Information Systems Research with an Attitude

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Abstract

Attitudes have been uniquely defined by each discipline that uses them and information systems (IS) research is no exception. While traditional IS research looks at attitudes toward a behavior, consumer research pursues attitudes towards objects. This study applies concepts from marketing to formalize and operationalize Attitude consistent with the marketing perspective as involvement, including both cognitive and emotional evaluations. This broader, consumer-oriented conceptualization is empirically validated within a well established nomological network of technology acceptance constructs. Our study offers researchers a new rationale for the inclusion of an attitude measure in IS Research.

ACM Categories: K.4.4, J.4, H.1.2,

Keywords: Survey, Structural Equation Modeling, Technology Acceptance, Attitude Research

Introduction

Predicting the use of web-based technology is important for firms wishing to encourage the use of intranets by their employees, extranets by their trading partners and websites by their customers. Knowledge about consumer/user attitudes is thus a vital component of ecommerce. The study of attitudes, however, has been inconsistent across disciplines. In traditional IS research (Davis, 1985; Davis et al., 1989; Taylor & Todd, 1995; Mathieson, 1991), the construct is typically cognitive in nature, focused on attitudes towards a behavior, or not used at all. Consumer behavior studies, on the other hand, categorize attitude as "involvement" with a target object, whether it is an advertisement, video or product (Laaksonen, 1994; Laurent & Kapferer, 1985).

Both research streams provide valid historical arguments on how this construct is characterized. The question is not which stream is right, but rather which perspective is best for investigating the acceptance of new computer-mediated technologies and web-based applications. *Does measuring attitude help our ability to predict technology use? If so, are both cognitive and emotional responses important in studying web-enabled information systems?* As computer-mediated environments are quite different from traditional computing environments, customary IS approaches to studying them may be outmoded (see Table 1). While traditional computing environments provide static interfaces and structured search approaches, a computer-mediated environment (CME), utilizing Web technology, offers interactivity, telepresence, and immersion into a

Characteristics	Traditional Computing Environments	Computer-Mediated Environments
Navigation	linear, menu or hierarchical	non-linear and hierarchical
Audience	Broadcast	Narrowcast
Content	static or dynamic	static and dynamic
Exchange	uni-directional	Interactive
Communication	through the media	with or through the media

Table 1. A comparison of traditional and computer mediated environments.

virtual environment (Steuer, 1992; Hoffman & Novak, 1996). Web technologies, which are rapidly evolving, offer information presentation, access and communication via the Internet, through technologies such as: search engines, interactive chat and streaming media software, hypertext and scripting languages, plug-ins, database systems, hardware, protocols, authoring tools and graphical electronic mail systems.

Literature Review

Ajzen and Fishbein (1972) defined Attitude as the degree of evaluative affect that an individual associates with using an object. Alternatively, it has been described as a person's positive or negative feelings about performing a target behavior in a work setting (Ajzen & Fishbein, 1972), and the user's desirability of his or her using a target system (Mathieson, 1991). Davis (1985) viewed attitude from a cognitive perspective focusing on a system's utility for enhancing work performance. In the original Technology Acceptance Model (Davis, 1985; Davis et al., 1989) (see Figure 1), it was posited that individuals developed attitudes toward technology based on: (1) the perceived usefulness (PU) of the technology on the job and (2) a subjective appraisal of the degree to which the technology is easy to use (EOU). Attitudes, in turn, would have a direct impact on a user's intent to use the technology. Attitudes were hypothesized to play an important role in mediating the effects of PU and EOU.

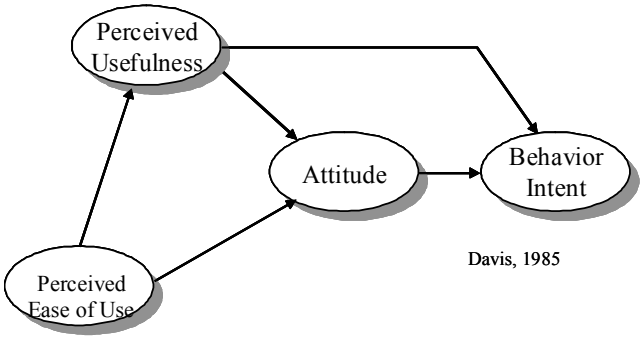

Figure 1. The Technology Acceptance Model

Many studies (Davis et al., 1989; Thompson et al., 1991; Taylor & Todd, 1995), even those with both affective and cognitive components, found the impact of attitude on prediction to be minimal. More recent studies (Venkatesh et al., 2003; Brown et al., 2002) suggest that, under certain circumstances, attitude does not have a significant influence on behavioral intent. So, why hasn't the Attitude construct been significant in IS research?

First, these studies vary widely in the types of technologies (the use of a PC, a student computing center, or a new software) and context (mandatory vs. voluntary) being investigated. Second, they focus on technologies used primarily at job settings. Technology was viewed from a utilitarian perspective for productivity improvement, with the motivation for use being extrinsic and focused on the outcome. Thus the preliminary choice of operationalizing the attitude variable as cognitive in nature was understandable. Alternatively, there have been several studies that looked at playfulness, creativity or training (Webster & Martocchio, 1992; Hoffman & Novak, 1996; Venkatesh, 1999). Although work-related technologies were investigated, subjects reported affective reactions (i.e. "fun", "enjoyable", "exciting"). Positive affect indicates that there may be intrinsic motivations for use. Intrinsic motivations look at the process of using technology. Hedonistic outcomes (for fun), in addition to utilitarian and social outcomes, were found to be important precursors for intent to purchase a PC for home use (Venkatesh & Brown, 2001).

A recent study on the acceptance of mandated technology in the banking industry, found a strong link between perceived usefulness and attitude, and a weak link between attitude and intent (Brown et al., 2002). Nonetheless, this study suggests that even in cases where the use of a technology is required, the role of attitudes cannot be overlooked. Attitudes can affect perceptions of the work environment and management actions, and user satisfaction with the system. Brown et al. (2002) further note that attitudes may be considered a critical dependent variable in its own right.

It appears that there are new reasons to consider attitude an important variable for IS research. It can serve as either an independent or dependent variable, give researchers new insight into the motivations for use of technologies in multiple venues (e.g. work, school, home), and give managers a tool to monitor employee perceptions. As individuals react to technology both cognitively and emotionally, a new way to operationalize this variable is essential. Marketing literature offers a different perspective on this subject and is discussed next.

Expanding the Attitude Construct

Marketing researchers have, for a long time, studied consumer purchasing behavior by jointly considering cognitive (knowledge) and affective (feeling or belief) responses to products and services (Celuch & Evans, 1989; Fogarty, 1994; Munson & McQuarrie, 1987; Shostrom, 1963). Because TAM considers Attitude as purely cognitive (Davis, 1985), valuable subjective information is being lost which might improve the ability to predict purchase behavior and usage for some technologies. In addition, IS research looks at attitude toward the behavior, while marketing pursues attitudes towards objects. Marketing literature conceptualizes attitude as an "evaluative judgment", a person's reaction to a *target object* (Cohen & Areni, 1991). Perceptions about objects, whether they are products, events or systems, can be used to guide acceptance (Laaksonen, 1994; Laurent & Kapferer, 1985; Zaichkowsky, 1985).

From a marketing perspective, the Attitude construct centers on how people feel about an object and the relative importance of it to them personally. A construct which covers this domain is referred to as "Involvement". If a consumer is highly involved with an object, it means they will spend a great deal of time processing information about it, and their level of arousal towards cues and details are heightened (Johar, 1995). In IS terms, an object can be a technology, a system or a website.

Involvement has already been studied as it relates to technology. For example, Rubin (1984) categorized television viewers as instrumental or ritualistic users. Ritualistic users used the television out of habit or boredom. Instrumental users were more selective of content and considered television use as exciting, thrilling and enjoyable. It is possible that users of Web technology will employ comparable viewing strategies, and formulate similar attitudes towards using it.

Methodology

The purpose of this study is to investigate if measuring attitude can help us to better predict technology use, and if so, whether a broader conceptualization of attitudes is better then a purely cognitive measure in predicting the acceptance of web technology. The method selected for data collection is the survey. Items were taken from existing scales whose reliability and validity are well established. The ideal sample frame consists of subjects who have access to a computer with web capability, are computer literate and have had exposure to the technology in multiple venues (work, school or home). Consistent with prior TAM studies (Agarwal & Prasad, 1997; Agarwal & Prasad, 1998), Executive and part-time MBA's were used. These individuals hold essential positions in industry and are also in a unique position to be able to recognize opportunities for applying Web technology in the multiple domains of their life.

In all, three models based on TAM are evaluated. Statistical analysis includes tests for reliability and validity, measurement modeling and confirmatory structural equation modeling (SEM). Appendix A shows how each construct was operationalized and its source. Cognitive Attitude consists of four items taken directly from Davis' work. The Involvement Attitude measure is a marketing scale called the Personal Involvement Inventory (PII) (Zaichkowsky, 1985). It is a 20-item semantic differential scale measuring personal relevance and contains both cognitive and emotional perceptions. In other studies where involvement has been addressed, PII demonstrates high reliability with a Coefficient Alpha between .90 and .97 (Celuch & Evans, 1989; Fogarty, 1994; Munson & McQuarrie, 1987; Shostrom, 1963). Note that the four Cognitive Attitude items are incorporated in the full Involvement Attitude measure (see the Appendix A).

The "Perceived Usefulness" (PU) construct was first defined by Davis' (1985) and focused on the usefulness of technology for enhancing one's ability to perform on the job. For the purpose of this study, however, the definition will be shifted from "job", to "work". Work covers not only the requirements of a person's occupation, but also additional types of tasks that people might classify as work, such as schoolwork and homework assignments. Good performance at school may thus result in intrinsic or extrinsic rewards on the job.

Data Collection

A total of 202 out of 210 questionnaires distributed were completed successfully by subjects enrolled at part-time MBA programs from three research-oriented universities on the east coast. Participation was voluntary. Before pooling the data, an analysis of variance (ANOVA) was conducted for mean

differences, as recommended by Neter et al., (1990). The Scheffe Method of multiple comparisons was performed on three items: age, sex and education level. The results indicated that none of the three groups was significantly different from the others on these criteria. Accordingly, the data was pooled for statistical analysis. The subjects were predominately male (72.3%) with an average age of 31. Over 90% of the sample was employed either full or part time.

Results for Individual Constructs

First, the two attitude measures were analyzed. As PII contains more items than the Cognitive Attitude measures, it demonstrated higher reliability (Cronbach Alpha = .9493 vs. .7586) when applied to the Web context (see Tables 2 and 3). In Table 3, note that the cognitive measures (*) appear in the lowest 1/3 of the group in terms of contribution to the domain of the construct. The reliability and internal consistency of all other constructs was high. Next, a factor analysis was performed on the PII measure and the results indicated there was only one factor. This is consistent with early findings that the scale was unidimensional (Zaichkowsky, 1985). Comparative statistics, including the means and standard deviations for each variable, can be found in Table 4.

Cronbach Alpha for Scale (standardized)= .7586			
Item #	**Corrected Item-Total Correlation**	**Squared Multiple Correlation**	**Alpha if Item Deleted**
5	.6215	.3972	.6643
8	.5551	.3437	.7009
16	.5528	.3381	.7020
1	.4943	.2923	.7350

Table 2. Scale Reliability for Cognitive Attitude

Next, measurement modeling was performed to analyze the loading of each item on its construct. This analysis indicates that all twenty items load well on the Involvement Attitude construct, ranging between .783 and .475. Composite Factor Reliability (CFR) for the scale was good at .9481, while the Average Variance Extracted (AVE) was .4873. To prepare for the structural modeling, an average score for Involvement Attitude was generated for each subject using all 20 items. This summation procedure is consistent with the method recommended by Zaichkowsky (1985). For Cognitive Attitude, the loadings ranged from .743 to .598 which is adequate. As expected, both the CFR and AVE were lower at .7611 and .4449 respectively (see Table 4).

Cronbach Alpha for Scale (standardized)= .9493			
Item #	**Corrected Item-Total Correlation**	**Squared Multiple Correlation**	**Alpha if Item Deleted**
11	.7781	.6985	.9407
6	.7780	.6855	.9409
19	.7606	.6593	.9413
9	.7595	.6352	.9408
3	.7532	.6706	.9409
7	.7317	.6701	.9414
10	.7262	.6650	.9416
14	.7203	.6204	.9415
4	.7187	.6537	.9415
15	.7143	.6556	.9418
12	.7132	.6677	.9417
17	.6751	.6854	.9422
5 *	.6737	.5539	.9423
18	.6444	.5592	.9428
20	.6386	.6084	.9428
8 *	.6093	.5002	.9433
16 *	.6081	.4854	.9433
13	.6062	.5408	.9433
1 *	.4789	.3669	.9453
2	.4253	.3355	.9499

Table 3. Scale Reliability for Involvement Attitude

Measured Construct	**Number of Items**	**Means/ Standard Deviation*** N=202	**Cronbach Alpha**	**Average Variance Extracted**	**Composite Factor Reliability**
Perceived Ease of Use (EOU)	4	6.03/ .95	.9273	.7961	.9393
Perceived Usefulness (PU)	4	5.31/1.38	.9500	.8158	.9463
Cognitive Attitude	4	5.84/1.01	.7586	.4449	.7611
Involvement Attitude	20	5.68/1.09	.9493	.4873	.9481
Behavioral Intent (BI)	4	6.17/1.04	.9238	.7560	.9251

For AVE, values > .50 are considered good and for CFR values > .70 are recommended.
* 7 pt. Likert scales were used for these measures.

Table 4: Statistical Analysis of Major Constructs

Structural Equation Modeling

The purpose of structural equation modeling (SEM) is to confirm relationships that should exist between constructs. For this study, three models are tested using AMOS software and the results are compared. The three main constructs, Perceived Usefulness, Perceived Ease of Use and Behavioral Intent, were operationalized using existing measures and remained the same in all three comparisons. The first model contains no attitude measure, the second and third each use a different measure of attitude, (Cognitive Attitude and Involvement Attitude, respectively).

An initial pass of the data using the baseline model shows that all paths are significant at the .05 level of significance (See figure 2 and table 5). As expected, both PU and EOU share the burden in directly predicting BI. EOU also contributes indirectly to BI through PU. Of interest is the robust weight of the path from EOU to BI. Over time, most studies show this variable will fade in importance. It is possible that EOU may continue to be critical to users as web technology evolves. Next, we turn to the R-squared[1] value. In model 1, the R-squared result for Behavioral Intent of 31.1% is a reasonable benchmark when compared to other TAM studies. With only two main predictor variables, this parsimonious model has been a workhorse in the IS arena for some time, especially when predicting the adoption of work-related technologies.

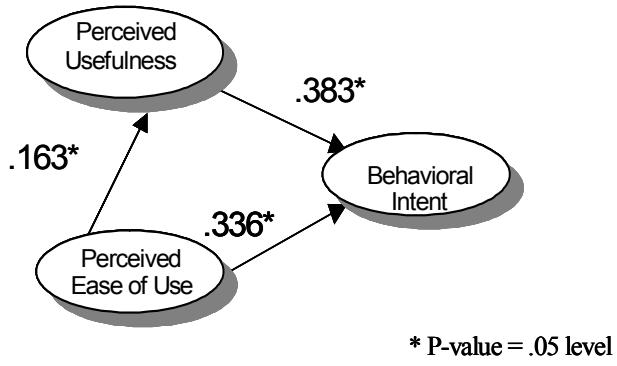

Figure 2. Structural Model without Attitude. Adjusted R^2 for Behavioral Intent is .311.

Next, the cognitive measure for Attitude was introduced into TAM. On the whole, model 2 (see figure 3 and table 6), provides a good fit of the data (Adjusted Chi-square = 1.951, AGFI = .883). The residuals are reasonable at .059 and the RMSEA is good at .07. In the structural diagram, it can be seen that all paths are positive and statistically significant at the .05 level. The strongest path occurs between PU and BI (.523). Including cognitive measures of attitude notably raised the predictive capability of Behavioral Intent from 31.1% (Model 1) to 43.8% (Model 2). The ability to predict user attitudes as well, at least on a cognitive level, is a valuable enhancement. The second model can explain 30.5% of the variance in attitude[2]. Cognitive Attitudes toward Web Technology appear to strengthen the ability to predict BI.

The third model containing the broader Involvement Attitude is discussed next (see figure 4 and table 6). When the involvement operationalization was introduced, the link between PU and Attitude rose from .383 to .492, and the link between Attitude and BI also increased (from .242 to .279). The R-squared values improved for both BI (from 43.8% to 45.9%) and Attitude (from 30.5% to 33.0%) as the Involvement Attitude construct replaced the cognitive measure. These results suggest that both cognitive and emotional reflections play a role in predicting use of Web-enabled technologies.

Limitations of the Study

While most studies on technology acceptance examine a single technology, this study looks at a suite of technologies used to interact with the Web. A possible limitation could be the extent to which these interfaces are not standardized. However, with today's browser interface, we don't believe this is the case. Another limitation of this study is the use of a conveniences sample of MBA students.. During preliminary testing of this model with undergraduates, it was noted that on average, graduates reported they spend less time on the web per week, and less time chatting, than undergraduate students do. This suggests that MBA students may be a reasonable subject pool when considering future intent to use.

[1] The R-squared value is produced by the AMOS package as a squared multiple correlation value which is independent of the unit of measurement. It represents a lower bound estimate of reliability and takes into consideration all variables influencing an endogenous variable other than residual variables. It is determined by squaring the standardized loading factors for all related indicators (Loehlin, 1998). Note that all values reported here are standardized.

[2] In model 2, the calculation for standardized R^2 for the Cognitive Attitude model is as follows: EOU to Cognitive Attitude has direct effect of .336 plus an indirect effect of .062 (.163*.383) for total effect of .398. PU has direct effect of .383. R^2 for Cognitive Attitude is equal to $.398^2$ + $.336^2$ or .305. The calculation for standardized R^2 for BI is as follows: PU-Cognitive Attitude has direct effect of .523 plus an indirect effect of .092 (.383*.242) for total effect of .615. Cognitive Attitude has direct effect of .242. R^2 for BI is equal to $.615^2$ + $.242^2$ or approximately .438. The calculation of R-squared for all models follows a similar pattern.

Path	Loading	P-value	Effects: (Direct +Indirect)/Total	R-Squared
EOU – PU	.163	.050	(.163 + .000)/.163	
PU – BI	.383	.050	(.383 + .062)/.445	BI: .311
EOU – BI	.336	.050	(.336 + .000)/.336	

Table 5. Structural Model without Attitude

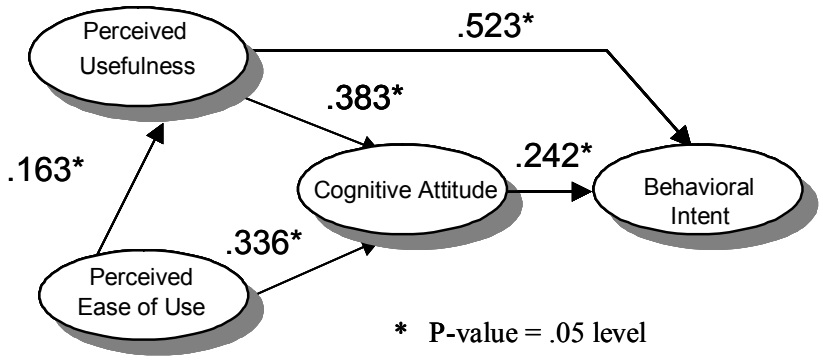

Figure 3. Structural Model with Cognitive Attitude. Adjusted R^2 for Cognitive Attitude is .305; Adjusted R^2 for Behavioral Intent is .438.

Statistic: Preferred Value	Model 1 No Attitude	Model 2 Cognitive Attitude	Model 3 Involvement Attitude
Chi-Square (df)	104.898 (51)	119.035 (61)	126.116 (61)
P-value: Higher is better	.000	.000	.000
Adjusted Chi-Square (χ^2/df): Lower is better	2.057	1.951	2.067
AGFI: Higher is better	.844	.883	.872
RMR: Lower is better	.062	.059	.073
RMSEA: Lower is better	.07	.07	.07
R-Squared (ATT): Higher is better	-	.305	.330
R-Squared (BI): Higher is better	.311	.438	.459

Table 6. Comparative Statistics for Attitude Models[3]

The use of random sampling and an assessment of non-response bias, however, are recommended for future studies. [3]

Finally, we did not control for how individual subjects used Web technologies. It is possible that stratification of the sample into those that use the Web mainly for social aspects of work might place a different level of importance on attitude than those that use it for (say) job related information searches. This is fertile ground for future research.

Summary and Conclusions

The improvement in predictive capability, seen in the successive changes to a specific technology acceptance model, helps us to address both of the questions posed at the beginning of the study.

- **Does measuring attitude help our ability to predict technology use?**
- **If so, are both cognitive and emotional responses important in studying web-enabled information systems?**

[3] To complete the analysis, a chi-squared difference test was performed. Pair wise comparison of nested models was conducted. The results indicate that model 1 and 3 are significantly different from each other at the .05 level.

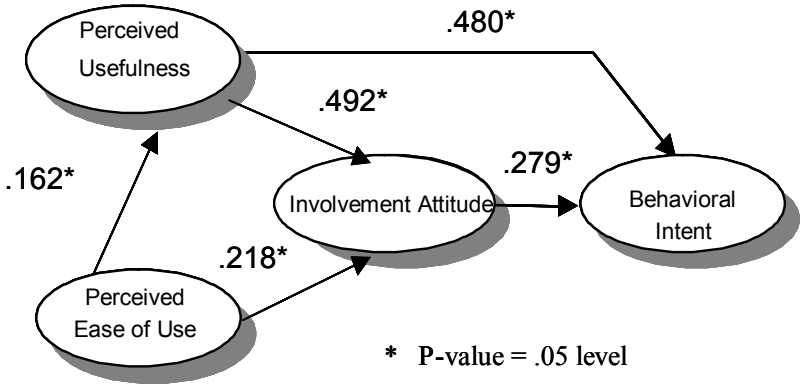

Figure 4. Structural Model with Involvement Attitude. Adjusted R^2 for Involvement Attitude is .330; Adjusted R^2 for Behavioral Intent is .459.

Certainly the inclusion of an attitude measure in this research provides evidence that the construct has a positive effect in explaining variance in behavioral intent to use web technology. The initial rise in predictiveness in BI, from 31.1% to 43.8% points to a pivotal role for this wayward variable in IS research. The further increase in explained variance (from 43.8% to 45.9) over the directly equivalent cognitive model can be attributed to the broader conceptualization of attitude as involvement. Our results strongly indicate that measuring attitude does indeed significantly improve our ability to predict technology use.

We would assert that at the minimum, our results give us pause to contemplate on theoretical development in this area. Our findings provide a rationale for not only retaining the Attitude construct in technology acceptance research, but also for including it as a broader, involvement-oriented measure, containing both cognitive and emotional components. Consumer oriented environments and the interactive nature of the medium can lead to perceptions that new technologies are both cognitively demanding and intrinsically satisfying. As the Web has become a market-driven medium, researchers need to identify new consumer-oriented measures to study it. Our conceptualization of attitude encapsulates the spectrum of responses expected towards technologies which can be used both for work and play. Perhaps researchers should consider refining and applying it when the context being studied provides situations where affect is important, such as during socialization activities, learning games, or entertainment activities. Additional work on the refinement and separation of the cognitive and affective components of attitude (Zaichkowsky, 1994) can be addressed in the future.

In conclusion, this research sensitizes future work to: (a) the importance of Attitude as a mediating variable particularly in the acceptance of multi-functional technologies, (b) the possibility that the nature of the constructs should closely align with the nature of the technologies being assessed, and (c) the Personal Involvement Inventory scale which appears robust in its reliability and cohesiveness when used to study the acceptance of Web technology. It is hoped that this research stimulates further thinking about the role and nature of this construct in the nomological network of technology acceptance in particular and IS research in general.

References

Agarwal, R. and Prasad, J. (1997). "The Role of Innovation Characteristics and Perceived Voluntariness in the Acceptance of Information Technologies," *Decision Sciences*, Vol.28, No.3, pp. 557-582.

Agarwal, R. and Prasad, J. (1998). "A Conceptual and Operational Definition of Personal Innovativeness in the Domain of Information Technology," *Information Systems Research*, Vol.9, No.2, pp. 204-215.

Ajzen, I. and Fishbein, M. (1972). "Attitudes and Normative Beliefs and Factors Influencing Behavioral Intentions," *Journal of Personality and Social Psychology*, Vol.21, pp. 1-9.

Brown, S.A., Massey, A.P., Montoya-Weiss, M.M., and Burkman, J.R. (2002). "Do I Really Have to? User acceptance of Mandated Technology," *European Journal of Information Systems*, Vol.11, pp. 283-295.

Celuch, K. and Evans, R. (1989). "An Analysis of the Convergent and Discriminant Validity of the Personal Involvement Inventory and the Consumer Involvement Profile," *Psychological Reports*, Vol.65, No.3 (Part 2), pp. 1291-1297.

Cohen, J.B., and Areni, C.S. (1991). "Affect and Consumer Behavior," in Robertson, T.S., & Kassarjian, H.H. (Eds.), *Handbook of Consumer Behavior*, Englewood Cliffs, NJ: Prentice Hall, pp. 188-240.

Davis, F.D. (1985). "A Technology Acceptance Model for Empirically Testing New End-User Information Systems: Theory and Results," unpublished Doctoral Dissertation, Massachusetts Institute of Technology.

Davis, F.D., Bagozzi, R.P., and Warshaw, P.R. (1989). "User Acceptance of Computer Technology: A Comparison of Two Theoretical Models," *Management Science*, Vol.35, No.8, pp. 982-1003.

Fogarty, G.J. (1994). "Using the Personal Orientation Inventory to Measure Change in Student Self-Actualization," *Personality and Individual Differences*, Vol.17, No.3, pp. 435-439.

Hoffman, D.L. and Novak, T.P. (1996). "Marketing in Hypermedia Computer-Mediated Environments: Conceptual Foundations," *Journal of Marketing*, Vol.60, No.3, pp. 50-68.

Johar, G.V. (1995). "Consumer Involvement and Deception from Implied Advertising Claims," *Jrl. of Marketing Research*, Vol.32, pp. 267-279.

Laaksonen, P. (1994). *Consumer Involvement*, New York: Routledge Press.

Laurent, G. and Kapferer, J.N. (1985). "Measuring Consumer Involvement Profiles," *Journal of Marketing Research*, Vol.22, No.1, pp. 41-53.

Loehlin, J.C. (1998). *Latent Variable Models: An Introduction to Factor, Path and Structural Analysis*, Mahway, NJ: Lawrence Erlbaum Associates.

Mathieson, K. (1991). "Predicting User Intentions: Comparing the Technology Acceptance Model with the Theory of Planned Behavior," *Information Systems Research*, Vol.3, No.3, pp. 173-191.

Munson, J.M. and McQuarrie, E.F. (1987). "The Factorial and Predictive Validities of a Revised Measure of Zaichowsky's Personal Involvement Inventory," *Educational and Psychological Measurement*, Vol.47, pp. 773-782.

Neter, J., Wasserman, W., and Kutner, M.H. (1990). *Applied Linear Statistical Models: Regression, Analysis of Variance, and Experimental Designs*, Boston, MA: Irwin.

Rubin, A.M. (1984). "Ritualized and Instrumental Television Viewing," *Journal of Communication*, Vol.34, No.3, pp. 67-77.

Shostrom, E.L. (1963). *Personal Orientation Inventory*, San Diego, CA: Ed ITS.

Steuer, J. (1992). "Defining Virtual Reality: Dimensions Determining Telepresence," *Journal of Communication*, Vol.42, No.4, pp. 73-93.

Taylor, S. and Todd, P.A. (1995). "Assessing IT Usage: The Role of Prior Experience," *MIS Quarterly*, Vol.19, No.4, pp. 561-570.

Thompson, R.L., Higgins, C.A., and Howell, J.M. (1991). "Personal Computing: Toward a Conceptual Model of Utilization," *MIS Quarterly*, Vol.15, No.1, pp. 124-143.

Venkatesh, V. (1999). "Creation of Favorable User Perceptions: Exploring the Role of Intrinsic Motivation," *MIS Quarterly*, Vol.23, No.2, pp. 239-260.

Venkatesh, V. and Brown, S.A. (2001). "A Longitudinal Investigation of Personal Computers in Homes: Adoption Determinants and Emerging Challenges," *MIS Quarterly*, Vol.25, No.1, pp. 71-102.

Venkatesh, V., Morris, M., Davis, G., and Davis, F. (2003). "User Acceptance of Information Technology: Toward a Unified View," *MIS Quarterly*, Vol.27, No.3, pp. 425-478.

Webster, J. and Martocchio, J.J. (1992). "Micro-computer Playfulness: Development of a Measure with Workplace Implications," *MIS Quarterly*, Vol.16, No.2, pp. 201-226.

Zaichkowsky, J.L. (1985). "Measuring the Involvement Construct," *Journal of Consumer Research*, Vol.12, No.3, pp. 341-352.

Zaichkowsky, J.L. (1994). "The *Personal Involvement* Inventory: Reduction, Revision, and Application to Advertising," *Journal of Advertising*, Vol. 23, No.4, pp. 59-70.

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Appendix A

This survey asks for your reaction to the World Wide Web (Web) and Web technology in general. Web technology is a suite of hardware and software products that provide seamless connectivity to Web-based information. These include all hardware and software technologies that are used to surf the Web, chat, work with e-mail, download information, etc.

All measures used a 7-point Likert scale (1=Strongly Disagree, 7=Strongly Agree)

Perceived Usefulness Items- Davis, 1985
Using the Web makes it easier to do my work.
Using the Web improves the quality of the work I do.
Using the Web enhances my work performance.
Using the Web enhances my effectiveness.

Perceived Ease of Use Items - Davis, 1985
It would be easy for me to become skillful at using Web technology.
Interacting with Web technology is clear and understandable.
Learning to use Web technology is easy for me.
Overall, I find Web technology easy to use.

Semantic Differential Items for Attitude/Involvement (PII) - Zaichkowsky, 1985		
Item #		
1. (D)	*Good	Bad
2.	Of no concern to me	Of concern to me
3.	Irrelevant	Relevant
4.	Unexciting	Exciting
5. (D)	*Positive	Negative
6.	*Valuable	Worthless
7.	Dull	Fascinating
8. (D)	*Beneficial	Harmful
9.	*Matters to me	Doesn't matter to me
10.	Uninteresting	Interesting
11.	*Significant	Insignificant
12.	*Vital	Not vital
13.	Boring	Thrilling
14.	*Means a lot to me	Means nothing to me
15.	*Appealing	Unappealing
16. (D)	*Wise	Foolish
17.	*Essential	Nonessential
18.	Undesirable	Desirable
19.	*Wanted	Unwanted
20.	Not needed	Needed

* = These items are reverse coded. D = This item is part of Davis' 4-item TAM Cognitive Attitude Scale.

Behavioral Intent Items - Davis, 1985
Assuming Web technology is available to me, I predict I will use it on a regular basis in the future.
For future tasks, I would use Web technology.
In the future, I plan to use the Web often.
I intend to increase my use Web technology in the future.

Appendix B: Covariance Matrix

	weasie	wqual	wperf	weff	eskillf	eclear	eeaslrn	easuse	agood	acon	arel	aexc	apos	avalue	adull	abene	amatte	aunint	asig	avital	abor	amean	aapps	awise	aessen	aundes	awant	aneed	fpredict	ffutuse	foften	fincrea
weasier	1.611																															
wqual	1.266	1.915																														
wperf	1.332	1.703	1.942																													
weff	1.203	1.531	1.601	1.831																												
eskillf	0.089	0.185	0.092	0.166	0.632																											
eclear	0.050	0.218	0.104	0.286	0.504	0.969																										
eeaslrn	0.129	0.249	0.119	0.269	0.547	0.726	0.925																									
easuse	0.097	0.235	0.122	0.304	0.555	0.766	0.866	0.993																								
agood	0.370	0.459	0.459	0.545	0.348	0.376	0.463	0.455	1.073																							
acon	0.446	0.624	0.700	0.670	0.037	0.097	0.058	0.007	0.232	2.686																						
arel	0.518	0.651	0.690	0.752	0.212	0.166	0.249	0.258	0.526	0.965	1.316																					
aexc	0.397	0.433	0.508	0.475	0.110	0.128	0.075	0.085	0.413	0.792	0.839	1.223																				
apos	0.366	0.447	0.395	0.535	0.213	0.228	0.308	0.295	0.537	0.439	0.673	0.591	0.976																			
avalue	0.508	0.500	0.525	0.538	0.193	0.207	0.239	0.237	0.464	0.465	0.585	0.600	0.578	0.849																		
adull	0.286	0.392	0.400	0.412	0.175	0.156	0.139	0.174	0.335	0.635	0.596	0.733	0.484	0.549	1.018																	
abene	0.286	0.374	0.364	0.396	0.174	0.127	0.174	0.136	0.337	0.411	0.496	0.433	0.447	0.499	0.444	0.954																
amatter	0.503	0.522	0.559	0.603	0.180	0.082	0.164	0.156	0.375	0.674	0.743	0.666	0.551	0.612	0.648	0.629	1.208															
aunint	0.297	0.395	0.421	0.467	0.146	0.086	0.164	0.177	0.377	0.509	0.655	0.670	0.512	0.464	0.678	0.452	0.622	0.913														
asig	0.380	0.504	0.498	0.535	0.189	0.103	0.224	0.227	0.426	0.546	0.726	0.591	0.564	0.644	0.584	0.556	0.781	0.513	1.023													
avital	0.459	0.646	0.703	0.662	0.173	0.161	0.214	0.241	0.403	0.690	0.825	0.700	0.572	0.720	0.700	0.463	0.819	0.534	0.901	1.620												
abor	0.414	0.403	0.447	0.474	0.162	0.152	0.154	0.206	0.291	0.315	0.422	0.535	0.348	0.390	0.584	0.296	0.491	0.498	0.404	0.565	0.891											
ameans	0.458	0.506	0.596	0.559	0.218	0.075	0.139	0.171	0.339	0.533	0.711	0.657	0.500	0.545	0.573	0.439	0.686	0.522	0.656	0.814	0.558	1.162										
aapps	0.238	0.370	0.387	0.394	0.167	0.103	0.164	0.173	0.309	0.387	0.553	0.614	0.451	0.449	0.564	0.463	0.611	0.585	0.513	0.567	0.531	0.676	0.888									
awise	0.286	0.426	0.402	0.436	0.236	0.185	0.194	0.180	0.352	0.374	0.496	0.475	0.445	0.521	0.483	0.511	0.528	0.381	0.519	0.551	0.342	0.475	0.411	0.990								
aessen	0.515	0.643	0.718	0.596	0.195	0.125	0.179	0.179	0.438	0.568	0.668	0.515	0.458	0.629	0.461	0.418	0.651	0.458	0.645	0.964	0.373	0.596	0.413	0.539	1.216							
aundes	0.341	0.396	0.523	0.505	0.103	0.046	0.129	0.117	0.299	0.412	0.496	0.434	0.422	0.434	0.501	0.389	0.501	0.498	0.448	0.533	0.508	0.530	0.542	0.461	0.412	0.909						
awant	0.379	0.456	0.566	0.513	0.162	0.130	0.169	0.172	0.367	0.416	0.559	0.557	0.476	0.519	0.490	0.452	0.546	0.490	0.527	0.615	0.409	0.633	0.548	0.448	0.536	0.536	0.787					
aneed	0.507	0.625	0.681	0.646	0.179	0.122	0.219	0.215	0.315	0.489	0.580	0.385	0.417	0.493	0.409	0.369	0.597	0.434	0.555	0.747	0.329	0.513	0.380	0.330	0.785	0.412	0.473	0.980				
fpredict	0.634	0.676	0.618	0.660	0.180	0.138	0.199	0.160	0.345	0.318	0.467	0.298	0.353	0.356	0.243	0.300	0.358	0.321	0.305	0.402	0.244	0.332	0.226	0.237	0.349	0.292	0.307	0.347	0.930			
ffutuse	0.717	0.798	0.745	0.767	0.218	0.201	0.244	0.220	0.400	0.357	0.470	0.268	0.337	0.395	0.260	0.305	0.345	0.304	0.296	0.476	0.317	0.343	0.245	0.244	0.427	0.315	0.324	0.366	0.768	1.006		
foften	0.642	0.651	0.664	0.681	0.215	0.158	0.224	0.195	0.405	0.405	0.532	0.394	0.363	0.480	0.325	0.291	0.428	0.360	0.353	0.563	0.291	0.440	0.325	0.293	0.502	0.383	0.396	0.403	0.815	0.845	1.102	
fincreas	0.758	0.802	0.823	0.846	0.112	0.064	0.085	0.082	0.291	0.445	0.501	0.434	0.390	0.480	0.373	0.305	0.464	0.400	0.336	0.545	0.360	0.434	0.347	0.279	0.527	0.386	0.421	0.499	0.702	0.837	0.857	1.271