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Understanding Continuance of Advanced Internet-based Learning Technologies: The Role of Satisfaction, Prior Behavior, and Habit

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Abstract

Despite the growing interest in Internet-based learning technologies (IBLT) and the application of advanced Internet technologies in education, research investigating continued usage of these tools has been very scarce. The objective of this study is to gain a better understanding of factors influencing students' continued usage of these learning technologies. Building upon prior literature, satisfaction and prior behavior are posited to have a direct impact on IBLT continued usage. In addition, we take into consideration the "habit" construct in order to better explain the automatic nature of IBLT continuance. The research model is tested in a longitudinal setting. Results present strong support for the existing theoretical links of IBLT continuance model, as well as for those newly hypothesized in this study. The implications are noteworthy for both researchers and practitioners.

Keywords: IS continuance, Satisfaction, Prior Behavior, Habit, e-learning

1. Introduction

The Internet creates a new medium for education and training. Students can make use of the Internet to access and download teaching materials including both text and video. Also, with the use of online chat room or video conferencing, students can communicate with their instructors and fellow students. Despite the growing interest in Internet-based learning and the application of advanced Internet technology in education, research investigating the use of IBLT remains scarce. Limayem and Hirt (2003) stated that previous studies on Internet-based education focused primarily on learning outcomes and learning processes, but rarely explored factors that drive students' adoption of IBLT as well as those that encourage their continued use.

Understanding students' adoption of IBLT is important, as teachers are reluctant to invest their time and effort in this new medium if they are not confident that students will find the new medium acceptable (Lee et al. Forthcoming). However, IBLT adoption is just the first step toward overall IS success. An IBLT implementation can truly be considered as "a success" when a significant number of students have moved beyond initial adoption and used the technology on a continued basis. Thus, there is a need to identify the factors that encourage students to continue using the Internet-based learning technologies.

As it is the case for IS, an IBLT implementation can truly be considered as "a success" when a significant number of users have moved beyond initial adoption and used the information systems on a continued basis (Bhattacharjee 2001, Davis and Venkatesh 2004, Limayem and Hirt 2003). Bhattacharjee (2001) was one of the very first researchers to propose an IS continuance model in line with the expectation confirmation theory. His IS continuance model seeks to explain an IS user's intention to continue using an IS. Bhattacharjee's (2001) investigation stopped at intention, without assessing IS continuance, and his model assumed that IS continued usage is primarily determined by intention. Though this assumption has

been validated in past IS research on IS adoption, it may not explain IS continuance equally well in the case of IBLT post-adoption.

As a step toward bridging the gap, we develop a research model of IBLT continuance, identifying causal links among users' prior behavior, satisfaction evaluations, and IBLT continued usage, and testing the moderating effect of habit on the relationship between IBLT continued intention and IBLT continued usage. This paper is structured as follows. We first introduce our research model. Then, we describe research method and discuss statistical results. We conclude the paper by highlighting implications for both research and practice.

2. Research Model

Figure 1 depicts the research model of IBLT continuance. We review the relevant literature and identify several theoretical perspectives to explain IBLT continued usage.

Figure 1: Research Model

2.1 IS Continuance

IS continuance describes behavior patterns reflecting continued use of a particular IS. Continuance refers to a form of post-adoption behavior. Although the term "post-adoption" actually refers to a suite of behaviors that follow initial acceptance (Rogers 1995), including continuance, routinization, infusion, adaptation, assimilation, etc., in the literature it is often used as a synonym for continuance (cf. Karahanna et al. 1999). In this study, we limit ourselves to the terms IS continuance or continued IS usage behavior.

Bhattacharjee's (2001) "Post-acceptance model of IS continuance" seeks to explain an IS user's intention to continue using an IS. Based on expectation-confirmation theory, IS continuance intention is predominantly determined by satisfaction and perceived usefulness. In the marketing literature, satisfaction is considered key to building and retaining a loyal base of long-term consumers. A similar argument can be made in the context of IS continuance where satisfaction with an IS tends to reinforce a user's intention to continue using the system. By including perceived usefulness, Bhattacharjee's (2001) model reflects current thinking in the area of IS which holds that perceived usefulness is the only construct consistently influencing user intention across both adoption and post-adoption phases. The model also relates satisfaction and perceived usefulness to the degree with which the user's

expectations about the IS are confirmed. Expectation provides the baseline level against which confirmation is assessed by users to determine their evaluative response or satisfaction. The better they are met, the more useful it appears to users and the more satisfied they are. Bhattacharjee (2001) was one of the very first researchers proposed an IS continuance model, however, his investigation stopped at intention, without assessing IS continuance, and his model assumed that IS continued usage is primarily determined by intention. In this study, we review prior literature and propose several new causal links to explain IBLT continued usage.

2.2 The Role of Satisfaction

Satisfaction has been widely adopted as an important determinant of IS success (DeLone and McLean 1992, 2003; Rai et al. 2002). It is also one of the most important concepts in marketing, and has attracted a great deal of research interest in the past few decades. Bolton and Lemon (1999) suggested and empirically demonstrated that if customers with higher levels of satisfaction (in time t) will have higher usage (in time $t+1$) than customers with lower levels of satisfaction. Danaher and Rust (1996) also found empirical evidence regarding the notion that a customer who is more satisfied with a service will have higher subsequent usage levels. This argument is consistent with adaptive expectations theory (Oliver and Winer 1987) where customers predict future preferences based on their current preferences and do not incorporate future taste changes. In this study, we built upon this line of argument, and suggested that a user who is more satisfied with the usage experience will have higher level of IBLT continued usage.

2.3 The Role of Prior Behavior

Prior behavior has been one of the core research topics of many studies in the psychology and marketing domain (e.g. Bagozzi and Warshaw 1990, Fredricks and Dossett 1983, Norman and Smith 1995). Ajzen (1991) argued that prior behavior could be used to test the sufficiency of any model designed to predict future behavior under the assumption of stable determinants. In marketing, Bolton and Lemon (1999) suggested that a customer's recent usage experience can be used to predict his/her future usage. In the IS usage context, Davis and Venkatesh (2004) found that users' direct hands-on experience is the key driver of their sustained usage. They empirically showed that when they included the construct "prior usage behavior" as an additional antecedent of IS continuance behavior, all other determinants in the TAM become insignificant. Along with other researchers, we agree with Davis and Venkatesh's (2004) assertion that prior behavior is an important antecedent in predicting future behavior (Bagozzi and Kimmel 1995, Conner and Armitage 1998, Norman and Smith 1995).

2.4 The Moderating Impact of Habit

Quelette and Wood (1998) urged that frequently performed behaviors tend to become habitual and thus automatic over time. Supporting this line of reasoning, Aarts et al. (1998, p. 1364) found that habit strength attenuates the amount of information acquired and utilized before the decision is made. We therefore argue that if individuals are in the habit of using a particular system, the predictive power of intentions is attenuated. Put differently, habit and intention significantly interacted in the prediction of continuous IS usage. While habit in the behavioral domain increased in strength, intentions became less predictive of IS continuance. Given the range of arguments as presented above, we adopt the moderation perspective for the research reported in this paper. Consequently, we summarize the conceptual relationship between intention and habit as follows. If individuals are habitually performing a particular behavior (for example, using a particular IS), the predictive power of intention is weakened. Thus, the more a behavior is performed out of habit, the less cognitive planning it involves.

Applied to IBLT continued usage, this means that habit exerts a moderating (suppressing) effect on the relationship between intention and actual continued usage.

3. Method

The system used in this study was “Blackboard Learning System (www.blackboard.com).” It is a Web-based server software platform that offers industry-leading course management, an open architecture for customization and interoperability, and a scalable design that allows for integration with student information systems and authentication protocols. Blackboard is adopted as a teaching platform of several courses provided by a local university. Students can login to the system to download lecture notes, share documents with their project teammates, and communicate with their fellow students and course instructors. The usage of this system was entirely voluntary and students could use other means to download and upload materials and to communicate with their instructor and classmates. In other words, students were not penalized for not using this system. The sections below describe the details of data collection procedure, measurement and data analysis.

3.1 Data Collection Procedure

The research model was empirically tested using a longitudinal study. Data was collected at two time periods through online questionnaire. Online survey designs have the advantages of speeding up large amount of data collection and allowing for electronic data entry (Parasuraman and Zinkhan 2002). Participation in this study was voluntary. In order to encourage participation, an incentive is given to each of the participants in the form of bookstore cash coupons. A total of 505 samples were collected in this study.

3.2 Measurement

Table 1 lists the measures used in this research. We used items that had been validated by prior research, but modified the wording of the questionnaire in order to fit this particular context of Blackboard usage. The scales confirmation, satisfaction, and IS continuance intention, were primarily adapted from Bhattacharjee (2001). Habit was assessed using the measures from Limayem et al. (2003). The formative items measuring initial usage and IS continuance were taken from Davis (1989) and Steinfield (1985).

Constructs	Measures	Sources
Perceived Usefulness (PU)		
PU1	Blackboard is of benefit to me.	Bhattacharjee (2001)
PU2	The advantages of Blackboard outweigh the disadvantages.	
PU3	Overall, using Blackboard is advantageous.	
Confirmation (CONFIRM)		
CONFIRM1	My experience with using Blackboard was better than what I expected.	Bhattacharjee (2001)
CONFIRM2	The benefit provided by Blackboard was better than what I expected.	
CONFIRM3	Overall, most of my expectations from using Blackboard were confirmed.	
Satisfaction (SAT)		
SAT1	How do you feel about your overall experience of Blackboard Use: (Very dissatisfied/Very satisfied) (Very displeased/Very pleased) (Very frustrated/Very contented) (Absolutely terrible/Absolutely delighted)	Bhattacharjee (2001)
SAT2		
SAT3		
SAT4		
Continuance Intention (CI)		
CI1	If I could, I would like to continue my use of Blackboard.	Bhattacharjee (2001)
CI2	All things considered, I expect to continue using Blackboard during	

Constructs	Measures	Sources
CI3	the next four weeks. All things considered, it is likely that I will continue to use Blackboard during the next four weeks.	
Habit (HABIT)		
HABIT1 HABIT2 HABIT3	Using Blackboard has become automatic to me. Using Blackboard is natural to me. When faced with a particular task, using Blackboard is an obvious choice for me.	Limayem et al. (2003)
Prior Behavior / Continued Usage		
IU1/CU1 IU2/CU2	How often did you use Blackboard during the last 4 weeks? (Never/Always) (Once a month/Once a day)	Steinfeld (1985) Davis (1989)

Table 1: List of Measures

3.3 Data Analysis

The analysis of the data was done in a holistic manner using Partial Least Squares (PLS). The PLS procedure (Wold 1989) has been gaining interest and use among researchers in recent years because of its ability to model latent constructs under conditions of non-normality and small to medium sample sizes (Chin 1998, Chin and Gopal 1995, Compeau and Higgins 1995). Furthermore, due to the formative nature of some of the measures used and non-normality of the data, LISREL analysis was not appropriate (Chin and Gopal 1995). Thus, we chose PLS Graph Version 3.00 to perform the analysis.

4. Results

Following the two-step analytical procedures (Hair et al. 1998), we first examined the measurement model and then the structural model. The rationale of this two-step approach was to ensure our conclusion on structural relationship was drawn from a set of measurement instruments with desirable psychometric properties.

4.1 The Measurement Model

Convergent validity indicates the extent to which the items of a scale that are theoretically related should be related in reality. Table 2 and Table 3 present information concerning the loadings and weights of the measures of our research model. All our reflective measures fulfilled the recommended levels of the composite reliability and average variance extracted. As shown in Table 2, we noticed that all items of this study were higher than 0.50, as recommended by Fornell and Larcker (1981). All the values of composite reliability and average variance extracted were considered very satisfactory, with composite reliability at 0.92 or above and average variance extracted at 0.75 or above. All our formative measures had significant path loadings at the 0.01 level. As shown in Table 3, the four formative items in the model with weights from 0.59 to 0.71 demonstrated a substantive contribution to their corresponding construct.

Construct	Item	Loading
Perceived Usefulness CR=0.92, AVE= 0.75	PU1	0.90
	PU2	0.90
	PU3	0.90
Confirmation CR=0.93, AVE= 0.82	CONFIRM1	0.91
	CONFIRM2	0.92
	CONFIRM3	0.89
Satisfaction	SAT1	0.90

Construct	Item	Loading	
CR=0.94, AVE= 0.81	SAT2	0.91	
	SAT3	0.90	
	SAT4	0.89	
	Continuance Intention	0.88	
CR=0.92, AVE= 0.79	CI1	0.88	
	CI2	0.89	
	CI3	0.89	
Habit	HABIT 1	0.87	
	CR=0.93, AVE= 0.83	HABIT 2	0.93
	HABIT 3	0.92	

Notes: CR=Composite Reliability, AVE= Average Variance Extracted

Table 2: Psychometric Properties of Reflective Measures

Construct	Item	Weight	St. Error	t-value
Prior Behavior	IU1	0.69	0.27	2.50
	IU2	0.59	0.24	2.48
Continued Usage	CU1	0.71	0.25	2.85
	CU2	0.70	0.22	3.16

Table 3: t-statistics of Formative Measures

Testing for discriminant validity involves checking whether the items measure the construct in question or other (related) constructs. Discriminant validity was verified with the squared root of the average variance extracted for each construct higher than the correlations between it and all other constructs (Fornell and Larcker 1981). As shown in Table 4, each construct shares greater variance with its own block of measures than with the other constructs representing a different block of measures.

Correlations between Constructs					
	PU	CONFIRM	SAT	CI	HABIT
Perceived Usefulness (PU)	0.87				
Confirmation (CONFIRM)	0.63	0.91			
Satisfaction (SAT)	0.53	0.62	0.90		
Continuance Intention (CI)	0.66	0.71	0.62	0.89	
Habit (HABIT)	0.55	0.63	0.56	0.70	0.91

Table 4: Correlation between Constructs (Diagonal Elements¹)

Overall, these results provide strong empirical support for the reliability and convergent validity of the scales of our research model.

4.2 The Structural Model

Figure 2 presents the results of the longitudinal analysis with overall explanatory powers, estimated path coefficients (all significant paths are indicated with an asterisk), and associated t-value of the paths.

¹ Diagonal Elements are Square Roots of the Average Variance Extracted.

Figure 2: Results of PLS Analysis

Tests of significance of all paths were performed using the bootstrap resampling procedure. As shown in Figure 2, all hypothesized paths in the research model are found statistically significant.

Confirmation and perceived usefulness have significant impact on satisfaction, with path coefficients of 0.47 and 0.23 respectively. The two constructs account for 42% of the variance in satisfaction. Confirmation also has a significant effect on perceived usefulness, with 40% variance explained. Regarding the antecedents of continuance intention, both satisfaction and perceived usefulness are significant with path coefficient of 0.38 and 0.45 respectively, accounting for 53% variance of continuance intention. IBLT continued usage is predominantly determined by prior behavior and satisfaction, with path coefficients of 0.17 and 0.34 respectively. Finally, habit is also found to negatively moderate the link between continuance intention and IBLT continuance, with path coefficient of -0.36. Overall, the antecedent of IBLT continuance explains 23% of the variance.

5. Discussion and Conclusion

Motivated by the need to better understand IBLT continuance of Internet-based learning technologies, this study integrated diverse theoretical perspectives with the IBLT continuance model to examine factors influencing continued usage. The theoretical model takes into consideration the habitual nature of continuance, the impact of prior behavior, as well as satisfaction on IBLT continued usage. The findings present a strong support to the existing theoretical links of the IBLT continuance model, as well as to the ones that were newly hypothesized in this study. Specifically, satisfaction is the strongest determinant of IBLT continued usage. While, prior behavior is also found to significantly affect IBLT continuance. In addition, findings showed support for the moderating effect of habit on the link between continuance intention and IBLT continued usage. These results have several implications for theory and practice.

5.1 Limitations of this Study

Before moving on to highlight the implications for research and practice, we would like to address the limitations of this study. First, caution is in order before generalizing these results to other Internet-based learning technologies. Though we are convinced that Blackboard has all the necessary characteristics of modern Internet-based learning technologies, its specificity might have biased the results of this study. Second, prior research has empirically demonstrated that difference between self-reported measures of IS usage versus computer-record measures. In this study, students may over-reporting their usage behavior to give a more politically correct impression which is a rather common phenomenon (Straub et al. 1995). Finally, building upon IS continuance model, the rational models of human behavior, our model has neglected the socio-cultural or political impacts on student usage of Internet-based learning technologies. This may be the reason that our research model only explains 23% of the variance. Further refinement of this model by including other important variables that affect continuance is warranted.

5.2 Implications for Theory and Research

To the best of our knowledge, this study is one among a very few that have attempted to investigate the drivers of IBLT continued usage. Most previous studies on IBLT usage either focused on the initial IBLT usage or studied IS continuance intention. Our research model, however, further expands upon Bhattacharjee (2001)'s IS continuance model by adding the moderating effect (IS habit) on IS continuance intention and IS continued usage, positing direct links between satisfaction and IS continued usage, as well as between prior behavior and IS continued usage. Our findings confirm the theoretical argument that the strength of intention to predict continuance is weakened by a high level of IS habit. This may explain why prior studies did not find a significant relationship between intention and behavior (e.g., Dishaw and Strong 1999). Precisely, our findings imply that intentions can no longer be regarded as the only predictor of actual behavior. In our case, satisfaction and prior behavior become the important determinants of IS continuance. Thus, future studies on IS continuance should not adopt only the cognitive approach, but also the affective and habitual perspectives in understanding why users continue using an IS. Finally, this study is one of the very few attempts to investigate student continued usage of Internet-based learning technologies using an extended IS continuance model. In so doing, this research broadens the boundaries of IS continuance model and contributes to the emerging IS post-adoption literature.

5.2 Implications for Practice

In addition to the theoretical contribution just mentioned, our findings lead to several important recommendations to instructors, academic institutions and Internet-based learning technologies designers. In this research, we find that usage level as well as user satisfaction should be managed and enhanced for sustainable IS usage. First, prior behavior is an important factor determining the level of IBLT continuance. This suggests that once students adopt these technologies, they have a higher tendency to continue use them. Therefore, university administrators and instructors should carefully design an implementation plan that encourages IBLT usage at the early adoption stage. A "bad start" in terms of initial usage could significantly hinder continuous use of the system. Second, satisfaction becomes the most important factor determining the level of IBLT continuance. IS success model (DeLone and McLean 2003) asserted that user satisfaction can be maintained by managing information quality, system quality, as well as service quality of the information system. Thus, IBLT designers should keep these three important factors in mind when designing and developing IBLT. Finally, our results show that when students gain more experience with the system,

there is a shift in importance from a consciously-driven behavior to a habitual behavior. Thus, instructors should try during the first few weeks of the academic term to get students into the habit of using IBLT. This can be achieved by making use of discussion forums that facilitate in-class and off-class discussion, and making the lecture notes and other materials available for downloading by the students. Once the habit of using the IBLT increases, usage behavior becomes more automatic, and this may lead to a more sustainable continuance.

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