



RESEARCH ARTICLE

# A unified model of IT continuance: three complementary perspectives and crossover effects

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## Abstract

This study presents a unified model of information technology (IT) continuance, by drawing upon three alternative influences that are presumed to shape continuance behavior: reasoned action, experiential response, and habitual response. Using a longitudinal survey of workplace IT continuance among insurance agents at a large insurance company in Taiwan, we demonstrate that the above influences are interdependent, complementary, and have crossover effects. This study advances IT continuance research by theorizing and validating a unifying model that extends prior perspectives and by explaining interrelationships between these perspectives.

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## Introduction

Over the last decade, information technology (IT) continuance has emerged as a prominent area of information systems research. IT continuance refers to long-term or sustained use of an IT by individual users over a period of time (Bhattacharjee, 2001). A given IT cannot be considered successful if its usage is not sustained by users who are expected to benefit from its usage. However, to date, there exists very few theories of IT continuance, compared, for instance, with theories of IT acceptance (first-time use), such as innovation diffusion theory, technology acceptance model (TAM), theory of planned behavior (TPB), social cognitive theory, and the unified theory of technology adoption and use (UTAUT) (see Venkatesh *et al*, 2003 for a summary).

IT acceptance and continuance are conceptually and temporally distinct behaviors, in that continuance can occur only after acceptance (first-time use). However, IT continuance research has largely followed the same theoretical trajectory as that of IT acceptance (Ortiz de Guinea & Markus, 2009). A common underlying premise in these studies is that continued IT use is fundamentally an intentional or purposeful behavior, that is, based on users' conscious or planned decisions to act in a certain way. These decisions are presumed to involve two inputs: (1) expectations of benefits from future usage, such as the usefulness of the IT in task performance, and (2) summative judgments of the outcomes of prior usage, as captured in the user satisfaction construct, as embodied in the expectation-confirmation model (ECM) of IT continuance (Bhattacharjee, 2001). However, recent research indicates that some continued IT usage may be habitual, that is, based on repeated behavioral sequences that are automatically triggered by

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environmental cues (Kim & Malhotra, 2005; Limayem *et al.*, 2007), rather than purposeful behaviors. Other research suggests that IT continuance may be based on affective or emotional reactions such as cognitive absorption or satisfaction (Agarwal & Karahanna, 2000). However, to the best of our knowledge, no empirical research has examined the role of these alternative influences of IT continuance, explored potential interdependencies between these rival explanations, or integrated them into a unified and comprehensive theory of IT continuance.

While ECM has been a reasonable start, as research builds in this area, we believe that it is important to consider alternative theoretical perspectives to provide for an improved explanation of IT continuance. As Poole & Van de Ven (1989) state, leveraging theoretical tensions between different theoretical perspectives can 'stimulate the development of more encompassing theories' (p. 563). Such model comparison and unification has helped advance our understanding of research on IT acceptance (e.g., Venkatesh *et al.*, 2003) and software project escalation (Keil *et al.*, 2000). Extending Ortiz de Guinea & Markus' (2009) call, this paper theorizes three alternative influences presumed to influence IT continuance, namely, reasoned action, experiential response, and habitual response, and then empirically tests the proposed model using a field survey of insurance agents at a large financial holding company. The research questions explored in this paper are: (1) What are the salient drivers of IT continuance? and (2) How do these drivers influence each other and continuance behavior?

This study makes several contributions to the IT continuance literature. First, it clarifies, disentangles, and integrates different mechanisms or paths that can shape IT continuance behavior. Second, this study helps place prior findings and resolve conflicting findings in IT continuance research within a broader theoretical perspective by helping us see the forest (IT continuance research as a whole) from the trees (individual studies). Third, this study postulates a unified model of IT continuance that can help guide and inform future research in this area. As such, our proposed model may possibly be the first attempt to elaborate and extend upon ECM (Bhattacharjee, 2001), which has served as the primary theoretical basis of IT continuance research for over a decade.

The rest of this paper proceeds as follows. The next section describes three alternative explanations of IS continuance behavior, and attempts to reconcile and integrate these explanations into a single theoretical model. The third section describes our research methods for empirically testing our proposed model. The fourth section describes our data analytic procedures and results. The fifth section discusses the study's limitations and its implications for future research and practice.

## Theory and hypotheses

Following an extensive review of the literature, Ortiz de Guinea & Markus (2009) suggest that IT continuance is

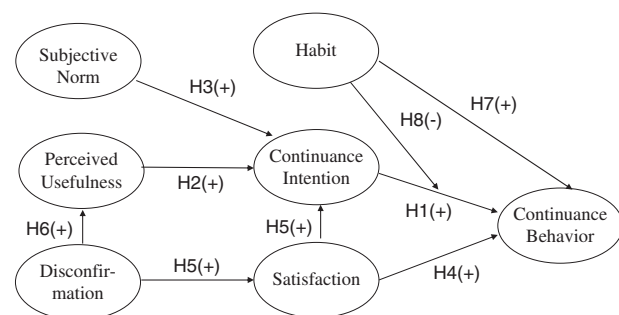
driven fundamentally by three rival explanations: rational choice (or reasoned action), emotions, and habits. This section examines each of these explanations, explores the extent to which they overlap or complement each other, and synthesizes them to postulate an integrated model of IT continuance. Our overall research model is shown in Figure 1.

### Reasoned action

Research on social psychology, such as the theory of reasoned action (TRA) (Fishbein & Ajzen, 1975) and the TPB (Ajzen, 1991), has long espoused that individual behavior is based on reasoned and planned action resulting from and consistent with people's conscious intentions regarding that behavior. Such reasoned action is also at the heart of IT acceptance models, such as TAM and UTAUT. Numerous empirical studies conducted within different IT usage settings confirm that users' intention to use IT is indeed the most influential determinant of their IT usage behavior (e.g., Sheppard *et al.*, 1988). In the IT continuance context, rational users are more likely to continue using a given IT if they have positive intentions of IT continuance. This expectation leads to our first hypothesis:

**H1:** *Users' IT continuance behavior is positively influenced by their intention to continue IT usage.*

A key question in IT continuance research is what factors drive user' IT continuance intentions (CIs). Social psychology theories, such as TRA and TPB, contend that intentions are derived from personal beliefs and attitudes regarding the behavior in question. In the IT usage context, two attitudinal beliefs are presumed to be the most salient in shaping user intentions toward usage, namely, perceived usefulness and perceived ease of use (Davis, 1989), alternatively called performance expectancy and effort expectancy, respectively (Venkatesh *et al.*, 2003). Perceived usefulness is the extent to which individuals believe that using a particular IT will enhance their job performance, and perceived ease of use is the extent to which users believe that learning how to use an IT or actually using it will be relatively free of effort (Davis, 1989). The expectation is that technologies that are perceived by users as being useful and easy to use are more



**Figure 1** Research model.

likely to result in positive user intentions regarding their usage.

While both perceived usefulness and perceived ease of use have been validated as salient antecedents of IT acceptance intentions, IT continuance research has shown that the effect of perceived ease of use tend to 'wear out' over time, as users become increasingly familiar and acclimatized with IT usage (Karahanna *et al*, 1999; Bhattacharjee, 2001). The rationale is that using an IT for the first time requires overcoming significant learning barriers on the part of potential users, and hence IT that are viewed as being substantially difficult to use are less likely to be accepted by wary users. However, once that learning barrier is overcome, subsequent usage is not constrained by high learning barriers, and hence, perceived ease of use is no longer salient to IT CIs. In contrast, perceived usefulness has a continued effect on users' IT CI because users are unlikely to continue IT use unless the IT benefits them in their future work. This pattern of effects is supported by empirical research in IT acceptance and continuance, particularly for utilitarian technologies (e.g., Karahanna *et al*, 1999; Bhattacharjee, 2001; Venkatesh *et al*, 2003). Hence, we propose:

**H2:** *Users' IT continuance intention is positively influenced by their perceived usefulness of continued IT usage.*

TRA and TPB also suggest that normative influences from peers or referent others, such as friends, peers, or colleagues at work, shape one's intentions toward a given behavior. These normative influences are represented using the subjective norm construct, defined as the degree to which individuals believe that people who are important to them think they should perform the behavior in question (Fishbein & Ajzen, 1975). In IT continuance context, this implies that users are likely to develop positive intentions toward IT continuance if they believe that their key referent others will approve of their continued IT usage, and negative intentions if they expect disapproval from these referents. Hence, we hypothesize:

**H3:** *Users' IT continuance intention is positively influenced by their subjective norm toward continued IT usage.*

### Experiential response and emotions

Though IT usage research has focused primarily on cognition-oriented rational models, Ortiz de Guinea & Markus (2009) contend that IT continuance behaviors are also shaped by emotive concepts such as satisfaction. Satisfaction is an affective response derived from prior IT usage experiences, and can therefore be viewed as an experiential response to IT usage. Satisfaction is irrelevant to IT acceptance given the lack of IT experience before acceptance. However, in continuance contexts, satisfaction with prior usage as the primary antecedent of IT continuance perhaps becomes more dominant than perceived usefulness, because users tend to ascribe more faith in their actual experiences (as captured by satisfaction) than in relatively

unknown future expectations (Bhattacharjee, 2001). Satisfied users tend to continue using an IT, while dissatisfied users tend to discontinue IT usage and/or switch to alternative IT.

However, exactly how satisfaction influences continuance remains unclear. ECM indicates that satisfaction influences IT continuance behavior via users' behavioral intentions, but subsequent research suggests that satisfaction may have a direct effect on behavior, without necessarily being mediated by intention (Ortiz de Guinea & Markus, 2009). Kim & Malhotra (2005) support the mediated model by suggesting that IT acceptance behavior is driven by intentions because the linkage between stimuli and action (i.e., the potential outcomes of IT usage) is not fully known before use, but in the case of IT continuance, when the linkage between stimuli and action is established, users are less likely to invest cognitive resources toward active processing of intentions, and rely on a more efficient, affective stimuli-based response, such as satisfaction.

In contrast, Ortiz de Guinea & Markus (2009) suggest that emotions such as satisfaction may drive IT usage directly without necessarily being mediated through behavioral intentions. Drawing upon psychology research, they claim, '(1) that the connection between emotion and behavior can occur without a person being consciously aware of the connection, and (2) that the effect of emotion may not be to create a particular behavioral intention, but rather to derail a previously formed behavioral intention about continuing IT use' (p. 438). When emotions conflict with consciously reasoned intentions, Scheier & Carver (1982) note, '[e]motion causes an interruption of ongoing processing, and calls for the rearrangement of goal priorities ... if the emotion becomes sufficiently intense, overall self-regulation may adjust in such a way that the level at which the emotion is being experienced temporarily becomes super-ordinate .... As attention is focused at the lower level, the person behaves single-mindedly and stereotypically, in a fashion that is dictated by the emotion' (pp. 177-178), supporting a super-ordinate role of emotion over reasoned behavior. Empirical research shows that satisfaction may have both a direct effect and a mediated effect (by intention) on IT continuance behavior (Doong & Lai, 2008). In light of the above theoretical expectations and empirical support for both the direct and mediated effects, we postulate:

**H4:** *Users' IT continuance behavior is positively influenced by their satisfaction with prior IT usage.*

**H5:** *Users' IT continuance intention is positively influenced by their satisfaction with prior IT usage.*

What are the antecedents of user satisfaction with IT usage? The ECM describes satisfaction as the overall emotive state resulting from users' disconfirmation of expectations from prior IT usage experiences (Bhattacharjee, 2001). According to this model, feelings of satisfaction arise when people compare their pre-usage expectations (such as perceived usefulness) with IT performance during actual usage. If perceived performance exceeds initial expectations then

users realize positive disconfirmation and satisfaction. But if perceived performance falls short of expectations then expectations are negatively disconfirmed and users are dissatisfied. Consumer behavior research (see Yi, 1990) and a growing body of IT continuance research (e.g., Bhattacharjee, 2001) provide empirical support for these associations. Hence, we hypothesize:

**H6:** *User satisfaction with prior IT usage is positively influenced by the disconfirmation of their expectations from prior IT usage.*

Bhattacharjee (2001) argues that the effects of pre-usage expectations and perceived performance on satisfaction are fully mediated by disconfirmation, and consequently redundant. Indeed, disconfirmation is measured as a difference score or a perceived difference between pre-usage expectations and performance. Including these constructs may help explain how users form disconfirmation judgments, but offer little explanation for satisfaction, and are therefore excluded from our research model. However, pre-usage expectations may be modified over time as users learn about the IT from their first-hand experience. For example, if their initial expectation is negatively disconfirmed, they may tone down their future expectations, which may influence future CI. Pre-usage expectations are often based on second-hand information, such as vendor claims or industry reports, and tend to be weaker and more unstable than post-usage expectations based on users' own first-hand usage experience. Hence, the disconfirmation process is not only central to the formation of satisfaction, but also to the formation of post-usage expectations. Since the primary expectation that drive IT usage behaviors is perceived usefulness, we hypothesize:

**H6:** *Users' perceived usefulness of IT continuance is positively influenced by their disconfirmation of expectations from prior IT usage.*

### Habitual response

Prior IT usage research indicates that much of continued IT use is habitual (Limayem & Hirt, 2003; Limayem *et al*, 2007). Habits is defined as 'a well-learned action sequence, originally intentional, that may be repeated as it was learned without conscious intention, when triggered by environmental cues in a stable context' (Ortiz de Guinea & Markus, 2009, p. 437). When IT use is habitual, it ceases to be guided by conscious planning and is instead triggered by specific environmental cues in an unthinking or automatic manner. Although the habits literature provide very little guidance on what environmental cues trigger habitual responses, Ortiz de Guinea & Markus (2009) contend that the mere presence of a specific task where a given IT was previously used may be a salient cue that can trigger habitual IT usage. The relative role of habitual response *vis-à-vis* reasoned action at different phases of IT usage is elaborated by Japerson *et al* (2005) as 'During initial use of an IT feature, individuals most likely engage in active

cognitive processing in determining post-adoptive intention or behavior, however, with any repetitive behavior, reflective cognitive processing dissipates over time, leading to non-reflective, routinized behavior' (p. 528).

Though habits are known to influence IT continuance behavior, the nomological path by which such influence occurs is unclear. Some studies suggest that habit directly influence continued IT use (e.g., Limayem & Hirt, 2003; Kim & Malhotra, 2005), others suggest that its effect on continued usage is mediated by IT CIs (e.g., Gefen, 2003), and still others suggest that habit moderates the impact of intentions on continued use (e.g., Kim & Malhotra, 2005; Limayem *et al*, 2007). Among these various options, the mediated effect is least consistent with the referent social psychology literature (e.g., Ouellette & Wood, 1998; Verplanken, 2006), which portrays habit as an alternative to reasoned action, rather than as adding to reasoned action. For instance, Wood *et al* (2002) say, 'People engaged in habitual actions do not consciously access habit intentions, either because they do not need to do so in order to repeat well-learned intentional responses or because the behavior was not intended to begin with' (p. 1283). Likewise, Ortiz de Guinea & Markus (2009) state, 'When intentional behavior becomes habitual, learned IT use behaviors may be repeated without conscious intention' (p. 437).

However, there are reasons to believe that habit may not only directly influence IT continuance behavior, but also moderate the relationship between CI and behavior. Limayem *et al* (2007) note, 'If individuals are habitually performing a particular behavior (for example, using a particular IS), the predictive power of intentions is weakened. Thus the more a behavior is performed out of habit, the less cognitive planning it involves' (p. 720), suggesting a moderating effect of negative valence. In light of the above expectations, we hypothesize:

**H7:** *Users' IT continuance behavior is positively influenced by their habit regarding IT usage.*

**H8:** *The relationship between users IT continuance intention and continuance behavior is negatively moderated by their habit regarding IT usage.*

The hypotheses described above not only present three alternative mechanisms shaping IT continuance – reasoned action, experiential response, and habitual response – but also suggest intricate interdependencies among these three paths. Each of these mechanisms reflects a distinct theoretical tradition: intention-based models, expectation-disconfirmation model, and theory of habits. These theories are complementary, in that they attempt to explain the same behavior from different perspectives. Yet, they are interdependent, in that there appears to be significant crossover effects between these theories, such as habits and ECM constructs are seen to influencing cognitions salient to reasoned action via direct or moderating effects. Hence, our research model depicted in Figure 1 is an attempt to elaborate and extend current continuance research by bridging together relevant and related

concepts from diverse theoretical perspectives and synthesizing them into an integrated model.

## Methods

### Empirical setting and subjects

Our research model was empirically tested using a survey of insurance agents at one of the five largest life insurance companies in Taiwan (with over 4000 employees). The insurance industry has traditionally been heavily reliant on IT, and hence this population was ideally suited for studying IT continuance. Eleven offices of this insurance company in Taipei, each with over 100 employees, were recruited for data collection, using our personal contacts with senior managers at the corporate headquarters. Managers at each office helped distribute the questionnaires to their employees. Participating agents received a gift voucher of NTD (New Taiwan Dollars) 100 as an incentive for their participation.

The target IT we examined was the primary work system used by insurance agents to process new member enrollment, claims requests, and billing of premiums, and perform other work-related tasks. Although agents were generally expected to use this system for their work, its usage was voluntary, in that agents who did not want to use it or found it difficult to use (especially new hires) could complete the necessary documentation on paper and forward it to office staff for entering into the system.

Subjects at our study sites received two survey questionnaires, spaced 1 month apart, along with a letter from the corporate office explaining the nature and purpose of this research and the importance of their participation. The first questionnaire asked subjects to identify their perceptions regarding the different constructs of interest in our study, and the second questionnaire, distributed 1 month later, measured their continued usage behavior. The two questionnaires were matched using a unique identifying code to create a longitudinal continuance profile for subjects' IT continuance process. Prior research recommends a gap of 1 month between perception and usage measurement (Teng *et al*, 2002; Lin & Bhattacharjee, 2009), since a longer gap may be moderated by factors beyond the researcher's control, and a shorter gap may not give adequate time for subjects to process their perceptions and use the targeted system.

Of the 600 questionnaires distributed to the subjects in 2 waves, 514 matched questionnaires were returned for a response rate of 86%. The high response rate may be attributable to the first-hand support and involvement of senior managers in our data collection effort and the incentive provided to subjects. Our sample consisted of 209 males (41%) and 305 females (59%), with 370 subjects holding a bachelor's degree or higher (72%) and 432 subjects with tenure in this firm for 1 year or longer (84%). Subjects' tenure was important because we were interested in understanding the continued behavior of those users who have been using a given IT system for a period of time.

### Operationalization of constructs

All constructs were measured by scales drawn and modified from previous literature, wherever possible from within the IT usage domain. Measurement items are listed in the Appendix A. Perceived usefulness was measured using Davis' (1989) four-item scale that has been extensively validated in the literature. Three of these items measured subjects' expectations of improvements in performance, productivity, and effectiveness from IT usage, while the fourth item measured overall usefulness perceptions. Subjective norm was measured using Venkatesh & Morris' (2000) three-item scale that examined the extent to which subjects believed that their coworkers, supervisors, and clients believed that they should use the system. CI was measured using Bhattacharjee's (2001) three-item scale that examined the extent to which subjects expected to continue using the system rather than discontinue its use. All of the above items were measured using a five-point Likert scale anchored between 'strongly disagree' to 'strongly agree'.

Satisfaction was measured using a four-item semantic differential scale adapted from Bhattacharjee (2001), since semantic scales are believed to be most effective in capturing affect or emotion such as satisfaction. The four items of this scale requested subjects to rate their overall IT usage experience between four adjective pairs: very dissatisfied – very satisfied, very displeased – very pleased, very frustrated – very contented, and absolutely terrible – absolutely delighted. Disconfirmation was measured using four Likert-scaled items taken from Bhattacharjee & Premkumar (2004) that asked subjects the extent to which their prior IT usage experience was better than their initial expectations of such usage. Habit was measured using Limayem *et al's* (2007) four-item measure that asked the extent to which subjects thought that using the system was automatic or natural or obvious to them, and to what extent they used it in a habitual manner.

Finally, IT continuance behavior was measured 1 month later using three items based on Limayem *et al* (2007) and Lin & Bhattacharjee's (2008) measures. In these items, subjects were asked to self-rate on a ten-point scale, what percentage of their clients and their workload they performed using the IT system, and what percentage of their working hours was spent using the system. Self-rated perceptual measures were employed for measuring behavior because server-based objective usage metrics were not available at our study site.

Original scale items, designed in English, were translated into the Chinese language for administration to our Taiwanese subjects by a university professor and several graduate students familiar with research methods. An external scholar, not affiliated with this study, was asked to translate back the Chinese scale items into corresponding English scales. A high degree of correspondence between the original English scales and those back-translated from Chinese assured that the translation process did not introduce any significant translation biases in our Chinese-language questionnaire.

The questionnaire was evaluated in two pilot tests using insurance agents at a different insurance company in the same city. Subjects were asked to fill out the survey questionnaire and identify any item in the questionnaire that they found confusing. The identified items were reexamined and modified to improve their readability and understandability. Pilot test data were analyzed using exploratory factor analysis with Varimax rotation. Items that loaded poorly on their hypothesized scales were reworded or dropped. This process of instrument refinement led to considerable improvement in construct validity and reliability for our measurement scales. Pilot test responses were excluded from our larger hypotheses testing survey.

### Data analysis and results

The final survey data were analyzed via a two-step structural equation modeling (SEM) approach suggested by Anderson & Gerbing (1988). The first step employed confirmatory factor analysis (CFA) for assessing scale reliability and validity, and the second step examined the structural model for empirically testing our proposed hypotheses. Results from these two steps are described next.

### Measurement modeling

For CFA analysis, the scale items corresponding to our eight constructs were modeled as reflective indicators for their corresponding constructs. The goodness-of-fit of the overall CFA model was examined using several fit metrics, as shown in Table 1. The normalized  $\chi^2$  ( $\chi^2$ /degrees of freedom) of the CFA model was smaller than the recommended value of 3.0, the RMR was smaller than 0.05, and the RMSEA was smaller than 0.08. Furthermore, CFI, GFI, NFI, and NNFI were all larger than or equal to 0.9, the minimum value recommended for good model fit. Overall, these figures suggest that the hypothesized CFA model of this study appropriately fits the empirical data.

Convergent validity was assessed using three criteria suggested by Fornell & Larcker (1981): (1) all CFA loadings were significant at  $P < 0.01$ ; (2) Cronbach's  $\alpha$  values of each construct exceeded 0.80, assuring construct reliability; (3) the average variance extracted (AVE) of each construct exceeded 0.50, indicating that measurement items for each construct captured more variance in the underlying construct than measurement error (see Table 1). The three criteria jointly assured convergent validity of constructs in our study.

For discriminant validity, we compared the square root of AVE for each in our CFA model (the principal diagonal elements in Table 2) with inter-factor correlations. The smallest square of 0.78 (for CI) was larger than the largest inter-factor correlation of 0.55, assuring discriminant validity of our observed data.

### Hypotheses testing

The seven main effects in our study (Hypotheses H1–H7) were tested using the SEM approach. Since SEM analysis is

**Table 1 Standardized loadings and reliabilities**

Construct	Indicators	Standardized loading	AVE	Cronbach's $\alpha$
Continuance behavior	CB1	0.81 ( $t = 21.76$ )	0.79	0.91
	CB2	0.88 ( $t = 24.40$ )		
	CB3	0.97 ( $t = 29.10$ )		
Satisfaction	ST1	0.89 ( $t = 25.34$ )	0.79	0.93
	ST2	0.88 ( $t = 24.68$ )		
	ST3	0.90 ( $t = 25.69$ )		
	ST4	0.88 ( $t = 24.82$ )		
CI	CI1	0.84 ( $t = 21.12$ )	0.61	0.81
	CI2	0.81 ( $t = 20.25$ )		
	CI3	0.68 ( $t = 16.09$ )		
Habit	HA1	0.91 ( $t = 26.28$ )	0.79	0.91
	HA2	0.94 ( $t = 27.82$ )		
	HA3	0.82 ( $t = 22.38$ )		
	HA4	0.89 ( $t = 25.43$ )		
Disconfirmation	DC1	0.90 ( $t = 25.69$ )	0.79	0.93
	DC2	0.91 ( $t = 26.43$ )		
	DC3	0.88 ( $t = 24.61$ )		
	DC4	0.87 ( $t = 24.37$ )		
Perceived usefulness	PU1	0.87 ( $t = 24.12$ )	0.74	0.90
	PU2	0.89 ( $t = 25.06$ )		
	PU3	0.87 ( $t = 24.37$ )		
	PU4	0.81 ( $t = 21.76$ )		
Subjective norm	SN1	0.88 ( $t = 24.41$ )	0.76	0.89
	SN2	0.90 ( $t = 25.21$ )		
	SN3	0.83 ( $t = 22.09$ )		

Goodness-of-fit indices ( $N = 514$ ):  $\chi^2_{254} = 632.58$  ( $P$ -value  $< 0.001$ ); NNFI = 0.96; NFI = 0.94; CFI = 0.97; GFI = 0.90; RMR = 0.02; RMSEA = 0.05.

**Table 2 Scale properties**

Construct <sup>a</sup>	Mean	SD	Inter-construct correlations <sup>b</sup>							
			F1	F2	F3	F4	F5	F6	F7	
F1	5.88	1.42	0.89							
F2	3.71	0.63	0.43	0.89						
F3	3.98	0.63	0.38	0.34	0.78					
F4	3.90	0.69	0.49	0.52	0.51	0.89				
F5	3.66	0.64	0.36	0.56	0.30	0.47	0.88			
F6	3.91	0.58	0.32	0.40	0.45	0.55	0.55	0.87		
F7	3.84	0.61	0.21	0.33	0.29	0.34	0.37	0.38	0.88	

<sup>a</sup>Legend: F1 = Continuance behavior; F2 = Satisfaction; F3 = CI; F4 = Habit; F5 = Disconfirmation; F6 = Perceived usefulness; F7 = Subjective norm.

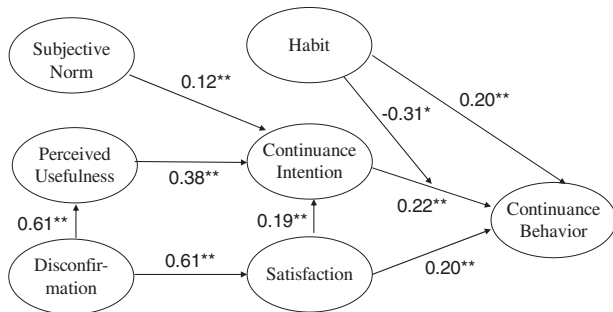
<sup>b</sup>Diagonal elements (in italics) represent square root of AVE for that construct.

less conducive to testing moderating effects, the moderating effect of habit (Hypothesis H8) was tested separately using regression models, as shown in Table 3. Figure 2 presents the results of all analyses, including the normalized  $\beta$  coefficient and significance of each of our hypothesized paths and variance explained for each dependent variable.

**Table 3** The test results of moderating effects

	Dependent variable: continuance behavior	
	Model 1	Model 2
CI	0.63**(t=4.24)	1.82**(t=3.25)
Habit	0.85**(t=6.34)	2.03**(t=3.68)
Habit * CI		-0.31*(t=-2.20)

Significance: \*\* $p < 0.01$ , \* $p < 0.05$ .

**Figure 2** SEM analysis of research model.

Significance: \*\* $p < 0.01$ , \* $p < 0.05$

SEM analysis supported each of our eight hypotheses. IT continuance behavior was significantly predicted by CI ( $\beta = 0.22$ ,  $P < 0.01$ ), satisfaction with prior IT usage ( $\beta = 0.20$ ,  $P < 0.01$ ), and habit ( $\beta = 0.20$ ,  $P < 0.01$ ), providing empirical support for Hypotheses H1, H4, and H7, respectively, and confirmed our central theses that reasoned action (as represented by CI), experiential response (represented as satisfaction), and habitual response are important influences on IT continuance behavior. Consistent with the expected crossover effect of habit (Hypothesis H8), the moderating effect of habit on the association between CI and behavior was also significant with a negative valence ( $\beta = -0.31$ ,  $P < 0.05$ ).

CI was significantly predicted by perceived usefulness ( $\beta = 0.38$ ,  $P < 0.01$ ), subjective norm ( $\beta = 0.12$ ,  $P < 0.01$ ), and satisfaction ( $\beta = 0.19$ ,  $P < 0.01$ ), supporting Hypotheses H2, H3, and H5, respectively. Satisfaction, in turn, was significantly predicted by disconfirmation of user expectations of IT use ( $\beta = 0.61$ ,  $P < 0.01$ ), supporting Hypothesis H5. In addition, disconfirmation had a significant effect on perceived usefulness ( $\beta = 0.61$ ,  $P < 0.01$ ), supporting Hypothesis H6, and providing support for the crossover effect between ECM and reasoned action. Implications of these findings are discussed in the next section.

## Discussion

### Limitations of the study

The findings of our study should be interpreted in light of its limitations. First, since our study was conducted in Taiwan (a developing country), our findings may not necessarily generalize to Western or developed countries.

IT users' cognitions and behavior are certainly influenced by cultural differences, for example, Western users may rely more on reasoned action and less on experiential response than Asian users. But since the goal of this paper was to construct and test an integrative continuance model of utilitarian systems, exploring cultural differences were beyond the scope of this study.

Second, there may be other factors influencing employees' continuance behavior, intention, and satisfaction beyond those examined in our study. For example, Svejvig & Pries-Heje (2011) mention institutional factors, such as the influence of management consultants promoting a 'best practice' agenda, ideological preferences of internal employees in order to cement their organizational position or power, and other invisible (behind the curtain) organizational forces that may coexist with or complement rational explanations of IT continuance as presented in this paper. Organizational employees may also continue using a sub-optimal IT due to inertia against change, to avoid the uncomfortable choice of reversing their initial IT acceptance decision, or to avoid asking their supervisors for a new IT. Additional factors for consideration in future studies include network externalities (Schilling, 2002), and personal innovativeness (Agarwal & Karahanna, 2000). Future research may explore the potential role of these factors on our hypothesized constructs and relationships, in order to expand the scope and explanatory power of our proposed model.

Third, our research model focused on the continuance of utilitarian systems that are common in workplace settings. There are certainly other kind of systems, such as hedonic systems (e.g., online video games) and communication-oriented systems (e.g., electronic mail or group support systems), where other constructs may be more salient in motivating continuance behavior than those suggested in our model. Hence, additional modifications may be needed in order to apply our model to non-utilitarian or non-workplace settings.

### Implications for research

This study reports several findings of potential interest for future research on IT continuance. First, this study provides a unified model of three alternative theoretical perspectives (i.e., reasoned action, experiential response, and habitual response) that may inform IT continuance behavior, at least in workplace settings. Previous research on IT continuance have drawn heavily from either TAM/UTAUT (based on expectations of future usage) (Davis, 1989; Venkatesh *et al*, 2003) or ECM (based primarily on prior experiential behavior) (Bhattacharjee, 2001), but little research has been done to integrate these two complementary influences or combine them with habit, which is known to influence continued IT usage (Limayem *et al*, 2007). Our research advances extant research in this area by presenting a theory-driven research model that not only extends ECM, but can also guide future research on IT continuance.



It is instructive to compare and contrast our unified model of IT continuance with extant models of IT usage such as TAM, UTAUT, and ECM. The perceived usefulness, subjective norm, and CI constructs in our model are based on TAM/UTAUT research, each of which represents the reasoned action choice based on expectations of future usage. It is noteworthy in this context that we did not consider perceived ease of use or perceived behavioral control in our model, because although these constructs are central to shaping users' IT acceptance (first-time usage) behaviors, their effects tend to attenuate as users start using IT and hence these constructs are unlikely to play a significant role in shaping IT continuance (long-term use) behaviors. One deficiency of the TAM/UTAUT research is its exclusion of affect or emotion as a driver of intention (Ortiz de Guinea & Markus, 2009). Our proposed model accounts for this shortcoming by using satisfaction to represent the emotive component of IT usage behavior.

The disconfirmation, satisfaction, and CI constructs in our model are based on ECM. ECM, as presented by Bhattacharjee (2001), extended the traditional expectation-confirmation research in marketing to postulate a direct association between disconfirmation and post-usage perceptions of perceived usefulness, which is also retained in our model. In this study, we go beyond the original ECM by incorporating continuance behavior that was missing from the original ECM. We demonstrate that satisfaction influences continuance behavior in two ways: a direct effect, as well as an indirect effect mediated by intention. These effects imply that sometimes IT users may continue using a system they are satisfied with, even if they do not have any more positive expectations from future usage. As Ortiz de Guinea & Markus (2009), emotion may directly influence user behavior, without necessarily influencing their conscious intention. The direct effect of satisfaction in our model captures this emotive component of IT usage, while the indirect effect is derived from ECM.

Finally, we synthesize the role of habit into our continuance model. Prior research (e.g., Limayem *et al*, 2007) has noted the importance of this construct in shaping IT usage behavior, and this is more likely to be the case during later stages of usage (i.e., continuance) when IT usage tends to be more habituated and sub-conscious rather than intentional and conscious. However, there exists some confusion in the literature as to whether the effect of habit on behavior is direct or moderated. Our findings support that of Limayem *et al* (2007), in that habit can not only drive continuance behavior in the absence of intentions (hence the direct effect), but also suppress the role of conscious or intentional cognitive processing on behavior (hence the negative moderation effect).

We also demonstrate that the three alternative theoretical paths by which individual users frame their IT continuance behaviors are not independent of each other, but rather complementary. This complementarity is captured in our unified model as crossover effects between

experiential response and reasoned action constructs, such as between disconfirmation and perceived usefulness and between satisfaction and CI. These crossover effects are of theoretical interest, because they suggest that experiential response may not only influence continuance behaviors, but also bias the reasoned action component of behavior. For instance, dissatisfied users will not only tend to reduce their IT continuance behavior, but are also likely to form negative CIs, despite the presence of strong cognitions (perceived usefulness and subjective norms) favoring continued IT usage. Likewise, disconfirmation of expectations not only shapes the experiential component of continuance behavior, but also has a corresponding bias on user perceptions of the usefulness of continued IT usage. Such crossover effects, empirically validated in this paper, suggest that considering only one or two of these components of IT continuance in isolation, as often done in prior research, can only provide us partial and limited explanations of the complex phenomenon of IT continuance. More such explorations of the interdependencies between different theories are clearly needed in order to develop a comprehensive and nuanced understanding of IT continuance.

### Implications for practice

This study addresses several issues of potential relevance to IT managers and vendors striving to enhance users' continuance behavior within their organizations or client firms. First, our finding that both experiential response and reasoned action are key drivers of continuance behavior suggests that organizational managers and vendors should not only educate their user base of the benefits of IT usage, but also ensure that they are satisfied with their IT usage experience. Because continued usage of IT systems is often central to effective functioning of organizations, managers should measure user satisfaction routinely in their organizations and initiate actions to redress issues of user dissatisfaction in order to ensure continued usage. Our model suggests that user dissatisfaction may not only negatively influence continuance behavior, but can also undermine the effect of efficacy of reasoned action, by biasing users' CIs.

Second, we reported that continuance behavior can be influenced through the formation of habit. Fostering users' habit can be an effective strategy for IT vendors to 'lock in' users by virtue of influencing their subconscious behavior and also by minimizing the effect of their conscious processing of intentions. To influence habit formation, managers/vendors should attempt to enhance users' use of IT by creating conditions conducive to usage (e.g., by providing adequate technical support). Though formation of habits was not examined in this study, this represents a fertile area for future continuance research.

In closing, this study postulated and empirically validated a unified model of IT continuance, by drawing upon three alternative influences that shape continuance behavior: reasoned action, experiential response, and habitual



response. Our research demonstrates that these three alternative pathways to continuance behavior are interdependent and complementary, in that they are influenced by crossover effects. We hope that the proposed

model can inform and guide future IT continuance research by providing a theoretical model that synthesizes prior perspectives as well as provides a comprehensive understanding of continuance behavior.

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## Appendix A

### Measurement items

*Continuance behavior* (Source: Limayem *et al*, 2007; Lin & Bhattacharjee, 2008)

CB1. What percentage of your clients do you serve using the system?

CB2. What percentage of your working hours do you spend on using the IS?

CB3. What percentage of your workload do you deal with using the IS?

(Anchored with 1: Under 10%; 2: 10–19%; 3: 20–29%; 4: 30–39%; 5: 40–49%; 6: 50–59%; 7: 60–69%; 8: 70–79%; 9: 80–89%; 10: more than 90%)

CI (Source: Bhattacharjee, 2001)

CI1. I intend to continue using the IS rather than discontinue its use.

CI2. My intentions are to continue using the IS rather than manual processing or other alternative means.

CI3. I plan to continue using the IS in my job.

*Subjective norm* (Source: Venkatesh & Morris, 2000)

SN1. People who influence my behavior (e.g., coworkers, supervisors, clients) think that I should use the IS.

SN2. People who are important to me (e.g., coworkers, supervisors, clients) think that I should use the IS.

SN3. People who influence my behavior (e.g., coworkers, supervisors, clients) would welcome my use of the IS in my work.

*Perceived usefulness* (Source: Davis, 1989)

PE1. Using the IS improves my performance.

PE2. Using the IS increases my productivity.

PE3. Using the IS enhances my effectiveness.

PE4. I find the IS to be useful for my work.

*Satisfaction* (Source: Bhattacharjee, 2001)

How do you feel about your overall experience of IS usage:

SA1. Very dissatisfied/very satisfied

SA2. Very displeased/very pleased

SA3. Very frustrated/very contented

SA4. Absolutely terrible/absolutely delighted

*Disconfirmation* (Source: Bhattacharjee & Premkumar, 2004)

Comparing my initial expectations about the IS with my actual usage experience, I found that ...

DI1: The IS improved my sales performance better than I initially expected.

DI2: The IS increased my personal productivity better than I initially expected.

DI3: The IS enhanced my job effectiveness better than I initially expected.

DI4: The IS was more helpful for my job than I initially expected.

*Habit* (Source: Limayem *et al*, 2007)

HA1: Using the IS has become automatic to me.

HA2: Using the IS comes naturally to me.

HA3: When faced with a particular task, using the IS is an obvious choice for me.

HA4: I have a habit of using the IS.