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Understand IS Continuance: A Technology Commitment Perspective

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UNDERSTANDING IS CONTINUANCE: A TECHNOLOGY COMMITMENT PERSPECTIVE

Social, Behavioral and Organizational Aspects of Information Systems

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Abstract

Incorporating commitment theory from social psychology and management science literature, this paper proposes a IS continuance model that explains users' intention to continuously use IS technologies. We argue that users' intention to continue using a IS technology (i.e., IS continuance) is determined by their commitment to that specific technology and moderated by the brand-specific technology product. Three dimensions of technology commitment, affective commitment, continuance commitment, and normative commitment, are identified to formulate a research model. The hypotheses are empirically tested and the model accounts for 70.9% of variances. Results and contributions of this research-in-progress model are discussed.

Keywords: IS continuance, commitment, instant messaging, structural equation modeling, moderating effects

Introduction

A recent *The New York Times* (Pogue, 2006) article on World-Wide-Web browsers offered an interesting statistic: although browser interfaces and functionalities are not dramatically different, 85% of Internet users continue to use Microsoft Internet Explorer even when similar technology products such as Opera and Mozilla are easily downloadable and free (Pogue 2006). The article raised an interesting and pertinent research question: *Why do users choose to keep on using a certain technology product – when other alternatives might be just as easily available and/or free?*

From individuals to organizations, our portfolio of available technology products is rapidly growing. While both individuals and organizations preliminarily adopt several technology products, only a few products actually experience continuous use (Selwyn 2003). As a result, organizations end up with redundant applications that were adopted but never inculcated through continuous use. Understanding why individuals and organizations end up using one of the many alternate (and easily/freely available) software products becomes a crucial issue for research and practice. For research, understanding user behavior surrounding continuous use allows for an extension of the adoption model. For practice, vendors of technology products would be immensely interested in knowing how and why users choose to continue to use a certain product among a set of competing alternatives.

To date, Davis et al.'s technology adoption model (TAM) (Davis 1989) has been one of predominant templates used to investigate, develop, and refine user adoption behavior. TAM and its derivates (Legris et al. 2003; Qingxiong Ma et al. 2004; Szajna 1996; Venkatesh et al. 2000; Venkatesh et al. 2003) with their roots in innovation diffusion theory (Rogers 1995), the theory of reasoned action (TRA) (Fishbein et al. 1975) and the theory of planned behavior (TPB) (Ajzen 1985), have proven successful in explaining users' initial acceptance of information systems (IS). However, while research has predominantly focused on the first-time use of IS, IS continuance, herein referred

to as an individual's continued use of a particular technology product, has received relatively less scrutiny within the IS community (Bhattacherjee 2001).

Within existing IS literature, there are two schools of thought in respect to users' continued use of technologies (Hsu et al. 2004). The first school views continued use as an extension of acceptance. Scholars pertain to this school refer to post-acceptance as a stage of acceptance process, such as "routinization" (Cooper et al. 1990; Zmud et al. 1992) or "confirmation" (Rogers 1995) that assumes a deterministic view of IS continuance decisions using the same set of pre-acceptance predictors. By overly emphasizing the unidirectional causal relationships between cognitive beliefs and behavior intentions, this school overlooks social, psychological, and economic influences such as social norms and cost concerns.

The second school identifies new sets of predictors that lead to users' subsequent beliefs and continuance decisions. Parthasarathy et al. (1998) suggested sources of influence (external and interpersonal), perceived service attributes (usefulness and compatibility), service utilization, and network externality (complementary product usage) as antecedents that affect people's decision to discontinue use of online services (Parthasarathy et al. 1998). Bhattacherjee (2001) used expectation-confirmation theory (ECT) from marketing literature to synthesize elements of IS adoption and marketing, proposing a model incorporating perceived usefulness, confirmation, and satisfaction as antecedents to IS continuance (Bhattacherjee 2001). However, the ECT-based model is captive to affective factors (e.g., the confirmation of expectation from prior use and perceived usefulness as causes of users' IS continuance) and is thus limited in accommodating the impact of non-affective elements in IS continuance.

In order to unravel consumer behavior surrounding information systems continuance, this paper synthesizes management and IS literature to propose an ontological shift to Davis et al.'s (1989) Technology Adoption Model. It argues that initial acceptance and use are necessary but not sufficient conditions for IS continuance. Instead, we offer a different, perhaps complementing lens to unravel how IS continuance rests on the users' perceived sense of "commitment" to a brand-specific technology product. The objective of this research-in-progress is to propose and empirically investigate technology commitment as an antecedent to IS continuance.

The remainder of this paper proceeds as follows. The next section reviews the IS continuance and commitment theories adopted from information systems, social psychology, and management science literature to derive the construct of technology commitment. Synthesizing commitment theory and the continuance theory, a theoretical model linking technology commitment to IS continuance is crafted and hypotheses developed. This is followed by an empirical validation of the hypothesized model along a presentation of the results. Finally, we end with a discussion of the results and a roadmap for our ongoing research agenda. Implications and limitations of this research are also discussed.

Literature Review and Hypotheses Development

IS Continuance Intention

Information systems continuance intention is defined as users' intention of continuous use of an IS technology product long after an initial acceptance decision (Bhattacherjee 2001). Compared to pre-acceptance determinants where cognitive beliefs such as perceived usefulness and ease of use play an important role, post-acceptance determinants concern the degree and type of attachment users feel to a particular technology product so as warrant IS continuance intentions. Central to the understanding is the fact that IS adoption does not beget continuous use. Companies commonly license (adopt) multiple software programs (e.g. Minitab, SPSS, Systat) for individuals to accomplish similar objectives (e.g. business analytics). However, in the long-run, it is common that individuals are often captive to using one particular software program in lieu of other adopted alternatives. Adoption of a technology does not always precipitate into continuous use.

Technology Commitment

The concept of technology commitment is derived from the commitment literature in management that emerged in the 1960s to study employee turnover (Mowday et al. 1982). Organizational commitment draws upon the belief that employees, through interactions, form or fail to form an attachment with the organization; employees who feel a sense of attachment are committed towards a longer tenure with an organization while employees who do not feel a sense of attachment are not (Meyer et al. 1991; Mowday et al. 1982). Borrowing the definition of commitment from Mowday et al. (1982) and Meyer and Allen (1991), we define technology commitment as the psychological bond

between an individual and a technology product that makes it *less likely* for the individual to *voluntarily discontinue* the use of the technology product. A closer look at the definition confirms that commitment must follow initial acceptance and use of a technology product. In a recent study of volitional use of information systems, Malhotra and Galetta (2005) found that volitional use of information systems is underpinned by notions of user commitment. Therefore, user commitment remains an important precursor to understanding sustained IS use (Malhotra et al. 2005). Dixit and Pindyck, too, implicate the need for substantial user commitment because of switching costs among alternative adopted technologies (Dixit et al. 1994).

Adhering to Meyer and Allen's (1991) work on commitment, we partition technology commitment into three dimensions[1]: affective commitment, normative commitment, and continuance commitment. Affective commitment refers to commitment subject to a *perceived emotional attachment to, identification with, and involvement* with a corresponding entity (Meyer et al. 1991). Affective commitment to technology thus relates to a users' sense of attachment to a technology product driven by internal motivation and a sense of involvement and identification (Allen et al. 1996; Meyer et al. 2002). For example, a Web developer that *values* robust Web application development may feel more *attached* to Sun's Java Server Pages (JSP) than Microsoft's Active Server Pages (ASP) because JSP offers a richer set of objects that can be embedded in Web pages. Affective technology commitment thus refers to the user's psychological bond with a technology due to hedonic (e.g. interface characteristics, playfulness), emotional (e.g. enjoyment), and/or even utilitarian (e.g. a shared sense of value) feelings towards a technology product. We can thus argue that users experiencing a sense of affective commitment to a technology product will more likely feel the need to sustain their use of the technology product.

> *H1: Affective commitment will have a positive influence on user's continuance intention for a technology product*

Continuance commitment refers to commitment subject to a *perceived awareness of costs* associated with a decision or action (Meyer et al. 1991). Continuance commitment to technology relates to a users' sense of attachment to a technology driven by cost concerns surrounding the choice of alternative technology products. A users' continuance cost includes financial and non-financial elements such as opportunity costs, substitution costs, learning curves, sunk costs, and contractual obligations. Continuance commitment to a technology product often depends on the costs of training, investment, and opportunities (Meyer et al. 1997). For example, in IS research, continuance commitment is often traceable is projects where lock-ins lead to commitment escalation, even when the project might be perceived as being in trouble (Abrahamsson 2002).

Continuance commitment is highly cognition dependent. Festinger's (1957) cognitive dissonance theory contends that when people invest tremendous effort in a specific goal, they tend to correspondingly increase their evaluation of the goal so that the dissonance that has been created between the effort and the original goal can be eliminated. (Festinger 1957; Harmon-Jones et al. 1999). We argue that continuance commitment subsumes prior experience and efforts of the user in relation to the technology. The cognitive dissonance theory suggests that one's commitment is influenced by the effort one has invested even though such efforts may not be relevant to the goal. For example, a user who has been trained in a Microsoft® Visual Basic environment for four years of college may be committed, albeit reluctantly, to the technology and continue to use it even if competing alternatives (e.g. Java or C#) could have been more promising for future development requirements. Because continuance technology commitment refers to the user's psychological bond with a technology due to concerns of costs stemming from discontinued use, the pressures of conforming may propel users to continue their intended affiliation to a technology product.

> *H2: Continuance commitment will have a positive influence on user's continuance intention for a technology product.*

Normative commitment refers to commitment subject to a *perceived obligation* to continue to serve a corresponding entity (Meyer et al. 1991). In contrast with affective commitment, normative commitment to technology thus relates

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[1] It is useful to note that, although there is a resemblance between the dimensions of Theory of Planned Behavior (TPB) (Azjen 1985) and commitment, this paper contends that the resemblance is contextual. In TPB, the dimensions try to understand "why users [preliminarily] intend to use a technology," technology commitment makes usage more actionable by trying to understand "why users continue to use a technology in face of available alternatives." Notably, by moving from the general to the specific, technology commitment serves as the missing link that ties "intention to use" to "continuous IS use" (IS continuance), thus progressing the arguments posed by TPB. We thank our anonymous reviewers for their comments on this issue.

to *external motivations (obligations)* that induce users to remain attached to a technology. Users internalize normative pressures and become committed because of social norms. As Meyer and Allen suggested, normative commitment is present only when the pressure, or "debt", is unpaid (Meyer et al. 1991). When the external pressure disappears, normative commitment may become trivial. For example, a user may feel attached to Microsoft® Visual Studio .NET environment mainly because a majority of team members uses it to develop Web applications, even though he or she may be affectively partial to Web Matrix - a competing technology product. Because normative commitment to technology refers to a user's psychological bond with a technology due to perceived obligation or pressure from people around him or her, this notion of social conformance can influence the user's intention to continue to use a technology product.

H3: Normative commitment will have a positive influence on user's continuance intention for an IS technology product.

The concepts of technology commitment and IS continuance do not occur in a vacuum but are underpinned by brand-specific technology products. For example, Malhotra and Galetta's (2004,) research on user commitment always uses a particular technology (e.g. Pillbury's discontinuous use of Intranets) as the underlying frame of reference. Because each technology product is perceived differently by users, inherent technology product characteristics may, by themselves, positively impact user IS continuance intentions. It is important to distinguish between technology types and brand-specific technology products. Technology types are technologies that do not share a common feature set (e.g. browsers vs. Web servers). Brand-specific technology products are products that provide a common set of services but show significant brand-specific differences (e.g. Apache Web server versus IIS Web server). Apache Web servers support multiple hardware platforms and has low operating system dependency while IIS only runs on Microsoft Windows; On the other hand, IIS has fewer API (Application Programming Interface) restrictions vis-à-vis Apache.

Similar brand-specific technology product differences can also be seen in apparently similar products such as instant messengers. For example, Google Talk and Yahoo! Messenger are both instant messaging programs but show significant brand-specific differences. Yahoo! Messenger offers a tremendous breadth of functions and features while Google Talk is simpler and uncluttered in its functional offerings. Again, MSN Instant Messenger (currently Windows Live Messenger) and Yahoo! Messenger show differences in mini-browser displays as well as in other functional features and specifications.

In the context of instant messaging applications, brand-specific technology differences becomes an important consideration in understanding IS continuance, perhaps even more than the communication network the application entails. For example, recent developments have allowed cross-listing of contacts between Yahoo! Messenger and Windows Live Messenger. While both instant messenger brands can access the entire contact space, what will culminate in the user choosing to continue use one brand over the other will largely be influenced by brand-specific technology differences.

At a more granular level, user commitment is traceably different across brand-specific technology products, impacting their continuous use (e.g. *The New York Times* (2006) report on continuous use of Internet Explorer over competing technology products such as Opera or Mozilla). Because this research focuses on understanding IS continuance in the context of *competing alternatives*, we use brand-specific technology products as the underlying context. Because users have varied perceptions of different technology products, we believe that the choice of brand-specific technology products moderates the relationship between commitment and continuance.

H4a: The strength of the relationship between affective commitment and IS continuance intention will show significant differences across brand-specific technology products.

H4b: The strength of the relationship between continuance commitment and IS continuance intention will show significant differences across brand-specific technology products.

H4c: The strength of the relationship between normative commitment and IS continuance intention will show significant differences across brand-specific technology products.

The hypothesized model is shown in Figure 1.

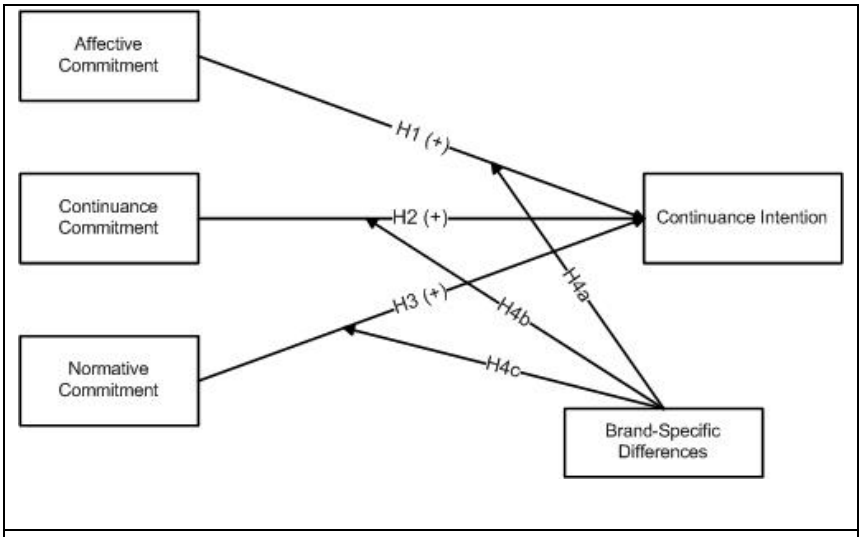

Figure 1. Research Model

Research Methodology

Data Collection

To empirically validate the model, our preliminary study was conducted over a period of three months in three undergraduate level business courses using online surveys. Considerable care was taken to operationalize the constructs and refine the measures over multiple iterations. Participants were all chosen from the same school and same level of seniority to ensure a homogeneous sample across multiple data collection efforts. Participants received credits for responding to the survey. Participation was voluntary and non-participants were assigned alternate tasks for equal credit points.

Participants were required to complete this online survey in a computer lab. Except for demographic questions, the survey consisted of multiple Likert-type questions. Responses to each item were measured on a 7-point scale with scale point anchors labeled: 1–strongly disagree; 2–moderately disagree; 3–slightly disagree; 4–neutral; 5–slightly agree; 6–oderately agree; 7–strongly agree. IRB approval information as well as a consent form was presented at the beginning of the survey. The survey was confidential and the student IDs were collected solely for the purpose of bonus credits.

Instant messaging technology was used to contextualize the relationship between technology commitment and IS continuance intentions. The choice of instant messaging as a technology was decided upon certain merits. First, instant messaging technologies are free, easy to download and install, and have very little footprint. Secondly, all participants appeared to have an overall understanding of the technology and had initially adopted it as a part of their communication application portfolio. Third, instant messaging technologies offer a wide variety of competing products, e.g. AOL Instant Messenger (AIM®), Microsoft® MSN Messenger, Yahoo! Messenger ™, and Google Talk $_{BETA}$, among others. All competing products were easy to download and install and shared a similar set of features. Moreover, it is not uncommon to find initial use of multiple instant messaging products among most users. In addition, instant messaging has also made inroads into organizations as an alternative mode of communication, thus providing for some added credence.

At the beginning of the survey, participants were asked to choose *any one* instant messenger product (such as Microsoft® MSN Messenger, AIM®, Yahoo! Messenger ™, Google Talk $_{BETA}$, etc.) that they most frequently use. Their choice generated personalized survey questions (refer to Appandix). Data from participants who had never initially adopted instant messengers was not collected. AIM® showed the most number of users (56.3%) followed by Microsoft® MSN Messenger (32.3%) and Yahoo! Messenger ™ (3.9%). Data collected from participants that chose

Yahoo! Messenger [TM] was dropped because of the constraints posed by testing effects with limited sample size. Finally, 412 usable responses were generated with 64% male and 36% female respondents.

Instrument Development

Instrument development followed a scale development procedure proposed by Devellis (Devellis 2003). Initial items were adapted from (Mowday et al. 1982), (Li et al. 2005) and (Bhattacherjee 2001). Two pre-tests were administered for the purpose of item prescreening, face validity test, and scale optimization. A two-step process was used to test the model. Preliminary analysis was used to construct factor scores which were then used in the context of the model to assess the paths. The operational definitions of the constructs are summarized as in Table 1. Items are listed in the Appendix.

Table 1. Operational Definition of Constructs

Construct	Operational Definition	Measurement
Affective Commitment	An individual's emotional attachment to a technology product	Adapted from Mowday et al. (1982)
Continuance Commitment	An individual's perceived costs from deciding to discontinue using the existing technology or choosing a competing technology product.	Adapted from Mowday et al. (1982)
Normative Commitment	An individual's belief that people important to him or her will think he or she should continue or discontinue using a technology product	Adapted from Li et al (2005)
Continuance Intention	An individual's intention to voluntarily continue using a technology	Bhattacherjee (2001)

Data Analysis

Data was analyzed using SPSS 13 (Norušis 2006) and EQS 6.1 (Build 83) (Bentler 2004; Byrne 2006) statistical software packages. Descriptive statistics were calculated in SPSS. For most items, the absolute values of skewness and kurtosis are smaller than 1.5 except for NC01 and BI01. Generally speaking, skewness and kurtosis does not appear to be a big concern. Second, the item-total correlation and Cronbach's alpha were calculated. Inter-item correlations were strong (greater than 0.85) and Cronbach's alphas were all greater than 0.7. In general, the dataset form our preliminary study indicated good internal consistency. The results are shown in Table 2.

Table 2. Descriptive Data

Construct	Item	Mean	Std. Dev.	Skewness	Kurtosis	Item-Total Corr.	Cronbach's Alpha
Affective Commitment	AC01	2.473	1.321	0.998	1.072	0.910	0.916
	AC02	2.663	1.423	0.885	0.525	0.930	
	AC03	2.609	1.351	0.862	0.873	0.936	
Continuance Commitment	CC01	4.913	1.721	-0.611	-0.691	0.887	0.865
	CC02	4.971	1.753	-0.486	-0.921	0.899	
	CC03	4.731	1.697	-0.518	-0.761	0.876	
Normative Commitment	NC01	2.214	1.429	1.621	2.525	0.938	0.915
	NC02	2.517	1.556	1.269	1.280	0.918	
	NC03	2.493	1.503	1.221	1.132	0.919	
Continuance Intention	CI01	2.546	1.346	1.312	2.129	0.860	0.716
	CI02	3.049	1.601	0.866	0.172	0.909	

Exploratory Factor Analysis

An exploratory factor analysis (EFA) was also conducted. Almost all items yielded factor loadings greater than 0.7 with cross-loadings smaller than 0.3. Results (Table 3) demonstrate acceptable convergent validity and discriminative validity (Byrne 2006; Fornell et al. 1981).

Table 3. Exploratory Factor Analysis

Construct	Item	Rotated Component Matrix			
		1	2	3	4
Affective Commitment	AC01	0.236	**0.825**	0.107	0.278
	AC02	0.175	**0.896**	0.103	0.176
	AC03	0.161	**0.885**	0.090	0.253
Continuance Commitment	CC01	0.069	0.115	**0.911**	0.043
	CC02	0.102	0.081	**0.921**	0.086
	CC03	0.113	0.071	**0.899**	0.110
Normative Commitment	NC01	**0.918**	0.161	0.076	0.143
	NC02	**0.859**	0.198	0.113	0.206
	NC03	**0.877**	0.184	0.119	0.169
Continuance Intention	CI01	0.237	0.331	0.079	**0.783**
	CI02	0.246	0.322	0.154	**0.765**

The Structural Model

Structural equation modeling (SEM) was used to confirm our hypothesis and test overall model fit. Structural equation modeling is particularly appropriate when attempting to confirm theory-driven models (Bentler 2004). As an extension of the general linear modeling (GLM) technique, SEM offers a robust validation procedure by its use of goodness-of-fit tests to determine if the pattern of variances and covariances in the data is consistent with the hypothesized structural model (Byrne 2006).

EQS was used to test the structural model. The model (Table 4), with $\chi^2/df = 1.459$ ($\chi^2 = 55.447$, $df = 38$) suggests a good fit. Other fit indices also support this result. CFI is 0.995, SRMR is 0.033, and the RMSEA is 0.033 with the 90% confidence interval between .010 and .053. Furthermore, the structural model explains 70.9% of variance in IS continuance intention among users. *Results evidence strong main effects of technology commitment as a precursor to IS continuance intentions.*

Table 4. Fit Indices of the Research Model

	Case	df	$\chi 2$	CFI	SRMR	RMSEA	90% CI of RMSEA	R-sqr
Research Model	412	38	55.447	0.995	0.026	0.033	(.010, .051)	0.709

The path coefficients between three exogenous constructs and one endogenous construct were also tested in the overall structural model (Figure 2). All path coefficients are significant and show support for H1, H2, and H3. Affective commitment appears to have the strongest direct effect (0.616, t=10.378, p<0.001) on continuance intentions, followed by normative commitment (0.312, t=2.064, p<0.05) and a weak direct effect of continuance commitment (0.096, t=5.871, p<0.001). Consistent with empirical research on the three dimensions of the commitment model (Meyer et al. 2002), correlations among exogenous variables were also conducted and findings do not suggest any significant overlaps between the commitment dimensions.

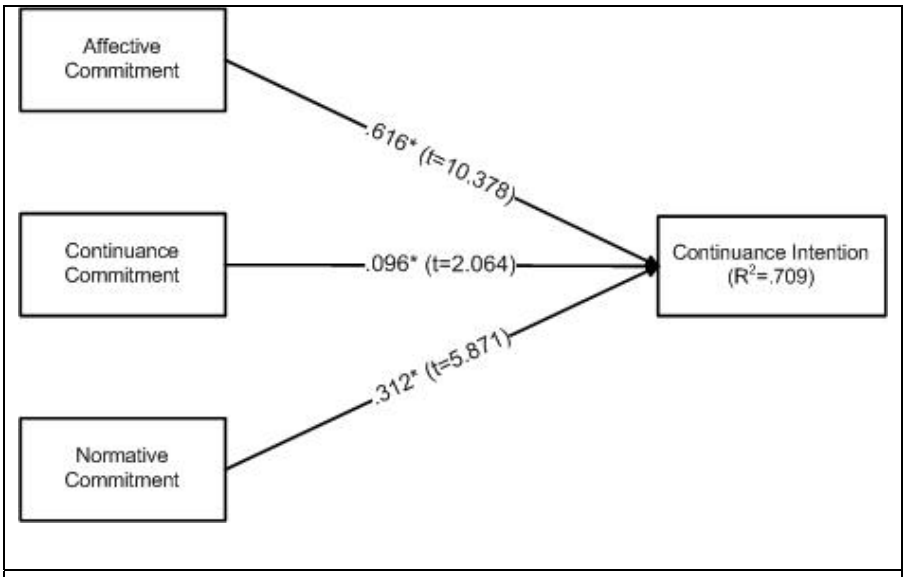

Figure 2. Path Diagram, All Users

Test of Moderation Effects

In order to test moderating effects of technology product on the relationship between commitment and IS continuance intentions, participants were split into the two major groups (AIM® users (n = 232) and MSN users (n = 133)). Individual model fits are shown is Table 5. Byrne's multi-group invariance test procedure (Byrne 2006; Byrne et al. 2003) was used to test moderation effects. Byrne's invariance test consists of a series of hierarchical models comparison with constraints on item loadings, factor variances, factor covariances, error residuals, and path coefficients one at a time. If the fit indices change significantly due to the application of a set of constraints, subsequent tests of constraint parameters are conducted until the moderator is pinpointed. The results are shown in the Table 6.

Both groups yielded good fit indices (Table 5) which laid the foundation for the test of moderating effect of technology product. The perceptible difference from the moderating influence of technology product lies in the relationship between continuance commitment and IS continuance intentions. While AIM® users show a moderate positive relationship between continuance commitment and IS continuance intentions, the relationship becomes negative and non-significant for MSN Messenger users. Among other differences, affective commitment has a greater main effect on IS continuance intentions among MSN users while normative commitment has a greater main effect on IS continuance intentions among AIM® users.

As hypothesized, path coefficients across technology products show some significant differences (Figures 3 and 4). Step 7 to 9 reveals that the release of constraints on normative commitment to continuance intention and continuance commitment to continuance intention makes significant change of the model χ^2. Results offer support for H4b, and H4c but not H4a.

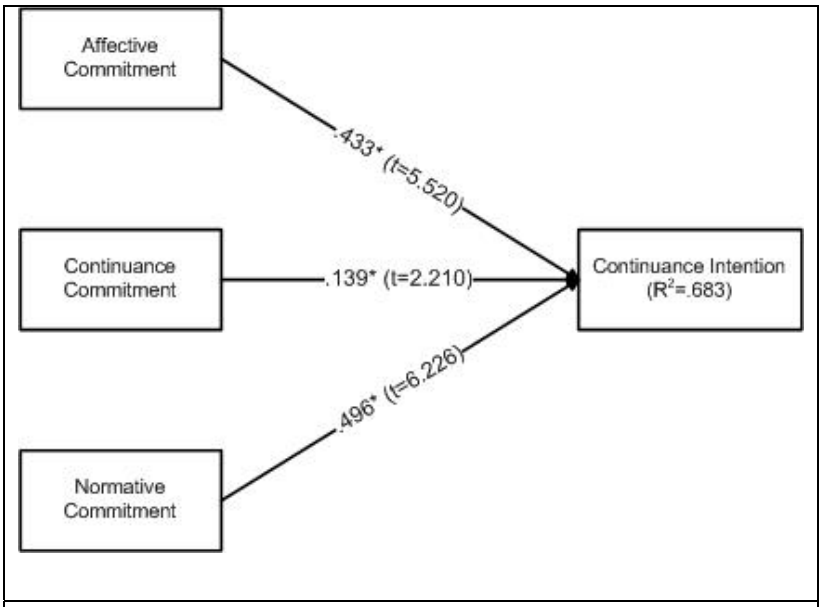

Figure 3. Path Diagram, AIM® users

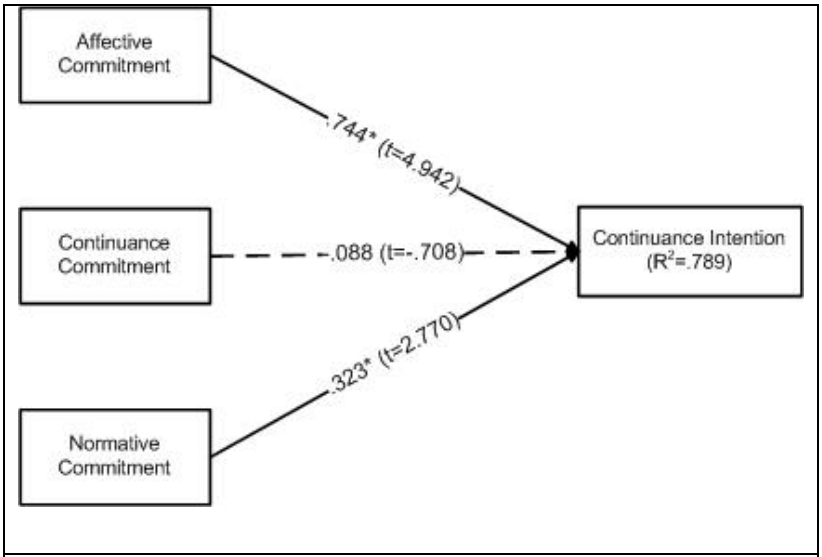

Figure 4. Path Diagram, Microsoft® MSN Messenger Users

Table 5. Fit Indices of Sub Groups

	Case	df	$\chi 2$	CFI	SRMR	RMSEA	90% CI of RMSEA	R-sqr
MSN Messenger Users	133	38	56.284	0.978	0.04	0.06	(.020, .092)	0.789
AOL IM Users	232	38	53.897	0.988	0.04	0.043	(.006, .067)	0.683

Table 6. Invariance Test

Step	Test	df	χ2	CFI	SRMR	RMSEA	Model Comparison	Δdf	Δχ2	ΔCFI	Sig.
1	Configural	76	110.182	0.985	0.040	0.035					
2	Metric	83	128.24	0.980	0.052	0.039	2 vs. 1	7	18.058	-0.005	n.s
3	Factor Variance	86	141.373	0.975	0.084	0.042	3 vs. 2	3	13.133	-0.005	n.s
4	Factor Covariance	89	150.368	0.972	0.098	0.044	4 vs. 3	3	8.995	-0.003	n.s
5	Residual	101	177.699	0.966	0.106	0.046	5 vs. 4	12	27.331	-0.006	n.s
6	Path Coefficient	104	194.994	0.960	0.109	0.049	6 vs. 5	3	17.295	-0.006	n.s
7	Release AC-CI	103	192.697	0.960	0.103	0.049	6 vs. 5	1	-2.297	0.000	n.s
8	Release CC-CI	103	189.176	0.962	0.109	0.048	6 vs. 5	1	-5.818	0.002	<0.05
9	Release NC-CI	103	180.773	0.966	0.104	0.046	6 vs. 5	1	-14.221	0.006	<0.001

Discussion

Results from the data collected from an initial survey reveal that users' perceived technology commitment is a strong predictor for IS continuance intentions. Not only do we find that the proposed model achieves good fit, but we also find that technology commitment dimensions contribute towards explaining 71 percent of the variance in IS continuance intentions. This suggests that users' technology commitment is actually an important aspect to be considered when explaining IS continuance intentions, somewhat resonant with the argument made by Malhotra and Galetta (2005).

From a theoretical perspective, the notion of matching a user's technology commitment to IS continuance intentions is, to the best of our knowledge, one of the early attempts to unravel user behavior related to the sustained use of a technology. From the findings suggested by this study, affective commitment seems particularly important in building users' IS continuance intentions. Such a finding also receives intuitive support as users would intend to keep using technology products that they like (affective), independent of influences (normative) or conditions (continuance). The weak relationship between continuance commitment and IS continuance intentions confirms that users are not particularly favorable towards any mandates, coercion, and compliance posed by the technology per se (e.g scheduled updates, patches, fixes), especially when the technology is free and openly available. However, user intentions gain ground if they feel that the using a technology provides a sense of membership.

However, a reexamination of IS continuance in the context for brand-specific technology products offers some interesting observations. While MSN messenger users' seem to be indifferent to the relationship between continuance commitment and continuance intentions, they seem to relatively enjoy the application compared to AIM® users. Among AIM® users, higher switching costs explain their continuance intentions. The finding is particularly interesting in light of the relatively stronger relationship between normative commitment and IS continuance intentions among AIM® users. Together, it may be implicated that because AIM® users may have more contacts on their network, switching costs are higher, compelling users to continuously use the application if under conditions of relatively lower affective commitment. To summarize, the perceptively greater impact of normative commitment on continuance for AIM® can be explained by the larger critical mass of AIM® users. Our surveys consistently verified that AIM® users greatly outnumber MSN messenger users among college students. People are more likely to continue to use AIM® if they feel that most of their friends and associates use AIM®.

Understanding information systems continuance offers tremendous benefits for the industry. The fierce competition among IS vendors is often a function of competing technology products. Take for example the statistical software industry that often relies on revenues from annual individual and site licenses. While SAS, SPSS, and Minitab may each claim significant brand-specific product differentiation advantages, all three programs offer a similar set of features. Subsequently, organizations may agree to initially adopt and use all three software programs. However, if after a year, the organization finds that individual members continue to use a particular product more often than others, it will most likely decide to not renew licenses of the other two competing products. As a result, adopted yet underused technology products cost organizations in the U.S. millions of dollars every year (Markus et al. 1994). Given that evolving business models in this competitive landscape vie for continuous use rather than initial acceptance of a technology product, it becomes crucial for organizations to understand the preconditions for IS continuance intentions.

This study also contributes to existing IS research in many ways. First, this study is one of few attempts to use the notion of technology commitment as an ontological shift to explain users' continuous use of technologies. This study goes beyond the adoption phase to look at routinization of technology use (Zmud et al. 1992) given multiple adopted alternatives. By doing so, the paper tries to look at perceived behavioral control in the face of discontinuous use of technology. Second, this paper tries to understand the influence of brand-specific technology differences on user intentions, thus shifting the research plane from inter-technology influences to intra-technology influences[2]. Third, the treatment of technology commitment as a multi-faceted constructs allows for the incorporation of a varied set of commitment dimensions, from emotion to social desirability and obligation. Third, this study offers a systematic development of instruments, refined and validated though empirical evidence for reference by future research. Finally, in receipt of strong empirical support, the technology commitment model offers an extrapolative framework with a degree of predictive validity for other forms of technologies and technology products.

Limitations and Future Research Agenda

The study is not without limitations. First, the subjects were undergraduate students and their perceptions of commitment and continuance may not be reflective of a broader population. Second, preliminary findings from this research-in-progress are captive to instant messaging technologies only and need to be validated in light of other competing technology products. Third, because IS continuance is a concept rooted in sustained use, a cross sectional treatment may not portray inherent nuances, necessitating a longitudinal study.

The model is being further refined with additional data collection proposed for the Summer and Fall of 2006. We intend to: (a) further data collection to trace the moderating effects of other technology products (e.g. Web browsers and email client products) (b) extend empirical findings with longitudinal data collection, and (c) investigate IS acceptance and use as precursors to technology commitment.

In sum, preliminary results suggest that technology commitment of users is an important consideration in unraveling the dynamics of IS continuance. Particular attention must be given to raise affective and normative technology commitment among users to sustain IS use. In a competitive landscape, the potential of affective commitment on IS continuance intentions is compelling – a fact that vendors may wish to consider in their design and delivery of technology products.

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Appendix

Instrument for Measuring Technology Commitment

Construct	ID	Item
Affective Commitment	AC01	I am extremely glad that I chose [Name of Specific Instant Messenger].
	AC02	I find [Name of Specific Instant Messenger] to be the best among available substitutes.
	AC03	Deciding to use [Name of Specific Instant Messenger] was definitely a right choice for me.
Continuance Commitment	CC01	Discontinue using [Name of Specific Instant Messenger] would require considerable personal sacrifice.
	CC02	I would have to give up a lot by abandoning [Name of Specific Instant Messenger].
	CC03	Many changes would have to occur in my present circumstances if I discontinue using [Name of Specific Instant Messenger].
Normative Commitment	NC01	Many of my friends use [Name of Specific Instant Messenger].
	NC02	Of the friends I communicate with frequently, many use [Name of Specific Instant Messenger].
	NC03	A large percentage of my friends use [Name of Specific Instant Messenger].
Continuance Intention	CI01	I predict I will continue to use [Name of Specific Instant Messenger] as I do now.
	CI02	I will keep using [Name of Specific Instant Messenger] as long as updates are available.

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