INVESTIGATING THE ROLE OF ATTITUDE IN TECHNOLOGY ACCEPTANCE FROM AN ATTITUDE STRENGTH PERSPECTIVE

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ABSTRACT

Despite the importance of attitude in predicting an individual's behavior, research on IT adoption has discounted the role of attitude in explaining technology acceptance behavior. Additionally, the attitude construct has often been omitted in research on IT acceptance. In this study, we call attention to the role of attitude in explaining technology acceptance behavior. In developing our research model, we draw on both the concept of attitude strength and previous technology acceptance studies. Empirical examination of our research hypotheses indicates that attitude toward system use fully mediates the effects of salient beliefs on behavioral intention when attitude is strong, whereas it partially mediates the effects when attitude is weak. Our findings provide additional insights in predicting technology acceptance behavior.

Keywords: Attitude, Attitude Strength, and Technology Acceptance Behavior

INTRODUCTION

The importance of technology acceptance as the precursor to the use of technology has attracted much attention from researchers and practitioners (Venkatesh, Morris, Davis, and Davis, 2003). The Technology Acceptance Model (TAM) has been widely studied and accepted as a valid model in predicting individual acceptance behavior across various information technologies and their users (Adams, Nelson, and Todd, 1992; Chin and Todd, 1995; Davis, Bagozzi, and Warshaw, 1989; Doll, Hendrickson, and Deng, 1998; Mathieson, 1991; Segars and Grover, 1993). Recently, TAM has been applied to the electronic business domain (e.g., Gefen and Straub, 2000; Lederer, Maupin, Sena, and Zhuang, 2000; Morris and Dillon, 1997; Teo, Lim, and Lai, 1999).

TAM explains the relationship between internal psychological variables – such as beliefs, attitudes, and behavioral intention – and actual system usage (Davis, 1986; 1989). According to Davis (1986), perceived usefulness and perceived ease of use are major beliefs that influence attitude toward system use and eventually lead to actual system use. TAM has been highly-regarded both because of its parsimony and because of its high predictive power in explaining IT acceptance behavior across various contexts (Mathieson, 1991; Venkatesh, 2000).

TAM may be criticized, however, for the lack of sufficient explanation about cognitive processes culminating in a user's acceptance of new technology. TAM still shares the basic premises and components outlined in Ajzen and Fishbein's Theory of Reasoned Action (Ajzen and Fishbein, 1980), but by excluding the attitude construct from the TRA model, TAM discounts the role of attitude in explaining technology acceptance behavior. Venkatesh and his colleagues dropped the construct of attitude from the technology acceptance model (Venkatesh and Davis, 1996; Venkatesh and Davis, 2000; Venkatesh et al., 2003), arguing that the role of attitude in explaining behavioral intention or actual adoption behavior is very limited and is at

best a partial mediator in the relationship between salient beliefs and the adoption behavior or intention. We contend that this argument is made without serious theoretical consideration and restricts the search for a comprehensive understanding of technology acceptance

We introduce the concept of *attitude strength* to reexamine the role of attitude in predicting behavioral intention to use a technology. *Attitude strength* is defined as *the degree to which attitude manifests itself in the form of temporal persistence, resistance to counterpersuasion, and predictability of behavior* (Petty and Cacioppo, 1986). Attitude toward system use (e.g., unfavorable, neutral, or favorable) is conceptually and empirically distinct from the strength in the attitude (e.g., weak or strong). An attitude affects an individual's behaviors by filtering information and shaping the individual's perception of the world (Fazio, 1986), whereas the strength in the attitude amplifies or neutralizes the effect of the attitude on behaviors (Krosnick and Petty, 1995). For example, a user who *strongly* holds a favorable attitude toward using a certain technology may adopt and continuously use the technology; but a user who *weakly* holds a favorable attitude toward using a technology may be easily persuaded to change his or her favorable attitude, preventing adoption or continued use of the technology.

Accordingly, the purpose of the present study is to provide a different perspective from which to understand the technology adoption process by examining the effect of attitude strength on the process. By doing so, we may be able to elucidate the role of attitude toward system use in the adoption process and to provide a plausible explanation as to why many previous studies on technology acceptance have often failed to find the mediating role of attitude toward system use. Most importantly, findings about the importance of attitude and attitude strength would redirect technology adoption research. Adoption research could thereby begin to consider factors affecting attitude strength in order to avoid situations where a technology is adopted but not used.

The remainder of this paper is organized as follows. We first focus our attention on the current tendency to discount the role of attitude when examining technology adoption behavior.

In doing so, we review previous research findings regarding the mediating effect of attitude on the belief–behavior linkage. The concept of attitude strength is then introduced to explain why previous findings about the mediating role of attitude are inconsistent. Based on the discussion of attitude strength, a series of hypotheses are developed and tested. Finally, we conclude with the implications and limitations of our approach.

THE ROLE OF ATTITUDE IN DETERMINING BEHAVIORAL INTENTION

In TAM, two factors are primary determinants of system use: perceived ease of use and perceived usefulness (Davis et al., 1989). Perceived usefulness is defined as the user's subjective probability that using a specific technology will increase his or her job performance within an organizational setting. Perceived ease of use is the user's assessment that the system will be easy to use and require little effort. Davis's model specifically postulates that technology usage is determined by behavioral intention to use the technology. Behavioral intention is in turn determined by attitude towards using the technology and by perceived usefulness. Attitude toward system use is postulated to partially mediate the effect of perceived ease of use and perceived usefulness on behavioral intention (Figure 1).

Davis (1989) found that perceived ease of use could be a causal antecedent to perceived usefulness, as opposed to a parallel, direct determinant of system usage. In other words, systems that are easy to use, and have easy, simple interfaces, should be systems that are also useful for people in their jobs. Restated, ease of use can be considered a pre-requisite for useful systems. With a significant body of literature lending support to TAM, the model has emerged as a powerful one with which practitioners can predict IT acceptance and usage behavior. When IT professionals foster users' beliefs in ease of use and usefulness of the focal IT, adoption and usage are likely to occur. (Venkatesh, 1999; Venkatesh and Davis, 1996).

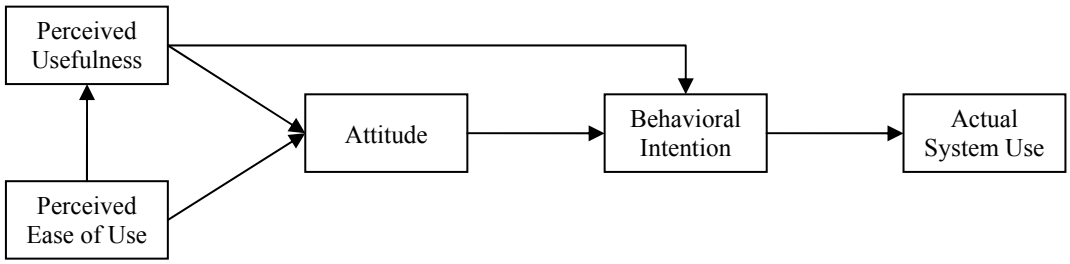


Figure 1. Technology Acceptance Model (Davis, 1989)

As has been previously mentioned, previous studies on IT adoption have tended to discount the role of attitude in explaining technology acceptance behavior. While this trend is based on empirical findings, it without significant theoretical support. Davis, Bagozzi, and Warshaw (1989) argue that users' acceptance behavior is solely determined by perceived ease of use, perceived usefulness, and behavioral intention, and that the role of attitude is at best a partial mediator. The findings of previous studies, summarized here in Table 1, were mixed in terms of their conclusions regarding the mediating role of attitude in IT acceptance. In particular, some studies reported that attitude fully mediated between behavioral beliefs and behavioral intention. Others argued that the attitude only partially mediated or did not mediate the relationship between salient beliefs and behavioral intention or actual usage. The accumulated empirical findings about the inconsistent role of attitude toward system use might be considered evidence for assigning attitude a minimal role of in studies of IT acceptance.

Table 1. Review of Prior IT Acceptance Studies: Attitude and Prior Experiences [a]

Studies	Prior Experiences with the Technology (Newness of Technology)	Mediating Role of Attitude in IT Acceptance Model
Davis et al. (1989)	New technology & no prior experience	Time1: Partial mediation [b] Time2: No mediation
Mathieson (1991)	Existing technology & self-choice among the technologies	Partial mediation
Taylor and Todd (1995)	Existing technology, but two samples: experienced & inexperienced users	Experienced user: No mediation Inexperienced user: No mediation
Agarwal and Prasad (1999)	New technology	Partial mediation
Yang and Yoo (2004)	New technology	Cognitive attitude: Partial mediation Affective attitude: No mediation
Hu, Chau, Sheng and Tam (1999)	New technology	Partial mediation
Chau and Hu (2001)	New technology	Partial mediation
Jackson, Chow and Leitch (1997)	New technology	No mediation
Chen, Gillenson and Sherrell (2002)	Existing technology: all participants had already used the virtual stores for 6 months prior to study	Full mediation
Karahanna, Straub and Chervany (1999)	New technology for potential adopters & Existing technology for current users	Potential adopters: No mediation Current users: Full mediation
Malhotra and Galleta (1999)	New technology, but all responses were collected after training sessions	Partial mediation
Moon and Kim (2001)	Existing technology & all respondents had prior experiences	Partial mediation
Hsu and Lu (2004)	Existing technology & users' prior experience with online games	Full mediation
Amoako-Gyampah and Salam (2004)	Existing technology & users had been involved in the implementation process after training sessions	Full mediation
Vijayasarathy (2004)	Existing technology & most respondents had prior experiences in Internet shopping	Full mediation
Riemenschneider et al. (2003)	New technology & potential users	No mediation
Shih (2004)	Relatively new technology: all respondents had prior Internet experience, but 67% of respondents had no prior *e*-shopping experience	Full mediation

a. This review includes studies that examine beliefs, attitude, and behavior or its intention.
b. Full mediation indicates that attitude fully mediates the effect of beliefs on behavior or its intention, whereas partial mediation indicates that perceived usefulness also directly affects behavior or its intention

However, a wealth of literature on attitude change and persuasion in social psychology has continuously lent support for the critical impact of attitude on behavior, information processing, social judgment, and other attitudes (Krosnick and Petty, 1995; Petty, Haugtvedt, and Smith, 1995). A key theme in this literature is the examination of dynamic causal relationships among various individual and contextual variables thought to make attitude strong. A variety of strength-related attributes of attitude including certainty, accessibility, extremity, and the

resulting effect of attitude strength on attitude-behavior consistency have been examined (Petty, Wegener, and Fabrigar, 1997). By subsuming the concept of attitude strength into the technology acceptance phenomenon, this study challenges the current tendency to downplay the role of attitude in explaining technology acceptance behavior.

Attitude Strength

Attitude toward a behavior is defined as *an individual's positive or negative evaluation of performing the behavior*. It involves an individual's judgment that performing a behavior is good or bad and also a general evaluation that an individual is inclined or disinclined to perform the behavior (Ajzen and Fishbein, 1980). The attitude guides the individual's behavior by filtering information and by shaping his or her perception of the world (Fazio, 1986). Research on attitude has also accumulated a great deal of evidence showing that some attitudes are weakly predictive of corresponding behaviors, whereas others are strongly predictive (Krosnick and Petty, 1995).

Given the conflicting views and findings on the role of attitude, social psychologists have attempted to explore why some attitudes are more stable and predictive of behavior and how those persistent and guiding attitudes can be formed. In examining the role of attitude strength, contextual variables such as the amount of relevant information and direct/indirect experience have been examined (for more details, see Petty and Krosnick, 1995). With regard to specific components of attitude strength, previous studies have focused on the attributes of attitudes including attitude certainty, attitude accessibility, and attitude extremity. Figure 2 illustrates these major concepts from studies on attitude strength. Attitude certainty refers to a subjective sense of conviction about one's attitude (Gross et al., 1995; Wegener et al., 1995). Attitude accessibility is the ease with which one can recall the attitude when one performs a behavior (Wegener et al., 1995). Attitude extremity is the degree to which an attitude goes further from neutral, regardless of valence (Wegener et al., 1995). These attitude attributes related to strength

have been operationalized and tested in ways that make them clearly distinct from one another so that they cannot be viewed as one factor (Krosnick and Petty, 1995). However, it is clear that all of these attributes correlate with the effect indicators of attitude strength (Krosnick and Petty, 1995).

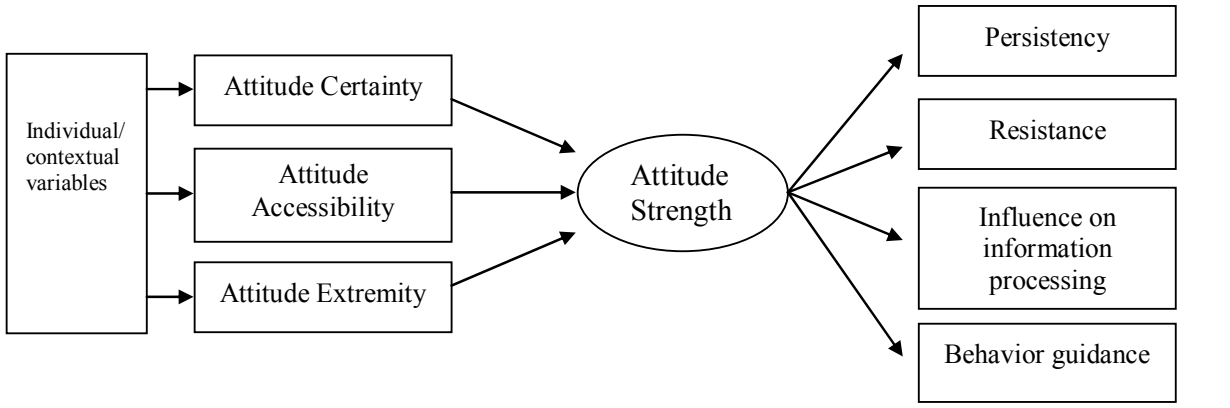


Figure 2. Attributes of Attitude, Attitude Strength, and its Manifestation

Previous studies on attitude strength have also examined the effects of attitude strength in terms of temporal persistency, resistance to counterpersuasion, the ability to influence information processing, and the ability to guide behavior (Krosnick and Petty, 1995; Petty et al., 1997). Temporal persistence and resistance to counterpersuasion can be understood as the properties of durability. The ability to influence information processing and the ability to guide behavior can be interpreted as the properties of impactfulness (Krosnick and Petty, 1995; Petty et al., 1997). These four effects of attitude strength (the right side of figure 2) are highly interconnected to control the effect of attitude on certain behaviors (Krosnick and Petty, 1995). For example, a persistent attitude may help an individual resist overt challenges, culminating in the improved predictability of subsequent behaviors (Schwartz, 1978). Individuals who hold a persistent and resistant-to-counterpersuasive attitude are likely to perform a behavior consistent with the attitude, because they process the information they receive through their attitude toward the behavior. This biased interpretation of the information guides their behavior (Eagly and

Chaiken, 1998; Kosnik, 1987). In sum, when an attitude is strong, it will be persistent over time, resistant to counterpersuasion, impactful on information processing and judgment, and predictive of corresponding behaviors to the attitude. In contrast, weak attitude would be temporary, susceptible to counterpersuasion, less impactful on information processing and judgment, and inconsistent in predicting behaviors.

Thus, the strength of an attitude is quantitatively distinct from the concept of attitude and can be understood as being composed of the aforementioned components. An attitude represents a general evaluation of performing a target behavior, such as positive/negative, good/bad, or favorable/unfavorable evaluation, whereas attitude strength indicates the strength of a favorable/unfavorable evaluation that can be either strongly predictive of corresponding behavior or weakly predictive.

Attitude, Attitude Strength, and Behavioral Intention

The formation of a strong attitude can be affected by a variety of individual and contextual variables (Petty et al., 1997). While a number of individual and contextual factors affecting the strength-related attributes have been identified in the attitude strength literature, only a few key variables require explanation to understand the formation of cognitive structure in technology adoption behavior. This is primarily because the technology acceptance literature employs variables such as experience, knowledge, and tenure as the antecedents to behavioral beliefs. These variables include amount of relevant information about attitude target, frequency of experience with the target, and direct/indirect experience (refer to Table 1). We discuss these variables among others to further the understanding of the chain relationship from individual and contextual variables to attitude attributes to the effects of attitude strength.

Several studies in the attitude strength literature indicate that the greater the amount of one's knowledge or information relevant to a behavior, the more the person is likely to engage in

careful and effortful consideration about performing the behavior (Petty and Cacioppo, 1986). In addition, the literature suggests that repeated experience and exposure to the target behavior provides the user with a greater opportunity to consider various aspects of performing the behavior in a relatively objective manner (Petty and Cacioppo, 1986). These arguments indicate that the more careful and effortful thoughts about a behavior one constructs, the more frequently and carefully the person compares various attributes of the target behavior with the information previously stored in memory. This ultimately creates a stronger schema about the behavior. Restated, it creates a strong attitude toward performing the behavior that is persistent over time, resistant to counterpersuasion, and predictive of the behavior. Fazio's (1986) work on the effect of direct personal experience versus indirect experience (e.g., information from other sources) when performing a behavior shows that the attitude formed by direct experience is more predictive of corresponding behavior than that shaped by indirect experience. This result agrees with an underlying premise in attitude strength research and implies that the attitude formed by direct experience may induce more careful and effortful consideration about the behavior (Petty and Cacioppo, 1986).

A key point addressed by attitude strength research is that when an individual obtains and possesses, by frequent and direct experience, an abundance of relevant information about performing a behavior, the person will engage in careful and effortful consideration of the behavior. This, in turn, engenders a strong attitude by affecting the attitude attributes related to attitude strength. In addition, accumulated research findings demonstrate another key point that the attitude strength moderates the relationship between attitude and corresponding behaviors (Petty and Krosnick, 1995).

Given the moderating role of attitude strength in attitude-behavior consistency, we may be able to infer a plausible explanation of why the findings of previous research on IT acceptance have not consistently demonstrated the mediating role of attitude in IT acceptance research. We

reason that whether a user has prior hands-on experience with a technology may influence the strength of the user's attitude toward using the technology. Based upon this reasoning, it follows that attitude strength may moderate the relationship between the attitude and either the behavior or the behavioral intention.

In particular, while novice users or potential adopters without prior hands-on experience may have a favorable attitude toward system use, the favorable attitude is likely to be weak and would neither significantly nor solely affect actual use or behavioral intention. The effect of the attitude on system use would be insignificant or supplemented by direct effect of belief in usefulness (i.e., no mediation or partial mediation). In contrast, users or potential adopters confident of their attitude toward the system use (i.e., strong attitude) because of prior hands-on experience would consistently engage in the behavior directed by the attitude. If this is the case, the effect of attitude on use would be considerable and may fully mediate the relationship between usefulness and ease of use beliefs and the behavior.

As the first step to validate our reasoning, we reviewed previous IT acceptance studies to identify the role of prior experience with the IT and to observe the possible mediating role of attitude in IT acceptance. The qualitative review and findings are summarized in Table 1 and Table 2. Based on the studies listed in Table 1, we constructed a contingency table (Table 2) illustrating that the difference in the mediating role of attitude in IT acceptance is contingent on whether participants in the studies had prior experience with the technology examined. The contingency table shows that when the participants had prior hands-on experience with the technology, their attitude toward system use fully mediated the relationship between beliefs and behaviors in 62.5% (5/8) of the studies, but partially mediated or did not mediate the relationship in 37.5% (3/8) of the studies. In contrast, the contingency table demonstrates that when the participants had no prior hands-on experience with the new technology, their attitude fully mediated the relationship between beliefs and behaviors in only 7.7% (1/13) of the studies, but

only partially mediated or did not mediate the relationship in 92.3% (12/13) of the studies. To test whether the difference in the mediating role of attitude in IT acceptance research is contingent in part on a participant's prior hands-on experience with technology, we calculated a value of chi-square (χ^2=7.29, *df*=1), and it is statistically significant at both $p < .05$ and $p < .01$. Hence, an initial validation of our reasoning is provided.

Table 2. A Contingency Table of Prior IT Acceptance Studies: Attitude and Prior Experience

	Mediating Role of Attitude in IT Acceptance Model [a]		
	Full Mediation	Partial Mediation or No Mediation	Total
Prior Experience with Existing Technology	5	3 (Partial mediation:2 / No mediation:1)	8
No Prior Experience with New Technology	1	12 (Partial mediation:6 / No mediation:6)	13
Total	6	15	21

a. Note. If a study reports two findings, we counted separately to represent the two findings (e.g., Davis et al., 1989; Taylor and Todd 1995; Yang and Yoo, 2004; Karahanna et al., 1999).

Given the substantive theoretical rationale for the moderating role of attitude strength in attitude-behavior linkage and the intuitively appealing result from the qualitative review above, we call for a reexamination of the mediating role of attitude in technology acceptance by incorporating the concept of attitude strength into the investigation. This study predicts that the moderating effect of attitude strength on attitude-behavior linkage may manifest itself in two different, yet related ways. First, the strength of attitude toward system use may positively moderate the relationship between attitude and behavioral intention. The positive relation between attitude and behavioral intention is likely to be more pronounced when the attitude is strong than when it is weak. Research on attitude change and persuasion has accumulated a great deal of supporting evidence for the moderating role of attitude strength in the realm of social psychology.

Second, the moderating effect of attitude strength may be represented as the difference in the mode – that is, full, partial, or no mediation – of mediating effect of attitude toward system use. Here, we assume that differential attitude strength indicates the different cognitive process of attitude formation such that the antecedents to attitude, i.e., salient behavioral beliefs, may

have differential effects on the attitude toward a behavior and thus on behavioral intention. Consider the relationship among behavioral beliefs (usefulness and ease of use), attitude toward system use, and behavioral intention to use a system, where usefulness influences both attitude and behavioral intention (Davis, 1986; Davis et al., 1989). When attitude toward system use is strong, the attitude may fully mediate the effects of beliefs on behavioral intention. This is because the relationship between attitude and behavioral intention would be strong enough to offset the direct effect of beliefs on behavioral intention and thereby leave only the indirect effect mediated by the attitude. In contrast, attitude may partially mediate the belief-behavioral intention relationship when it is weak, because the attitude-behavioral intention relationship would not be strong enough to offset the direct influence of belief in usefulness on behavioral intention. Hence, belief in usefulness would affect behavioral intention both directly and indirectly via the attitude toward system use when the strength of the attitude is weak. In addition, the effects of behavioral beliefs may vary according to the strength of the attitude, because the attitude formation may be affected by different contextual or individual factors. The above argument can be hypothesized as follows:

> **Hypothesis 1**: The positive relationship between attitude toward system use and behavioral intention to system use will be stronger when the attitude is strong than when it is weak.
>
> **Hypothesis 2a:** Attitude toward system use will *fully* mediate the effect of perceived usefulness and perceived ease of use on behavioral intention, when the attitude is *strong*.
>
> **Hypothesis 2b**: Attitude toward system use will *partially* mediate the effect of perceived usefulness and perceived ease of use on behavioral intention when the attitude is *weak*.

METHOD AND DATA ANALYSIS

Data Collection

The research model was tested using a sample of MIS students from a database management course. It was expected that few of the respondents would have previous experience with databases. The subjects were required to develop their own database for a major course

project. The survey instrument used to collect data for this study was distributed to the students by the instructor for extra credit. One hundred one (101) upper level undergraduates participated in the survey.

Approximately 53% percent of the subjects were male and 47% were female. The range of the respondents' ages is from 19 to 42 years old, and the average age was 20.7 years (subjects aged 19-21 composed 85% of the sample). Respondents were asked to rate the extent of their experience with a particular database system they learned to use during the course on a scale of 1 to 7, with 1 being a novice and 7 being an expert. This group of subjects considered themselves to be novice users of the database system (average 2.9). Additionally, 85% of the sample reported their familiarity level to be less than the scale's median value of 4. Subjects reported that they spent an average of 21.3 hours on computer-related activities.

Operationalization of Research Variables

Table 3 shows the measurement items for TAM constructs (perceived usefulness, perceived ease of use, attitude, and behavioral intention) and attitude strength. We employed the measurement items for TAM constructs from previous studies (Agarwal and Prasad, 1999; Davis, 1989; Davis et al., 1989; Gefen and Straub, 2000; Karahanna et al., 1999; Venkatesh and Brown, 2001; Venkatesh and Davis, 2000; Venkatesh and Morris, 2000; Venkatesh et al., 2003).

Table 3. Measurement Items

Constructs		Measurement Items [a]
Perceived Usefulness (PU)	PU1	Using the system improves my performance in my job.
	PU2	Using the system in my job increases my productivity.
	PU3	Using the system enhances my effectiveness in my job.
	PU4	I find the system to be useful in my job.
Perceived ease of use (PEOU)	PEOU1	My interaction with the system is clear and understandable.
	PEOU2	Interacting with the system does not require a lot of my mental effort.
	PEOU3	I find the system to be easy to use
	PEOU4	I find it easy to get the system to do what I want it to do
Attitude (A)	A1	Using the system is good
	A2	My using the system is favorable
Behavioral intention to use (BI)	BI1	Assuming I have access to the system, I intend to use it.
	BI2	Given that I have access to the system, I predict that I would use it
	BI3	In the future, I plan to use the system often
Attitude Strength		I feel certain about my attitude toward using the system

[a] All items measured on a 7-point scale ranging from 1 = "strongly disagree" to 7 = "strongly agree.

We used a single-item scale of attitude certainty to measure attitude strength, because (a) the primary purpose of this study is not to examine the unique effect of each strength-related attribute on the technology adoption process; (b) using attitude certainty rather than other attributes is appropriate for the self-reporting survey context of the current study (Wegener et al., 1995); and (c) in numerous studies adopting attitude certainty to gauge attitude strength, respondents have been asked to make one overall rating of the certainty of their attitude (Wegener et al., 1995). Additionally, to our knowledge, there is currently no multi-item scale for attitude certainty and no known psychometric measure for the effect indicators of attitude strength. Moreover, as discussed earlier, all attitude attributes share a common feature and correlate with the effect indicators of attitude strength (Krosnick and Petty, 1995), making it meaningless to adopt multiple strength-related attributes to measure attitude strength. For these reasons, we used a single-item scale of attitude certainty as an index of attitude strength.

Construct Reliability and Validity

Instead of incorporating a moderator variable to test the measurement model and structural model, we split the sample into two groups: a strong attitude group (n=46) and a weak attitude group (n=55) group. These groups were divided based upon the median score (median 4.0, mean 4.29, std. dev. 1.47). We chose this strategy primarily because we assume that the difference in attitude strength connotes the different cognitive process of attitude formation. An example of this would be that the behavioral beliefs of usefulness and ease of use may have differential effects on the attitude toward a behavior and thus on behavioral intention. In addition, before the model test, we examined the correlation between attitude and attitude strength. As expected, the correlation between attitude and attitude strength (correlation coefficient 0.17) appeared not to be statistically significant.

Construct reliability. Many studies have pointed out the critical importance of instrument reliability in IS research (Moore and Benbasat 1991; Straub et al. 2002). As reported in Table 4, the constructs have alpha values well above the cutoff point of 0.70 (Nunnally 1978), and the composite factor reliability (CFR) values are above the recommended threshold of 0.70 (Segars, 1997) for both the strong attitude group and the weak attitude group. In addition, average variance extracted (AVE) values for the constructs across three samples exceeded the threshold of 0.50, indicating that the constructs have captured a relatively high level of variance. AVE indicates the amount of variance captured by a construct as compared to the variance caused by measurement error (Fornell and Larcker, 1981). The results of the reliability checks indicate a relatively high level of instrument validity.

Table 4. Reliability, Validity, and Correlations

	Alpha	CFR	AVE	PU	PEU	A	BI
Strong Attitude Group:							
Perceived Usefulness (PU)	0.96	0.97	0.90	(0.95)*			
Perceived Ease of Use (PEOU)	0.92	0.95	0.82	0.29	(0.90)		
Attitude Toward the Use of a System (A)	0.95	0.97	0.94	0.48	0.61	(0.97)	
Behavioral Intention to Use (BI)	0.96	0.97	0.92	0.47	0.51	0.85	(0.96)
Weak Attitude Group:							
Perceived Usefulness (PU)	0.97	0.98	0.92	(0.96)			
Perceived Ease of Use (PEOU)	0.90	0.92	0.73	0.41[c]	(0.85)		
Attitude Toward the Use of a System (A)	0.86	0.94	0.88	0.58	0.50	(0.94)	
Behavioral Intention to Use (BI)	0.95	0.97	0.93	0.56	0.33	0.60	(0.96)

* Value on the diagonal represents the square root of AVE.

Convergent and discriminant validity. We conducted confirmatory factor analysis (CFA), which specifies the links between the latent and manifest variables. Factor loadings for the measurement model were computed as reported in Table 5. The criteria for the acceptable level of convergent validity are individual item loadings greater than 0.7 (Fornell and Larcker, 1981). All loadings and weights are statistically significant at $p<0.01$.

Table 5. Confirmatory Factor Analyses

	Strong Attitude Group		**Weak Attitude Group**	
Items	Loading	Weight	Loading	Weight
PU1	0.931	0.272	0.966	0.257
PU2	0.960	0.250	0.973	0.286
PU3	0.957	0.245	0.973	0.261
PU4	0.948	0.287	0.934	0.234
PEOU1	0.913	0.272	0.833	0.317
PEOU2	0.814	0.218	0.746	0.154
PEOU3	0.928	0.312	0.898	0.329
PEOU4	0.953	0.299	0.930	0.350
A1	0.971	0.507	0.938	0.530
A2	0.972	0.522	0.939	0.535
BI1	0.975	0.345	0.963	0.384
BI2	0.965	0.365	0.978	0.351
BI3	0.943	0.331	0.931	0.309

In addition, we addressed the issue of discriminant validity. The first guideline for discriminant validity is that the square root of AVE for each construct should be greater than the correlation values of the construct with other constructs (Fornell and Larker 1981). All constructs across the samples passed the guideline as reported in Table 4, providing the evidence for their discriminant validity. Another guideline for discriminant validity is the procedure suggested by Gefen et al.

(2003). We compare the discriminant validity in the original measurement model (CFA) with four latent constructs against other measurement models with only three constructs, which included every possible combination of collapsing two constructs into one. Table 6 shows that the chi-square of the original CFA is significantly smaller than the CFA of any alternative model. Since combining two latent variables adds three degrees of freedom to the model, the chi-square differences between the original CFA and any alternative model should be greater than at least 7.81 ($p = 0.05$). As Table 6 shows, all differences are above the threshold. The chi-square value in the original CFA was significantly better than the reduced measurement models. Therefore, the discriminant validity criterion is also met.

Table 6. Pairwise Discriminant Analysis of Constructs

Models	Strong Attitude Group		Weak Attitude Group	
	χ^2_{df}	χ^2 **difference**	χ^2_{df}	χ^2 **difference**
Original measurement	$\chi^2_{38} = 45.30$	--	$\chi^2_{38} = 53.10$	--
BI with PU	$\chi^2_{41} = 126.25$	80.95	$\chi^2_{41} = 167.22$	114.12
BI with PEOU	$\chi^2_{41} = 134.36$	89.06	$\chi^2_{41} = 157.06$	103.96
BI with A	$\chi^2_{41} = 58.89$	13.59	$\chi^2_{41} = 81.47$	28.37
A with PU	$\chi^2_{41} = 96.29$	50.99	$\chi^2_{41} = 103.93$	50.83
A with PEOU	$\chi^2_{41} = 71.87$	26.57	$\chi^2_{41} = 64.23$	11.22
PU with PEOU	$\chi^2_{41} = 169.65$	124.35	$\chi^2_{41} = 169.82$	116.72

Common method variance. We also check for common method variance. "Method variance refers to variance that is attributable to the measurement method rather than the construct of interest" (Podsakoff et al. 2003, p. 879). In many behavioral studies, the nature of self-reported data collection and the logical flow of items can cause common method variance. Many studies pointed out that only few published papers have addressed common method variance despite using the self-report survey method (Woszczynski and Whitman 2004).

To test common method variance in this study, we employed three methods: the common method variance model (Lindell and Whitney 2001), the single factor analysis (Podsakoff et al. 2003, Bentler et al. 1980), and the delta method (Podsakoff et al. 2003, Bentler et al. 1980).

Lindell and Whitney (2001) proposed a process model for dealing with common method variance. In their model, a marker variable is placed between dependent and independent variables and the lowest correlation between the marker variable and other constructs is used to check the changes in the statistical significance of the correlations between dependent and independent variables. The correlations of constructs, the partial correlation coefficients, and the adjusted partial correlations were examined to check the contamination by common method variance. The lowest among the correlations between the dependent and predictor variables was 0.13. This does not affect the significance of the correlation between behavioral intention and the other manifest variables. This result shows that the correlation coefficients between the constructs of this study are not contaminated by common method variance.

In this study, we also carried out the single factor analysis and delta method proposed by Podsakoff et al. (2003) and Bentler and Bonnet (1980). Delta is computed using three estimations: the null model (MM0) that has no underlying factor, a common-factor measurement model (MM1), in which all items have one underlying factor, and the measurement model (MM2). "If, for example, the Chi-square of another competing model, MM1, is 20 percent of the Chi-square of MM0, we can conclude that MM1 explains 80% of the total variation" (Straub et al. 1995, p. 1335). This percentage is computed as:

$Delta = [\chi^2_{MM0} - \chi^2_{MMi}] / \chi^2_{MM0}$, where χ^2_{MMi} is chi-square value of MM_i (i = 1 or 2).

Table 7 shows the computation of delta for our model. Since there is no cut-off value for delta, we report the delta values in the manner of Straub et al. (1995).

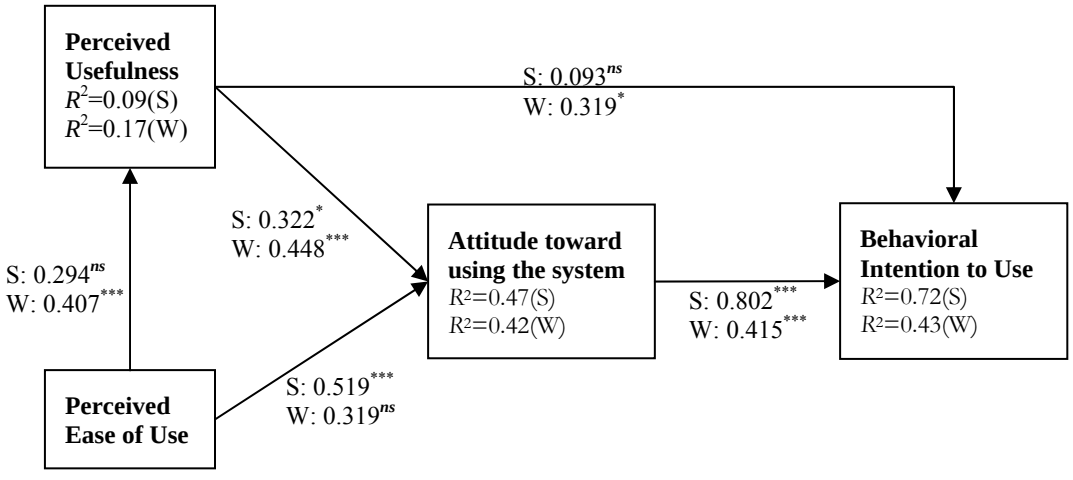
Table 7. Chi-Square Comparisons

Model	Strong Attitude Group			Weak Attitude Group		
	d.f.	Chi-square	Delta	d.f.	Chi-square	Delta
Null model	55	631.86	--	55	684.85	--
One factor model	44	263.03	0.58	44	289.60	0.58
Measurement model	38	45.30	0.93	38	53.10	0.92

In addition, we can assess the improvement of the fit index values by comparing the significance of the difference in chi-square between one factor and measurement model (Straub et al. 1995). The differences in chi-square between two models across the three samples are well above of a chi-square value at p = 0.001 with six degree of freedom. The results indicate that the current measurement model is superior to other models. Since the above test shows that the measurement model fits the data better than a single-factor model, it provides support for the validity of constructs in the measurement model.

Assessment of Structural Model

To test the structural model, we used PLS graph 2.91.03.04. PLS is a powerful approach for analyzing models and theory building because of the minimal demands on measurement scales, sample size, and residual distributions (Chin, 1998; Wold, 1985). In addition, the component-based PLS avoids two serious problems: inadmissible solutions and factor indeterminacy (Fornell and Larker 1981). Figure 3 shows the results of the structural model test. All path coefficients are over the conservative cut-off value 0.1 (Pedhazur, 1997) except the path from perceived usefulness to behavioral intention for the strong attitude group.



* p<0.05, ** p<0.01, *** p<0.001 (based on $t_{(100)}$, two-tailed test), ^{ns} not significant
S: Strong Attitude Group, W: Weak Attitude Group

Figure 3. The Results of Structural Model Assessment

In the case of the strong attitude group, attitude toward using the system shows full mediation of the effect of perceived usefulness and perceived ease of use on behavioral intention. The direct effect of perceived usefulness on behavioral intention is not indicated in the results (path coefficient 0.09, $p>0.05$). Attitude toward using the system, however, explains 72 % of the variance in behavioral intention (path coefficient 0.80, $p<0.001$). In the case of the weak attitude group, attitude toward using the system shows a partial mediation of the effect of perceived usefulness and perceived usefulness on behavioral intention to use. The results indicate a direct effect of perceived usefulness on behavioral intention (path coefficient 0.31, $p<0.05$), unlike in the case of the strong attitude group. Attitude toward using the system, however, explains a relatively low portion of the variance in behavioral intention ($R^2=0.43$, path coefficient 0.41, $p<0.001$) compared to the case of strong attitude case. This result lends support for H1, which proposed that the positive relationship between attitude toward system use and behavioral intention will be stronger when the attitude is strong than when it is weak. Our results also support H2a and H2b, which proposed that full or partial mediation of the effect of perceived ease of use and perceived usefulness will be determined by the strength of the attitude. The difference between the strong and weak groups in the coefficients of the path from attitude to behavioral intention is statistically significant at $p<0.001$. Attitude in the strong attitude group fully mediates the effect of beliefs on behavioral intention, while in the weak attitude group it only partially does so. Moreover, the difference in the R^2s of behavioral intention of the two groups is also statistically significant at $p<0.001$.

The role of perceived ease of use is found to be interesting depending on the strength of attitude. When the user attitude is strong, perceived ease of use is shown to directly affect attitude toward using the system (path coefficient 0.51, $p<0.001$) but not perceived usefulness (path coefficient 0.29, $p>0.05$). However, when the strength of the user attitude is low, perceived ease of use is shown to directly affect perceived usefulness (path coefficient 0.40, $p<0.001$) but

not attitude toward using the system (path coefficient 0.29, p>0.05). Perceived usefulness appears to mediate the effect of ease of use on attitude.

In terms of the explanatory power of the model, PLS draws on R^2 values for each endogenous variable and does not use Goodness-of-Fit Indices utilized in covariance-based structural equation modeling (Chin, 1998). The primary objective of PLS is the minimization of error in all endogenous variables, while that of the covariance-based structural equation modeling approaches is the minimization of the differences between the observed and the reproduced covariance matrices (Hulland, 1999). Accordingly, the effectiveness of a model in PLS is determined by the R^2 values for the endogenous variables (Hulland, 1999). High R^2 values for the attitude toward using the system (R^2 for strong attitude group = 0.47, for weak attitude group = 0.42) and for behavioral intention (R^2 for strong attitude group = 0.72, for weak attitude group = 0.43) suggest that this model can be used to predict the relationships between the constructs.

DISCUSSION AND CONCLUDING REMARKS

In the current study, we set out to understand the role of attitude strength in explaining the effect of attitude on the behavioral intention of individual users. We categorized the strength of individual users' attitudes toward using the system. We then tested the proposed impact of attitude strength on the relationships among the variables of the technology acceptance model.

The empirical results support the proposed research hypotheses. Interestingly, this study revealed that regardless of the strength of the attitude toward using the system, attitude toward using the system is the most important determinant of behavioral intention to use the system. This finding is congruent with the Theory of Reasoned Action (Ajzen and Fishbein, 1980; Fishbein and Ajzen, 1975) that assumes the full mediating role of attitude on behavioral intention, but slightly different from the studies of the technology acceptance model (Davis et al., 1989; Venkatesh and Davis, 2000) that argue for a partial or minimal mediating role of attitude on

behavioral intention. Among the technology acceptance studies, Agarwal and Prasad (1999) report results similar to this study. They indicate that when prior experience, tenure, and knowledge are taken into account, the effect of attitude is stronger than that of usefulness on behavioral intention.

Prior to discussing the implications of the current research, it is necessary to be aware of its limitations. One limitation involves the use of behavioral intention as the dependent variable. Behavioral intention may have limited effect on actual behavior depending on facilitating conditions such as resource and knowledge availability. Second, data was collected in survey/questionnaire format using a student sample. The standard limitations of self-report data including self-selecting bias and low response rate apply to this research. The results of this study are, however, close to those of the previous studies on TAM, which indicates that this study may not be corrupted by the single source bias. The use of student sample may also raise a question about the generalizability of this study. However, many studies have found that there are no significant differences between student subjects and non-student subjects in individual behavior, organization psychology, and other fields (Locke, 1986). The final limitation concerns the operationalization of attitude strength. In this study, we focused only on certainty, a proxy of attitude strength. Future research may examine various factors such as persistence (Schwartz, 1978) and informational influence (Krosnick and Petty, 1995).

From a theoretical perspective, the current study sheds light on the importance of attitude, a construct that has been gradually omitted from technology adoption studies. Most notably, attitude toward using the system fully mediates the effects of perceived usefulness and perceived ease of use on behavioral intention in the case of the strong attitude group. That is to say, the effect of perceived usefulness is no longer significant in directly explaining behavioral intention, which is contrary to the findings of many technology adoption studies (e.g., Agarwal and Prasad, 1999; Davis et al., 1989; Gefen and Straub, 2000; Venkatesh, 2000; Venkatesh and Morris,

2000). This finding alerts researchers to be cautious in removing attitude from their models examining the technology acceptance of individuals. Even in the case of the weak attitude group, the attitude may not be simply ignored, because its effect on behavioral intention is greater than that of perceived usefulness.

One interesting finding with regard to the effect of ease of use on attitude in the strong attitude group is that the path coefficient of perceived ease of use is greater than that of perceived usefulness. Considering the student sample was expected to have little experience with the technology, we conjecture that the strong attitude might be formed through indirect experience or information which emphasized the difficulty of using information technology. Hence, in the context, perceived ease of use may carry more impact on attitude formation than perceived usefulness. This argument is also subject to further research.

The results also indicate that practitioners must be careful in using the technology acceptance model. Given that attitude strength toward using a system has a moderating effect, they should plan to employ methods or tools that will make users' attitudes strong enough to keep the adopted technology efficiently utilized.

Concluding Remarks

The current research, by investigating the role of attitude strength, provides a different perspective from which to understand technology adoption behavior. The findings of the current study may shed light on the importance of attitude in determining the behavioral intention to use a technology. Accordingly, the findings of this study can redirect technology adoption research to consider the factors affecting attitude strength. The goal of such research would be to avoid situations where a technology is adopted but not used.

This study, along with previous research, should be regarded as just one of the many steps necessary for understanding the use of information technologies. Attitude certainty, the

measure used in this study, is only one of many other factors explaining attitude strength. Future study may investigate the major antecedents of attitude strength in conjunction with the technology acceptance model to better explain users' behavior of using information technologies.

REFERENCES

Adams, D.A., Nelson, R.R., and Todd, P.A. "Perceived Usefulness, Ease of Use, and Usage of Information Technology: A Replication," *MIS Quarterly* (16:2) 1992, pp. 227-247.

Agarwal, R., and Prasad, J. "Are Individual Differences Germane to the Acceptance of New Information Technologies?," *Decision Sciences* (30:2) 1999, pp. 361-391.

Ajzen, I. "From intentions to actions: A theory of planned behavior," in: *Action Control: From Cognition to Behavior.,* J. Kuhl and J. Beckmann (eds.), Springer Verlag, New York, 1985, pp. 11-39.

Ajzen, I. "Attitude Structure and Behavior," in: *Attitude Structure and Function,* A.R. Pratkanis, S.J. Breckler and A.G. Greenwald (eds.), Lawrence Erlbaum Associates, Hillsdale, NJ, 1989, pp. 241-274.

Ajzen, I., and Fishbein, M. *Understanding Attitudes and Predicting Social Behavior,* Prentice-Hall, Englewood Cliff, NJ, 1980.

Amoako-Gyampah, K., and Salam, A.F. "An extension of the technology acceptance model in an ERP implementation environment," *Information & Management* (41:6), Jul 2004, pp. 731-745.

Bentler, P. M., and Bonnett, D. G. "Significance tests and goodness of fit in the analysis of covariance structures," *Psychological Bulletin*, (88:3), 1980, pp. 588-606.

Chau, P.Y.K., and Hu, P.J.-H. "Information technology acceptance by individual professionals: A model comparison approach," *Decision Sciences* (32:4), Fall 2001, pp 699-719.

Chen, L.-d., Gillenson, M.L., and Sherrell, D.L. "Enticing online consumers: An extended technology acceptance perspective," *Information & Management* (39:8), Sept 2002, pp 705-719.

Chin, W.W. "The Partial Least Squares Approach to Structural Equation Modeling," in: *Modern Methods for Business Research,* G.A. Marcoulides (ed.), Lawrence Erlbaum Associates, Mahwah, NJ, 1998, pp. 295-336.

Chin, W.W., Gopal, A., and Salisbury, W.D. "Advancing the theory of adaptive structuration: The development of a scale to measure faithfulness of appropriation," *Information Systems Research* (8:4) 1997, pp. 342-367.

Chin, W.W., and Todd, P.A. "On the use, usefulness, and ease of use of structural equation modeling in MIS research: A note of caution," *MIS Quarterly* (19:2) 1995, pp. 237-246.

Cool, K., Dierickx, I., and Jemison, D. "Business strategy, market structure and risk-return relationships: A structural approach," *Strategic Management Journal* (10:6) 1989, pp. 507-522.

Davis, F.D. "A Technology Acceptance Model for Empirically Testing New End-User Information Systems: Theory and Results," in: *Sloan School of Management*, MIT, Cambridge, MA, 1986.

Davis, F.D. "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology," *MIS Quarterly* (13:3) 1989, pp. 319-340.

Davis, F.D., Bagozzi, R.P., and Warshaw, P.R. "User Acceptance of Computer Technology: A Comparison of Two Theoretical Models," *Management Science* (35:8) 1989, pp. 982-1003.

Doll, W.J., Hendrickson, A., and Deng, X. "Using Davis's perceived usefulness and ease-of-use instruments for decision making: A confirmatory and multigroup invariance analysis," *Decision Sciences* (29:4) 1998, pp. 839-869.

Eagly, A.H., and Chaiken, S. "Attitude Structure and Function," in: *The Handbook of Social Psychology,* D.T. Gilbert, S.T. Fiske and G. Lindzey (eds.), McGraw-Hill, Boston, MA, 1998, pp. 269-322.

Fazio, R.H. "How Do Attitudes Guide Behavior?," in: *The Handbook of Motivation and Cognition: Foundation of Social Behavior,* R.M. Sorrentino and E.T. Higgins (eds.), Guilford, New York, NY, 1986, pp. 204-243.

Fishbein, M., and Ajzen, I. *Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research,* Addison-Wesley Publishing Company, Reading, MA, 1975.

Fornell, C., and Larcker, D. "Evaluating Structural Equation Models with Unobservable Variables and Measurement Error," *Journal of Marketing Research* (18) 1981, pp. 39-50.
Gefen, D., and Straub, D. "The Relative Importance of Perceived Ease-of-Use in IS Adoption: A Study of e-Commerce Adoption," *Journal of Association for Information Systems* (1:8) 2000, pp. 1-21.
Gefen, D., Karahanna, E, Straub, D.W. "Trust and TAM in online shopping: an integrated model," *MIS Quarterly* (27:1), 2003, pp. 51-90.
Gross, S. R., Holtz, R., and Miller, N. Attitude certainty. In R. E. Petty and J. A. Krosnick (Eds.), *Attitude strength: Antecedents and consequences,* Mahwah, NJ: Lawrence Erlbaum Associates. 1995, pp. 215-245.
Hsu, C.-L., and Lu, H.-P. "Why do people play on-line games? An extended TAM with social influences and flow experience," *Information & Management* (41:7), Sep 2004, pp. 853-868.
Hu, P.J., Chau, P.Y.K., Sheng, O.R.L., and Tam, K.Y. "Examining the technology acceptance model using physician acceptance of telemedicine technology," *Journal of Management Information Systems* (16:2), Fall 1999, pp. 91-112.
Hulland, J. "Use of partial least squares (PLS) in strategic management research: A review of four recent studies," *Strategic Management Journal* (20:2), Y: PLS 1999, pp 195-204.
Jackson, C.M., Chow, S., and Leitch, R.A. "Toward an understanding of the behavioral intention to use an information system," *Decision Sciences* (28:2) 1997, pp 357-389.
Karahanna, E., Straub, D.W., and Chervany, N.L. "Information Technology Adoption Across Time: A Cross-Sectional Comparison of Pre-adoption and Post-adoption Beliefs," *MIS Quarterly* (23:2) 1999, pp. 183-213.
Kosnik, R.D. "Greenmail: A Study of Board Performance in Corporate Governance," *Administrative Science Quarterly* (32:2) 1987, pp. 163-185.
Krosnick, J.A., and Petty, R.E. "Attitude Strength: An Overview," in: *Attitude Strength: Antecedents and Consequences,* R.E. Petty and J.A. Krosnick (eds.), Lawrence Erlbaum Associates, Mahwah, NJ, 1995, pp. 1-24.
Lederer, A.L., Maupin, D.J., Sena, M.P., and Zhuang, Y. "The Technology Acceptance Model and the World Wide Web," *Decision Support Systems* (29:3), Y: Internet and IS 2000, pp. 269-282.
Lindell, M.K., and Whitney, D.J., "Accounting for common method variance in cross-sectional research designs," *Journal of Applied Psychology*, 86, 1, (2001), pp. 114-121.
Locke, E. A. "Generalizing from laboratory to field: Ecological validity or abstraction of essential elements?" in E. Locke (ed.) *Generalizing from laboratory to Field Settings*, Lexington Books, Heath and Company, Lexington, MA, 1986, pp. 1-9.
Malhotra, Y., and Galleta, D.F. "Extending the Technology Acceptance Model to Account for Social Influence: Theoretical Bases and Empirical Validation," 32nd Hawaii International Conference on System Sciences, IEEE, Hawaii, 1999, pp. 1-14.
Mathieson, K. "Predicting User Intentions: Comparing the Technology Acceptance Model with the Theory of Planned Behavior," *Information Systems Research* (3:3) 1991, pp. 173-191.
Moon, J.-W., and Kim, Y.-G. "Extending the TAM for a World-Wide-Web context," *Information & Management* (38:4), Feb 2001, pp. 217-230.
Moore, G. C., and Benbasat, I. "Development of an instrument to measure the perceptions of adopting an information technology innovation," *Information Systems Research*, (2:3), 1991, pp. 192-222.
Morris, M.G., and Dillon, A. "How User Perceptions Influence Software Use, Decision Support Systems," *IEEE Software* (July-August), N 1997, pp. 58-65.
Nunnally, J., *Psychometric Theory*, McGraw-Hill, New York, NY, 1978.
Pedhazur, E.J. *Multiple Regression in Behavioral Research: Explanation and Prediction*, (3rd ed.) Harcourt Brace College Publishers, Fort Worth, 1997, p. 1058.
Petty, R.E., and Cacioppo, J.T. "The Elaboration Likelihood Model of Persuasion." In L. Berkowitz (Ed.), *Advances in Experimental Social Psychology* (Vol. 19, pp. 123-205). New York: Academic Press.
Petty, R.E., Haugtvedt, C.P., and Smith, S.M. "Elaboration as a determinant of attitude strength: Creating attitudes that are persistent, resistant, and predictive of behavior," in: *Attitude strength: Antecedents and consequences,* R.E. Petty, C.P. Haugtvedt and S.M. Smith (eds.), Lawrence Erlbaum Associates, Mahwah, NJ, 1995, pp. 93-130.

Petty, R.E., and Krosnick, J.A. (Eds.) *Attitude Strength: Antecedents and Consequences*. Mahwah, NJ: Erlbaum. 1995.
Petty, R.E., Wegener, D.T., and Fabrigar, L.R. "Attitudes and attitude change," *Annual Review of Psychology* (48) 1997, pp. 609-647.
Podsakoff, S., MacKenzie, B., Lee, J. Y., and Podsakoff, N. P. "Common method biases in behavioral research: A critical review of the literature and recommended remedies," *Journal of Applied Psychology*, (88:5), 2003, pp 879–903.
Riemenschneider, C.K., Harrison, D.A., and Jr, P.P.M. "Understanding IT adoption decisions in small business: Integrating current theories," *Information & Management* (40:4), Mar 2003, pp 269-285.
Schwartz, S.H. "Temporal Instability as a Moderator of the Attitude-Behavior Relationship," *Journal of Personality & Social Psychology* (36) 1978, pp. 715-724.
Segars, A. H., "Assessing the unidimensionality of measurement: A paradigm and illustration within the context of information systems research," *Omega*, (25:1), 1997, pp. 107-121.
Segars, A.H., and Grover, V. "Re-examining perceived ease of use and usefulness: A confirmatory factor analysis," *MIS Quarterly* (17:4), Y: Innovation 1993, pp. 517-525.
Shih, H.-P. "An empirical study on predicting user acceptance of e-shopping on the Web," *Information & Management* (41:3), Jan 2004, pp 351-368.
Taylor, S., and Todd, P.A. "Understanding information technology usage: A test of competing models," *Information Systems Research* (6:2) 1995, pp. 144-176.
Teo, T.S.H., Lim, V.K.G., and Lai, R.Y.C. "Intrinsic and Extrinsic Motivation in Internet Usage," *Omega* (27:1), N 1999, pp. 25-37.
Venkatesh, V. "Creation of Favorable User Perceptions: Exploring the Role of Intrinsic Motivation," *MIS Quarterly* (23:2) 1999, pp. 239-260.
Venkatesh, V. "Determinants of perceived ease of use: Integrating control, intrinsic motivation, and emotion into the technology acceptance model," *Information Systems Research* (11:4) 2000, pp. 342-365.
Venkatesh, V., and Brown, S.A. "A longitudinal investigation of personal computers in homes: Adoption determinants and emerging challenges," *MIS Quarterly* (25:1) 2001, pp. 71-101.
Venkatesh, V., and Davis, F.D. "A model of the antecedents of perceived ease of use: Development and test," *Decision Sciences* (27:10), Y: Self-Efficacy 1996, pp. 451-481.
Venkatesh, V., and Davis, F.D. "A theoretical extension of the technology acceptance model: Four longitudinal field studies," *Management Science* (46:2) 2000, pp. 186-204.
Venkatesh, V., and Morris, M.G. "Why Don't Men Ever to Stop to Ask for Directions? Gender, Social Influence, and Their Role in Technology Acceptance and Usage Behavior," *MIS Quarterly* (24:1) 2000, pp. 115-139.
Venkatesh, V., Morris, M.G., Davis, G.B., and Davis, F.D. "User acceptance of information technology: Toward a unified view," *MIS Quarterly* (27:3) 2003, pp. 425-478.
Vijayasarathy, L.R. "Predicting consumer intentions to use on-line shopping: the case for an augmented technology acceptance model," *Information & Management* (41:6), Jul 2004, pp 747-762.
Wegener, D. T., Downing, J., Krosnick, J. A., and Petty, R. E. Measures and manipulations of strength-related properties of attitudes: Current practice and future directions. In R. E. Petty and J. A. Krosnick (Eds.), *Attitude strength: Antecedents and consequences*. Mahwah, NJ: Lawrence Erlbaum Associates. 1995, pp. 455-487.
Werts, C.E., Linn, R.L., and Joreskog, K.G. "Intraclass reliability estimates: Testing structural assumptions," *Educational & Psychological Measurement* (34:1), N 1974, pp. 25-33.
Wold, H., Partial Least Squares, in: S. Kotz,N.L. Johnson (Eds), *Encyclopedia of Statistical Sciences*, Vol. 6, Wiley, New York, 1985, pp. 581-591.
Woszczynski, A. B., and Whitman, M. E. "The problem of common method variance in IS research," In *The Handbook of Information Systems Research*, Whitman and Woszczynski (Eds.), Idea Group Publishing, Hershey, PA, 2004, pp. 66-77.
Wood, W., Kallgren, C., and Priesler, R. "Access to attitude relevant information in memory as a determinant of persuasion," *Journal of Experimental Social Psychology* (21) 1985, pp. 73-85.
Yang, H.-d., and Yoo, Y. "It's all about attitude: revisiting the technology acceptance model," *Decision Support Systems* (38:1), Oct 2004, pp. 19-31.