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Force of Habit and Information Systems Usage: Theory and Initial Validation

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ABSTRACT

Over the last two decades, information systems (IS) research has primarily focused on people's conscious (intentional) behavior when trying to explain and predict IS usage. Consequently, almost no research has investigated the potential importance of subconscious (automatic) behaviors, also known as habits. This study represents a first step toward validating the idea that one can add explanatory power to a behavioral model such as Ajzen's [1985] theory of planned behavior (TPB) by including the habit construct. We conducted a two-stage questionnaire-based survey involving two different groups of students who had access to a sophisticated internet-based communication tool (IBCT). These data were used to test a behavioral model integrating theoretical constructs of TPB and a relevant subset of Triandis' [1980] behavioral framework. Our findings highlight the importance of considering *both* conscious (intentions) and subconscious (habits) factors in explaining usage behavior. Furthermore, we share our observations about antecedents of IBCT usage in the educational context. Implications for practice and research are discussed.

Keywords: Habit, IS usage, TPB, Internet-based communication tools (IBCT), education

[1]The two authors contributed equally to this research.

I. INTRODUCTION

In the past two decades of information technology (IT) usage research, the main focus has been on cognitive behavioral models. Based on models such as the theory of reasoned action (TRA) [Fishbein and Ajzen 1975], the theory of planned behavior (TPB) [Ajzen 1991; Ajzen and Madden 1986], and innovation theory [Rogers 1983, 1995], information systems (IS) research has developed many IT-specific models such as the technology acceptance model (TAM) and its variants [Davis 1989; Hartwick and Barki 1994; Mathieson 1991], the decomposed TPB [Taylor and Todd 1995b], and perceived characteristics of innovating (PCI) models [Karahanna et al. 1999; Moore and Benbasat 1991, 1996].

In all instances, great effort has been spent on understanding the antecedent factors that combine to influence actual IT usage behavior. In almost all situations, an individual's planned decision in the form of intentions is viewed as the main conduit through which all other factors must funnel in order to impact actual IT usage.

While the past studies have contributed to our understanding of many antecedent factors such as involvement, perceived ease of use, perceived usefulness, and how they relate to intentions, this study argues that we also need to focus on factors that are internal to the individual, yet differ from the rational, deliberate, cognitive decision making the IS academy has pursued thus far. As such, we reintroduce the notion of habit originally discussed by Thorngate [1976] and Triandis [1980] more than 20 years ago. In contrast to the deliberate rational concept of intention, habit refers to the non-deliberate, automatically inculcated response that individuals may bring to IS usage.

Defined this way, habit has relatively little conceptual overlap with intentions, and may thus provide additional explanatory power for IS usage. Prior research indicates that the suggestions by following Thompson et al. [1991] or by Davis' [1993] to consider the habit construct when trying to explain usage behavior may be promising indeed. Comparing the behavioral determinants of inexperienced and experienced IT users, Taylor and Todd [1995a] found, for example, that the two groups differ in both the strength of the causal relationship between behavioral intentions and behavior and the direct determinants of behavioral intentions. For experienced users, the intentions-behavior link was much stronger than for inexperienced ones, while the behavioral intentions of inexperienced users could better be explained by the antecedent variables in the model (a combination of TAM and TPB, dubbed augmented TAM) than those of experienced users.

This study represents a first step toward validating the idea that including the habit construct into a behavioral model adds explanatory power for IS usage. Our analysis of an initial data set on the usage of Internet-based communication technology (IBCT) suggests that this may indeed be the case.

We collected the data in a classroom setting at a large university in Hong Kong. While the use of student subjects is often regarded as bad practice as they may not adequately represent the real target population (e.g., managers), in this study we chose student subjects deliberately. Assuming that it does not matter much in what particular context data about IS usage habits are collected as long as the subjects (here, students), the technology in question (here, the IBCT), and the need for technology usage (here, the support of out-of-classroom communication) constitute a realistic context, we view our choice of context as a valid instance within which the development of IS usage habit can be studied. We consider it a beneficial side effect of this particular choice that it also permitted us to make a number of interesting observations about the specific nature of antecedent factors of IBCT usage in the educational context.

The remainder of this paper is organized as follows. In the following section we review the extant literature on IS usage, pointing out advantages and disadvantages of different approaches followed to date. We then describe our research model, research methodology, and results. The paper concludes by discussing

(1) the importance of considering habits (i.e., automatic or subconscious behavior) in addition to intentional behavior and
(2) the nature of social factors, facilitating conditions, and perceived consequences with respect to IBCT-usage in the educational environment.

II. LITERATURE REVIEW AND THEORETICAL FOUNDATIONS

To better understand the role of non-intentional (automatic) factors such as habit on IS usage, ideally a research framework should:

(1) include both intentional and automatic determinants of usage behavior [e.g., Triandis 1980].
(2) factor in properties of the social context, for example, in the form of social norms (e.g., TRA, TPB) or social factors [e.g. Triandis 1980]. As an interactive communication technology, an IBCT's overall usefulness depends largely on how much it is used by others (e.g., friends, teammates) [Markus 1987].
(3) reflect conditions in which users of a technology *perceive* to have only limited control over their own behavior (e.g., TPB). Users are likely to face constraining conditions when trying to use a technology. Depending on their individual situation, they may, however, perceive these constraints differently. For example, while two different users may be equally busy, the first one may perceive this situation as highly constraining, while the second one, who is more adept in managing his own time, may perceive the same situation as much less critical.

Keeping these criteria in mind, we thoroughly searched the extant literature for a model on which to build this research. In the following, we provide an overview of what we found and discuss how we used extant work to formulate the research model guiding our study.

OVERVIEW OF PRIOR WORK

Over the last two decades, IS research has addressed the problem of explaining and predicting IS usage behavior from several different angles. Before moving on to discuss our research model in detail, we provide a brief summary of the three major research streams developed to date. We hope this will help the reader to better back-trace the theoretical foundations on which this research is based.

Work based on Fishbein and Ajzen's [1975] theory of reasoned action (TRA) posits that a person's behavior can be predicted reasonably well by his or her intention to behave in a certain way. Intentions, in turn, are influenced by the person's attitudes toward the behavior and social norms. Further, attitudes and social norms are based on the person's salient beliefs (beliefs and evaluations, normative beliefs and motivation to comply) regarding the specific behavior in question. TRA is an

especially well-researched intentional model that has been widely used and tested in IS research and has proven successful in predicting and explaining behavior across a variety of other domains [Compeau and Higgins 1995b; Davis et al. 1989; Thompson et al. 1991]. Despite its success, the theory's relatively stringent boundary conditions [Sheppard et al. 1988] and conflicting empirical evidence regarding the importance of the social norms construct made further developments necessary. Two of TRA's most important derivatives for IS research are Davis' [1989] technology acceptance model (TAM) and Ajzen's [1985, 1991] theory of planned behavior (TPB).

TAM, specifically proposed for research in the IS domain [Agarwal and Prasad 1997], uses TRA as a theoretical base for specifying the causal linkages between two key beliefs influencing IS usage behavior: perceived usefulness and perceived ease of use on the one hand, and intentions and behavior on the other [Davis 1989]. By relying on only two beliefs that are designed to apply to different IS usage contexts, TAM represents a parsimonious, yet practical tool if one's sole goal is the prediction of information technology usage [Taylor and Todd 1995b]. However, if one's focus is to better understand and explain acceptance in ways that guide development beyond suggesting that system characteristics impact a person's usefulness perceptions and ease of use, both TRA and TPB are preferable. Like TAM, its parent, TRA, does not consider control factors, limiting its applications to situations in which behavior is completely voluntary [Ajzen and Madden 1986]. Realizing this shortcoming, Ajzen [1985, 1991] developed TPB, an extension of TRA, to account for conditions where individuals do not have complete control over their behavior.

A second major stream of research approached IS usage by building on Rogers' [1983] work on innovation diffusion. This research considers a person's perceptions about an innovation's characteristics as important influences on system usage and usage intentions. A major difference between work relying on innovation characteristics and models such as TRA, TAM, and TPB consists of the lack of an affective belief construct (attitude) in the former [Agarwal and Prasad 1997].

IS research forming a third, more recent, research stream applied various subsets of Triandis' [1980] behavioral framework to questions related to IS usage. Triandis developed his comprehensive model independently of TRA. In its original form, it includes variables as diverse as history, culture, genetic/biological factors, personality, and social situation, plus a number of others that are similar to those found in TRA and its derivatives: social factors, affect (attitude), facilitating conditions, intentions, and behavior. While the framework's overall complexity prevents it from being applied in its entirety, IS usage studies have productively used various subsets of it. For example, Thompson et al. [1991] used Triandis' work as a reference to explain PC usage, finding that social factors, complexity (ease of use), job fit, and long-term consequences (usefulness) had significant effects on PC usage. In a later study, the same authors found that experience—which they likened to Triandis' habit construct—had an important direct influence on usage [Thompson et al. 1994]. This corroborates the work of Bergeron et al. [1995], who reported that a person's expert information system (EIS) usage was influenced by experience, perceived usefulness, social factors, and facilitating conditions (external control factors).

Comparing the various frameworks underlying these three research streams, we realized that no single framework meets all of the criteria we listed at the beginning of this section. However, both Ajzen's [1985, 1991] and Triandis' models meet at least two: while TPB does not include automatic determinants of behavior (requirement number 1), Triandis framework uses objective instead of *perceived* facilitating conditions (requirement number 3).

Table 1. Comparison of Theoretical Constructs in Our Research Model, TPB, and the Initial Triandis Subset

Constructs	*Our Research Model*	*TPB*	*Triandis (subset)*
Behavior	• **Function of behavioral intentions, facilitating conditions and habits**	• Function of intentions and perceived behavioral control	• Function of behavioral intentions, facilitating conditions and habits
Behavioral Intention	• **Self-instruction to behave in a certain way** • **Direct function of affect, social factors, perceived consequences, and perceived facilitating conditions**	• Captures motivational factors; indication of how hard people are willing to try • Direct function of affect, social norms, and perceived behavioral control	• Self-instruction to behave in a certain way • Direct function of affect, social factors, and perceived consequences
Social norms - social factors	• **Internalization of referent group's subjective culture and specific interpersonal agreements**	• Perceived social pressure to perform/not to perform behavior • Based on normative beliefs about a referent other's opinion and his/her motivation to comply	• Internalization of referent group's subjective culture and specific interpersonal agreements
Perceived Behavioral Control (PBC)—Facilitating Conditions	• **Perceived** • **Belief about how easy/difficult behavior is going to be** • **Directly influences both intentions and behavior**	• Perceived • Belief about how easy/difficult behavior is going to be • Directly influences both intentions and actual behavior	• Objective • Influences behavior
Attitude (affect)—Affect	• **Emotional response to the thought of the behavior** • **Direct function of habits → reflects classic conditioning of behavior due to previous associations with pleasant/unpleasant events**	• Defined as affect → favorable or unfavorable evaluation/appraisal of behavior • Direct function of behavioral beliefs and associated evaluations	• Emotional response to the thought of the behavior • Direct function of habits → reflects classic conditioning of behavior due to previous associations with pleasant/unpleasant events
Behavioral beliefs—Perceived consequences	• **Salient beliefs about usefulness of behavior**	• Salient beliefs about usefulness of behavior	• Salient beliefs about usefulness of behavior
Habits	• **Automatic behavior**		• Automatic behavior

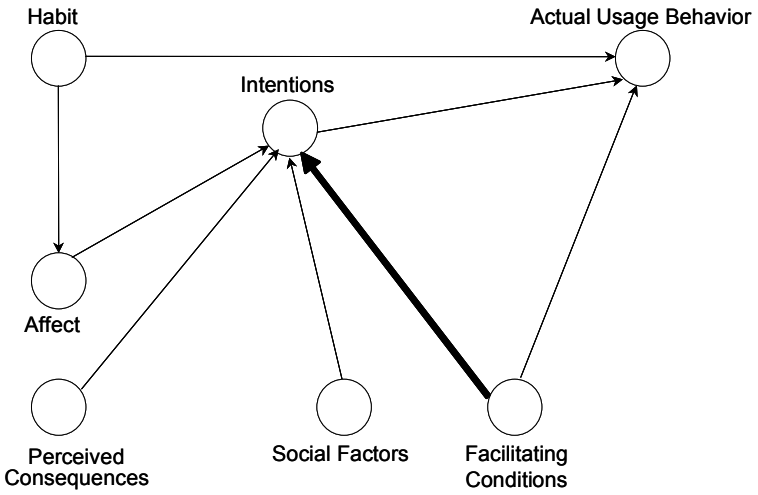

Figure 1. Research Model

OUR RESEARCH MODEL

As shown in Figure 1, our research model closely resembles a subset of Triandis' framework (see Table 1). Given the potential importance of the habit construct [Thompson et al. 1994] and its scanty consideration in IS research [Bergeron et al. 1995; Thompson et al. 1991], we chose Triandis' model rather than TPB as the point of departure for further theoretical refinement (see Table 1 for a comparison of TPB, Triandis, and our research model). In view of the problems related to measuring "objective facilitating conditions" as required by Triandis, we modified the model slightly, considering a person's associated perceptions instead. Substituting perceived for objective facilitating conditions is consistent with TPB. As an implication of this change, we added a causal relationship between perceived facilitating conditions and behavioral intentions (as is suggested in TPB and marked in bold in Figure 1).

In the remainder of this section we describe the concepts and relationships of the model, thereby paying special attention to explaining how it meets the requirements listed above.

Triandis intended his behavioral framework as a guide to research that would help scholars in social psychology integrate their findings by promoting a cumulative research tradition. In essence, his framework represents "a network of interrelated hypotheses around the constructs of attitude and behavior, placing them in the broadest possible context" [Triandis 1980]. While the model's comprehensiveness is fundamental to fulfilling Triandis' intention, it renders it hard (if not impossible) to apply the model in its entirety. Thus, IS research using the framework usually resorted to applying subsets of relevant constructs to the research problems addressed [Bergeron et al. 1995; Thompson et al. 1991, 1994]. In this study we will follow this convention, limiting ourselves to those constructs most relevant to explaining students' usage behavior: actual behavior, behavioral intentions, habits, affect, social factors, facilitating conditions, and perceived consequences.

According to Triandis, *behavior* refers (among other things) to socially defined patterns of muscle movement. It is directly influenced by a person's behavioral intentions *and* habits.

Behavioral intentions are instructions that people consciously give to themselves to behave in certain ways.

By contrast, *habits* reflect *automatic* behavior tendencies developed during the past history of the individual, such that particular stimuli elicit the behavior even when the individual does not instruct himself or herself to perform it. It follows that as a behavior becomes routinized, it comes under the influence of habits, but before it is routinized it will be under the influence of behavioral intentions [Triandis 1980]. While the causal relationship between behavioral intentions and behavior is analogous to that in TPB, the link between habits and behavior lacks a direct TPB counterpart since TPB does not include a construct analogous to the habit construct. Given the likely potential of the habit construct as a predictor of usage/behavioral intentions, we included the construct in our research model.

Facilitating conditions moderate the link between behavioral intentions and behavior on the one hand, and habits and behavior on the other. Even if a person has the intention to perform a particular behavior or habitually performs the behavior, the behavior may *not* occur when the facilitating conditions do not permit it. For example, a student who intends to use an IBCT to communicate with his/her peers will not be able to do so if his or her Internet connection doesn't work (which is an example for an objective facilitating condition). Triandis' facilitating conditions are similar, yet not identical, to Ajzen's [1985, 1991] perceived behavioral conditions (PBC). The differences are twofold. First, while the nature of PBC is, by definition, subjective (perceived), the nature of facilitating conditions is objective. Addressing this issue, Ajzen and Madden [1986, p. 456] note that

> it is often very difficult if not impossible to secure an adequate measure of actual control in advance of observing a behavior [and] that we can usually not be sure that individuals in fact possess the requisite resources and that appropriate opportunities will present themselves unless and until an attempt is made to perform the behavior under consideration.

Here, we follow their suggestion to measure perceptions instead of objective conditions. These perceptions refer to a person's beliefs about how easy or difficult the performance of the behavior in question is likely to be. Second, Triandis posits facilitating conditions to influence actual behavior, but not behavioral intentions. By contrast, TPB suggests that PBC has a direct influence on *both* actual behavior and behavioral intentions. In line with TPB, we modeled the causal relationships between perceived facilitating conditions and behavioral intentions and behavior as direct links. Consequently, our decision to employ perceived rather than objective facilitating conditions in our research model, is not only grounded empirically [c.f. Limayem et al. 2000], but also enjoys theoretical support [Ajzen 1985, 1991].

Consistent with TPB, both *affect* and *social factors* are hypothesized to influence behavioral intentions directly. The affect toward a behavior reflects the direct emotional response to the thought of the behavior: "is it enjoyable and delightful, or disgusting and unpleasant?" [Triandis 1980]. This definition is compatible with Fishbein and Ajzen's definition of attitudes (see above). Social factors which correspond to TPB's social norms [Bergeron et al. 1995] refer to the individual's internalization of the reference groups' subjective culture, and specific interpersonal agreements that the individual has made with others, in specific social situations.

In addition to affect and social factors, Triandis suggests that a third factor, called *perceived consequences*, influences behavioral intentions. Triandis' perceived consequences are similar to TPB's behavioral beliefs. In contrast to TPB, however, their influence on behavioral intentions is not

mediated by affect, but is posited to be direct, which is consistent with TAM [Davis 1993]. In other words, *perceived consequences* incorporate the basic premise that a person evaluates his or her behavior in terms of potential rewards and bases his or her choices of behavior on the desirability of the rewards. Finally, a person's affect is directly influenced by his or her habits. Put differently, affect is acquired through experience with the behavior and reflects classical conditioning of the behavior due to previous associations with pleasant or unpleasant events [Triandis 1980]. Due to the lack of a habit construct in TPB, this link does not have a counterpart in TPB.

III. METHODOLOGY

DATA COLLECTION

The data used in this research was collected at a large university in Hong Kong. In choosing our student subjects, we took advantage of the fact that one of the authors taught two different (one master level, one undergraduate level) IS courses, both supported by an IBCT to encourage out-of-class communication.

The data collection procedure consisted of four stages: (0) Introduction and demonstration of WebBoard (first week of the semester), (1) belief elicitation (week 9), (2) survey of intentions, habit, affect, perceived consequences, and social factors, (week 11), and (3) survey of behavior (actual usage of IBCT, week 14). The purpose of stage one was to elicit the students' salient beliefs about the consequences of using IBCT and the social factors influencing such behavior, as well as the facilitating conditions. The elicited beliefs were used to develop the measurement models of the respective constructs. Following belief elicitation, we constructed a survey instrument that was pre-tested and validated in stages 2 and 3. Figure 2 describes the data collection process.

The IBCT studied in this research was O'Reilly's WebBoard 3.5 (see **www.webboard.com**), a Web-based electronic bulletin board with a folder structure. During our study, the students could access the WebBoard application through a hyperlink that was added to their respective course Web sites. As shown in Figure 3, hyperlinks to the WebBoards were made an integral part of the general menu of the two Web sites.

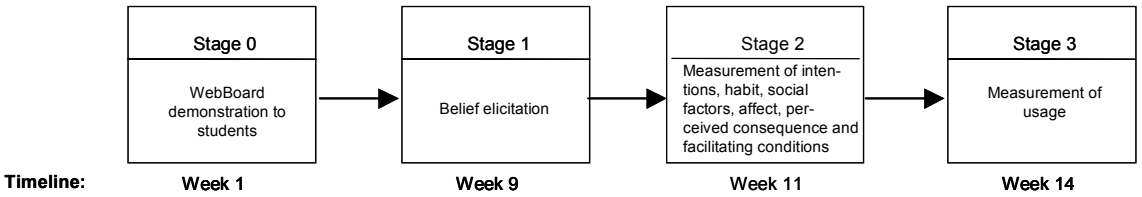

Figure 2. Data Collection Process

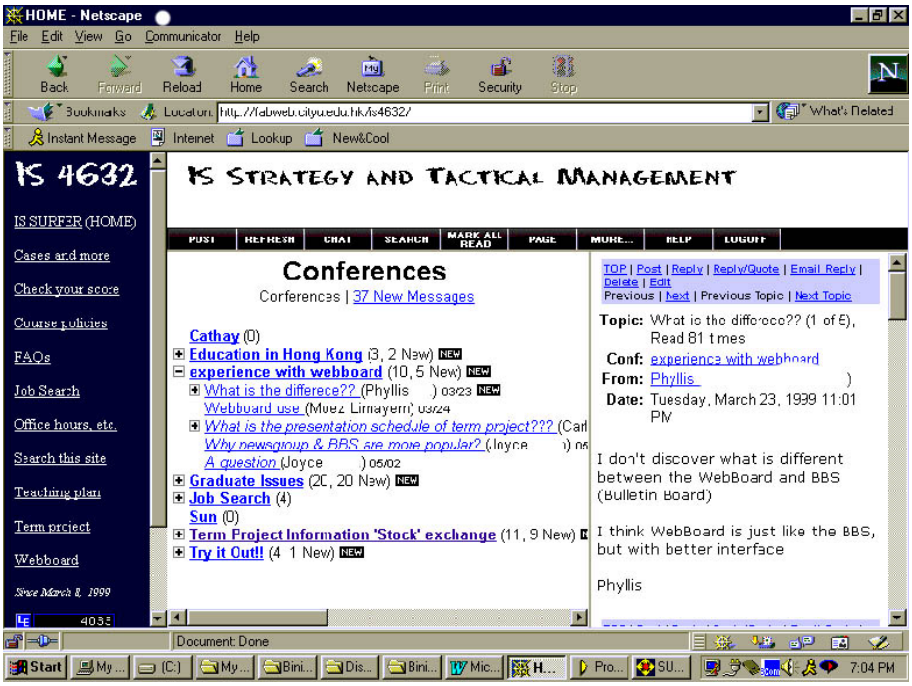

Figure 3. Access to WebBoard Application Via Course Web Site

Stage 0: Introduction and Demonstration of WebBoard. In week one of the semester, WebBoard was introduced and an extensive and comprehensive demonstration of this software was given to the students participating in this study. Students were encouraged to ask questions about all aspects of the system.

Stage 1: Belief Elicitation. The belief elicitation was carried out through a questionnaire and focus groups involving a total of 31 undergraduate and master students. These students were representative of the students eventually sampled in that they were enrolled in the same programs and in similar courses. Belief elicitation took place in week nine of the semester. This procedure helped us arrive at a set of beliefs that is both salient and relevant to the population under study. The students were asked to perform three tasks: (1) to specify possible consequences of using WebBoard (perceived consequences), (2) to enumerate conditions that would facilitate the usage of WebBoard (facilitating conditions), and (3) to identify the people who might influence their behavior (social factors). The purpose of the belief elicitation was to complement a list of formative items measuring the perceived consequences, facilitating conditions, and social factors constructs that we had already compiled from the literature. The exact questions used in the belief elicitation stage are listed in Appendix B. We received a total of 233 suggestions for items, averaging about eight items per participant. For details about these items as well as their frequency counts, the reader is referred to Table 2.

Table 2. Suggested Items and Frequency Counts

Social Factors	
Items	*Frequency*
1. Instructor's influence	21
2. Classmates' influence	8
3. Friends' influence	12
4. Term projects teammates' influence	16
Total Frequency	**57**
Perceived Consequences	
Items	*Frequency*
1. Access useful information	19
2. Share ideas with classmates	11
3. Get fast answers to questions	10
4. Improve communication with instructor	10
5. Improve performance in class	5
6. Improve communication with classmates	14
Total Frequency	**69**
Facilitating Conditions	
Items	*Frequency*
1. Good understanding of how to use WebBoard	19
2. Easy access to Internet	30
3. Inexpensive access to Internet	15
4. Fast Internet connection	18
5. Assistance provided by WebBoard experts is adequate	20
6. Too busy to use WebBoard	5
Total Frequency	**107**

Stage 2: Survey 1. In the first survey, a questionnaire (see Appendix A for items used) measuring intentions to use WebBoard, habits, affects, perceived consequences, and social factors was administered to 144 graduate and undergraduate students, 92 of whom returned the completed questionnaire. This survey took place in week 11 and participation was voluntary.

Stage 3: Survey 2. The second questionnaire (see Appendix A for items used) was administered one month later to the same 144 students. It included only two questions intended to measure the level of WebBoard usage since answering the first questionnaire. The second questionnaire was returned by 94 students.

Table 3. Student Demographics

Demographic Properties		*Percentages*
Gender	Male	54%
	Female	46%
Major	3rd year BBA in IS	80%
	Master in IS	20%

In all, 60 students responded to *both* questionnaires[2] (survey 1 and survey 2), which corresponds to an overall response rate of close to 42 percent. We conducted t-tests on the answers to all of the questions and we did not find any significant differences between males and females nor between graduate and undergraduate students. The demographic profile of the 60 respondents is summarized in Table 3.

MEASURES

To ensure a high level of measurement reliability in operationalizing our research constructs, we chose items that had been suggested in previous research wherever possible. Most of our reflective items for affect, intentions, actual usage, and habit were found this way (see Table 4). The remaining constructs—social factors, perceived consequences, and facilitating conditions—were measured with formative items identified through the belief elicitation exercise (see above).

In deciding whether to measure a construct with formative or reflective items, Chin and Gopal [1995] urge researchers to consider whether the items form the *emergent* first-order factor or constitute reflective (congeneric) indicators tapping into a *latent* first-order factor. Although we could have used reflective items validated in previous studies to measure perceived consequences, social factors, and facilitating conditions, we opted for formative measures instead. In this way we could gain a more precise understanding of the situation-specific items forming these constructs. For example, in contrast to Compeau and Higgins [1995a] who used 11 reflective measures to measure *outcome expectations*—a similar construct to *perceived consequences*—we measured perceived consequences using formative items. The rationale behind this decision is that one of our objectives in this study was to explore the factors that motivate students to use IBCT. Detailed descriptions of actual wording and response scales are given in Appendix A.

[2]For the sole purpose of being able to match the questionnaires of survey 1 with those of survey 2, we had asked the students to identify their questionnaires with the last four digits of their telephone numbers.

Table 4. Sources of Reflective Measures for Affect, Intentions, Actual Usage, and Habit

Construct	*Source of Reflective Measure*
Affect	In constructing our measure we stayed as faithful as possible to the original definition of the construct given by Fishbein and Ajzen [1975, p. 11] and Triandis [1980, p. 211-212]; see also Agarwal and Prasad [1999] and Taylor and Todd [1995b] on operationalization of attitudes.
Intentions	We adapted items from the work of Mathieson [1991], Agarwal and Prasad [1998]; Taylor and Todd [1995b], and Karahanna et al. [1999].
Actual Usage	We adapted items from Davis [1989], Limayem et al. [2000], and Straub et al. [1995].
Habit	As opposed to Thompson et al. [1994] and Bergeron et al. [1995] who operationalized habits as experience, we followed Triandis' [1980] suggestion to capture the nature of habits as automatic behavioral tendencies.

DATA ANALYSIS

The analysis of the data from the 60 respondents who answered both questionnaires 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 1995a]. It allows the researcher to specify both the relationships among the conceptual factors of interest and the measures underlying each construct. When using PLS, the researcher simultaneously analyzes how well the measures relate to the associated construct and whether the hypothesized relationships at the theoretical level are empirically verified. PLS's ability to include multiple measures for each construct also provides more accurate estimates of the paths among constructs, which is typically biased downward by measurement error when using techniques such as multiple regression. Furthermore, due to the formative nature of some of the measures used (discussed below) and non-normality of the data, LISREL analysis was not appropriate in our case [Chin and Gopal 1995].

The analysis was conducted with PLS-Graph version 3.00 [Chin 2001]. Tests of significance for all paths were performed using the bootstrap resampling procedure [Cotterman and Senn 1992]. The number of samples in the bootstrap procedure was set to 200.[3] Table 5 includes the descriptive statistics of all reflective variables.

[3]We chose bootstrapping over the use of jackknifing since computational time was not a constraint and jackknifing is considered both less efficient and an approximation to the bootstrap [Chin 1998, p. 320]

Table 5. Descriptive Statistics

	Minimum	*Maximum*	*Mean*	*Standard Deviation*
Habit	1.00	3.80	2.46	.61
Affect	2.25	4.25	3.16	.37
Intentions	1.00	5.50	2.23	1.21
Usage	1.00	6.00	2.05	.97

Convergent validity. For reflective measures, all items were viewed as parallel (i.e., congeneric) measures capturing the same construct of interest. To assess their convergent validity, we applied the standard approach for evaluation, where all path loadings from construct to measures are expected to be strong (i.e., 0.70 or higher). Instead of using Cronbach's alpha, which represents a lower bound estimate of internal consistency due to its assumption of equal weightings of items [Chin 1998], we used the *composite reliability measure* developed by [Werts et al. 1974].

Table 6 shows the weights and loadings of the measures to their respective constructs. As Chin [1998] notes, loadings should be interpreted for reflective measures and weights for formative ones. For all constructs with multiple reflective measures, most of the items are reasonably high (i.e., above 0.70), with the majority being above 0.80, demonstrating convergent validity. In the few situations were the loadings were below 0.70, they were complemented by other more reliable measures (as happened in the case of affect and habits). Furthermore, all reflective measures were found to be significant ($p < 0.01$). The composite reliability measures (see ρ in column 1 of Table 6) and the average variance extracted (see Table 7) provided additional support for reliability and convergent validity, with all reliabilities being greater than 0.70 and average variance shared between the construct and measures to be above the 0.50 recommended level [Chin 1998, p. 321).

Discriminant validity. To assess discriminant validity, we examined the average variance extracted (AVE) [Fornell and Larcker 1981] and looked at crossloadings. The average variance extracted is a measure of shared variance between constructs and their respective measures. A satisfying level of discriminant validity is achieved when the square root of the AVE for a particular construct is larger than the correlations between it and the other constructs [Chin 1998]. Examining crossloadings is an explicit test to assess whether reflective measures load higher with their respective constructs than with other constructs. In the case of formative measures, all item measures can be independent of one another since they are viewed as items that create the *emergent factor*. Thus, high loadings are probably inflated and reliability assessments such as Cronbach's alpha are not applicable. Here, Chin [1998] suggests that the weights of each item be used to assess how much each contributes to the overall factor.

As shown in Table 7, the discriminant validity of the measurement model was verified: the square root of the variance extracted for each construct was higher than that of the correlations between it and the other constructs. This implies that each of our constructs shares greater variance with its own block of measures than with that of other constructs representing a different block of measures [Chin 1998, p. 321].

Table 6. Construct Weights and Loadings

Factor	*Item*	*Weight*	*Loading*	*Standard Error*	*t-value*
Actual usage	Perceived Actual Usage 1		0.90	0.042	21.33
ρ = 0.80	Perceived Actual Usage 2		0.89	0.107	8.35
Intentions	Intentions 1		0.94	0.020	45.64
ρ = 0.88	Intentions 2		0.93	0.030	31.10
Affect	Affect 1		0.81	0.085	9.61
ρ = 0.81	Affect 2		0.81	0.120	6.77
	Affect 3		0.68	0.125	5.41
	Affect 4		0.55	0.144	3.84
Habit	Habit 1		0.83	0.049	16.89
ρ = 0.90	Habit 2		0.76	0.062	12.43
	Habit 3		0.83	0.046	18.31
	Habit 4		0.84	0.040	20.89
	Habit 5		0.69	0.122	5.64
Facilitating Conditions	Good understanding of how to use WebBoard	0.77		0.20	3.93
	Easy access to Internet	0.43		0.22	1.92
	Inexpensive access to Internet	0.64		0.21	3.04
	Fast Internet connection	0.18		0.25	0.72 ns
	Assistance provided by WebBoard experts is adequate	0.37		0.21	1.71
	Too busy to use WebBoard	-0.21		0.32	-0.65 ns
Social Factors	Instructor's influence	-0.58		0.28	-2.05
	Classmates' influence	-0.05		0.51	-0.09 ns
	Friends' influence	0.16		0.58	0.26 ns
	Term projects teammates' influence	-0.76		0.34	-2.28
Perceived Consequences	Access useful information	-0.57		0.25	-2.30
	Share ideas with classmates	-0.09		0.27	-0.32 ns
	Get fast answers to questions	-0.01		0.34	-0.02 ns
	Improve communication with instructor	-0.31		0.21	-1.46 ns
	Improve performance in class	-0.26		0.31	-0.83 ns
	Improve communication with classmates	-0.3		0.3	-1.01 ns

Table 7. Correlation Among Construct Scores (AVE in Diagonals)

	Affect	*Intention*	*Habit*	*Actual Usage*
Affect	0.5208			
Intention	0.433	0.8774		
Habit	0.417	0.313	0.6325	
Actual Usage	0.154	0.561	0.503	0.8010

Table 8. Loadings and Crossloadings for Reflective Measures

	Affect	*Intention*	*Habit*	*Usage*
Affect 1	.80	.25	.35	.11
Affect 2	.83	.25	.26	.10
Affect 3	.63	-.19	.37	-.16
Affect 4	.62	.08	.15	.03
Intentions 1	.28	.94	.31	.52
Intentions 2	.23	.94	-.29	.53
Habit 1	.29	.28	.83	.41
Habit 2	.30	.31	.77	.39
Habit 3	.39	.10	.82	.39
Habit 4	.36	.30	.84	.48
Habit 5	.23	.28	.70	.31
Usage	.11	.45	-.47	.90
Usage	.15	.55	-.43	.89

Our examination of crossloadings supported these results. We arrived at this result by successfully performing the following procedure [Chin 1998, p. 326]. Check the table (here Table 8) describing the loadings and crossloadings for reflective measures in the following way. First, go down a particular column—whichever one represents the particular construct of interest—and check whether all indicator loadings for that particular construct are higher than those of other indicators used to measure different constructs. Repeat the test for all constructs. Second, go across a particular row (representing a particular indicator), and check whether this particular indicator loads higher on its own construct than on other constructs. Repeat the test for all indicators.

Checking for multicolinearity. In addition, to avoid multicolinearity problems with similar measures for the same construct, with cross contamination between formative constructs and to make sure that all the formative measures are indeed of a formative nature, we conducted the following tests for each construct measured with formative indicators. The first step was to run a regression analysis with one formative measure as the dependent variable and all the remaining items as independent variables

to insure that R^2 is low. In these regression analyses, we also tested for the significance of the *variance inflation factors* (VIF). Neter et al [1996] argue that these factors measure how much the variances of the estimated regression coefficients are inflated as compared to when the predictor variables are not linearly related. These authors suggest that the largest VIF value among all variables is often used as an indicator of the severity of multicolinearity. A maximum VIF value in excess of 10 is frequently taken as an indication that multicolinearity may be unduly influencing the least squares estimates. In the case of perceived consequences, R^2 was as low as 18 percent and the highest VIF was 1.40. For facilitating conditions, R^2 was as low as 11.6 percent and the highest VIF was 1.21. Finally, for the social factors, R^2 was 9.6 percent and the highest VIF was 2.93. Third, we ran a factor analysis with all measures to check for redundancy within and across constructs. No meaningful grouping was found. These results confirm our conjecture that perceived consequences and facilitating conditions are indeed of a formative nature and that there are no multicolinearity problems with similar measures for the same construct and nor is there cross contamination between formative constructs.

IV. RESULTS

Figure 4 presents the results of testing our research model using PLS analysis. The (standardized) estimated path effects are given along with the associated t-value. All significant paths ($p < 0.01$) are indicated with an asterisk.

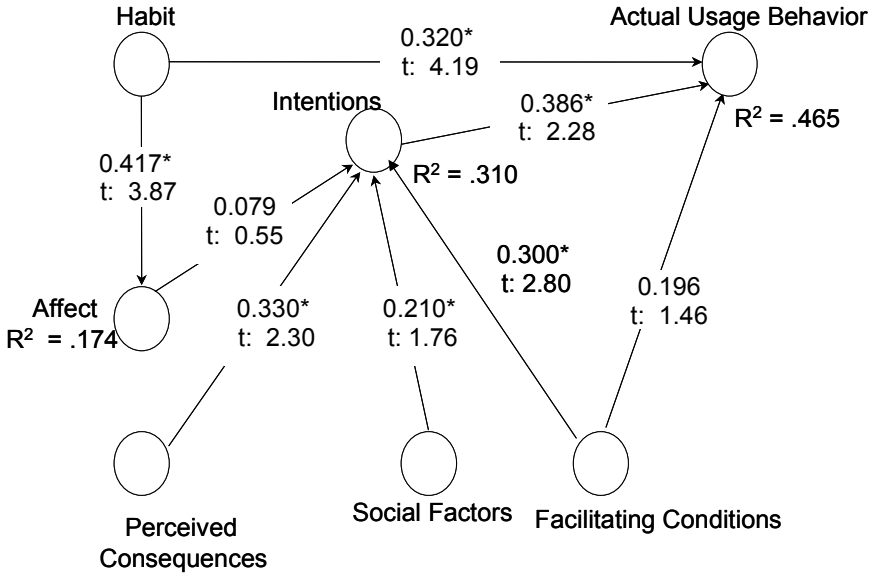

Figure 4. Results (Research Model)

Except for the path between affect and behavioral intentions, all remaining paths connecting antecedent factors to behavioral intentions were significant. Perceived consequences had a substantial effect on intentions with a path coefficient of 0.330. Habit had a strong effect on affect at 0.417. Social factors had a significant but moderate effect on intentions at 0.210. Interestingly, the new hypothesized link between facilitating conditions and intentions turned out to be strong with a path coefficient of 0.30. Overall, the antecedent constructs explained 31 percent of the variance in the intentions construct.

Explaining the actual usage of WebBoard, habit and intentions had significant effects with path coefficients of 0.320 and 0.386 respectively. The link between facilitating conditions and usage was not significant with a path coefficient of 0.196. Overall, the model explained 46.5 percent of the variance in WebBoard usage.

As for formative measures, four out of six items for facilitating conditions, two out of four items for social factors, and one out of six items for perceived consequences were found to contribute significantly to the formation of their respective constructs (see Table 6).

For facilitating conditions, the items that turned out to be significant were good understanding of how to use WebBoard, inexpensive access to the Internet, a fast Internet connection, and adequate assistance by WebBoard experts. For social factors, while instructor and teammates were significant, classmates and friends did not appear to have an impact. For perceived consequences, the significant item was access useful information.

To assess the merit of our research model, we compared it to both TPB and to the initial subset of the Triandis (1980) model as described above. We tested the TPB model using the same measures as the ones used to test the two Triandis variants (the initial Triandis subset and our research model).

As shown in Figure 5, affect, social norms (TPB equivalent to Triandis' social factors), and PBC (TPB equivalent to perceived facilitating conditions) were hypothesized to influence intentions. Actual usage behavior was hypothesized to be affected by both facilitating conditions and intentions. Overall, the results were consistent with the results of our research model. Specifically, all hypothesized links were significant except for the links between affect and intentions and the link between PBC and actual usage. Importantly, the TPB model explained only about 24 percent of the variance in intentions and 38 percent of the variance in actual usage compared to 31 percent and 46.5 percent for our research model.

A third analysis compared the results of our research model with that of the initial subset of Triandis' model (i.e., our research model without the new hypothesized link between facilitating conditions and intentions). While both our research model and the relevant Triandis subset explain actual behavior equally well, results indicate that our model explains 31 percent of the variance in intentions (see Figure 4) as opposed to the 23 percent explained by the Triandis subset (see Figure 6).

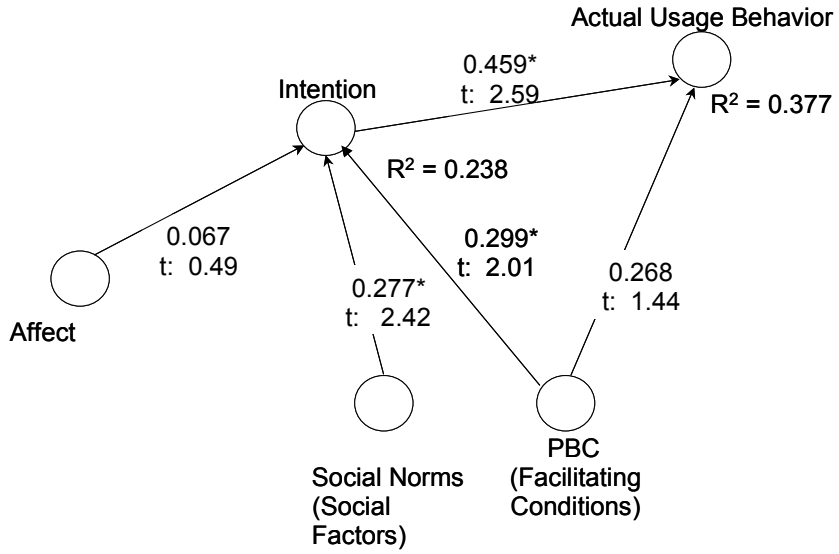

Figure 5. Results Using TPB

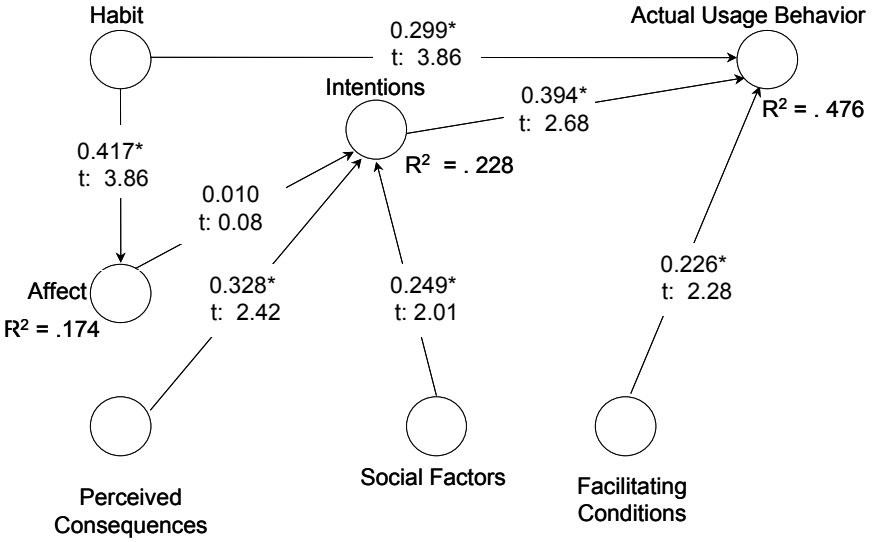

Figure 6. Results Using a Relevant Subset of the Triandis' Model

V. DISCUSSION

SUMMARY

At the beginning of this paper, we noted that past IS research has sought to explain IS usage primarily with the help of cognitive behavioral models. In contrast to this tradition, we suggested considering the concept of habit as an additional predictor of IS usage. Viewing habitual behavior as automatic and subconscious as opposed to planned and conscious (intentional behavior), we introduced it as a concept that should have relatively little conceptual overlap with the concept of intentions.

To test whether the inclusion of habit would in fact lead to a higher percentage of explained variance in usage behavior, we conducted a two-stage questionnaire-based survey about IBCT usage at a large university in Hong Kong. In choosing the educational context as a backdrop for our study we gained, as a side bonus, insights on factors that influence student usage behavior with respect to Web-based teaching tools.

To see whether the idea of introducing the habit construct into behavioral models for the purpose of increasing their explanatory power has any merit, we examined whether the students' habits (i.e., their automatic behavioral tendencies) exert any impact on their IBCT usage behavior. In addition, we explored the importance of factors usually studied in IS usage research including the students' social environment (social factors), their perceptions about the system's usefulness (perceived consequences), and other, external conditions not completely under the student's control (perceived facilitating conditions).

We chose a subset of relevant constructs and causal relationships from Triandis' [1980] behavioral framework as our point of departure for the development of a theoretical model to guide this research. This model was subsequently refined through incorporation of ideas about the treatment of external control factors (facilitating conditions) derived from Ajzen's [1985, 1991] theory of planned behavior. A belief elicitation exercise was performed to identify a set of potentially relevant salient beliefs influencing students' affect, intentions, and actual behavior in the context of university education in Hong Kong.

We conducted a survey among undergraduate and graduate students collecting data at two different times: week 11 and week 14 (see Figure 2).

To examine the merit of our research model, we compared its results with those of TPB and the initial subset extracted from Triandis' framework. Most of the findings were in line with our expectations. Both our research model and the Triandis subset explained the two dependent variables of interest—students' behavioral intentions and actual behavior—considerably better than TPB. Furthermore, a (small) set of significant salient beliefs related to social factors, perceived consequences, and facilitating conditions was identified.

In the following sections we elaborate on the importance of the habit contruct in the context of technology acceptance and explore in more detail the role played by facilitating conditions as a determinant of intentions and actual behavior. We further discuss the implications of our findings with respect to social factors, facilitating conditions, and perceived consequences.

IMPORTANCE OF THE HABIT CONSTRUCT

Given that the main difference between the two Triandis variants (our research model and the initial subset) and TPB consists of including the habit construct as a determinant of actual behavior,

our results support the conjecture that habit plays an important role in explaining usage behavior. If these results can be confirmed by subsequent research, TPB may be refined productively by incorporating the habit construct as a determinant of actual behavior. This extension would be in line with Ajzen [1991, p. 199], who notes that TPB is open to the inclusion of additional predictors *if* it can be shown that they capture a significant proportion of the variance in intention or behavior after the theory's current variables have been taken into account.

As suggested above, the difference between the two Triandis variants and TPB in explaining variance in actual behavior appears to be at least partially due to the inclusion of the habit construct in the Triandis-based models. Habits as opposed to behavioral intentions refer to automatic behavioral tendencies that occur *without* self-instruction.

Triandis argues that the relative influence of habits and behavioral intentions on actual behavior is a function of time: as time goes by, the importance of behavioral intentions on actual behavior gradually decreases while that of habits, or automatic behavior, increases. This would suggest that if instructors succeed in getting their students into the habit of using a new technology quickly, their efforts at shaping the students' intentions to use the technology could become less intense over time. One promising strategy of getting students into the habit of using a technology may thus consist of making its use mandatory initially; for example, by tying the technology's usage directly to the students' grades or by requesting the students to use the technology to perform their assignments. One of the authors of this paper experimented successfully with an assessment system that tied the frequency and quality of students' WebBoard contributions to their participation grade. In addition to receiving credits for every (valuable) posting, the students could earn an extra bonus for adopting the system quickly (during the first week of the semester). Combined, these two incentives appeared to generate sufficient momentum to ensure moderate usage for the remainder of the semester, despite the fact that aside from the initial encouragement and the instructor's occasional WebBoard contributions no further incentives were given. When we interviewed the students later about what role the incentives played in their decision to continue to use WebBoard, most of them claimed that their initial decision to use the technology was positively influenced by the incentives, while their decision to continue to use the WebBoard was not. These observations are consistent with Agarwal and Prasad [1997], who concluded that for initial acceptance behavior, an external mandate to change might provide the necessary motivation, while for continued future use, adopters base their decision on their own evaluations of the innovation.

Readers familiar with the literature on media choice behavior in general, and Markus' [1987] theory of critical mass in particular, may argue that an alternative explanation for our observations may be that WebBoard usage reached a critical mass, which made it worthwhile for students to use the medium. We would like to note, however, that these two explanations do not need to be viewed as competitive [Poole and Van de Ven 1989]. Getting into the habit of doing something is a phenomenon located at the individual level of analysis, while reaching critical mass is a phenomenon located at the institutional level of analysis. Thus, if viewed through a structurational lens [DeSanctis and Scott Poole 1994; Giddens 1984; Orlikowski 1992; Orlikowski and Robey 1991], these two explanations may actually be complementary [Markus and Robey 1988], explaining different aspects of the same phenomenon. For example, the development of a student's habits of using a new form of communication technology can be viewed as conditioned by properties of the institutional context within which the technology is used. Examples for properties of the institutional context that may promote the development of habits are the incentives given by the instructor or the total number of fellow students already using the technology. Conversely, properties of the institutional context may either be reinforced or gradually transformed depending on the nature of the human agents' (here,

the students') actions [Orlikowski 1992]. For example, Markus' work would suggest that the more students get into the habit of using the technology, the more likely the creation of a public good (e.g., in the form of a well-maintained information archive or opinion exchange), which appears as an emergent institutional property, may gradually gain in importance in conditioning the students' future behavior such that they are increasingly more motivated to use the technology.

FACILITATING CONDITIONS AS DETERMINANT OF INTENTIONS, NOT ACTUAL BEHAVIOR

A second interesting result is the three models' different aptitude in explaining variance in the behavioral intentions construct. Our research model explained more variance than either of the other two. While the amount of variance explained is roughly the same for both the initial subset of Triandis' model and TPB, the respective reasons why both of them explained less variance than our research model may differ.

In the case of the initial Triandis subset, its shortcoming most likely stems from considering perceived facilitating conditions as a direct antecedent of actual behavior instead of as a direct antecedent of behavioral intentions.

In the case of TPB, the difference between our research model and TPB in explaining behavioral intentions probably originates from regarding perceived consequences as a direct, as opposed to an indirect (via affect), influence of behavioral intentions. This interpretation is consistent with previous research based on TAM, which empirically supports the idea that usefulness beliefs (which are analogous to our perceived consequences construct) exert an important *direct* influence on behavioral intentions in addition to their indirect influence via affect [Davis et al. 1989].

SOCIAL FACTORS

According to our data, social factors (operationalized as *referent others*) seem to play a role in explaining the students' intention to use IBCT. This is supportive of the findings by Mathieson [1991], Taylor and Todd [1995b], and Venkatesh and Morris's [2000] that social norms influence behavioral intentions to use a technology. Similarly, Thompson et al. [1991] found a significant relationship between social factors and utilization. However, apparently the students distinguished between two groups of *referent others*: Those who are closely associated with the particular social context in which the technology may be used productively, and those who are not. Thus, while instructor and teammates turned out to have significant influence on students' intentions to use WebBoard, friends, family, and classmates did not. These findings are consistent with Fulk et al.'s [1987] social information processing theory which posits that in choosing a communication technology, a person simultaneously considers rational (e.g., usefulness of the technology) and social factors. While we expected that the instructor functioned as an important referent for the students, it was interesting to see that teammates played an important role, but classmates did not. We assume that the students found it more straightforward to replace (or at least complement) one communication medium with another than to explore completely new ways of (and reasons for) class communication. Thus, students quickly moved their team meetings from the real world of face-to-face encounters to WebBoard's virtual learning space [Leidner and Jarvenpaa 1995]. By contrast, class-wide communication in WebBoard's open discussion forums (conferences) did not have a real-world counter-

part. Thus, we assume that our students, who apparently did not feel the need to communicate to the entire class prior to the introduction of WebBoard, did not extract any value from doing so via WebBoard either. In other words, in the latter case, WebBoard may have been more a solution in search of a problem than a practical solution to a real problem.

Given the importance of the instructor in the students' decision to use the technology, it seems that instructors should keep an active role in shaping the students' technology experience, even if the technology has initially been well received by the class. Although, as argued earlier, a special set-up of the social context can generate sufficient momentum to initiate and uphold usage levels temporarily, it apparently takes continued reinforcement by relevant others (instructor and teammates) to *fully* develop the students usage habits. Thus, instructors showing little interest in the technology beyond the initial phases of the course may witness an eventual decline in the students' usage of the technology. This is especially likely in Hong Kong Chinese learning contexts where the learning model applied often resembles what Leidner and Jarvenpaa [1995] refer to as *objectivist*: a model in which it is assumed that the instructor is the source of objective knowledge that is related, rather than created, during class. Thus, if instructors—as the course's focal point—start showing little interest in using the technology, the students may simply follow their example. This explanation is also consistent with structuration theory if we consider the instructor's behavior as property of the course's institutional context.

FACILITATING CONDITIONS

With respect to facilitating conditions, we identified four salient beliefs that appear to contribute significantly to the formation of the students' intentions to use WebBoard at the university: good understanding of how to use WebBoard, assistance provided by WebBoard experts is adequate, easy access to Internet, and inexpensive access to the Internet.

The first three items refer to ease of use of the technology. Davis [1989; Davis et al. 1989] defined perceived ease of use as the degree to which the prospective user expects the target system to be free of effort. Consistent with that work, we found perceived facilitating conditions to influence directly the students' behavioral intentions. Furthermore, no direct influence on actual behavior was found. Interpreting these results in the light of Taylor and Todd's [1995a] work where it was found that inexperienced users' intentions were better predicted by antecedent variables such as ease of use and usefulness than by those of experienced users, we need to ask ourselves whether the salient beliefs we identified here would be equally relevant for students who had come to experience the technology hands-on in previous semesters. Following Adams et al. [1992], it may well be that a completely different set of salient beliefs becomes relevant. Additional research is needed to explore this particular question.

A fourth item that we identified as an important component of our facilitating conditions construct touched upon economic aspects of using the technology. Apparently, the students' intention to use WebBoard depended on whether they had inexpensive access to the Internet. This finding makes sense considering the weak financial situation of many of our students (in particular, undergraduate students). Unable to afford laptops or an ISP account of their own, many students depend on financial and technical support from their university. While most universities have impressive computer lab facilities, it is less common to find universities with fully fledged programs that provide students with laptops and Internet connections at low or no cost so that they can take full advantage of the Internet's "anytime, anyplace" properties. In our opinion, IBCT's potential of supporting out-of-

classroom communication is based on exactly these two assets. In other words, if access to the Internet remains limited to access on campus, students may be less inclined to use WebBoard or other IBCT productively as complementary learning aids.

Finally, two items (being too busy to use WebBoard and having a fast Internet connection) initially identified in the belief elicitation exercise did not appear to play any significant role in shaping the students' intention to use WebBoard. Interestingly, interviews conducted two semesters later with another group of WebBoard users (part-time master's students) brought to light precisely these two issues. The number one factor preventing the students from using the Webboard appeared to be being too busy to contribute to WebBoard communications, while slow Internet connections were blamed for not permitting the students to explore effectively more advanced WebBoard features such as chat. Further research is needed to resolve these contradictions.

PERCEIVED CONSEQUENCES

Much to our surprise, only one out of six beliefs identified in the belief elicitation exercise seemed to matter in forming intentions: accessing useful information. Compared to other items such as improving communication with the instructor or getting fast answers to questions, the belief to be able to access useful information presumes a relatively passive use of the medium. By contrast, items such as sharing ideas with classmates or improving communication with classmates would call for higher levels of active participation. As Bond [1991, p. 25] indicates, Chinese students usually do not associate active class participation or learning from each other with a normal learning context: "Students respond to teachers as to a stern parent—with attention, silence, and fear. They do not question teachers, or challenge their judgments." Further, Leidner and Jarvenpaa [1995, p. 287] note that "traditionally, students are accustomed to thinking in terms of what they get out of a course rather than what they contribute to the knowledge created in a course." Both Bond's and Leidner and Jarvenpaa's comments provide possible explanations for why items alluding to beliefs focusing on sharing ideas and improving communication with classmates did not appear to matter much in forming behavioral intentions.

Overall, the effect of perceived consequences (which is similar to Davis' [1989] perceived usefulness construct) on intentional behavior turned out to be quite strong. This was expected considering the existing empirical evidence demonstrating the validity of this relationship [Adams et al. 1992; Davis 1993; Davis et al. 1989; Mathieson 1991; Taylor and Todd 1995a]. Nevertheless, given that we identified only one belief related to perceived consequences (accessing useful information), further research is necessary if we want to better understand the specific factors that promote usage behavior in the educational context. In other words, we have here an excellent example of the challenge Segars and Grover [1993] may have alluded to when they urged the IS community to further explore the nature and specific influences of factors that may alter the user perception-usage equation.

LIMITATIONS

As in all studies, there are limitations. We are concerned that an 11-week period between WebBoard introduction (first week of semester) and the first survey (measuring habit) was not enough to let the students develop strong usage habits. The average habit score was 2.46 on a Likert scale

ranging from 1 to 5. Another related concern deals with students overreporting their usage behavior to give a more politically correct impression, which is a rather common phenomenon [Straub et al. 1995].

Furthermore, this research was conducted in a Hong Kong Chinese environment. Therefore, culture may have influenced the results, in particular those that refer to the nature of the salient beliefs we have identified to form social factors, perceived consequences, and facilitating conditions. Several studies found that cultural effects play an important role in the attitude toward and the usage of IT [e.g., Straub 1994; Straub et al. 1997]. Moreover, in his highly interesting book on the psychology of the Chinese, Bond argues that there are some distinctive characteristics of the way Chinese think and these cultural characteristics appear to arise from the style of social training and the educational requirements that distinguish Chinese from other groups. Specifically, he mentions that "Chinese are more concrete and practical than Americans in their tendencies to evaluate ideas in terms of their immediate application" (p. 25). This stronger focus on practicality and immediate application may, for example, have been the primary reason why we found only one item—and a pretty obvious one at that (accessing useful information)—to influence significantly the students' perceived usefulness beliefs. Of course, an analogous problem would be encountered were the data derived from American or European students. Our findings, related to the specific salient beliefs identified above, should thus be viewed keeping in mind that they may apply better to Chinese than to other cultural contexts. Finally, caution is in order before generalizing on our results to other IBCT. Although we are convinced that WebBoard has many important characteristics of modern IBCT as discussed by Peffers and Bloom [1999]—it is Web-based, it offers asynchronous (threaded discussions) as well as synchronous interaction (chat), it permits one to send attachments and hyperlinks, it connects to e-mail, etc.—its specificity might have biased the results of this study in ways that can only become evident if we directly compare our results with others derived from research involving another IBCT.

VI. CONCLUSIONS

Although this research addresses an interesting question and provides promising insights about the role of habit in influencing usage behavior as well as the nature of factors influencing student usage behavior of IBCT in support of teaching, many questions remain unanswered.

With respect to anchoring the habit construct into prior IS research, we are only at the beginning. In this study we did not test, for example, whether habit and intention have any interaction effects with respect to IS usage. Confirming the existence of such an effect would support our intuitive reasoning (see above) that the influence of intention on behavior may decrease as the behavior becomes more habitual. A finding like this would have major ramifications on research and practice. In terms of research, the explanatory power of existing technology usage models may be considerably improved. Practically, these results may translate into changing the very nature of the managerial measures taken to shape a workforce's IS usage behaviors, especially those that have long since passed the adoption stage. For example, while according to prior research, managers would be advised to focus primarily on their employees' intentions if they want to influence their usage behavior, our results suggest that any change program targeting the intentional aspects of IS usage may, in fact, be futile if the behavior in question is performed habitually and thus lacks the necessary anchor for these measures to take hold. Internet-based communication technologies where adoption may have given way to continued use are plentiful: prominent examples are intranets, extranets, the WWW in general, customer relationship management (CRM) applications, Web-based discussion forums, video applications such as net-meeting, and so forth.

With respect to the remaining questions on *student usage* of IBCT, in a recent special report on international education published by the *International Herald Tribune* [October 16, 2000, p. 17], the author of the report's lead article, "An Online Revolution: Web Changes the Face of Teaching," notes that the biggest challenge for anyone in online education is to determine the most appropriate uses for the technology. That's a big question indeed; admittedly, too big to be answered in a single step or with a single research project. Viewed in this larger context, we consider the contribution of this paper to be a preparatory step. For example, to complement this research, a qualitative follow-up study may focus on the development of a rich and extensive model of the processes underlying university students' IBCT usage behavior. Such a study would help discover how learning processes might change as a result of introducing IBCT as teaching aids. Orlikowski's [1992] ideas on structuration, Markus' [1987] critical mass theory, and/or Fulk et al.'s [1987] social information processing model could serve as theoretical foundations to act as a basis for this type of research.

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IX. ABOUT THE AUTHORS

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X. APPENDICES

APPENDIX A: MEASURES

All items used the following response scale.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Social Factors: In the belief elicitation phase, the students identified four specific groups of people who are likely to influence the usage of IBT intention and behavior. These were instructor, classmates, friends, and teammates for term project. A Likert-type scale with five levels (1 = strongly disagree to 5 = strongly agree) was used for these four formative items:

- My instructor thinks it is important to use WebBoard
- My classmates think it is important to use WebBoard
- My friends think it is important to use WebBoard
- My teammates for my term projects think it is important to use WebBoard

Affect: Four reflective items were used to measure students' affect regarding using WebBoard. A Likert-type scale with five levels (1 = strongly disagree to 5 = strongly agree) was employed to elicit the extent to which the respondents felt that the use of IBT is smart, enjoyable, boring, and pleasant.

For each of the following, please answer by an X in the box that best represents your level of agreement or disagreement.

- Affect 1. The use of WebBoard is smart
- Affect 2. The use of WebBoard is enjoyable
- Affect 3. The use of WebBoard is boring
- Affect 4. The use of WebBoard is pleasant

Habits: Five reflective items were used to measure the extent to which the act of using IBT became automatic for the respondent. A Likert-type scale with five levels (1 = strongly disagree to 5 = strongly agree) was employed.

For each of the following statements, please answer by an X in the box that best represents your level of agreement or disagreement.

- Habit 1. The use of WebBoard has become a habit for me
- Habit 2. I am addicted to using WebBoard
- Habit 3. I must use WebBoard
- Habit 4. I don't even think twice before using WebBoard
- Habit 5. Using WebBoard has become natural to me

Perceived Consequences/Beliefs: In the belief elicitation phase, six items were suggested by the students. A Likert-type scale with five evels (1 = strongly disagree to 5 = strongly agree) was used for all questions:

Indicate your perception of the potential results of WebBoard usage:

- Allows me to access useful information
- Allows me to share ideas with classmates
- Allows me to get fast answers to questions
- Allows me to improve communication with instructor
- Allows me to improve performance in class
- Allows me to improve communication with classmates

Facilitating Conditions: Facilitating conditions are objective environmental factors that make an act easier to do (Triandis 1980). Six formative items compiled from the literature and from the belief elicitation were included. A Likert-type scale with five levels (1 = strongly disagree to 5 = strongly agree) was used for all questions:

- I have a good understanding of how to use WebBoard
- I have easy access to the Internet
- I have inexpensive access to the Internet
- I have a fast Internet connection
- Assistance provided by WebBoard experts is adequate
- I am too busy to use WebBoard

Intentions: Two reflective items measuring the intention of the respondent to access WebBoard during a week for the next month:

Intention 1: how many times do you intend to access WebBoard **during a week** for the next month?

|___1____|___2____|___3____|___4____|___5____|___6____|___7___|

1: not at all
2: less than once a week
3: about once a week
4: two or three times a week
5: several times a week
6: about once a day
7: several times each day

Intention 2: how many messages do you intend to post on WebBoard **during a week** for the next month?

|___1____|___2____|___3____|___4____|___5____|___6____|___7___|

1: not at all
2: less than once a week
3: about once a week
4: two or three times a week
5: several times a week
6: about once a day
7: several times each day

Actual Behavior: This construct was measured in the second questionnaire (one month after the first questionnaire was administered). Two reflective items measuring the level of perceived actual usage of WebBoard since the first questionnaire were included:

Usage 1: how many times have you accessed WebBoard **during a week** for the last month?

|___1____|___2____|___3____|___4____|___5____|___6____|___7___|

1: not at all
2: less than once a week
3: about once a week
4: two or three times a week
5: several times a week
6: about once a day
7: several times each day

Usage 2: how many messages have you posted on WebBoard **during a week** for the last month?

|___1____|___2____|___3____|___4____|___5____|___6____|___7___|

1: not at all
2: less than once a week
3: about once a week
4: 2 or three times a week
5: several times a week
6: about once a day
7: several times each day

APPENDIX B: ACTUAL WORDING OF THE ELICITATION QUESTIONS

Please think of the act of using the WebBoard software.

- List up to five things that will make it easy for you to use WebBoard (for example having a computer at home)
- List anything that may prevent you from using WebBoard
- List the people that you know that can influence your decision to use WebBoard (examples are your classmates, instructor, etc.)
- List up to five positive consequences that you expect from using WebBoard (example: better communication with your teammates)
- List up to five negative consequences that you expect from using WebBoard (example: less time for other forms of communication)
- In the space below, put any additional ideas about what could result from using WebBoard

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