

# Predicting the Continuance Usage of Information Systems: A Comparison of Three Alternative Models

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*Abstract:* -This study seeks to examine, through empirical evidence, the relative explanatory power of three prospective models in predicting users' continuous adoption of information system (IS). The three models include: Expectation-Confirmation Theory Model (ECTM, Model 1), the integration of ECTM with Technology Acceptance Model (TAM) (ECT-TAM model, Model 2), and a hybrid model integrating ECT, TAM and emotions (Model 3).

Three hundred and fifty web portal site users were obtained from a survey. The paper assessed the psychometric properties of the measures through confirmatory factor analysis and then employed structural equation modeling analysis in order to examine and compare the ability of the three prospective models to better predict users' continuous adoption of IS.

Data analysis using LISREL shows that all three models meet the various goodness-of-fit criteria. In terms of variance explained for intention to continue IS usage, all three models perform equally well. As for the explanatory power of satisfaction, Model 3 has the highest R<sup>2</sup> (71%), followed by Model 2 (69%), and Model 1 (68%). This result confirms the erstwhile discussion of continuance intention behavior in which adding emotion factors to the cognitive process model will enhance the predictive power of the satisfaction. Perceived usefulness and perceived ease of use predict the level of user satisfaction better than emotions and perceived usefulness is the stronger predictor of user satisfaction than other variables. The Model 3 provides additional information to increase our understanding of IS continuance intention behavior.

*Key-Words:* - Confirmation, Perceived usefulness, Perceived ease of use, Positive emotion, Negative emotion, Satisfaction, Continuous adoption intention

## 1. Introduction

The continuous growth of the investment in IS has drawn a lot of studies about the effectiveness of user adoption. These studies have employed a variety of theoretical perspectives and formed the main research stream, which includes technology acceptance model (TAM), theory of reasoned action (TRA), and theory of planned behavior (TPB). However, these studies have given more attention to examining the initial adoption of IS rather than the factors that drive users to continue to use an IS after they have adopted the system (Karahanna et al., 1999; Bhattacharjee, 2001).

Understanding users' continuous usage of an IS is critical, as the previous studies in consumer behavior show that it costs five times as much to acquire a new customer than to retain an existing one. In addition, users in general have a substantial body of IS experience, which makes continuance usage increasingly important (Hong et al., 2008). For example, when it comes to information service free of charge such as Internet service providers, online newspapers, and website portals, users are free to choose either to stay or to leave. Hence, the subsequent continued usage of the service is central to the long term viability of many IS providers.

IS continuance is a form of post-adoption behavior. It depicts behavior patterns reflecting the continued use of a particular IS. Bhattacharjee (2001) proposed a model in line with the Expectation-Confirmation

Theory (ECT) to explain users' intention to continue using an IS. His investigation supported the hypothesized relationships between (dis)confirmation, satisfaction, perceived usefulness, and continuance intention.

Bhattacharjee's work has led to a substantial body of research proposing hybrid models to advance our understanding of users' continuance intention to use a particular IS (E.g., Hong, Thong and Tam, 2006; Liao, Chen and Yen, 2007; Premkumar and Bhattacharjee, 2007; Tsai and Huang, 2007). These hybrid models were built by integrating ECT into TAM, TPB, or IDT (Innovation of Diffusion Technology). Among them, the most popular framework has been the integration of ECT and TAM (Liao et al. 2007; Bhattacharjee, 2001; Thong, Hong and Tam, 2006; Roca, Chiu and Martinez, 2006). Nevertheless, these studies have been focused on exploring the cognitive predictors (i.e., perceived usefulness and perceived ease of use) influencing users' IS continuance usage behavior.

Studies on consumers' repurchase behavior have found emotion to be an important factor in satisfaction model and on enhancing the predictive power of the cognitive process (Bigne, Andreu and Gnoth, 2005; Mano and Oliver, 1993; Muller, Tse and Venkatasubramaniam, 1991; Westbrook, 1987; Westbrook and Oliver, 1991; Wirtz and Bateson, 1999). This study drew on the literature on emotion to formulate a new integrated model which

might provide a much broader perspective on explaining continued IS usage intention.

The objective of this research is to compare the relative explanatory power of three models. The first model is based on ECT (Oliver, 1980). The second model is a hybrid model that integrates ECT with TAM (ECT-TAM model). While the first two models have proven to significantly explain continued IS usage intention, the third model is a hybrid model that integrates the ECT-TAM and emotions (ECT-TAM-Emotion).

It would be worthwhile to see whether a research model integrating ECT, TAM, and emotion theories can explain IS continuance intention more than either ECT or ECT-TAM model consider alone. Findings from this research may therefore help validate factors involved in the IS continuance decision processes.

## **2. Theory and research models**

### **2.1 Model 1: Expectation Confirmation Theory Model (ECTM)**

Oliver (1980) proposed Expectation-Confirmation Theory (ECT) in the marketing literature to explain the determinants of consumer satisfaction/dissatisfaction and repurchase intention of products and services. Oliver (1980) suggested that consumers form an initial expectation (pre-expectation) prior to using the product. The satisfaction of consumers is determined by their pre-expectation and the extent to which their

pre-expectation were (dis)confirmed. (Dis)confirmation represents the (mis)match between the pre-expectation and the perceived performance of product or service. Consumers' expectation are confirmed when the performance of a product or service is as much as expected. Positive disconfirmation occurs when the product or service performs better than expected. Negative disconfirmation occurs when the product or service performs worse than expected. Hence, consumers can be satisfied if they are confirmed or positively disconfirmed. In turn, satisfied customers form intentions to reuse the product or service in the future, while dissatisfied consumers discontinue its subsequent use or purchase.

ECTM was validated by various empirical studies (See Figure 1). For example, Bruce (1998) examined the satisfaction rate of Australian students in searching information over the internet and found that effect of pre-expectation on satisfaction is direct and positive. Ladhari (2007) also found similar results. Bhattacharjee (2001)'s study supported the role of satisfaction in determining IS continuance intention. Similar findings include the work of Hong et al. (2006) on digital systems learning usage and the Liao et al.'s (2007) study on e-government service. Perceived performance is not included in this model because perceived performance measure is already captured by part of the confirmation construct (Hong et al., 2006).

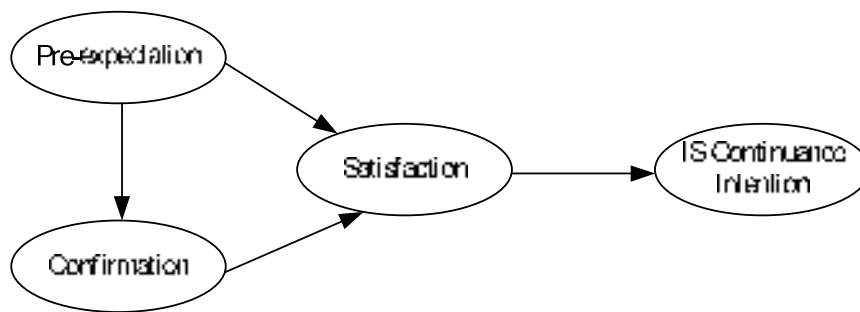


Figure 1. Expectation Confirmation Theory Model (ECTM, Model 1)

**2.2 Model 2: ECT-TAM Model**

Model 2 is a hybrid model that integrates ECT with TAM (ECT-TAM model, see Figure 2). Decomposing the belief structures in the ECTM, the Model 2 considers the post beliefs of users after actual experience of the IS. By decomposing beliefs, the relationship between belief of confirmation and satisfaction can become clearer.

TAM posits that users’ satisfaction with an IS and intention to adopt an IS are determined by two major perceptual factors: perceived usefulness and perceived ease of use (Davis, 1989). Perceived usefulness is defined by Davis (1989) as the extent to which a user believes that using a particular system would enhance his or her job performance. Perceived ease of use can be described as the degree to which a person

believes that using a particular system is free of effort. TAM also postulates that perceived usefulness will be influenced by perceived ease of use.

While TAM was originally developed to explain users’ initial adoption of a new IS, many studies applied TAM to examine users’ adoption intention after they had adopted and were using the IS. Examples include Taylor and Todd’s (1995) study on usage intentions of a computing service facility, Davis’s work on e-mail system (1989), and Konana and Balasubramanian’s (2005) work on online investing adoption. In summary, TAM seems to successfully predict users’ acceptance of various corporate IS (Adams et al., 1992; Chin and Todd, 1995) and is stable across people and context.

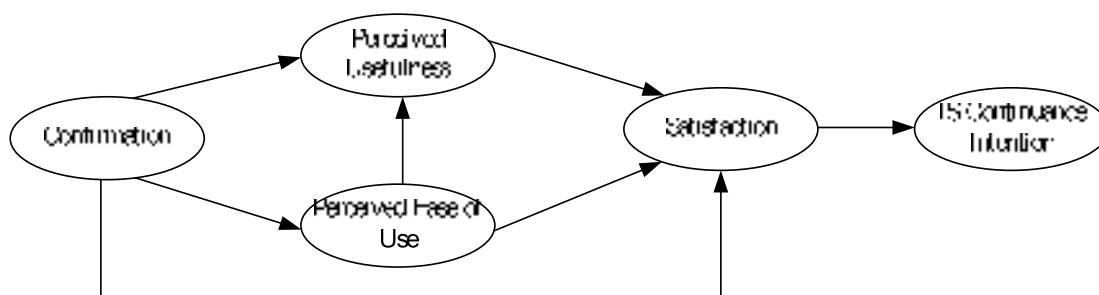


Figure 2. ECT-TAM Model (Model 2)

**2.3 Model 3: ECT-TAM-Emotion Model**

Research in consumer behavior has found

that emotion coexists with cognition (i.e. confirmation) in the formation of satisfaction (Mano and Oliver, 1993;

Mooradian and Olver 1997; Philips and Baumgartner, 2002). The emotions expressed by humans can be divided into two positive and negative emotions (Westbook, 1987). Positive emotions express an intention to include while negative emotions express an attempt to exclude. Positive emotions that users feel from using an IS can be described as happy, cheerful, glad, warm, vigorous, and enthusiastic (Elsbach and Barr, 1999; Hockey et al., 2000; Sanna, 1998). Negative emotions are emotions users feel sad, frustrated, angry, scared, fearful, and distressed in response to using an IS.

Positive and negative emotions are not necessarily two entirely opposite states (Goldstein and Strube, 1994). In other words, positive emotions do not necessarily correspond to the opposite of negative emotions. In the case of IS adoption, because users might experience multiple aspects of IS simultaneously, multiple appraisals attributed to those aspects can bring out multiple emotional states (positive or negative emotions). Research in consumers has recognized these types of dual experiences of negative and positive emotions in consumption (Oliver, 1993; Mano and Oliver, 1993; Mooradian and Olver, 1997).

### **2.3.1 Confirmation and positive/negative emotions**

Users can experience different emotions through the various stages of IS adoption process. Previous studies have shown that emotions may be determined by the confirmation of product or service

experienced (Mooradian and Olver, 1997). Confirmation is a cognitive evaluation after the adoption of an IS. According to Roseman's appraisal theory of emotion (1984), the appraisals of an IS can trigger specific reactions which has much to do with the amount of motivational consistency. In a sense, a user experiences specific emotional state (i.e. positive emotion and negative emotion respectively) when the appraisals of an IS that is either motive consistent (confirmation or positive disconfirmation) or motive inconsistent (negative disconfirmation). Bigne, Andereu, and Gnoth (2005) examined the effects of theme parks experience on guests. They found that positive emotions resulted from the positive disconfirmation of the experiences and vice versa. Other studies also found the similar results, including the works of Phillips and Baumgartne (2002) and Wirtz and Bateson (1999).

### **2.3.2 Emotions and cognitive beliefs**

Previous research have shown that emotions help direct attention toward experiences and initiate belief-forming processes (Goldberg et al., 1999; Weiner, 1985, 1986). In the case of IS adoption, (dis)confirmation of IS performance can trigger emotions, leading users to form beliefs about the IS. Davis (1989) pointed out that the principal concepts among the beliefs of adoption are perceived usefulness and perceived ease of use. Hence, confirmation or positive disconfirmation of IS experience may trigger positive emotions, directing users to recognize the IS as useful and/or ease of use.

On the contrary, negative disconfirmation of IS experience may elicit negative emotions, leading users to perceive the IS as not so useful and/or ease of use.

Prior research in consumer behavior have found that emotions played a critical role in determining the perceptions of company image and product attributes (Gountas and Gountas, 2007). Consumers perceived more positive company image and product attributes when they reported more positive emotions. On the other hand, more negative emotions caused more negative evaluation of company image and product attributes.

### 2.3.3 Emotions and satisfaction

Previous studies have found a

valence-congruent relationship between emotions and product or service satisfaction (Dube-Rioux, 1990; Oliver, 1993; Westbrook, 1987; Mooradian and Olver, 1997). Satisfaction is decreased by negative emotions and increased by positive emotions either in normal product usage or in response to a service failure. Results found similar effects include the work of Philips and Baumgartner (2002) on orange juice experiment, the work of Oliver (1993) on vehicles and course demand, and the work of Dube-Rioux (1990) on restaurant service.

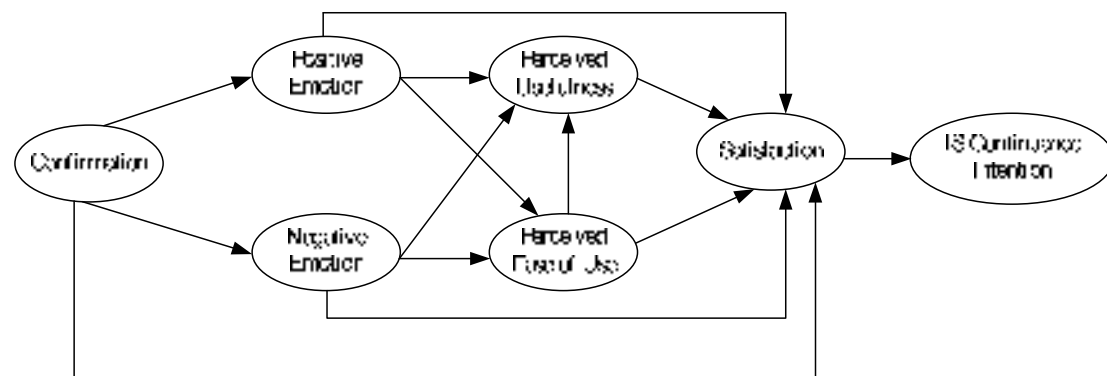


Figure 3. ECT-TAM-Emotion Model (Model 3)

## 3. Research method

### 3.1 Participants and the IS

According to the 2007 ARO Internet Survey Study of IX on Taiwan internet users, 88% of internet users have at least a junior college degree, with a mean age of 25, and 74% of them have at least one year of internet usage experience. Research subjects for the study were undergraduate students with a mean age of 23, and all have at least one year

internet usage experience, which fit quite well with the above mentioned internet user characteristics in Taiwan.

An anonymous questionnaire survey was conducted on a stratified sampling of college students. A total of 350 questionnaires were sent out. Of them, 20 were rejected which leaves 320 valid questionnaires. Research stimulus used for the IS is web portal system. The primary reason is that internet

usage has become a mundane necessity in everyday life. Web portals enable the users to acquire the desired information more efficiently. The 2007 ARO Internet Survey Study of IX on Taiwan internet users indicates that Yahoo! is the most popular and leading internet brand among internet users in Taiwan. Hence, Yahoo! was selected as the targeted IS for the study.

### **3.2 Construct measurement**

The scale items were taken from previous studies and modified to suit the context of the current study (see Appendix 1). IS continuance intention refers to user intention to continue using the IS (Mathieson, 1991). Satisfaction refers to user experience evaluation of an IS adoption. The measurement items developed by Spreng et al. (1996) were used. This paper adopted the conceptual definitions and measurement scales of perceived usefulness and perceived ease of use by Davis (1989). Perceived usefulness refers to the belief of increased performance for users adopting a certain system. Perceived ease of use refers to the user's belief of how difficult it is to use a certain system.

Within the context of IS usage behavior, emotions can be measured by the feelings of using IS. Positive emotions are induced when users experience feelings of joy and interest while negative emotions are formed when users experience feelings of anger, disgust, and contempt (Westbrook, 1987). DES scale developed by Izard (1977) was used to measure these two constructs.

Oliver and Linda (1981) defined pre-expectation as beliefs about the level of

product or service attributes. Pre-expectation can be operationalized as either individual beliefs or the summation of such beliefs. For the confirmation, the operational definition and measurement items developed by Oliver (1980) were used. Oliver (1980) defined confirmation as the objective judgment of consumers on the difference in experience of pre-expectation and actual experience.

### **3.3 Scale validation**

Structural equation modeling (SEM) was adopted to validate the instruments for unobserved constructs and test the research models. The reliability of measurement items was assessed by the internal consistency method. Cronbach's alpha provides a reasonable estimate of internal consistency. These values range from 0.83 to 0.95. All values surpass the recommended value of 0.6 or 0.7 (Nunnally, 1978). The details of the reliability test are shown in Table 1.

Table 1  
Confirmatory Factor Analysis Results

Construct measurement	Mean	Standard deviation	Factor loadings	Composite reliability	AVE
IS continuance intention				0.99	0.93
CITI1	5.65	1.29	0.95		
CITI2	5.61	1.18	0.95		
CITI3	5.68	1.20	0.99		
Satisfaction				0.92	0.79
SAT1	5.54	1.24	0.97		
SAT2	5.45	1.22	0.95		
SAT3	5.14	1.23	0.74		
Perceived Usefulness				0.93	0.77
PU1	5.27	1.27	0.79		
PU2	5.25	1.22	0.84		
PU3	5.45	1.15	0.92		
PU4	5.47	1.13	0.96		
Perceived ease of use				0.95	0.82
PEU1	5.52	1.13	0.90		
PEU2	5.37	1.19	0.87		
PEU3	5.67	1.13	0.90		
PEU4	5.47	1.13	0.93		
Positive emotion				0.95	0.90
PE1	5.05	1.19	0.93		
PE2	5.00	1.15	0.97		
Negative emotion				0.95	0.86
NE1	2.68	1.30	0.89		
NE2	2.53	1.25	0.95		
NE3	2.44	1.29	0.93		
Pre-expectation				0.97	0.88
EXP1	5.39	1.08	0.91		
EXP2	5.31	1.10	0.91		
EXP3	5.56	1.28	0.95		
EXP4	5.47	1.07	0.97		
Confirmation				0.93	0.83
CON1	5.09	1.16	0.86		
CON2	5.18	1.24	0.95		
CON3	4.95	1.28	0.91		

Convergent validity was also assessed. Convergent validity of research instruments is commonly estimated by assessing item reliability, construct reliability, and average

variance extracted (AVE)(Fornell and Larcker, 1981). All constructs exceed the recommended level of construct reliability 0.80 and AVE 0.5 (Chau, 1997). The details



of the convergent validity test in Table 1 show that these results provide support for the convergent validity.

Discriminant validity can be checked by comparing the squared correlation between two constructs with their average variances extracted. Discriminant validity is

demonstrated if the AVE of both constructs are greater than the squared correlation (Chau, 1997). The test results indicate that the discriminant validities between constructs are within the criteria. The details are shown in Table 2.

Table 2  
AVE and Shared Variances

	CITI	SAT	PU	PEU	PE	NE	EXP	CON
CITI	0.93							
SAT	0.86	0.79						
PU	0.73	0.75	0.77					
PEU	0.74	0.74	0.85	0.82				
PE	0.40	0.45	0.45	0.44	0.90			
NE	-0.41	-0.42	-0.41	0.43	0.53	0.86		
EXP	0.76	0.77	0.69	0.69	0.47	-0.44	0.88	
CON	0.58	0.64	0.75	0.73	0.53	0.38	0.77	0.83

#### 4. Data analysis and results

Structural equation modeling (SEM) analysis was employed using LISREL 8.50 to assess the three prospective continued IS usage models. SEM has been suggested not only as being appropriate for comparing alternative models (Joreskog and Sorbom, 1993; Taylor and Todd, 1995), but also as being useful for examining theoretically justified models such as the three

prospective models in this study (Bagozzi and Yi, 1988; Bentler, 1989). The maximum likelihood estimation (MLE) was used to estimate variables.

The same set of fit indices was used to examine the fit of the three structural models. All indices correspond with their recommended values commonly suggested in prior literature (Chau, 1997), exhibiting a good fit with data gathered (see Table 3).

Table 3  
Summary of Fit Indices

Fit indices	Recommended value	Model 1	Model 2	Model 3
$\chi^2/df$	<5	3.31	4.23	3.91
GFI	$\geq 0.90$	0.91	0.89	0.90
AGFI	$\geq 0.80$	0.87	0.80	0.85
NFI	$\geq 0.90$	0.97	0.94	0.96

NNFI	$\geq 0.90$	0.97	0.94	0.95
CFI	$\geq 0.90$	0.98	0.95	0.97
RMSR	$\leq 0.10$	0.04	0.04	0.06
RMSEA	$\leq 0.08$	0.06	0.07	0.06

The path coefficients indicate the strengths of the relationships between the dependent and independent variables. R<sup>2</sup> values represent the amount of variance explained by the independent variables. Figures 4-6 show the results of the three structural models.

**Model 1:**

For the Model 1, all the indices suggested a good fit (GFI=0.91, AGFI=0.87, NFI=0.97, NNFI=0.97, CFI=0.98, RMSR=0.04, RMSEA=0.06). Figure 4 shows that all the causal relationships were supported except the impact of confirmation on satisfaction. IS continuance intention was determined by user satisfaction. The paths from pre-expectation to confirmation and satisfaction were both significant. The model explained 91% of the variance in IS continuance intention, 68% of the variance in user satisfaction, and 66% of the variance in confirmation.

**Model 2:**

The structural model 2 also showed an adequate fit (GFI=0.89, AGFI=0.80, NFI=0.94, NNFI=0.94, CFI=0.95, RMSR=0.04, RMSEA=0.07). As shown in Figure 5, all the paths among variables were

significant, except the path between confirmation and satisfaction. The model accounted for 91% of the variance in IS continuance intentions, 69% of the variance in user satisfaction, 88% of the variance in perceived usefulness, and 61% of the variance in perceived ease of use. Perceived usefulness was the stronger determinant of user satisfaction than perceived ease of use.

**Model 3:**

Table 3 also presents the results of model 3 with the fit indices providing support for a good model fit (GFI=0.90, AGFI=0.85, NFI=0.96, NNFI=0.95, CFI=0.97, RMSR=0.06, RMSEA=0.06). Figure 6 shows salient relationships among variables, except the path between confirmation and satisfaction. R<sup>2</sup> values range from 0.33 (negative emotion) to 0.91 (IS continuance intention). The effect of the newly added positive emotion and negative emotion were salient. Positive emotion had direct positive effect on perceived usefulness, perceived ease of use, and satisfaction. Negative emotion had negative impact on perceived ease of use and satisfaction. Also, a weak and positive effect on perceived usefulness was observed.

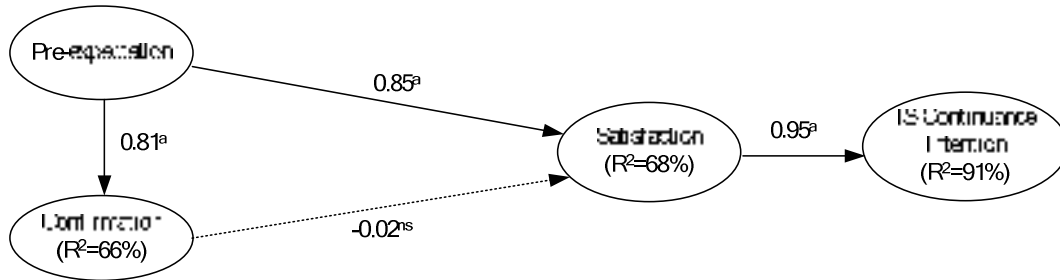


Figure 4: Model 1: ECTM (<sup>a</sup> $p < 0.001$ ; <sup>b</sup> $p < 0.01$ ; <sup>ns</sup> $p > 0.05$ )

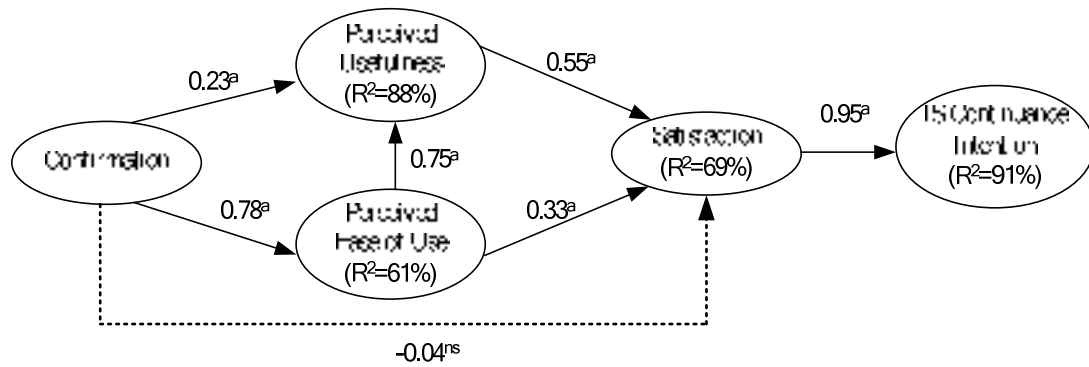


Figure 5: Model 2: ECT-TAM Model (<sup>a</sup> $p < 0.001$ ; <sup>b</sup> $p < 0.01$ ; <sup>ns</sup> $p > 0.05$ )

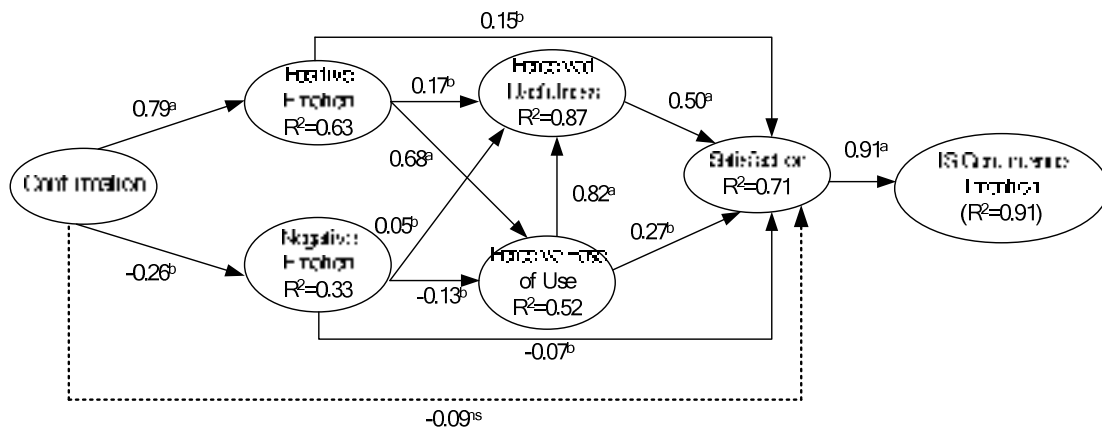


Figure 6: Model 3: ECT-TAM-Emotion (<sup>a</sup> $p < 0.001$ ; <sup>b</sup> $p < 0.01$ ; <sup>ns</sup> $p > 0.05$ )

## 5. Discussion

The objective of the current study was to compare the relative explanatory power of three prospective models of IS continuance intention: (1) Model 1: ECTM, (2) Model 2: ECT-TAM Model, and (3) Model 3:

ECT-TAM-Emotion Model. Overall, all three models demonstrated adequate fit with the data. Further, all the causal relationships in these models, except for confirmation to satisfaction, were found to be significant. We discuss some interesting results below.

One of the most interesting finding was that all three models are shown to have good fit to the data. In terms of explanatory power, each of them accounted for the same variance in user intention to IS continuance intention ( $R^2=91\%$ ). Our result implies that ECT, which was originally proposed in the marketing literature to understand consumers' attitude toward product satisfaction and subsequent intention, can still extend its application to the understanding of continued IS usage behavior.

As for the explanatory power of satisfaction, Model 3 ( $R^2=71\%$ ) has a stronger predictive power than Model 2 (69%) and Model 1 (68%). This result confirms the erstwhile discussion of customer repurchase behavior in which adding emotion factors to the cognitive process model will enhance the predictive power of the satisfaction (Bigne, Andrew and Gonth, 2005; Westbrook, 1987; and Westbrook and Oliver, 1991).

The path from confirmation to user satisfaction was not significant across the three models. However, the paths from perceived usefulness and perceived ease of use to user satisfaction were significant in Model 2 and Model 3. The result provides a good explanation why confirmation of the usage experience may not lead to user satisfaction. Perceived usefulness and perceived ease of use are the cognitive appraisal of how the IS will help the user to fulfill a task, not just the pre-expectation on the IS. Consistent with the findings of Hong et al. (2006), the result suggests that TAM

can be extended its application to advance the understanding of IS continued usage behavior.

This study found strong influence of perceived usefulness on user satisfaction in both Model 2 and Model 3. Given the fact that the path from perceived usefulness to satisfaction has been shown to be consistently strong over time in previous adoption research, the effect of perceived usefulness on satisfaction is understandable.

As proposed in Model 3, confirmation significantly associated with both positive emotion and negative emotion supporting both the theory of cognitive appraisal of emotion (Roseman, 1984) and previous study (Mooradian and Olver, 1997). Past research linking emotion and satisfaction found that product satisfaction is decreased by negative emotion and increased by positive emotion (e.g., Oliver and Swan, 1989; Mano and Oliver, 1993; Mooradian and Olver, 1997). The results of our study were consistent with past results.

The result shows that positive emotions lead to increased levels of perceived usefulness, perceived ease of use, and user satisfaction than negative emotions for the same IS, indicating that users appraise more positively in perceived ease of use, perceived ease of use, and satisfaction when they are in good mood. Perceived usefulness and perceived ease of use predict the level of user satisfaction with IS better than emotions, suggesting that these two variables mediate the effect of emotions on satisfaction.

As a conclusion, cognitive evaluation after

the use of IS produces the (dis)confirmation. Users' appraisal of the situational state (i.e. confirmation or disconfirmation) elicits positive and negative emotions. Positive emotions lead to increased cognitive load in working memory, and, hence, users might perceive the IS more useful and ease of use. Higher level of perceived usefulness and perceived ease of use will elevate the level of satisfaction, which in turn produces higher level of IS continuance intention.

### 5.1 Implications

On a practical level, according the findings of this study, IS providers must take into account all the three aspects of emotions, cognitive beliefs (perceived usefulness and perceived ease of use), and satisfaction. They should design the IS that can exceed users' expectations and hence trigger users' positive emotional responses and minimize their negative emotions. This in turn will make the system appear useful and more ease-of-use and ensure user satisfaction with IS adoption. Satisfaction then leads to increase the continuance intention to use the IS. Avoiding users to have negative emotions with IS is very important since negative emotions trigger users feel less ease-of-use of the system and less satisfaction with the system.

On a theoretical level, the present study contributes to the body of knowledge of IS continuance intention by integrating the emotion, cognition, and satisfaction in a model and compare the model to cognition-based models. The introduction of the emotion as the post-adoption behavior presents opportunities for further studies that

can contribute to the understanding of users' post adoption behavior.

### 5.2 Limitations and future research

One limitation originates in the biases inherent in most research. The current study only considers web portal site as the stimuli and hence we should be cautious about the generalization of the results. However, while this limitation is noted, it should not undermine the results because the increasing use of Windows-based interfaces systems.

More research is needed to further validate and compare the models with a population of a different type of IS users. It will be interesting to know if the models can hold across different IS and IS users. Introducing moderating effects of user characteristics is also another way to further the knowledge. Mooradian and Oliver (1997) noted that there exists a relationship between personality, emotions, cognition, and satisfaction. Users who are more extrovert are more likely to have positive emotions toward adopting IS and hence are more like to be satisfied.

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## **Appendix A. Measurement Indicators**

### **A.1. Continued IT usage intention (Strongly disagree ... Strongly agree)**

- CIT1 I intend to continue using PORTAL SITE rather than discontinue it use.
- CIT12 My intentions are to continue using PORTAL SITE than use any alternative means.
- CIT13 If I could, I would like to continue using PORTAL SITE as much as possible.

### **A.2. Satisfaction (7-point semantic differential scale)**

How do you feel about your overall experience of PORTAL SITE use?

- SAT1 Very dissatisfied/Very satisfied.
- SAT2 Very displeased/Very pleased.
- SAT3 Very frustrated/Very contented.
- SAT4 Absolutely terrible/Absolutely delighted.

### **A.3. Perceived usefulness (Strongly disagree ... Strongly agree)**

- PU1 Using PORTAL SITE enhances my effectiveness.
- PU2 Using PORTAL SITE increases my productivity.
- PU3 Using PORTAL SITE improves my performance.
- PU4 Overall, PORTAL SITE is useful in searching information.

### **A.4. Perceived ease of use (Strongly disagree ... Strongly agree)**

- PEU1 Learning to use PORAL SITE is easy for me.
- PEU2 My interaction with PORTAL SITE is clear and understandable.
- PEU3 I believe it is easy to get the PORTAL SITE to do what I want it to do.
- PEU4 Overall I believe PORTAL SITE would be easy to use.

### **A.5. Positive emotion (Strongly disagree ... Strongly agree)**

- PE1 Whenever I use the PORTAL SITE, I always feel interest.
- PE2 Whenever I use the PORTAL SITE, I always feel joy.

### **A.6. Negative emotion**

- NE1 Whenever I use the PORTAL SITE, I always feel anger.
- NE2 Whenever I use the PORTAL SITE, I always feel disgust.

NE3 Whenever I use the PORTAL SITE, I always feel contempt.

### **A.7. Expectation**

EXP1 Using PORTAL SITE will help me learn new knowledge and skill.

EXP2 Using PORTAL SITE will help me get better performance in class or job.

EXP3 PORTAL SITE will provide me flexibility to learn new knowledge on my own time.

EXP4 PORTAL SITE will give the ability to learn new knowledge.

### **A.8. Confirmation**

CON1 My experience with using PORTAL SITE was better than what I expected.

CON2 The service level provided by PORTAL SITE was better than what I expected.

CON3 Overall, most of my expectations from using PORTAL SITE were confirmed.