner. Compatibility has a positive medium direct influence on Perceived Ease of Use, Self-Efficacy, and Attitude Toward Using BELS. It also has a statistically significant indirect effect on Perceived Usefulness which was mediated by Self-Efficacy and Perceived Ease of Use.

**System Response** means the perception of students on rapid, reliable, and sensible responses provided by BELS. This variable has a positive, medium direct and statistically significant impact on Perceived Usefulness. It also has only a small, positive, but impact on Attitude Toward Using BELS transmitted by Perceived Usefulness but is not statistically significant.

**Interactivity** refers to the interactions among students themselves and also between instructors and students. This variable has a positive medium direct impact on Perceive Ease of Use, while it has only a small positive but indirect impact on Perceived Usefulness transferred by Perceived Ease of Use. The same nature also occurred on Attitude Toward Using BELS which is mediated by Perceived Ease of Use and Perceived Usefulness. All effects are statistically significant except on Attitude Toward Using BELS.

**Social Influence** involves the encouragement of utilizing BELS a student receives from important people. Social influence showed a positive medium direct influence on Perceived Usefulness, Self-Efficacy, and Attitude Toward Using BELS while it has only a small positive but indirect influence on Perceive Ease of Use intervened by Self-Efficacy. All effects are statistically significant except for the effect on Attitude Toward Using BELS.

To summarize of hypothesis testing:

(a) Nine of the 16 hypotheses were fully supported. These findings endorse the importance of the direct effect of (i) Perceived Ease of Use (H3), System Function (H11), Computer Anxiety (H17), and System Response (H20) on Perceived Usefulness; (ii) Self-Efficacy (H15), Computer Anxiety (H18), Compatibility (H19), and Interactivity (H22) on Perceived Ease of Use and (iii) Social Influence (H24) on Self-Efficacy.

(b) Among the 16, six hypotheses were partial supported. Despite the fact that the hypothesized significant causal effect was not supported, but there was a statistically significant correlation between the variables with the same aspect as specified for the hypothesized causal effect. (i) Perceived Ease of Use (H1), Perceived Usefulness (H2), and Social Influence (H25) on Attitude Toward Using; (ii) System Function (H12) on Perceived Ease of Use and (iii) Self-Efficacy (H14), and Interactivity (H21) on Perceived Usefulness.

(c) Only one out of 16 hypotheses was not supported. The study revealed that the effect of Computer Anxiety (H16) on Self-Efficacy is only small negative (-0.045S) direct effect in which it was not displayed any important role for this study.

It is noted that 15 out of 16 hypotheses fully and partially support the findings obtained from the studies of Alharbi and Drew (2014), Tran and Glowatz (2014), Ali et al. (2013), Mao and Hu (2013), Chen et al. (2013), Cheng (2012), Escobar-Rodriguez and Monge-Lozano (2012), Fidani and Idrizi (2012), Tselios et al. (2011), Chuo et al. (2011), Wu et al. (2010), and Liao and Huang (2009). They were all the foundation used to formulate the theoretical model of this study.

## The New Finding Results of This Study

Table 5 indicates the new findings of this study which were not reported in earlier studies: thus, they are suggested to be re-investigated in future studies.

**Table 5:** New Findings

| |
|---|
| 1. System Function does not demonstrate a statistically significant direct effect on Self-Efficacy but there is a statistically significant positive correlation between these two variables. |
| 2. Compatibility reveals a statistically significant positive direct effect on Self-Efficacy and there is a statistically significant positive correlation between these two variables. |
| 3. Self-Efficacy does not exhibit a statistically significant direct effect on Attitude Toward Using BELS but there is a statistically significant positive correlation between these two variables. |
| 4. Compatibility does not have a statistically significant direct effect on Attitude Toward Using BELS but a statistically significant positive correlation is found between these two variables. |
| 5. Social Influence obtains a statistically significant positive direct effect on Perceived Usefulness and a statistically significant positive correlation is also found between these two variables. |

The new findings displayed in Table 5 represent that (a) although System Function does not have, but Compatibility has, a statistically significant direct impact on Self-Efficacy, however each of these two variables have a statistically significant positive correlation with Self-Efficacy; (b) Self-Efficacy and Compatibility do not cause statistically significant direct effects on Attitude Toward Using BELS, but both of them have a statistically significant positive correlation with Attitude; and (c) Social Influence has a strong positive direct influence on Perceived Usefulness as well as their strong correlations also emphasized.

## Implication of the Finding Results

According to the finding results where at least medium sizes of total effects between variables are found in the final model. It is likely to suggest BELS providers some practical objectives and actions which intend to increase the attitude of individual learner towards BELS usage. Table 6 demonstrates objectives together with their associated actions obtained from the model.

**Table 6:** Objectives and Suggested Actions

| Objectives and Model Variables | Suggested Means of Executing Actions |
|---|---|
| 1. Increase the individual's perception and confidence of having sufficient capability to manage and implement courses of action when using BELS. (Self-Efficacy) | 1.1 Teachers should motivate students with the positive learning atmosphere in a BELS learning context.<br>1.2 Teachers should demonstrate how BELS can be easily executed for learning activities e.g. quizzes and assignments; in order to build students' confidence in using BELS. |
| 2. Increase the perception that their knowledge and experience are appropriate and consistent with BELS learning style. (Compatibility) | 2.1 BELS providers should develop BELS to be more flexible and support various styles of learning.<br>2.2 Teachers should provoke that BELS is appropriate and suitable for course studies. |
| 3. Increase the perception of BELS flexibility for instructional accessing and assessment media. (System Function) | 3.1 Provides different types of tools to encourage students to use BELS (e.g. multimedia, forum, chat, and blog).<br>3.2 Provides customized features that allow students to easily manage and control their course activities.<br>3.3 Provides flexibility of access to fit with a variety of student learning styles. |
| 4. Increase the perception that BELS is useful. (Perceived Usefulness) | 4.1 Teachers should provide course materials in several forms using multimedia provided by BELS e.g. video, YouTube, which will improve student's perception of BELS capabilities.<br>4.2 Encourage students who use BELS to have a perception that they have higher profile than students who do not use BELS |
| 5. Increase the perception that important people believe students should use BELS. (Social Influence) | 5.1 Teachers encourage students to complete their course activities by using BELS and show the high performance achievement results. |
| 6. Increase the recognition that BELS is simple to use. (Perceived Ease of Use) | 6.1 Teachers should provide guidance for using BELS then students will know how to use BELS properly. |

**Table 6:** Continued

| Objectives and Model Variables | Suggested Means of Executing Actions |
|---|---|
| 7. Increase the teachers and students interaction as well as the interaction among students. (Interactivity) | 7.1 Teachers should communicate with students using various means provided by BELS.<br>7.2 Teachers encourage students to discuss the topics with friends using facilities provided by BELS |
| 8. Reduce the anxiety aroused in process using computer. (Computer Anxiety) | 8.1 Teachers provide a demonstration of using BELS to make them be familiar with the system. |
| 9. Increase the perception that using BELS is fast and consistent. (System Response) | 9.1 Teachers demonstrate the learning tools and pinpoint the system response time to students. |

## Limitations of the Study

Reliability and validity of the research design for this study are considered as the study's limitations.

**The Reliability of the Research Design:** Since this study is a primary study related to factors influencing the attitudes toward using BELS conducted in Thailand, it should be measured by repeating the study.

**The Internal Validity:** The proposed theoretical model included only variables obtained from a number of previous studies. For future studies, it is suggested to observe other variables not tested by this study.

**External Validity:** The study employed students who studied basic computer related and used with BELS for at least 3 months, with a confidence level of 95 percent and 5 percent of precision. It is recommended that a future study may be conducted using BELS for other fields of study.

## Conclusion

The final theoretical model addressed 16 hypotheses obtained from previous studies, and 15 out of 16 hypotheses were fully and partially supported.

The finding highlights the significance of the positive influence of self-efficacy and compatibility on a positive attitude toward using BELS. The new findings in Table 5 confirmed that although Self-Efficacy and Compatibility have a positive correlation with Attitude toward Using BELS, but they do not have statistically significant direct effects on Attitude. System Function does not cause a statistically significant direct effect on Self-Efficacy while Compatibility initiates a statistically positive direct impact on Self-Efficacy. Social Influence has a statistically significant positive direct influence on Perceived Usefulness. It is highly recommended that for future studies these new findings and hypothesis related to the causal effects of these variables should be re-investigated again.

From a practical perspective, this study introduces useful information for schools, colleges, and universities' lecturers who want to successfully adopt BELS environment. The designing and implementing BELS can be supported by the practical objectives and associated actions presented in Table 6. Especially, enhancing the learners' confident and motivating them with the positive learning atmosphere will help learners increase more effective and efficient in using BELS. This may cause an improvement in students' attitude toward using BELS. Teachers should provide and demonstrate various types of tools (e.g. multimedia, forum, chat, and blog) to encourage students to use BELS to support their different learning styles. BELS providers may apply these suggestions to develop BELS with various flexible functionalities to support various styles of learning.

This type of study should be repeated and especially the new finding results of this study should be re-verified in future studies. The indicators of two variables; Content Feature and Perceived Enjoyment, need to be further investigated since they were removed from the model at the earlier stage.

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## Appendix

The questionnaire was condensed to show the labels of each variable and its indicators and their measuring scales.

**Section 1:** Personal Data

1. Your gender
   ☐ Male ☐ Female
2. What is your age range in years?
   ☐ Less than 18 ☐ 18- 20 ☐ 21-23 ☐ 24 or more
3. What is your year of study?
   ☐ Freshman ☐ Sophomore ☐ Junior ☐ Senior ☐ Other
4. Have you had experience using the combination of face-to-face learning and e-learning system for at least 3 months?
   ☐ Yes ☐ No

**Section 2:** Participants' Response to each of the given statements using the 5-point Likert scale:
(1) Strongly Disagree, (2) Disagree, (3) Neutral, (4) Agree, (5) Strongly Agree.

| ***Compatibility*** | **Indicator** | ***Perceived Usefulness*** | **Indicator** | ***Computer Anxiety*** | **Indicator** |
|---|---|---|---|---|---|
| BELS is compatible with aspects of my course studies. | CP1 | I believe BELS improves my performance. | PU1 | I feel apprehensive about using BELS in order to learn this course. | CA1 |
| BELS is totally suitable for my current activities. | CP2 | I believe BELS is a useful learning tool. | PU2 | I am scared to make mistakes by beating incorrect keys or operating unsuitable tasks on BELS which cannot be corrected. | CA2 |
| I think that using BELS is suitable for my way of study. | CP3 | I believe BELS helps me accomplish my learning effectively. | PU3 | Using BELS is somewhat intimidating to me. | CA3 |
| BELS fits into my work style. | CP4 | I believe BELS makes my work easier. | PU4 | Speed of the Internet can influence my motivation to use BELS. | CA4 |
| ***System Function*** | **Indicator** | ***Social Influence*** | **Indicator** | ***System Response*** | **Indicator** |
| BELS provides learners with overall control on learning activities. | SF1 | People who I trust can encourage me to use BELS. | SI1 | The system is quick in responding to my request. | SR1 |

**Section 2:** Continued

| ***System Function*** | **Indicator** | ***Social Influence*** | **Indicator** | ***System Response*** | **Indicator** |
|---|---|---|---|---|---|
| Students can learn BELS anytime and anywhere. | SF2 | The subject teacher has been supportive in using BELS. | SI2 | The response of the system is consistent. | SR2 |
| BELS offers mixed media such as audio, video and content forms of course materials. | SF3 | In general, the Faculty of Business Administration has supported the use of BELS. | SI3 | This system response time is reasonable. | SR3 |
| BELS provides the method of taking quizzes and assignments. | SF4 | Students who use BELS feel more prestige than those who don't. | SI4 | | |
| BELS display subject material in appropriate structure and understandable format. | SF5 | Students who use BELS have outstanding performance. | SI5 | | |
| BELS can clearly present course content. | SF6 | | | | |

**Section 2:** Continued

| ***Perceived Ease of Use*** | **Indicator** | ***Perceived Enjoyment*** | **Indicator** | ***Interactivity*** | **Indicator** |
|---|---|---|---|---|---|
| BELS is easy to use. | PEOU1 | I discover that using BELS is pleasurable. | PE1 | I believe BELS can assist interactive communication between instructor and student. | I1 |
| BELS is easy to learn how to use it. | PEOU2 | The process of using BELS is enjoyable. | PE2 | I believe BELS can assist interactive communication among students. | I2 |
| BELS usage is easy to develop skillful. | PEOU3 | I have fun when using BELS. | PE3 | I believe BELS atmosphere is a wonderful interaction medium. | I3 |
| ***Attitude Toward Using*** | **Indicator** | ***Self-Efficacy*** | **Indicator** | ***Content Feature*** | **Indicator** |
| I like using BELS. | ATU1 | I feel confident using the BELS. | SE1 | The content of BELS is personalized. | CF1 |
| I would recommend BELS to my friends to use it. | ATU2 | I feel confident operating BELS. | SE2 | The content of BELS is easy to understand. | CF2 |
| It is a positive idea to use BELS. | ATU3 | I feel confident using BELS content. | SE3 | The design of resources is appropriate and accessible. | CF3 |

**Table A1:** Profile of Respondents

| **GENDER** | **Frequency** | **Percent** | **EXPERIENCE** | **Frequency** | **Percent** |
|---|---|---|---|---|---|
| Male | 59 | 23.7 | Yes | 59 | 23.7 |
| Female | 190 | 76.3 | Yes | 190 | 76.3 |
| *Total* | *249* | *100.0* | *Total* | *249* | *100.0* |

| **AGE (Years)** | **Frequency** | **Percent** | **Cumulative Percent** |
|---|---|---|---|
| Less than 18 | 0 | 0 | 0 |
| 18-20 | 213 | 85.5 | 85.5 |
| 21-23 | 32 | 12.9 | 98.4 |
| 24 or more | 4 | 1.6 | 100.0 |
| *Total* | *249* | *100.0* | Mean Age = 19.48, SD = 1.228 |

| **EDUCATION** | | | |
|---|---|---|---|
| Freshman | 241 | 96.8 | 96.8 |
| Sophomore | 1 | 0.4 | 97.2 |
| Junior | 4 | 1.6 | 98.8 |
| Senior | 3 | 1.2 | 100.0 |
| *Total* | *249* | *100.0* | Mode = Freshman |

**Table A2:** Final Factor Analysis

| Indicator | Latent Variables | | | | | | | | | | Cronbach Alpha |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **SI** | **CA** | **SE** | **SF** | **I** | **SR** | **PU** | **CP** | **PEOU** | **ATU** | |
| SI1 | **.806** | -.029 | -.042 | -.075 | -.078 | -.013 | .016 | -.011 | -.013 | -.015 | |
| SI2 | **.744** | -.046 | -.105 | -.014 | -.050 | .019 | -.074 | -.018 | .015 | .023 | |
| SI3 | **.660** | .009 | .059 | -.050 | -.001 | -.144 | .040 | .071 | -.076 | -.026 | 0.820 Good |
| SI4 | **.562** | -.029 | .012 | .015 | .016 | .077 | -.129 | -.023 | -.008 | .017 | |
| SI5 | **.587** | .010 | .046 | -.015 | .064 | -.004 | -.034 | -.059 | -.001 | -.068 | |
| CA1 | -.065 | **.920** | .010 | .042 | .028 | .021 | .050 | -.073 | .021 | .023 | |
| CA2 | -.015 | **.917** | .006 | .018 | -.015 | -.046 | .083 | .046 | .015 | -.037 | 0.922 Excellent |
| CA3 | -.030 | **.920** | -.019 | .027 | .009 | .014 | .014 | -.015 | .043 | .013 | |
| SE1 | -.024 | -.002 | **.772** | -.079 | -.030 | -.081 | -.035 | -.019 | -.017 | .010 | |
| SE2 | -.037 | .004 | **.779** | -.077 | -.039 | .000 | .027 | -.011 | -.075 | -.055 | 0.869 Good |
| SE3 | -.035 | -.006 | **.813** | -.010 | .010 | -.075 | -.038 | -.098 | -.043 | -.027 | |
| SF1 | -.045 | .040 | -.093 | **.528** | -.041 | .019 | .071 | .028 | -.079 | .094 | |
| SF2 | .074 | -.026 | -.062 | **.599** | -.052 | .067 | -.031 | -.086 | -.032 | -.016 | 0.803 Good |
| SF3 | -.105 | .059 | -.026 | **.646** | .026 | -.082 | .111 | -.024 | .016 | -.076 | |

**Table A2:** Continued

| Indicator | Latent Variables | | | | | | | | | | Cronbach Alpha |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **SI** | **CA** | **SE** | **SF** | **I** | **SR** | **PU** | **CP** | **PEOU** | **ATU** | |
| SF4 | -.106 | .014 | -.082 | **.620** | .009 | .009 | .068 | -.077 | -.057 | .073 | 0.803 Good |
| SF5 | -.013 | .046 | .090 | **.635** | .050 | -.061 | -.148 | .016 | .047 | -.140 | |
| SF6 | .045 | -.046 | -.009 | **.650** | -.092 | .025 | -.178 | .008 | .009 | .024 | |
| I1 | -.071 | -.016 | -.008 | -.037 | **.836** | -.076 | .004 | -.021 | -.074 | -.035 | 0.839 Good |
| I2 | -.048 | .034 | -.030 | -.015 | **.851** | -.055 | -.047 | -.034 | -.039 | -.039 | |
| I3 | .046 | -.014 | -.027 | -.052 | **.629** | .053 | -.076 | -.053 | -.014 | .002 | |
| SR1 | -.037 | .010 | -.043 | .011 | -.014 | **.778** | .024 | -.042 | -.056 | -.125 | 0.808 Good |
| SR2 | -.049 | .008 | .015 | -.034 | -.083 | **.711** | .004 | -.078 | -.020 | .021 | |
| SR3 | -.014 | -.014 | -.120 | -.026 | -.034 | **.779** | -.042 | -.059 | -.031 | .023 | |
| PU1 | .035 | .018 | -.030 | -.064 | -.060 | .013 | **.578** | -.033 | .005 | -.019 | 0.809 Good |
| PU2 | -.032 | -.012 | .022 | -.080 | -.041 | -.114 | **.658** | .049 | -.055 | .011 | |
| PU3 | -.040 | .025 | -.087 | -.041 | .009 | .054 | **.658** | -.001 | -.081 | -.037 | |
| PU4 | -.055 | .039 | .030 | -.006 | -.021 | .018 | **.685** | -.103 | .002 | -.087 | |
| CP1 | .005 | -.011 | -.089 | -.085 | -.108 | -.037 | .064 | **.732** | -.068 | .019 | 0.781 Acceptable |
| CP2 | .018 | -.004 | -.044 | -.071 | -.033 | -.092 | .015 | **.765** | -.088 | -.037 | |

**Table A2:** Continued

| Indicator | Latent Variables | | | | | | | | | | Cronbach Alpha |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **SI** | **CA** | **SE** | **SF** | **I** | **SR** | **PU** | **CP** | **PEOU** | **ATU** | |
| CP3 | -.077 | .003 | .084 | .009 | .101 | -.101 | -.076 | **.566** | .015 | -.114 | 0.781 |
| CP4 | -.041 | -.019 | -.060 | .006 | -.002 | .098 | -.152 | **.595** | .031 | -.031 | Acceptable |
| PEOU1 | -.042 | .018 | -.021 | -.071 | -.011 | -.071 | .043 | -.069 | **.746** | -.064 | 0.812 |
| PEOU2 | -.043 | .038 | -.055 | -.012 | -.024 | .001 | -.071 | -.118 | **.810** | -.063 | Good |
| PEOU3 | .005 | .001 | -.070 | -.010 | -.114 | -.047 | -.141 | .058 | **.722** | .017 | |
| ATU1 | -.029 | .037 | -.071 | -.024 | -.105 | .015 | .021 | -.100 | -.020 | **.781** | 0.793 |
| ATU2 | -.026 | -.020 | -.026 | -.049 | -.026 | -.043 | -.123 | .006 | -.056 | **.815** | Acceptable |
| ATU3 | -.021 | -.020 | .013 | -.054 | .095 | -.098 | -.042 | -.037 | -.038 | **.637** | |

**Total Variance Explained**

| Latent Variable | Initial Eigenvalues | | | Rotation Sums of Squared Loadings | | |
|---|---|---|---|---|---|---|
| | **Total** | **% of Variance** | **Cumulative %** | **Total** | **% of Variance** | **Cumulative %** |
| SI | 11.354 | 30.685 | 30.685 | 2.767 | 7.479 | 7.479 |
| CA | 2.920 | 7.892 | 38.578 | 2.713 | 7.333 | 14.812 |
| SE | 1.991 | 5.382 | 43.960 | 2.630 | 7.109 | 21.920 |
| SF | 1.711 | 4.625 | 48.585 | 2.627 | 7.099 | 29.020 |

**Table A2:** Continued

| Total Variance Explained | | | | | | |
|---|---|---|---|---|---|---|
| **Latent** | **Initial Eigenvalues** | | | **Rotation Sums of Squared Loadings** | | |
| **Variable** | **Total** | **% of Variance** | **Cumulative %** | **Total** | **% of Variance** | **Cumulative %** |
| I | 1.508 | 4.077 | 52.661 | 2.545 | 6.879 | 35.899 |
| SR | 1.389 | 3.753 | 56.415 | 2.506 | 6.773 | 42.672 |
| PU | 1.277 | 3.450 | 59.865 | 2.463 | 6.655 | 49.327 |
| CP | 1.164 | 3.146 | 63.011 | 2.417 | 6.534 | 55.861 |
| PEOU | 1.119 | 3.026 | 66.037 | 2.410 | 6.514 | 62.375 |
| ATU | 1.036 | 2.801 | 68.838 | 2.391 | 6.463 | 68.838 |

*Noted:* **(a)** Extraction Method: Principal Component Analysis; **(b)** Rotation Method: Equamax with Kaiser Normalization. Rotation converged in 12 iterations; **(c)** Kaiser-Meyer-Olkin Measure of Sampling Adequacy = .894; **(d)** Bartlett's Test of Sphericity Approx: Chi-Square = 4705.161, df = 666, p = 0.000; **(e)** Significant loading factors are highlighted; **(f)** Only factors (latent variables) with eigenvalues ≥ 1 are shown

**Table A3:** Descriptive Statistics for Model Variables

| Variable/ Indicator | Mean | Standard Deviation | Skewness | Kurtosis | Variable/ Indicator | Mean | Standard Deviation | Skewness | Kurtosis |
|---|---|---|---|---|---|---|---|---|---|
| **Social Influence (SI)** | 3.979 | 0.505 | -0.305 | -0.026 | **System Response (SR)** | 3.988 | 0.582 | -0.434 | 0.237 |
| SI1 | 3.840 | 0.619 | -0.403 | 0.693 | SR1 | 3.950 | 0.714 | -0.326 | 0.002 |
| SI2 | 4.090 | 0.619 | -0.060 | -0.400 | SR2 | 3.960 | 0.734 | -0.369 | -0.034 |
| SI3 | 4.010 | 0.707 | -0.218 | -0.383 | SR3 | 4.060 | 0.600 | -0.021 | -0.210 |
| SI4 | 4.000 | 0.701 | -0.141 | -0.544 | **Perceived Usefulness (PU)** | 4.187 | 0.488 | -0.155 | -0.535 |
| SI5 | 3.950 | 0.664 | -0.196 | -0.029 | PU1 | 4.140 | 0.587 | -0.032 | -0.204 |
| **Computer Anxiety (CA)** | 3.216 | 0.962 | -0.117 | -0.826 | PU2 | 4.310 | 0.542 | 0.058 | -0.621 |
| CA1 | 3.240 | 1.007 | -0.093 | -0.643 | PU3 | 4.120 | 0.640 | -0.107 | -0.579 |
| CA2 | 3.300 | 1.055 | -0.058 | -0.750 | PU4 | 4.190 | 0.672 | -0.243 | -0.805 |
| CA3 | 3.110 | 1.040 | -0.024 | -0.820 | **Compatibility (CP)** | 4.149 | 0.469 | -0.008 | -0.419 |
| **Self-Efficacy (SE)** | 4.012 | 0.594 | -0.042 | -0.432 | CP1 | 4.210 | 0.553 | 0.054 | -0.201 |
| SE1 | 4.000 | 0.651 | -0.085 | -0.342 | CP2 | 4.190 | 0.603 | -0.106 | -0.418 |
| SE2 | 4.000 | 0.704 | -0.145 | -0.565 | CP3 | 4.110 | 0.618 | -0.075 | -0.418 |
| SE3 | 4.040 | 0.643 | -0.033 | -0.566 | CP4 | 4.080 | 0.636 | -0.068 | -0.529 |
| **System Function (SF)** | 4.198 | 0.410 | -0.050 | -0.331 | **Perceived Ease of Use (PEOU)** | 4.122 | 0.545 | -0.055 | -0.652 |
| SF1 | 4.120 | 0.550 | 0.060 | 0.146 | PEOU1 | 4.090 | 0.684 | -0.113 | -0.854 |
| SF2 | 4.170 | 0.578 | -0.024 | -0.212 | PEOU2 | 4.140 | 0.648 | -0.143 | -0.645 |
| SF3 | 4.350 | 0.547 | -0.031 | -0.782 | PEOU3 | 4.140 | 0.580 | -0.016 | -0.147 |
| SF4 | 4.200 | 0.594 | -0.087 | -0.378 | **Attitude Toward Using (ATU)** | 4.075 | 0.544 | -0.204 | -0.062 |
| SF5 | 4.220 | 0.571 | -0.028 | -0.322 | ATU1 | 4.040 | 0.698 | -0.265 | -0.258 |
| SF6 | 4.130 | 0.622 | -0.093 | -0.460 | ATU2 | 4.040 | 0.668 | -0.205 | -0.209 |
| **Interactivity (I)** | 4.007 | 0.618 | -0.320 | -0.353 | ATU3 | 4.150 | 0.569 | 0.009 | -0.097 |
| I1 | 4.100 | 0.728 | -0.289 | -0.666 | | | | | |
| I2 | 4.040 | 0.717 | -0.258 | -0.438 | | | | | |
| I3 | 3.880 | 0.687 | -0.060 | -0.376 | | | | | |

**Table A4:** Correlations

| Variables | | Model Variables | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | SF | SI | SE | CP | SR | I | PU | PEOU | ATU | CA |
| Model Variables | System Function (SF) | 1 | | | | | | | | | |
| | Social Influence (SI) | .457 | 1 | | | | | | | | |
| | Self-Efficacy (SE) | .459 | .409 | 1 | | | | | | | |
| | Compatibility (CP) | .485 | .390 | .483 | 1 | | | | | | |
| | System Response (SR) | .369 | .373 | .512 | .530 | 1 | | | | | |
| | Interactivity (I) | .392 | .438 | .344 | .449 | .432 | 1 | | | | |
| | Perceived Usefulness (PU) | .541 | .480 | .469 | .487 | .454 | .469 | 1 | | | |
| | Perceived Ease of Use (PEOU) | .432 | .394 | .444 | .495 | .422 | .445 | .553 | 1 | | |
| | Attitude Toward Using (ATU) | .439 | .383 | .455 | .457 | .396 | .434 | .476 | .457 | 1 | |
| | Computer Anxiety (CA) | -.161 | .071 | -.068 | -.039 | -.037 | -.088 | -.218 | -.158 | -.042 | 1 |

From the table of correlations, it is seen that:

(a) The shaded cells in Appendix Table A4 correspond with sixteen causal effects remained in the modified theoretical model which have statistically significant at a level of 0.05 except for the correlation between Computer Anxiety ↔ Self-Efficacy.

(b) Cross hatched cells indicate the fifteen correlations among exogenous variable. They all have statistically significant at a level of 0.05 except for Computer Anxiety ↔ Social Influence, Computer Anxiety ↔ Compatibility, Computer Anxiety ↔ System Response, Computer Anxiety ↔ Interactivity.

(c) The ten correlations (Highlight in red) are statistically significant which may be incorporated in the theoretical model. This suggests that these may not be significant causal effects in the modified model.

**Table A5:** Analysis Results of All Effects of the Final Model

| Variable | | Effect | Endogenous Variable | | | |
|---|---|---|---|---|---|---|
| | | | Intervening | | | Dependent |
| | | | Self-Efficacy (SE) | Perceived Usefulness (PU) | Perceived Ease of Use (PEOU) | Attitude Toward Using (ATU) |
| Exogenous | System Function (SF) | Direct | 0.197(0.152M) | 0.286***(0.294M) | Nil | Nil |
| | | Indirect | Nil | SF-SE-PEOU-PU 0.009(0.009S) | SF-SE-PEOU 0.037(0.027S) | SF-PU-ATU 0.060(0.044S) SF-SE-ATU 0.033(0.024S) SF-SE-PEOU-ATU 0.005(0.003S) SF-SE-PEOU-PU-ATU 0.002(0.001S) |
| | | Total Indirect | Nil | 0.009(0.009S) | 0.037(0.027S) | 0.100(0.072S) |
| | | ***Total*** | **0.197(0.152M)** | **0.295**(0.303M)** | **0.037(0.027S)** | **0.100(0.072S)** |
| | Computer Anxiety (CA) | Direct | -0.025(-0.045S) | -0.062**(-0.148M) | -0.077*(-0.131M) | Nil |
| | | Indirect | Nil | CA-PEOU-PU -0.018*(-0.044S) CA-SE-PEOU-PU -0.001(-0.003S) | CA-SE-PEOU -0.005(-0.008S) | CA-PU-ATU -0.013(-0.022S) CA-PEOU-ATU -0.010(-0.017S) CA-PEOU-PU-ATU -0.004(-0.007S) CA-SE-PEOU-ATU -0.001(-0.001S) CA-SE-PEOU-PU-ATU -0.0002(-0.0004S) CA-SE-ATU -0.004(-0.007S) |
| | | Total Indirect | Nil | -0.019(-0.047S) | -0.005(-0.008S) | -0.032(-0.054S) |
| | | ***Total*** | **-0.025(-0.045S)** | **-0.081**(-0.195M)** | **-0.082(-0.139S)** | **-0.032(-0.054S)** |

**Table A5:** Continued

| Variable | | Effect | Endogenous Variable | | | |
|---|---|---|---|---|---|---|
| | | | Intervening | | | Dependent |
| | | | Self-Efficacy (SE) | Perceived Usefulness (PU) | Perceived Ease of Use (PEOU) | Attitude Toward Using (ATU) |
| Exogenous | Compatibility (CP) | Direct | 0.555***(0.430M) | Nil | 0.533***(0.387M) | 0.326(0.237M) |
| | | Indirect | Nil | CP-PEOU-PU 0.127***(0.131M) CP-SE-PEOU-PU 0.025*(0.026S) | CP-SE-PEOU 0.105*(0.077S) | CP-PEOU-ATU 0.069(0.050S) CP-PEOU-PU-ATU 0.027(0.019S) CP-SE-ATU 0.092(0.067S) CP-SE-PEOU-ATU 0.014(0.010S) CP-SE-PEOU-PU-ATU 0.005(0.004S) |
| | | Total Indirect | Nil | 0.152**(0.157M) | 0.105*(0.077S) | 0.207(0.150M) |
| | | ***Total*** | **0.555***(0.430M)** | **0.152**(0.157M)** | **0.638***(0.464M)** | **0.533*(0.387M)** |
| | System Response (SR) | Direct | Nil | 0.135*(0.151M) | Nil | Nil |
| | | Indirect | Nil | Nil | Nil | SR-PU-ATU 0.028(0.022S) |
| | | Total Indirect | Nil | Nil | Nil | 0.028(0.022S) |
| | | ***Total*** | **Nil** | **0.135*(0.151M)** | **Nil** | **0.028(0.022S)** |
| | Interactivity (I) | Direct | Nil | Nil | 0.279*(0.248M) | Nil |
| | | Indirect | Nil | I-PEOU-PU 0.067*(0.084S) | Nil | I-PEOU-ATU 0.036(0.032S) I-PEOU-PU-ATU 0.014(0.012S) |
| | | Total Indirect | Nil | 0.067*(0.084S) | Nil | 0.050(0.044S) |
| | | ***Total*** | **Nil** | **0.067*(0.084S)** | **0.279*(0.248M)** | **0.050(0.044S)** |
| | Social Influence (SI) | Direct | 0.258*(0.195M) | 0.206*(0.207M) | Nil | 0.139(0.099S) |
| | | Indirect | Nil | SI-SE-PEOU-PU 0.012*(0.012S) | SI-SE-PEOU 0.049*(0.035S) | SI-SE-ATU 0.043(0.030S) SI-SE-PEOU-ATU 0.006(0.004S) SI-SE-PEOU-PU-ATU 0.002(0.002S) SI-PU-ATU 0.043(0.031S) |
| | | Total Indirect | Nil | 0.012*(0.012S) | 0.049*(0.035S) | 0.094(0.067S) |
| | | ***Total*** | **0.258*(0.195M)** | **0.218*(0.219M)** | **0.049*(0.035S)** | **0.233(0.166M)** |
| Intervening | Self-Efficacy (SE) | Direct | Nil | Nil | 0.190*(0.178M) | 0.166(0.155M) |
| | | Indirect | Nil | SE-PEOU-PU 0.045*(0.060S) | Nil | SE-PEOU-ATU 0.025(0.023S) SE-PEOU-PU-ATU 0.009(0.009S) |
| | | Total Indirect | Nil | 0.045*(0.060S) | Nil | 0.034(0.032S) |
| | | ***Total*** | **Nil** | **0.045*(0.060S)** | **0.190*(0.178M)** | **0.200(0.187M)** |
| | Perceived Ease of Use (PEOU) | Direct | Nil | 0.239***(0.339M) | Nil | 0.129(0.129M) |
| | | Indirect | Nil | Nil | Nil | PEOU-PU-ATU 0.050(0.050S) |
| | | Total Indirect | Nil | Nil | Nil | 0.050(0.050S) |
| | | ***Total*** | **Nil** | **0.239***(0.339M)** | **Nil** | **0.179(0.179M)** |
| | Perceived Usefulness (PU) | Direct | Nil | Nil | Nil | 0.209(0.148M) |
| | | Indirect | Nil | Nil | Nil | Nil |
| | | Total Indirect | Nil | Nil | Nil | Nil |
| | | ***Total*** | **Nil** | **Nil** | **Nil** | **0.209(0.148M)** |