

THE OTHER SIDE OF ACCEPTANCE: STUDYING THE DIRECT AND INDIRECT EFFECTS OF EMOTIONS ON INFORMATION TECHNOLOGY USE

Anne Beaudry, Alain Pinsonneault, / *MIS Quarterly* Vol. 34 No. 4
pp. 689-710/December 2010

Presented by Eren CON

The Aim of the Article

- Past researches has been primarily based on **cognitive models** and little attention has been given to **emotions**.
- This paper argues that emotions are important drivers of behaviors and examines **how emotions experienced early in the implementation of new IT applications relate to IT use**.

The Scope of the Study

- Develop a framework that classifies emotions into four distinct types: **challenge, achievement, loss, and deterrence emotions**
- The direct and indirect relationships between four emotions **excitement, happiness, anger, and anxiety**
- *IT use were studied through a survey of 249 bank account managers.*

Introduction

- Previous studies are mainly based **on cognitive models**
 - technology acceptance model (Davis 1989; Davis et al. 1992),
 - the unified theory of innovation diffusion theory (Rogers 1983),
 - the decomposed theory of planned behavior (Taylor and Todd 1995)
 - The social cognitive theory (Compeau et al. 1999).

Introduction

- New IT complex and multifaceted and **cognitive models do not capture all of the antecedents of behaviors** (psychology)
- Emotions also play a powerful and central role in our lives; **they influence our beliefs and attitudes and they help guide our thinking, decision making, and actions.**
- **Emotion-based models of IT use are thus needed to complement cognitive-based approaches.**

Reason for the Study

- **Most studies have looked at how ongoing IT use triggers emotions** and how these emotions influence subsequent user attitudes, beliefs, and intentions. **Little attention has been given to understanding how emotions can influence initial IT use.**
- There is a **need for a framework that can predict the occurrence of emotions** and explain their consequences on IT use (Komiak and Benbasat 2006; Lewis et al. 2003; Venkatesh 2000).

Emotions in Studies of IT Use

- Emotions are a mental state of readiness for action that promote behavioral activation and help prioritize and organize behaviors in ways (Bagozzi et al. 1999; Lazarus 1991).
- IS studies are classified **studied before (*anticipation*) or after (*impact*) the deployment of the new IT** and by the type of emotions analyzed: **system specific emotions** (emotions associated with a particular IT system) or **general emotions** (emotions related to IT or computers in general).

Emotions in Studies of IT Use

Table 1. Emotions in Studies of IT Use

Author	Emotion	Operational Definition	Type of Emotion	Sample	Main Results
Anticipation Period					
Chin and Gopal 1995	Enjoyment	The extent to which the activity of using the computer is perceived to be enjoyable in its own right, apart from any performance consequence (Davis et al. 1992)	Specific	64 undergraduate students surveyed on their intention to adopt a group support system	Across 6 various approaches to analyze the data, enjoyment explains, on average, 15% of the variance of adoption intention
Impact Period					
Bhattacharjee 2001	Satisfaction	Users' affect with the system (online banking)			Satisfaction positively related

Table 1. Emotions in Studies of IT Use

Cenfetelli 2004	Positive vs. Negative	Positive emotion: happiness, joy, contentment Negative emotion: worry, anger, frustration, disgust, fear, and anxiety	Koufaris 2002	Enjoyment	One of the emotion components of flow which is the holistic sensation that people feel when they act with total involvement	Specific	280 subjects (from online market research company)	Enjoyment is positively related to one's intention to return to an online shopping website ($\beta = 0.400^{**}$)
Davis et al. 1992	Enjoyment	The extent to which the computer is perceived to be enjoyable in its own right	Trevino and Webster 1992	Flow	A subjective psychological experience that characterizes the human-computer interaction as playful		75 e-mail users and 79 voice mail users	Flow is positively related to attitudes toward the system (.15), effectiveness (.16), and quantity of use (.08) all paths at $p < 0.05$.
Kim et al. 2004	Pleasure	The degree to which one is happy	Venkatesh 1999	Enjoyment	The extent to which the activity of using the computer is perceived to be enjoyable in its own right		Sample 1: 69 knowledge workers Sample 2: 146 knowledge workers	Enjoyment is positively related to perceived ease of use
	Arousal	The degree to which one is excited or stimulated	Venkatesh et al. 2003	Affect	One's linking for a particular behavior (computer use)		Sample 1: 54 users (online meeting management) Sample 2: 58 users (portfolio analysis)	Affect is not significantly related to intention to use
				Anxiety	The feelings of apprehension or anxiety that one experiences		Sample 4: 38 users (accounting system)	Anxiety is negatively related to intention to use ($\beta = -0.15^*$)
			Webster et al. 1993	Flow	A subjective psychological experience that characterizes the human-computer interaction as playful		43 users of e-mail	Flow is positively related to use, .82, $p < 0.05$

* $p < 0.05$; ** $p < 0.01$;

*** $p < 0.001$

Emotions in Studies of IT Use

Table 1. Emotions in Studies of IT Use (Continued)					
Author	Emotion	Operational Definition	Type of Emotion	Sample	Main Results
Impact of Period					
Brown et al. 2004	Anxiety	One's level of fear of apprehension associated with actual or anticipated use of IT to communicate with others	General & Specific †	193 university students	Computer-mediated communication (CMC) anxiety is negatively related to attitude toward using a CMC tool ($\beta = -0.58^{***}$)
Compeau and Higgins 1995	Anxiety	The feelings of apprehension that one experiences	General	1020 knowledge workers (computers in general)	Anxiety is negatively related to use ($\beta = 0.11^{***}$)
	Affect	The enjoyment one derives from using computers			Affect is positively related to use ($\beta = 0.19^{***}$)
Compeau et al. 1999	Affect	The enjoyment one derives from using computers		394 subscribers of a business periodical (computers in general)	Affect is positively related to use ($\beta = 0.25^{***}$)
	Anxiety	The feelings of apprehension that one experiences			Anxiety is not related to system use
Todman and Monaghan 1994	Anxiety	The pressure felt when interacting with a computer		180 undergraduate students (computers in general)	Computer anxiety is negatively related to use ($\beta = -0.69^{**}$)
Venkatesh 2000	Anxiety	One's apprehension, or even fear, when faced with the possibility of using computers	Specific	Sample 1: 58 users (online help desk) Sample 2: 145 users (property management system) Sample 3: 43 users (payroll application)	Anxiety is negatively related to perceived ease of use (T1: $\beta = -0.30^{***}$; T2: $\beta = -0.26^{***}$; T3: $\beta = -0.25^{***}$) [‡]
	Enjoyment	The extent to which the activity of using a specific system is perceived to be enjoyable in its own right			Enjoyment is positively related to perceived ease of use (T1: ns; T2: $\beta = 0.18^{*}$; T3: $\beta = 0.24^{**}$)
	Playfulness	The degree of spontaneity in micro-computer interactions			Playfulness is positively related to perceived ease of use (T1: $\beta = 0.20^{***}$; T2: $\beta = 0.16^{*}$; T3: ns)
Webster and Martocchio 1992	Anxiety	One's tendency to be uneasy, apprehensive, or fearful about use of computers	General	Sample 1: 61 undergraduate students Sample 2: 158 undergraduate students Sample 3: 95 undergraduate students Sample 4: 77 users (computers in general)	Computer anxiety is negatively related to playfulness (S1: ns; S2: $\beta = -0.60^{***}$; S3: $\beta = -0.56^{***}$; S4: $\beta = -0.46^{***}$)
	Playfulness	One's tendency to interact spontaneously, inventively, and imaginatively with microcomputers			Playfulness is positively related to learning (S3: $\beta = 0.24^{*}$; S4: $\beta = 0.42^{***}$), mood (S3: $\beta = 0.33^{**}$; S4: $\beta = 0.34^{**}$), involvement (S4: $\beta = 0.49^{***}$), and satisfaction (S4: $\beta = 0.32^{**}$)

* $p < 0.05$; ** $p < 0.01$;
*** $p < 0.001$

Results of Previous Studies

- First, all studies, with the exception of Chin and Gopal (1995), focused on **emotions that occurred during the impact period**.
- Second, the **empirical evidence on the relationship between** some specific emotions and IT use in the **impact period is mixed**.
- Third, the effects of emotions occurring **prior to the deployment of a new IT** (i.e., in the anticipation period) on attitudes, beliefs, behaviors, and IT use occurring during the impact period **are left largely unexplored**. Yet research in psychology, and more specifically the **appraisal tendency framework** (ATF) (Han et al. 2007; Lerner and Keltner 2000), suggests that **emotions exert long-lasting effects on judgment, decision making, and behaviors**.

A Framework for Classifying Emotions

- We draw on the coping model of user adaptation (Beaudry and Pinsonneault 2005) and on appraisal theories of emotions (e.g., Lazarus and Folkman 1984; Smith and Ellsworth 1985) to develop a framework that classifies emotions.
- Beaudry and Pinsonneault (2005) suggested individual reactions to new IT events **are based on the assessment of their personal and professional relevance and are determined by primary appraisal and secondary appraisal.**

A Framework for Classifying Emotions

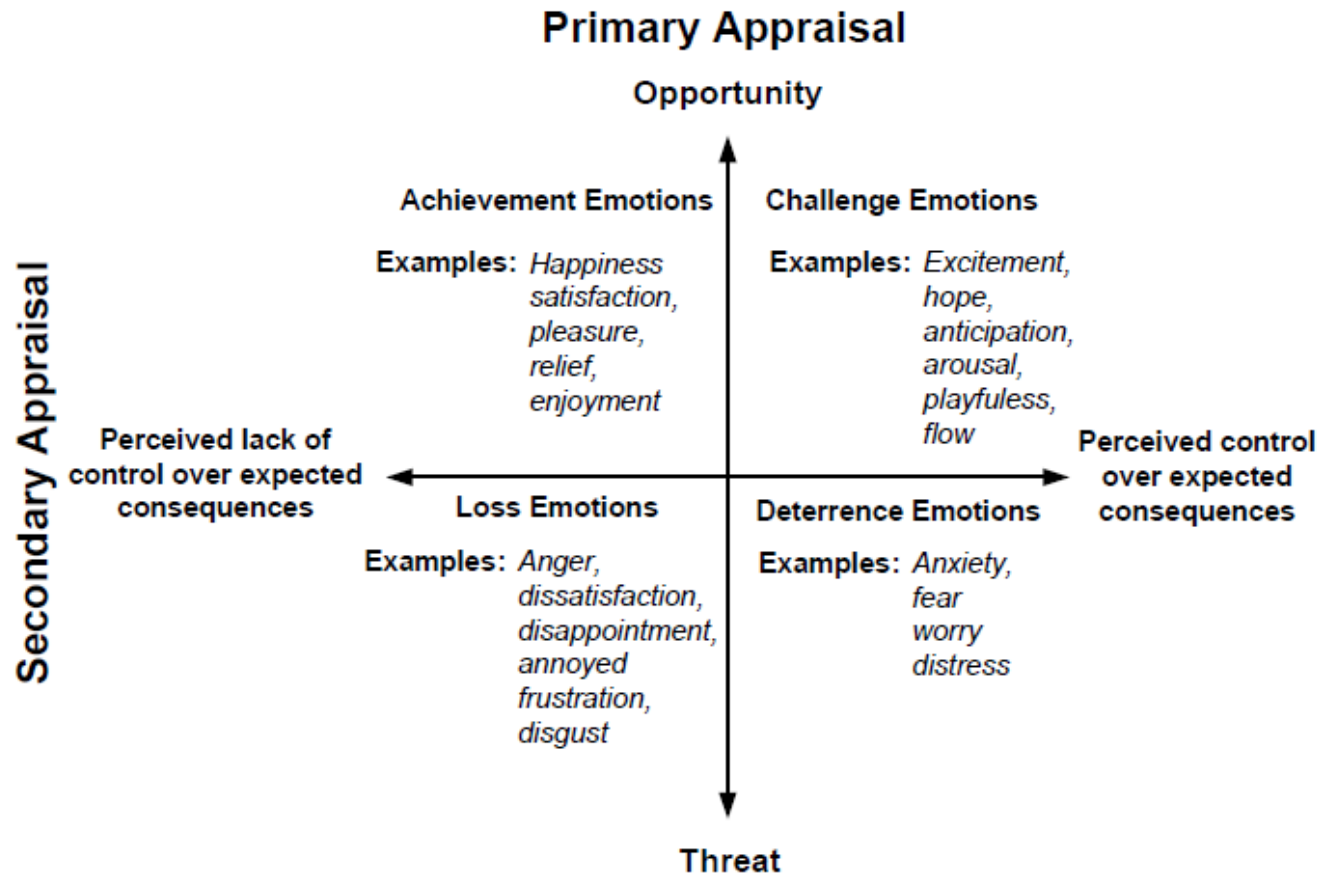


Figure 1. A Framework for Classifying Emotions

Loss Emotions (Anger and IT Use)

- This class of emotions reflects the perception of an IT event as a threat and the perception of a lack of control over its consequences.
H1a Anger will be negatively associated with IT use.
- **Direct effect of anger on IT use:** Anger triggered by failures in the use of self-service technology has been found to be negatively related to customer satisfaction, loyalty, and frequency of future use (Gelbrich 2009).
- **Indirect effects of anger on IT use:** ATF suggests that because anger is associated with the belief that other people are responsible for the negative event.

Deterrence Emotions (Anxiety and IT Use)

- Emotions from this class occur when the IT event is perceived as a threat and the individual feels that he/she has some control over its consequences. (Anxiety, worry, fear, and distress)
- **Direct effect of anxiety on IT use:** Anxiety has also been found to be negatively related to several antecedents of IT use such as perceived ease of use and usefulness
 - H2a Anxiety will be negatively associated with IT usage.
- **Indirect effects of anxiety on IT use.** ATF suggests that anxiety will be associated with adaptation behaviors that aim at reducing the risk level of a situation
 - H2b Anxiety will be positively associated with IT use through seeking social support.
 - H2c Anxiety will be negatively associated with IT use through psychological distancing.

Challenge Emotions (Excitement and IT Use)

- Emotions from this class are triggered by the appraisal of an event as being an opportunity likely to result in positive consequences
- **Direct effect of excitement on IT use:** Scherer and Tran (2001) suggest that emotions such as excitement are likely to fuel the investment of energy into new activities of exploration

H3a Excitement will be positively associated with IT use.

Challenge Emotions (Excitement and IT Use)

- **Indirect effect of excitement on IT use:**ATF suggests that how it fits with their tasks, users will focus their adaptation efforts on two main behaviors.
- Excitement will trigger *task adaptation* (i.e., modifying the work).

H3b Excitement will be positively associated with IT use through task adaptation.
- Excitement will also lead to *seeking instrumental support* (i.e., looking for help from colleagues or from on-line or manual support to enhance one's usage of a given IT).

H3c Excitement will be positively associated with IT use through seeking instrumental support.

Achievement Emotions (Happiness and IT Use)

- Emotions from this class result from the appraisal of an upcoming event that will generate positive outcomes.
- **Direct effect of excitement on IT use:** In IS, happiness has been associated with the satisfaction of an individual feeling that he/she has achieved a goal

H4a Happiness will be positively associated with IT use.

Achievement Emotions (Happiness and IT Use)

- **Indirect effect of excitement on IT use:** Happiness is associated with situations appraised as safe, having a high degree of certainty, and not requiring efforts to secure the expected benefits.
- In the context of IS, we expect that happiness, because it is associated with a low activation to perform intermediate behaviors

H4b Happiness will not be associated with task adaptation.

H4c Happiness will not be associated with seeking instrumental support.

Research Method

- Our study took place **in two major North American banks**, each of which had implemented a **new in-house developed**, integrated suite of applications to support account managers
- These systems were appropriate for the present study for two primary reasons.
 - **First**, although different, both systems offered a complete set of functionalities that covered most of account managers' tasks.
 - **Second**, the account managers from both banks benefitted from significant flexibility in their jobs and could adapt the way they worked, which was important to study adaptation efforts.

Measurement Instruments Development

- **Emotions:** Emotions are defined as a **mental state of readiness for action that arises from the appraisal of an IT event** (in our study, the IT event is the announcement of the imminent deployment of a new system). In order to compare and contrast different emotions, we focused on one emotion per class from our framework: **anger (loss emotion), anxiety (deterrence emotion), happiness (achievement emotion), and excitement (challenge emotion).**
- We used Lazarus and Folkman's (1984) measure of emotion intensity and asked respondents to report the degree to which they felt each emotion at the announcement of the deployment of the new system. **A five-point Likert scale ranging from "not at all" to "a great deal" was used.**

Measurement Instruments Development

- **Adaptation Behaviors:** We define *task adaptation* as the degree to which users modify their work. This can be done either by changing existing work routines and procedures or by adding activities to their jobs (i.e., doing new things).
- **IT Use:** IT use is defined as the extent to which one actively interacts with the new IT while performing one's job. Respondents were asked to indicate, on a seven-point scale ranging from "never" to "many times a day," how often they use the new system to perform a list of specific tasks.

Data Collection

- Both banks followed a similar implementation process. **Bank A announced the deployment of the new system to account managers three weeks prior to the start of the deployment** while **Bank B's announcement was made six weeks prior to the deployment**. The system was deployed sequentially in both banks over about 12 months.
- The interviews were conducted between one and two months after the deployment of the new IT.
- The **survey was conducted six months after the end of the deployment of the systems**. The questionnaires were sent by internal mail to the **365 account managers of Bank A** and to the **161 account managers of Bank B**. Two weeks later, a reminder letter was sent to all account managers. One month after the initial mailing, 260 questionnaires (161 from Bank A and 99 from Bank B) were returned for a global response rate of 49.4 percent.

Data Collection

- Respondents' average tenure with the banks was 9.4 years and ranged from 2 to 38 years. On average, respondents had been account managers for 6.3 years (ranging from 2 to 18 years). Respondents' age varied from 24 to 62, with an average of 41 years of age. Reported level of education was 23 percent (56) with a high school degree, 21.7 percent (54) with a college degree, and 55 percent (138) with an earned graduate degree. They worked an average of 8.5 hours per day, ranging from 5 to 12 hours per day.

Table 2. Study Time Line						
	System Design, Development, and Testing	Announcement of Implementation	Deployment	Interviews	Building and Pilot Testing Questionnaire	Data Collection (Questionnaire)
Bank A	1997–1998	February 1999	March 1999 – April 2000	June 2000	June – July 2000	August 2000
Bank B	1998–1999	March 1999	April 1999 – March 2000	May 2000	June – July 2000	August 2000

Assessment of Measurement Properties

- We assessed the measurement properties of the model with confirmatory analysis using EQS version 6. This assessment was performed in three steps. First, we tested the fit of the 32 items specified to load on the 10 first order constructs of our model (five adaptation behaviors and five dimensions of IT use). As none of the fit indices met the thresholds, we performed a principal component analysis using all 32 items.

Table 3. Reliability and Variance among Constructs

	Reliability	Venting	InstSup	TaskAd	SocSup	Dist	ResAll	Info	Neg	FigHead
Venting	.81	.487								
InstSup	.76	.274	.758							
TaskAd	.71	.116	.223	.780						
SocSup	.75	.267	.294	.336	.860					
Dist	.77	.191	.108	.009	.156	.606				
ResAll	.89	.128	.429	.487	.366	.001	.775			
Info	.76	.073	.204	.468	.281	.071	.591	.926		
Neg	.81	.001	.057	.444	.166	.124	.215	.559	.908	
FigHead	.70	.040	.023	.237	.127	.029	.380	.445	.476	.610

Model Testing-Anger, Anxiety, and IT Use

- As shown in Figure 2, all paths, except the one between anger and IT use and the one between venting and IT use were significant at the $p < 0.05$ or better.

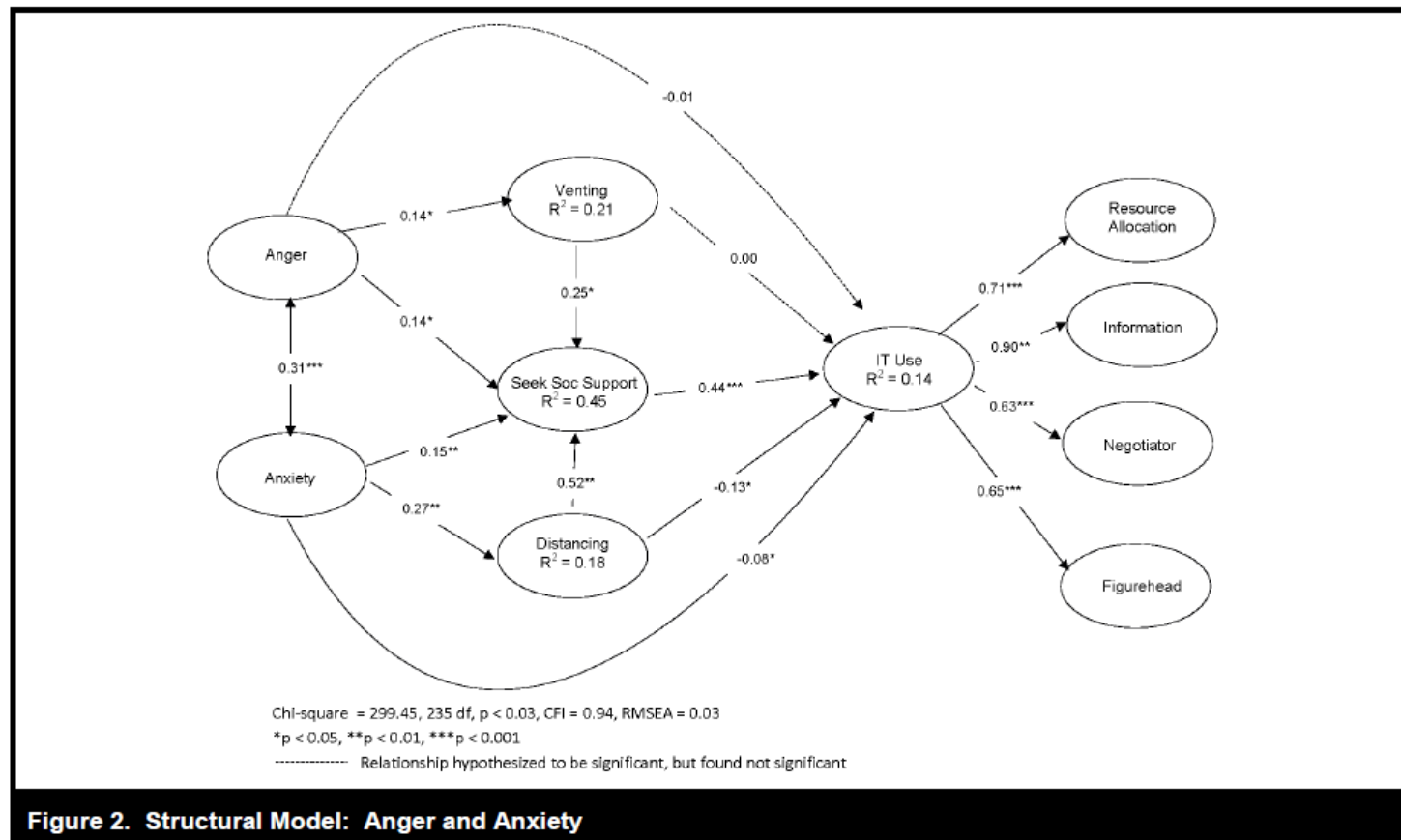


Figure 2. Structural Model: Anger and Anxiety

Model Testing-Excitement, Happiness, and IT Use

- Figure 3 shows that, contrary to our expectations, excitement was not significantly directly related to IT use (.04, n.s.) (H3a not supported). It was, however, positively associated with task adaptation (.20, $p < .01$), which was also positively associated with IT use (.64, $p < .001$) (H3b supported). Finally, excitement was positively associated with seeking instrumental support (.16, $p < .01$), which was not associated with IT use (.11, n.s.) (H3c not supported).

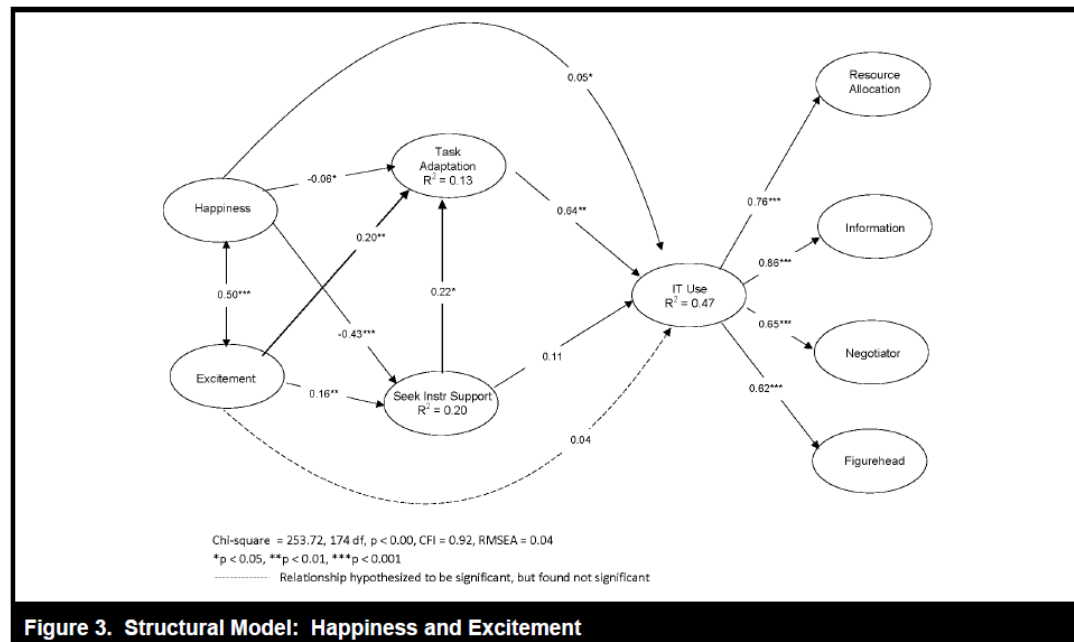


Figure 3. Structural Model: Happiness and Excitement

Post Hoc Analyses

- For each emotion (i.e., happiness, excitement, and anxiety), we selected respondents with scores of either 4 or 5 (our measure for emotions ranged from 1 “not at all” to 5 “a great deal”). We then divided each group into four subgroups using the median score on each of the two adaptation behaviors that were related to a given emotion. For example, the 85 users who scored high on anxiety were divided into four subgroups:
 - (1) high seeking social support and high distancing (n=22),
 - (2) high seeking social support and low distancing (n = 18),
 - (3) low seeking social support and high distancing (n = 12),
 - (4) low seeking social support and low distancing (n =33).

Post Hoc Analyses

- Individuals who distanced themselves from the new IT but who also sought high levels of social support used the new IT more than individuals who distanced themselves but did not highly seek social support (Equation 1).
- Also, users who distanced themselves from the new IT but who also sought social support had higher usage levels than users who did not perform much of either adaptation behavior (Equation 2).
 - *High Dist. & High SSS (32.27) > High Dist. & Low SSS (22.83) ($p < .05$) (1)*
 - *High Dist. & High SSS (32.27) > Low Dist. & Low SSS (25.33) ($p < .05$) (2)*

SSS: Seeking Social Support
Dist.: Distancing

Post Hoc Analyses

- Happy users who relied extensively on both seeking instrumental support and task adaptation used the new IT significantly more than happy users who relied less on these two adaptation strategy (Equation 3).
- Also, happy users who sought instrumental support and adapted their tasks used the new IT significantly more than users who only sought instrumental support (Equation 4).
- Users who relied mainly on task adaptation used IT significantly more than users who relied mainly on instrumental support (Equation 5).
- Happy individuals who relied mainly on task adaptation used the new IT significantly more than individuals who did not rely much on any adaptation strategy (Equation 6).
 - *High SIS & High TA (32.09) > Low SIS & Low TA (22.59) ($p < .001$) (3)*
 - *High SIS & High TA (32.09) > High SIS & Low TA (22.69) ($p < .001$) (4)*
 - *Low SIS & High TA (31.32) > High SIS & Low TA (22.69) ($p < .01$) (5)*
 - *Low SIS & High TA (31.32) > Low SIS & Low TA (22.59) ($p < .01$) (6)*

Post Hoc Analyses

- ANOVA analyses indicate that highly excited users who adapted their tasks and sought instrumental support used the new IT significantly more than those who did not rely much on any adaptation strategy (Equation 7).
 - Users relying on both adaptation strategies also had a higher usage level than those who only sought instrumental support (Equation 8).
 - Our results also suggest that task adaptation had stronger positive effects on IT use than seeking instrumental support. Users who relied mainly on task adaptation used the new IT more than users who relied mainly on instrumental support (Equation 9).
 - Finally, as expected based on the SEM results, individuals who relied mainly on task adaptation used the new IT more than individuals who did not rely on any adaptation strategy (Equation 10).
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- *High SIS & High TA (33.00) > Low SIS & Low TA (23.08) ($p < .001$) (7)*
 - *High SIS & High TA (33.00) > High SIS & Low TA (22.02) ($p < .001$) (8)*
 - *Low SIS & High TA (31.61) > High SIS & Low TA (22.02) ($p < .01$) (9)*
 - *Low SIS & High TA (31.61) > Low SIS & Low TA (23.08) ($p < .01$) (10)*

SIS: Seeking Instrumental Support
TA: Task Adaptation

Discussion

- The two positive emotions (excitement and happiness) explain 13 percent, 20 percent, and 47 percent of the variance of task adaptation, seeking instrumental support, and IT use, respectively.
- The negative emotions (anger and anxiety) explain 21 percent, 45 percent, 18 percent, and 14 percent of venting, seeking social support, psychological distancing, and IT use, respectively.
- **Excitement** (a challenge emotion) is not directly related to IT use.
- **Happiness** (an achievement emotion) was found to be weakly positively related to IT use.

Discussion

- Contrary to our expectations, our results show that *anger* (a loss emotion) is not related to IT use directly.
- *Anxiety* (a deterrence emotion) was found to be related to use in a way that is more complex than recounted in the extant IS literature.
- The overall relationships between *negative emotions and IT use* thus result from the combination of the direct negative links, the indirect negative link through psychological distancing, and the indirect positive link through seeking social support.
- Our results further indicate that the direct relationship between emotions and IT use is somewhat limited and that emotions are strongly related to IT use via indirect relationships through intermediate adaptation behaviors.

Contributions to Research and Practice

- This study makes three contributions to research.
 - First, this paper **complements existing cognitive-based models and helps predict and explain a wide range of IT-related behaviors** including IT use.
 - Second, the framework developed in this paper **classifies emotions, specifies the conditions under which different emotions are triggered, predicts when emotions with the same valence will have similar or different effects**
 - Third, our paper provides insights into the different paths through which emotions are related to IT use. By mapping these paths, our paper explains the mixed evidence on the relationships between anxiety and IT use.

Limitations and Future Research

- This study has two main limitations.
 - First, the fact that emotions were studied retrospectively might have left room for some recall bias. To minimize **this potential bias, we designed our study carefully and followed common practices from psychology for studying** emotions retrospectively.
 - A second limitation lies in the fact that different emotions and adaptation mechanisms might be **triggered by the organizational context**.

Results

- This research suggests many avenues for research
 - First, although **individuals experience emotions privately**, emotions are **likely to be influenced by group and contextual factors such as group norms**, peer reactions, top management, and organizational culture.
 - Second, it is important to study the **link between the general emotions elicited by IT** (such as computer phobia or computer anxiety) and the particular emotions triggered by specific IT applications.
 - A third avenue **for future research is to study how and what technological features can trigger emotions**.

Results

- This study **provides preliminary evidence on the importance of emotions in understanding user reactions to the implementation of new IT.**
- While this paper provides **some insights about the link between emotions and IT use**, it also uncovers several questions that need to be addressed.
- It is hoped that the **ideas and results put forth in this paper will stimulate research on emotions and IT use**, which remains a relatively unexplored area in our field.

Thank you, Questions 😊