USER INTERFACE DESIGN: A STUDY OF EXPECTATION-CONFIRMATION THEORY

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ABSTRACT. In a century of high technology and in a cyber world, the website is recognized as a super fast medium of information transfer, sharing and data harmonization. Users around the world look for information in various kinds of websites and online sources. These multicultural users have different experiences and expectations regarding the structure of a website and how to use it. However, there are limited guidelines for the development of websites for multicultural users. In particular, there is a lack of specific standards for user-centric websites that should be taken into account during the development of a website. Such guidelines would be useful in giving designers an overview of how to develop websites that will satisfy the expectations of users around the world. The present study explored ASEAN users' expectations of an informational website based on expectation-confirmation theory (ECT), which is adapted from the consumer behavior literature. Eight constructs, namely, expectation, perceived usefulness, perceived ease of use, perceived performance, satisfaction, interface quality, confirmation and continuance intention were used to measure a user-centric Web-based interface. The results of the study demonstrate satisfactory reliable and valid scales of the model constructs.

Keywords: expectation-confirmation, user acceptance, satisfaction, continuance intention

INTRODUCTION

Expectation-confirmation theory (ECT) posits that expectations, coupled with perceived performance, lead to satisfaction. This effect is mediated through positive or negative confirmation between expectations and performance. If a product outperforms expectations (positive confirmation), then satisfaction will result. If a product falls short of expectations (negative confirmation), then the consumer is likely to be dissatisfied (Oliver, 1980; Spreng et al., 1996). The four main constructs in the model are: expectations, performance, confirmation, and satisfaction. Expectations reflect anticipated behavior (Bhattacherjee, 2001b). They are predictive, indicating expected product attributes at some point in the future (Spreng et al., 1996). Expectations serve as the comparison standard in ECT, that is, what consumers use to evaluate performance and form a confirmation judgment. Confirmation is hypothesized to affect satisfaction, with positive confirmation leading to satisfaction and negative confirmation leading to dissatisfaction.

Bhattacherjee (2001b) studied users of an online banking system in order to examine the cognitive beliefs and affect influencing the individual's intention to continue using the informational website (i.e. the continuance intention). In the present study, eight hypotheses de-

rived from the ECT model were empirically validated using a field survey of users' experience of an informational website, prototype from the ASEAN biodiversity website (Aslina & Azizah, 2014; Aslina & Baharum, 2013). The results suggest that users' continuance intention is determined by their satisfaction with Web use and perceived usefulness of continued Web use.

METHODOLOGY

The quantitative phase of the current research focuses on empirically retesting the ECT model in a different setting with newly gathered data. The survey participants and settings and the research results are discussed in this section. The study used eight constructs, namely, expectation, perceived usefulness, perceived ease of use, perceived performance, satisfaction, interface quality, confirmation and continuance intention. The operationalization of the constructs is summarized in Table 1.

Table 1. Operationalization of Constructs

Construct	Operational Definition	Items	Source of Measures Extended in this Study
1. Perceived usefulness (PU)	Users' perceptions of the expected benefits of using the ASEAN biodiversity website	PU1. The interface helps me be more effective. PU2. The interface helps me be more productive. PU3. The interface is useful.	Davis et al. (1989); Bhattacherjee (2001a; 2001b); Bhattacherjee & Premkumar (2004); Wu, Lin, & Tsai (2005); Limayem & Cheung (2008); Brown et al. (2008); Tao et al. (2009); Shih, Shiau, & Huang(2010); Nalysis (2010); Sonderegger & Sauer (2010); Stone & Baker-Eveleth (2013); Vela (2013)
2. Perceived ease of use (PE)	Users' perceptions of the ease and convenience of using the ASEAN biodiversity website	PE1. The interface is easy to use. PE2. The interface is simple to use. PE3. The interface is easy to remember to use it.	Venkatesh & Davis (2000); Chin & Lee (2000); Nantel & Glaser (2008); Brown et al. (2008); Tao et al. (2009); Leuthold et al. (2011)
3. Perceived performance (PP)	Users' perceptions of orientation on the ASEAN biodiversity website	PP1. The interface is easy to navigate through the objects of the website. PP2. All the objects in the Web interface well organized. PP3. The interface is easy to read the website's content.	McKinney et al. (2002); Susarla et al. (2003); Tao et al. (2009); Wang (2012)
4. Expectation (E)	Users' expectations for the location of Web and interface objects on the ASEAN biodiversity website	E1. The Web objects in the interface fit my expectation. E2. The Web object's location operation fit my expectation. E3. The interface fit my expectation. E4. My experience using the interface was better than what I expected. E5. I able to expect the location of the objects easily.	Chin & Lee (2000); McKinney et al. (2002); Susarla et al. (2003); Wang (2012)
5. Confirmation (C)	Users' perceptions of the congruence between expectations of the ASEAN biodiversity website use and its actual performance	C1. The interface meets my needs. C2. The interface fit my needs.	Spreng et al. (1996); Chin & Lee (2000); Bhattacherjee (2001b); Wu et al. (2005); Limayem & Cheung (2008); Tao et al. (2009); Shih et al. (2010); Chen-Yueh & Yi-Hsiu (2010); Wang (2012); Stone & Baker-Eveleth (2013)

Construct	Operational Definition	Items	Source of Measures Extended in this Study
6. Satisfaction (S)	Users' affect regarding (feelings about) prior use of the ASEAN biodiversity website	S1. The interface is pleasant to use. S2. I am satisfied with the use of the interface. S3. I am satisfied with the interface.	Spreng et al. (1996); Chin & Lee (2000); Bhattacherjee (2001a; 2001b); Wu, Lin, & Tsai (2005); Tao et al. (2009); Shih, Shiau, & Huang (2010); Sonderegger & Sauer (2010); Chen-Yueh & Yi-Hsiu (2010); Wang (2012); Stone & Baker-Eveleth (2013); Vela (2013)
7. Continuance intention (CI)	Users' intention to continue using the ASEAN biodiversity website	CI1. I felt comfortable using the interface. CI2. I would recommend it to a friend. CI3. I like working with the interface.	Mathieson (1991); Bhattacherjee (2001b); Wu, Lin, & Tsai (2005); Tao, Cheng, & Sun (2009); Nalysis (2010); Shih, Shiau, & Huang (2010); Chen-Yueh & Yi-Hsiu (2010); Wang (2012); Stone & Baker-Eveleth (2013)
8. Interface quality (IQ)	Users' affect (feelings) regarding the attractiveness of the user interface design on the ASEAN biodiversity website	IQ1. The interface is appealing. IQ2. The interface is pleasant. IQ3. The interface has a clear design. IQ4. The interface has a clear design. IQ5. The interface is user friendly.	Chin & Lee (2000); Bhattacherjee (2001a; 2001b); Sonderegger & Sauer (2010)

Participants and Settings

The sample comprised 160 participants. The sample was almost equally balanced between genders, with 46% of the participants being male (n = 74) and 54% female (n = 86). All the participants were citizens or residents of an ASEAN country (Brunei, Myanmar, the Philippines, Indonesia, Lao PDR, Malaysia, Singapore, Thailand and Vietnam). Most of the participants (82%) used English as their second language. This indicates that they were familiar with international websites and used English language websites. The majority of the participants (85%) visited the Web every day. To ensure that the participants represented the culture of each country, it was determined that each participant must have resided in their country of origin longer than in any other country and that their native language was their main language of communication. Data collection took place online and in person (at universities, institutes and companies). Most of the participants had more than six years' experience in the field of technology and the Web. Most of them also had attained a level of education at the undergraduate and postgraduate level. The 27 questionnaire items (Table 1) were developed after validation and reliability testing by experts. These items represent the variables utilized in the current study. Other than wording modifications to fit the specific technology studied in this research, no changes were made to the user acceptance scale. All items were measured on a five-point Likert scale, where 1 = completely disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = completely agree.

RESULTS AND FINDINGS

To test the hypotheses, the structural equation modeling using the partial least squares approach (SEM-PLS) was applied using SmartPLS (Version 3) to analyze the data in three steps: 1) measurement model, 2) structural model, and 3) mediation effect test.

Measurement Model

In order to detect the collinearity of the indicators, the variance inflation factor (VIF) was evaluated. When the VIF value is less than 0.5, collinearity issues are not suspected. In this study, the VIF values for all the constructs were less than 0.5, which indicated there were no collinearity issues.

The next step was to examine the statistical significance of the outer weights using the bootstrapping method. In formative measurement, if both the weight and loading are not significant, there is no empirical support for the indicator's relevance in providing content to the formative index. However, if any indicator weights are not statistically significant, then the size and significance of the indicator loadings should be examined. The results of the study showed that all the formative indicators were significant. Using SmartPLS, the measurement model was used to test the validity of measurement (Figure 1).

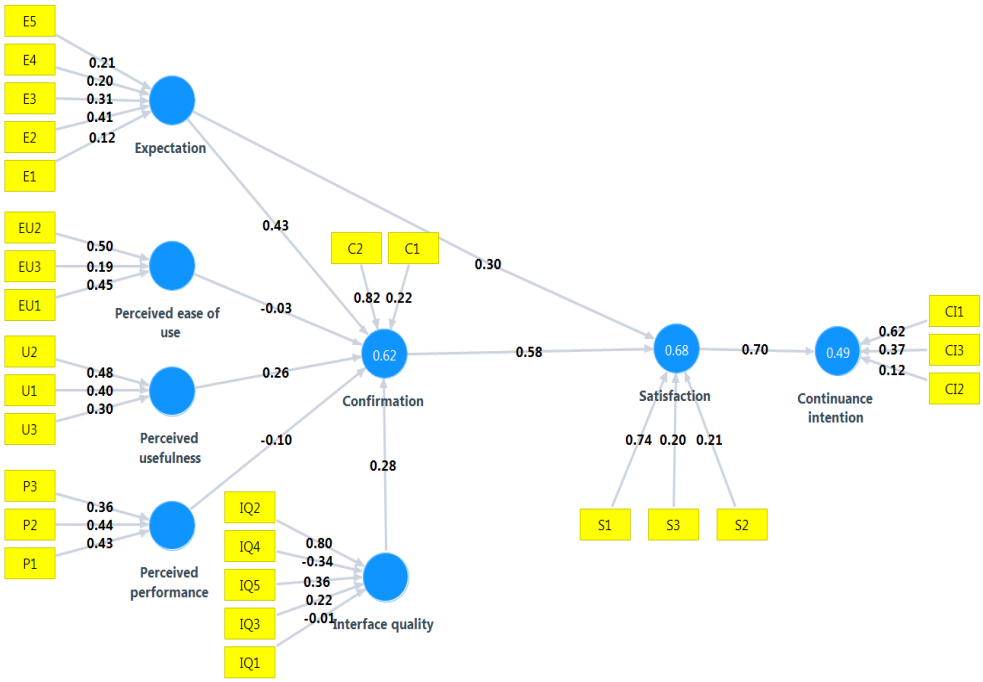

Figure 1. Measurement Model

Structural Model

The structural model is also called an inner model in the context of PLS (Hair, Hult, Ringle, & Sarstedt, 2014). Once the validity and reliability of the measurement model is confirmed, the structural model is applied to test the relationship between the constructs (endogenous and exogenous). The results of the structural model enable the researcher to assess how well the data are supporting the theory or concept. The steps in assessing the structural model are checking the collinearity issues, checking for the path model (regression) and significance level, and checking the level of the coefficients of determination (R^2). The first step in the structural model assessment is examining the collinearity of the model using ordinary least squares regression to check the probability of bias in the path coefficients if there is a significant level of collinearity among the predictor constructs (Hair et al., 2014).

PLS-SEM fits the data to obtain the best parameter estimate by maximizing the explained variance of the dependent/endogenous latent variable. To do so, a number of steps were performed. First, in order to assess collinearity, each set of predictors was assessed separately. Based on the rule of thumb, it is recommended that all VIF values are less than 2; however, a VIF value less than 5 is still not violent of collinearity (O'Brien, 2007). In this study, the VIF values for all the predictor sets were below 4 (below the threshold), and all the constructs' tolerance values were higher than the recommended threshold (0.2). Therefore, there were not significant levels of collinearity between each set of predictor variables (constructs).

Since there was not a collinearity issue, the researcher moved to the next steps, which are examining the regression weight with the endogenous variable and the significance level. The next step was assessing the path model and the significance of the structural model relationships. To do so, bootstrapping was run to assess the confidence interval of the result. The path coefficients for the structural model are shown in Figure 2. The path coefficient was calculated in order to assess the accuracy of the predictors in the proposed model.

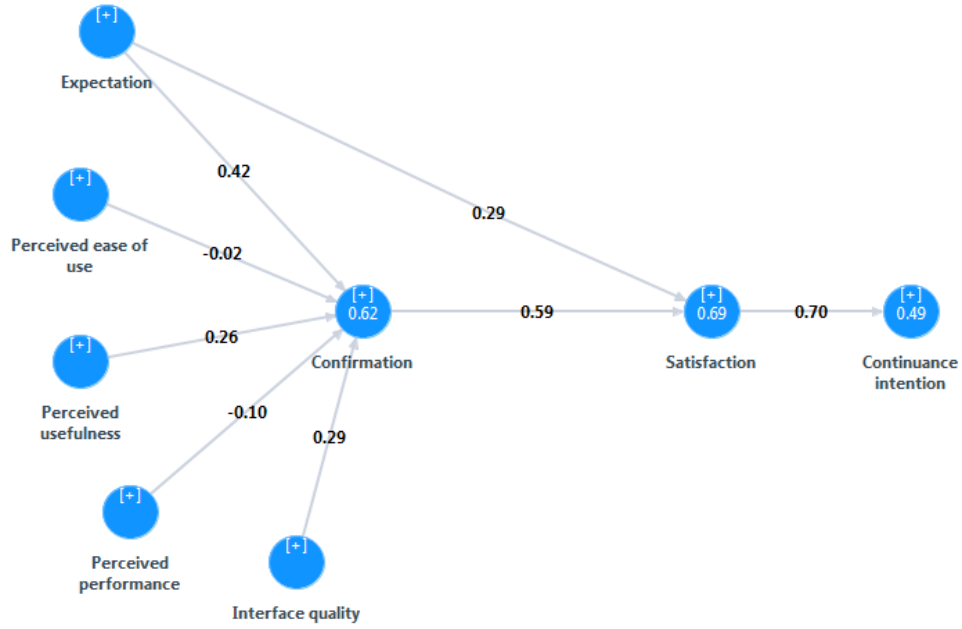

Figure 2. Structural Model

DISCUSSION

Overall, based on the results of the hypotheses testing (Table 2), the theory-based model was supported by the data; thus showing that the proposed model can predict satisfaction and intention to continue surfing or browsing the Web with the developed user interface (prototype). To reduce the rejection of websites by users, these findings can be taken into account in the development of sustainable user interface design guidelines. The coefficient of determination (R^2) results show that the proposed model predicted 49% of Web viability (R^2 = 0.49) (Table 3).

In addition to evaluating the R^2 values of all the endogenous constructs, the change in the R^2 value when a specified exogenous construct is omitted from the model can be used to

evaluate whether the omitted construct has a substantive impact on the endogenous constructs. This measure is referred to as the f^2 effect size (Hair et al., 2014).

Table 2. Results of Hypotheses Testing

Hypothesis	Result
H1 Satisfaction is connected positively and significantly to continuance intention.	Accepted
H2 Confirmation has a positive and significant impact on satisfaction.	Accepted
H3 Perceived usefulness has a positive and significant relation to confirmation.	Accepted
H4 Perceived ease of use has a positive and significant relation to confirmation.	Rejected
H5 Perceived performance has a positive and significant relation to confirmation.	Rejected
H6 Expectation has a positive and significant relation to confirmation.	Accepted
H7 Expectation has a positive and significant impact on satisfaction.	Accepted
H8 Interface quality has a positive and significant impact on confirmation.	Accepted

Table 3. Coefficient of Determination R^2

	R Square
Confirmation	0.62
Continuance intention	0.49
Satisfaction	0.69

The f^2 effect size allows an assessment to be made of an exogenous construct's contribution to an endogenous latent variable's R^2 value. The f^2 values of 0.02, 0.15 and 0.35 indicate an exogenous construct's small, medium or large effect, respectively, on an endogenous construct. In this study, thef^2 value of confirmation on satisfaction was 0.16 (indicating medium effect size); the f^2 value of expectation on satisfaction was 0.53 (indicating large effect size); the f^2 value of expectation on confirmation was 0.16 (indicating medium effect size); the f^2 value of interface quality on confirmation was 0.08 (indicating small effect size); the f^2 value of perceived ease of use on confirmation was 0 (indicating small effect size); the f^2 value of perceived performance on confirmation was 0.01 (indicating small effect size); and the f^2 value of perceived usefulness on confirmation was 0.07 (indicating small effect size).

In conclusion, an analysis of the measurement model and structural model produced a valid and reliable model. The original model contained eight constructs and 27 items that could be used to guide and assess user interface design. In the results, six items were removed, namely, perceived ease of use (PE1, PE2, PE3) and perceived performance (PP1, PP2 and PP3). The remaining constructs facilitate the development of a user interface that feels easy to use, is simple and easy to remember. In addition, the information is conveyed on the website efficiently, as the user experiences the interface as easy to navigate, organized and easy to read (Nurul Hidayah, Azizah, & Fariza Hanis, 2014; Nurul Hidayah, Fariza Hanis, Azizah, & Mohd, 2011) Even though some items were removed, the model provides an essential guideline for enhanced usability in interface design.

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