Association for Information Systems
AIS Electronic Library (AISeL)

AMCIS 2006 Proceedings

Americas Conference on Information Systems
(AMCIS)

December 2006

Affect as Information in the Decision to Use Technology

Robin Wakefield
Baylor University

Follow this and additional works at: http://aisel.aisnet.org/amcis2006

Affect as Information in the Decision to Use Technology

Robin L. Wakefield
Baylor University
Robin_Wakefield@baylor.edu

ABSTRACT

Individuals use affect (i.e. feelings) as information in the decision-making process, including the decision to use technology. Researchers acknowledge that individuals make judgments after first assessing their feelings. Those feelings then become important in the formation of attitudes toward the target. This research applies the affect as information theory in the evaluation of user responses toward a new technology, RedTacton, which uses the human body for broadband networking. The hypotheses propose relationships among traditional TAM variables (i.e. perceived usefulness, perceived ease of use, intent) and perceived enjoyment, positive affect and negative affect. A structural equations model is tested based on a random sampling of 358 individuals in the U.S. The results show that affect has a positive impact on both user enjoyment and perceptions of the usefulness of the technology. Implications of the results for the design of technology and for maximizing technology use are presented.

Keywords

TAM, affect, technology use, perceived enjoyment

INTRODUCTION

The acceptance and use of information systems is one of the most mature research areas in the IS literature (Hu et al 1999), yet it remains a vital topic due to enormous capital investments by organizations and the rapid rate of technology innovation. Alternatively, studies on the acceptance and use of technology outside of the workplace is limited despite indications that technology is moving toward a level of pervasiveness unlike anything modern users have experienced. The recent surge of RFID exemplifies how technology is poised to infiltrate the everyday affairs of the average technology user. Since the advent of the technology acceptance model (TAM; Davis, 1989), researchers have continuously tested, modified and extended the paradigm to better predict and explain user attitudes and behavior in the workplace. Recent research synthesizes the various studies to provide a more unified model of user acceptance and a deeper, more comprehensive view of the phenomenon (e.g. UTAUT, Venkatesh, Morris, Davis, and Davis, 2003). The usefulness of the paradigm for IS research in organizational contexts is indisputable. However, as Van der Heijden (2004) shows, TAM is restricted by the contextual boundaries in which it is applied. This limitation has restricted researchers from fully developing TAM with a thorough investigation of the model both within and without the organization.

Van der Heijden (2004) highlights how TAM is constrained in his examination of the utilitarian and hedonic nature of systems and the little-used variable called perceived enjoyment (PE). By incorporating principles from consumer behavior literature, a richer explanation of user behavior emerges. Perceived enjoyment is identified as an affect-related variable that compliments the traditional utilitarian constructs in TAM (i.e. perceived usefulness, PU; perceived ease of use, PEOU). As TAM is broadened to encompass all technology users, the usefulness of the paradigm is enlarged and user intentions are better understood in a culture pressing toward pervasive computing.

The present research continues in this manner to enlarge the conceptualization of what it means to accept and use technology. The social cognition literature is incorporated in order to apply the *affect-as-information* theory to technology acceptance and use. Social cognition emphasizes how the cognitive accessibility of affect (i.e. feelings) informs the beliefs that influence judgment and behavior. This study demonstrates that user affect provides relevant information that influences hedonic as well as utilitarian beliefs about an information system which in turn influence usage intentions. A greater understanding of user attitudes and usage behavior within and without the organization is important to develop systems that contribute in the move toward information system ubiquity.

THEORETICAL BACKGROUND

Technology Acceptance

The technology acceptance model (TAM) is the dominant paradigm supporting technology acceptance and use research in utilitarian contexts. TAM is rooted in motivational theory (Deci, 1975) in which both extrinsic and intrinsic rationales determine user behavior. The two constructs, perceived usefulness (PU) and perceived ease of use (PEOU), are extrinsic variables that demonstrate robustness throughout the literature examining user behavior (e.g. Venkatesh, 1999; Szajna, 1996; Davis, 1989). Since organizations are most concerned with performance outcomes in utilitarian or work-related contexts, researchers often evaluate information processing models such as TAM that emphasize utilitarian beliefs. These beliefs are motivated by extrinsic factors related to the functionality of the technologies and practical benefits to the user.

The belief-intention (or belief-behavior) relationship in TAM is based on the theory of reasoned action (TRA; Ajzen and Fishbein, 1980). TRA posits that the influence of external variables on behavior is mediated by cognitive beliefs (e.g. PEOU, PU). PEOU reflects the belief that interacting with technology is relatively free of cognitive effort and PU is the belief that using a technology enhances job performance (Davis, 1989). Since the supposition within attitude theories (e.g. Fishbein and Ajzen, 1975) is that judgments are based directly on beliefs and indirectly on affect, most TAM research occurs in organizational contexts and intrinsic beliefs such as perceived enjoyment (see Davis, Bagozzi, and Warshaw, 1992) receive little attention. PE is an affect-related factor in which the activity of using technology is enjoyable apart from technology performance or other external user benefits (Davis, et al 1992). As an intrinsic motivator, enjoyment is derived from technology interactions and is internal to the user. Social cognition principles advocate that affect (or feelings) contribute directly to evaluative judgments and feelings are a conscious representation of unconscious appraisals. Thus, feelings are highly informative as they represent an evaluation of the target and influence behavior.

Social Cognition

Social cognition research emphasizes that it is through cognitive accessibility that concepts and beliefs influence judgment. The saliency of feelings contributes information that is incorporated in the decision-making process. For example, on the basis of social cognition consumer behavior researchers have long acknowledged the *How-do-I-feel-about-it* heuristic in consumer decision making. When individuals make judgments about products, they generally hold a representation of the target in mind, inspect personal feelings toward the target and evaluate the target with a reliance on those feelings. The outcome is individual behavior or a consumption choice based on the evaluation of feelings toward the target. Thus, affect is a source of information in evaluative judgments (Pham, 1998; Schwarz and Clore, 1983, 1988; Wyer and Carlston, 1979). Moreover, any stimulus initiates a sequence of cognitive and affective responses that describes the way the individual *sees* and *feels* about the target (Izard, 1977).

Social cognition researchers have developed conceptualizations for the encoding, storage and retrieval of information. From this body of research the *affect-as-information* hypothesis was developed (see Schwarz and Clore, 1983; Clore and Byrne, 1974; Wyer and Carlston, 1979). Before discussing this principle, it is necessary to distinguish key terms such as affect, feelings and information. According to Clore, Wyer, Dienes, Gasper, Gohm, and Isbell (2001), affect is a representation of value analogous to the way in which cognition is a representation of knowledge. Whereas cognition encompasses the spectrum related to the truth or falsity of knowledge, affect includes the range of good to bad or positive to negative that relates to value. As affect becomes salient, the individual generates feelings or specific emotions based on experiential representations of the goodness or badness of the target. For example, fear is the feeling that results from a perceived threat. However, first the individual assesses the extent of the badness or negativity of the threat prior to the feeling of fear. Feelings are based on internal cues or information that results from affective processes (Clore, 1992). In this context, affective feelings are a representation of all kinds of internal signals and inform the individual about the goodness (positiveness) or badness (negativity) of a target. Hence, the information provided by affect is in the form of feelings rather than words and those feelings are experienced directly (Clore, 1992).

The affect-as-information approach is based on five principles that include: experience, information, attribution, attributional constraint, and immediacy (Clore, et al 2001). The experience principle considers the salience of feelings and how the influence of affect on judgments is mediated by *how* individuals experience the affect. It is the experiential process that determines the degree of information value (i.e. degree of goodness or badness) provided by the affect.

According to the information principle, feelings provide conscious feedback or information internal to the individual that are related to the relevance of the situation to the individual. Feelings represent the overall significance of the target to the individual. However, the information value of affect depends on how the affect is attributed and the impact of attributional constraints. Affect influences judgment when the individual attributes the experience and related feelings to the object of the judgment. However, these attributions may be constrained by the duration of the affect and the salience of its object. The

immediacy principle states that affective feelings are reactions to current mental content so that the cause of feelings is generally whatever the individual is mentally focused on at the time.

These principles form the basis on which researchers explain the influence of feelings on judgments. The psychology literature demonstrates how feelings provide information that influences evaluative judgments (e.g. Gouaux, 1971; Griffit and Veitch, 1971; Lott and Lott, 1960). In contrast to attitude theories (e.g. Fishbein and Ajzen, 1975) in which judgments are based indirectly on affect, the experience principle posits that affective feelings contribute directly to evaluative judgments and feelings are a conscious representation of unconscious appraisals. Thus, feelings are highly informative as they represent an evaluation of the target.

HYPOTHESES

The research model is illustrated in Figure 1. The basis for the model is TAM and includes the utilitarian constructs PU and PEOU. Two additional latent constructs PE and affect represent the extension of the model.

PE represents the intrinsic belief that technology provides user benefits that are internal rather than external. In the initial development of the belief-intention relationship for technology acceptance, Davis et al (1992) propose the significance of intrinsic motivators such as PE to impact usage intentions. PE provides a strong explanation for internet use in users that surf websites for entertainment purposes as opposed to functional or school-related purposes (Van der Heijden, 2004; Atkinson and Kydd, 1997). Thus, enjoyment beliefs are a strong predictor of usage intentions for technologies that provide internal user benefits such as pleasure. This leads to the following hypothesis that recognizes the predictive value of intrinsic motivators related to technology acceptance and use.

> H1: Perceived enjoyment is a significant predictor of intentions to use technology.

Social cognition research posits that affect provides information that influences judgments or beliefs. Interactions with technologies create experiences that give rise to affective feelings. The affect is an integration of assessments associated with the goodness or badness of the target object as it relates to the individual. According to *affect-as-information* theory, affective feelings serve as additional information in the formation of user attitudes and beliefs regarding the target. As positive affect related to a technology increases, the user will attribute the positive affect to the target which in turn will increase perceptions of pleasure associated with the technology. This leads to the following hypothesis:

> H2: Affect is a significant predictor of perceived enjoyment.

Moreover, it is likely that the user will believe that a technology is more useful when positive affect toward the technology increases. Most TAM models depict PEOU as the sole predictor of PU. However, good 'vibes' or favorable inclinations toward a technology may provide more explanation of why users believe a technology is useful in functional and/or hedonic contexts. That is, users may be more inclined to believe the technology serves goal-oriented purposes as well as entertainment purposes in the presence of positive affect in contrast to negative affect. Thus, affect is likely an important antecedent of usefulness beliefs leading to the following hypothesis:

> H3: Affect is a significant predictor of perceived usefulness.

METHODOLOGY

The scales to measure the latent constructs were derived from prior IS research and consumer behavior literature. The scales for PEOU and PU originate from Davis (1989) and the behavioral intention scale was developed from the work of Ajzen and Fishbein (1980). Scales for perceived enjoyment are derived from the work of Van der Heijden (2004). A total of nine items measuring positive and negative affect were modified from the consumer behavior scales of Murry and Dacin (1996). Scale items are presented in Appendix A.

A cross-sectional survey design was used to examine the hypotheses. We employed the services of an online research firm to collect data from a random sample of adults located across the United States. A total of 358 individuals completed the online questionnaire after reading about RedTacton, a new technology that uses the human body for broadband networking. Respondents were 44 percent male and 56 percent female. About 52 percent of the respondents were between the ages of 25 and 44, with 38 percent over 45 years. Close to 47 percent indicated a household income of less than $45,000, and 25 percent report a yearly household income of greater than $75,000.

RESULTS

The reliability of each scale to measure the desired construct was assessed using Cronbach's alpha. Each scale demonstrates a Cronbach's alpha exceeding the suggested minimum of .70 supporting the scale items as representative of each construct. Prior to testing the SEM model, exploratory factor analysis was conducted using the data to test for convergent and

discriminant validity (see Appendix A). Each item loads high on its associated construct and descriptive statistics of the constructs are in Table 1.

Construct	Mean	Std. Dev.
PEOU	3.16	1.15
PU	3.09	1.02
PE	2.34	1.04
Intent	2.84	1.24
Positive Affect	3.10	1.15
Negative Affect	2.71	1.16

Table 1. Descriptive Statistics

The SEM model was then estimated using AMOS 4.0 (Arbuckle and Wothke, 1999). The results indicate an acceptable fit of the model to the data (X^2 = 307.51; p < .001). The fit measures (i.e. GFI = .90, CFI = .97, NFI = .95, TLI = .96, IFF = .97) provide different perspectives on the acceptability of the model and indicate good support with all indices above the generally accepted value of .90 (Hair, Anderson, Tatham, and Black, 1998). The root means square error of approximation (RMSEA = .07) is less than the .08 threshold (MacCallum, et al. 1996) and also indicates a good model fit.

The data supports each of the hypothesized relationships in the model. As enjoyment beliefs increase, users indicate greater intentions to use the technology (β = .396, p < .001). Positive affect is significantly related to enjoyment beliefs (β = .828, p < .001) and usefulness beliefs (β= .279, p< .001). The squared multiple correlation (SMC) is equivalent to the more familiar R^2 and is an indicator of the explanatory power of the model. The SMC indicates the amount of variance in the dependent variable that is explained by a set of predictor variables. The explanatory power of the model is high with the predictors explaining approximately 84 percent of the variance in perceived enjoyment, 73 percent of perceived usefulness, and 68 percent of the variance in intentions to use the technology.
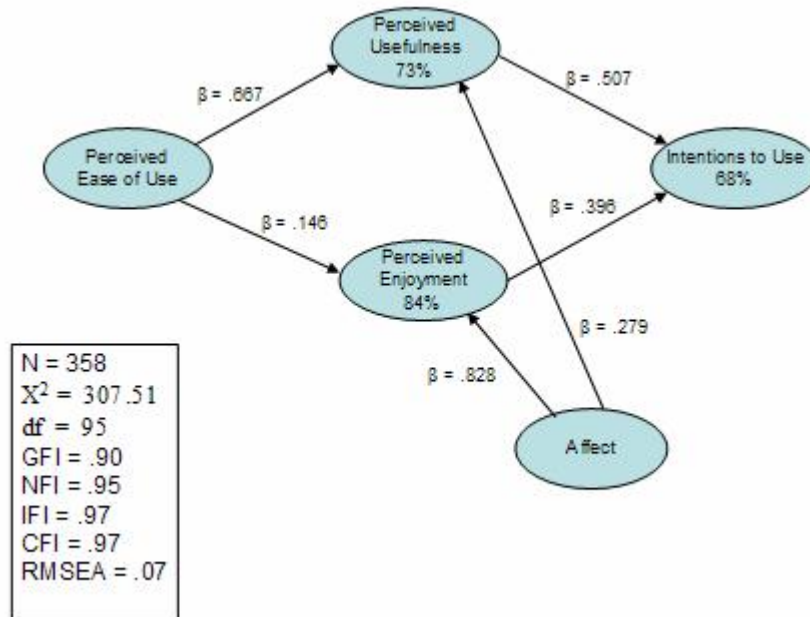

Figure 1. Structural Model

DISCUSSION AND LIMITATIONS

The SEM results indicate the efficacy of affect to explain and predict user beliefs as well as contribute to the understanding of usage intentions. Together, affect and PEOU are significant antecedents of PE explaining more of the variance in PE than prior research. Whereas PEOU alone explains 35 percent of the variance in PE and 23 percent in PU in one recent study (Van der Heijden, 2004), the inclusion of affect increases the variance explained in PE to 84 percent and in PU to 73 percent. Moreover, as a predictor of technology beliefs, affect increases the understanding of what drives usage intentions. The present model explains 68 percent of the variance in intentions compared to 35 percent of the variance in intentions for

website use (Van der Heijden, 2004) and 33 to 50 percent depending on the technology training intervention (Venkatesh, 1999).

This study demonstrates that affect makes important predictive contributions to traditional technology belief variables, expands the TAM model and contributes to the understanding of user behavior. Positive affect is an antecedent of both a utilitarian belief (PU) and a hedonic belief (PE) and is critical in the formation of those beliefs. Increasing positive affect is likely to increase user acceptance and use of technologies in the workplace as well as in society in general. The implications for achieving computing ubiquity are fairly transparent. Positive technology experiences are important drivers of favorable attitudes toward technology.

One important limitation in this study is that the sample is biased toward technology users. Although personal area networks as described by RedTacton are unique, the respondents are at the very least internet users. Initial contact was made by e-mail and responses were compiled using an online survey. Hence, those in the population less familiar with technology are not likely included in the sample. However, the RedTacton technology was chosen because of its novelty and uniqueness. It is likely that these traits are effective generators of definite affective responses toward the technology. Although the generalization of the results to other technologies appears to be a limitation, the appraisal and affective reaction toward a given object tends to be generalized to the whole class of objects and demonstrates a constancy (Arnold, 1960). Thus, it is likely that the technology selected serves as an adequate proxy for technology in general although the extent to which RedTacton is a class unto itself is unknown.

CONCLUSION

The broad conclusion of this study is that affect has a role in decision models related to technology acceptance and use. Users integrate their feelings toward a technology into their beliefs about the technology which impacts their behavior. Prior TAM models based on utilitarian beliefs and tested using functional technologies provide a narrow understanding of acceptance and use. As ubiquitous computing technologies make advances into everyday affairs, the importance of affective variables in user acceptance models increases. Drawing attention to the role of affect and how it provides information that influences behavior broadens the application of TAM and the understanding of user behavior.

ACKNOWLEDGMENTS

REFERENCES

1. Aggarwal, P., and Law, S. (2005) Role of relationship norms in processing brand information, *Journal of Consumer Research,* 32, 3, 453-464.

2. Ajzen , I., and Fishbein, M. (1980) *Understanding Attitudes and Predicting Social Behavior,* Prentice-Hall, Englewood Cliffs, NJ.

3. Arbuckle, J. L., and Wothke, W. (1999) *AMOS 4.0 User's Guide,* SmallWaters Corporation, Chicago.

4. Atkinson, M. A. and Kydd, C. (1997) Individual characteristics associated with World Wide Web use: an empirical study of playfulness and motivation, *Data Base for Advances in Information Systems*, 28, 2, 53-62.

5. Baker, J., Parasuraman, A., Grewal, D., and Voss, G. (2002) The influence of multiple store environment cues on perceived merchandise value and patronage intentions, *Journal of Marketing,* 66, 2, 120-141.

6. Clore, G. L., and Byrne, D. (1974) A reinforcement affect model of attraction, in *Foundations of Interpersonal Attraction,* T. L. Huston (ed.), Academic Press, NY, 143-170.

7. Clore, G. L. (1992) Cognitive phenomenology: feelings and the construction of judgment, in *The Construction of Social Judgments,* LL. Martin and A. Tesser (eds.), Lawrence Erlbaum Associates, NJ, 133-163.

8. Clore, G. L., Wyer, R. S., Dienes, B., Gasper, K., Gohm,C., and Isbell, L. (2001) Affective feelings as feedback: some cognitive consequences, in *Theories of Mood and Cognition*, L.L. Martin and G. L. Clore (eds.), Lawrence Erlbaum Associates, NJ, 27-62.

9. Davis, F. D. (1989) Perceived usefulness, perceived ease of use, and user acceptance of information technology, *MIS Quarterly,* 13, 3, 319-340.

10. Davis, F. D., Bagozzi, R. P., and Warshaw, P. R. (1992) Extrinsic and intrinsic motivation to use computers in the workplace, *Journal of Applied Social Psychology,* 22,14, 1111-1132.

11. Deci, E. L. (1975) *Intrinsic Motivation,* Plenum Press, New York.

12. Gouaux, C. (1971) Induced affective states and interpersonal attraction, *Journal of Personality and Social Psychology,* 20, 37-43.

13. Griffitt, W., and Veitch, R. (1971) Hot and crowded: influences of population density and temperature on interpersonal behavior, *Journal of Personality and Social Psychology,* 17, 92-98.

14. Hair, J. F., Anderson, R. W., Tatham, R., L., and Black, W.C. (1998) *Multivariate Data Analysis,* Prentice Hall, NJ.

15. Hu, P. J., Chau, P. Y. K., Sheng, O. R. L. and Tam, K. Y. (1999) Examining the technology acceptance model using physician acceptance of telemedicine technology, *Journal of Management Information Systems* 16, 2, 91-112.

16. Izard, C. E. (1977) *Human Emotions*, Plenum Press, NY.

17. Lott, B. E., and Lott, A. J. (1960) The formation of positive attitudes toward group members, *Journal of Abnormal and Social Psychology*, 61, 297-300.

18. MacCAllum, R. C., Browne, M. W., and Sugawara, H. M. (1996) Power analysis and determination of sample size for covariance structure modeling, *Psychological Methods,* 1, 130-149.

19. Murray, J. P., and Dacin, P. A. (1996) Cognitive moderators of negative-emotion effects: implications for understanding media context, *Journal of Consumer Research*, 22(March), 439-447.

20. Pham, M. T. (1998) Representativeness, relevance, and the use of feelings in decision making, *Journal of Consumer Research,* 25 (September), 144-159.

21. Schwarz, N. (2001) Feelings as information: implications for affective influences on information processing, in *Theories of Mood and Cognition,* L.L. Martin and G.L Clore (eds), Lawrence Erlbaum Associates, NJ, 159-176.

22. Schwarz, N. (1990) Feelings as information: informational and motivational functions of affective states, in *Handbook of Motivation and Cognition* Vol. 2, E. Torry Higgins and Richard M. Sorrentino (eds.), New York, Guilford, 527-561.

23. Schwarz, N. and Clore, G. L. (1983) Mood, misattribution, and judgments of well-being: informative and directive functions of affective states, *Journal of Personality and Social Psychology,* 45, (September), 513-523.

24. Schwarz, N. and Clore, G. L. (1988) How do I feel about it? Informative functions of affective states, in *Affect, Cognition, and Social Behavior*, K. Fiedler and J. Forgas (eds.), Hogrefe International, Ontario, Canada, 44-62.

25. Szajna, B. (1996) Empirical evaluation of the revised technology acceptance model, *Management Science,* 42, 1, 85-92.

26. Van der Heijden, H. (2004) User acceptance of hedonic information systems, *MIS Quarterly,* 28, 4, 695-704.

27. Venkatesh, V. (1999) Creation of favorable user perceptions: exploring the role of intrinsic motivation, *MIS Quarterly,* 23, 2, 239-260.

28. Venkatesh, V., Morris, M. G., Davis, G. B., and Davis, F. D. (2003) User acceptance of information technology: toward a unified view, *MIS Quarterly,* 27, 3, 425-478.

29. Wyer, R. S., and Carlston, D. (1979) *Social Cognition, Inference, and Attribution,* Lawrence Erlbaum Associates, NJ.

Appendix A

		Factor Loadings	Cronbach's alpha
Perceived Usefulness	**1-5 Scale; Strongly Disagree…Strongly Agree**		.96
PU 1	Using the system would improve my job performance.	.76	
PU 2	Using the system would increase my productivity.	.76	
PU 3	Using the system would make it easier for me to do tasks.	.77	
PU 4	I would find the system useful.	.63	
Ease of Use	**1-5 Scale; Strongly Disagree…Strongly Agree**		.92
PEOU 1	Interaction with the system is clear and understandable.	.82	
PEOU 2	I would find the system easy to use.	.79	
PEOU 3	Interaction with the system does not require a lot of mental effort.	.79	
PEOU 4	I would find it easy to get the system to do what I want it to do.	.75	
Intentions	**1-5 Scale; Strongly Disagree…Strongly Agree**		.95
Int 1	It is very likely that I will use the system when available.	.70	
Int 2	I definitely will use the system.	.77	
Int 3	I intend to use the system as soon as possible.	.78	
Perceived Enjoyment			.92
I think I would find the use of the system….			
Enjoyable 1 2 3 4 5 Disgusting		.64	
Exciting 1 2 3 4 5 Dull		.77	
Pleasant 1 2 3 4 5 Unpleasant		.63	
Negative Affect			.95
Please indicate your feelings toward using the system.			
Not at all distressed 1 2 3 4 5 Very distressed		.84	
Not at all nervous 1 2 3 4 5 Very nervous		.84	
Not at all upset 1 2 3 4 5 Very upset		.78	
Not at all fearful 1 2 3 4 5 Very fearful		.85	
Positive Affect			.97
Not at all enthusiastic 1 2 3 4 5 Very enthusiastic		.85	
Not at all happy 1 2 3 4 5 Very happy		.86	
Not at all excited 1 2 3 4 5 Very excited		.86	
Not at all thrilled 1 2 3 4 5 Very thrilled		.86	
Not at all pleased 1 2 3 4 5 Very pleased		.84	