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RESEARCH NOTE

An Empirical Examination of Individual Traits as Antecedents to Computer Anxiety and Computer Self-Efficacy[1]

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Abstract

To better understand how individual differences influence the use of information technology (IT), this study models and tests relationships among dynamic, IT-specific individual differences (i.e., computer self-efficacy and computer anxiety), stable, situation-specific traits (i.e., personal innovativeness in IT) and stable, broad traits (i.e., trait anxiety and negative affectivity). When compared to broad traits, the model suggests that situation-specific traits exert a more pervasive influence on IT situation-specific individual differences. Further, the model suggests that computer anxiety mediates the influence of situation-specific traits (i.e., personal innovativeness) on computer self-efficacy. Results provide support for many of the hypothesized relationships. From a theoretical perspective, the findings help to further our understanding of the nomological network among individual differences that lead to computer self-efficacy. From a practical perspective, the findings may help IT managers design training programs that more effectively increase the computer self-efficacy of users with different dispositional characteristics.

Keywords: Self-efficacy, anxiety, personality, negative affectivity, personal innovativeness

ISRL Categories: AA, AA03, AA05, GA02, GB07

Introduction

During the 1990s, there was renewed interest in the influence of individual differences on the diffusion of information technology (IT) in the workplace. Individual differences refer to factors

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such as personality, situational, and demographic variables that influence user's beliefs about and use of information technology (Agarwal and Prasad 1999). Researchers have found that stable situation-specific individual differences such as personal innovativeness in IT (Agarwal and Prasad 1998b) or computer playfulness (Webster and Martocchio 1992) as well as dynamic, situation-specific individual differences such as computer self-efficacy (Compeau and Higgins 1995a) and computer anxiety (Harrison and Rainer 1992) influence how individuals perceive and use information technology.

Although mounting evidence suggests individual differences influence IT use, more integrative research is needed to better understand the nomological net among individual differences that relate to IT acceptance and use (Marakas et al. 2000; Weil and Wugalter 1990). Theory suggests that broad stable traits such as neuroticism (Watson and Clark 1984) and situation-specific, stable traits such as innovativeness (Goldsmith and Hofaker 1991) influence dynamic individual differences such as situation-specific efficacy or anxiety that lead to individuals' beliefs and behavior (Kanfer and Heggested 1997). Given that dynamic individual differences have been directly linked with behaviors, perhaps understanding the fundamental underpinnings of how dynamic individual differences can arise would be of value for developing IT training programs more effectively. Hence, we examine the relationships among broad and stable, situation-specific individual traits on dynamic, situation-specific individual differences.

Specifically, this study examines the pattern of relationships among dynamic, IT-specific individual differences (i.e., computer anxiety and computer self-efficacy) and stable individual differences (i.e., personal innovativeness, negative affectivity, and trait anxiety). The paper begins by examining the relationship between computer self-efficacy (CSE) and computer anxiety (CA). Next, we link individual differences to CSE and CA. Then, we empirically examine the hypothesized relationships. The paper concludes with a discussion of results, limitations, and implications for practice. We extend our understanding of how stable individual differences (both broad and situation-specific) affect CA and CSE.

Theoretical Model

The theoretical model underpinning this study is presented in Figure 1. The model suggests that dynamic, IT-specific individual differences (i.e., computer self-efficacy and computer anxiety) are a function of stable situation-specific (i.e., personal innovativeness in IT) and broad (i.e., negative affectivity and trait anxiety) traits. Table 1 presents definitions of constructs used in this study. The following sections elaborate on the constructs in the model and the proposed relationships among them.

Dynamic Individual Differences

Dynamic, situation-specific individual differences reflect malleable dispositions that affect responses to stimuli within a specific situation. Dynamic individual differences differ from stable traits in that training, incentives, or other environmental factors may diminish or increase their influence on behavior over time (Ghiselli et al. 1981). Within innovation diffusion research, CSE and CA are well-established dynamic, situation-specific individual differences.

Computer Self-Efficacy

Computer self-efficacy (CSE) refers to individuals' judgment of their capabilities to use computers in diverse situations (Compeau and Higgins 1995b; Marakas et al. 1998). Research suggests that individuals who possess high CSE are more likely to form positive perceptions of IT (Venkatesh and Davis 1996), and, more frequently, use of IT (Compeau et al. 1999). In a review of the literature, Marakas et al. (1998) identified numerous behavioral, cognitive, and environmental influences on CSE. They suggest that computer anxiety is an important correlate of CSE.

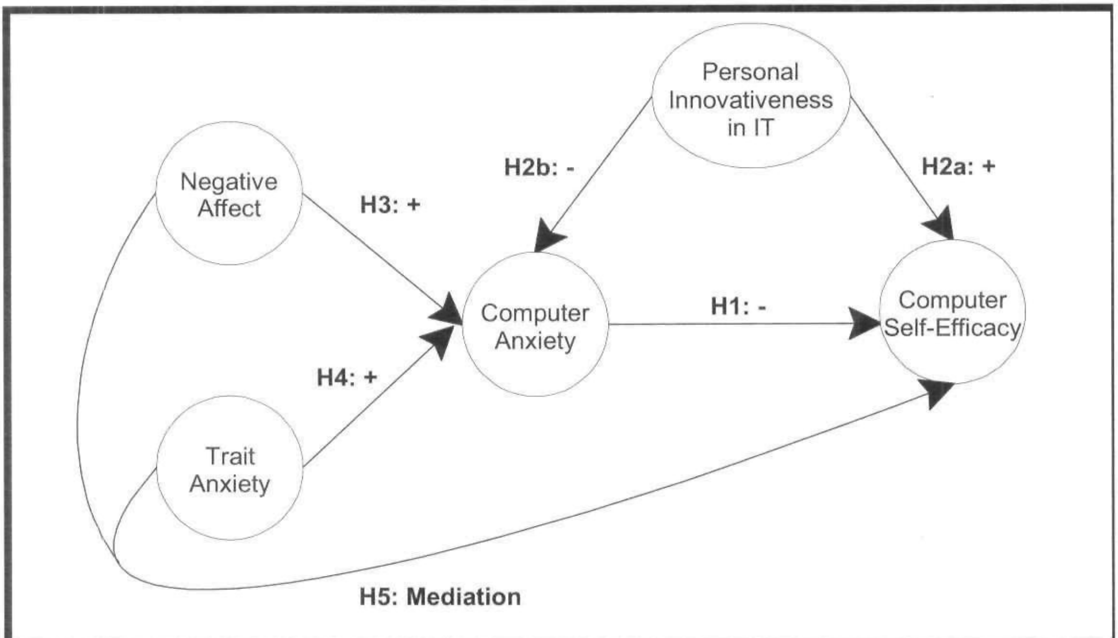

Figure 1. Theoretical Model

Table 1. Construct Definitions

Construct	Definition
Individual Differences	Factors such as personality, situational, and demographic variables that influence users' beliefs about and use of information technology
Dynamic Situation-Specific Individual Differences	Factors that reflect relatively enduring dispositions to respond to stimuli within a specific situation that may be changed through training or other experience.
Traits	An enduring predisposition to respond to stimuli across situations.
Broad Traits	Traits that are enduring and predispose individuals to respond consistently to stimuli across situations.
Situation-Specific Traits	Traits that are enduring and predispose individuals to respond to stimuli in a consistent manner within a narrowly defined context or group of target objects.
Computer Self-Efficacy	Individuals' judgment of their capabilities to use computers in diverse situations.
Computer Anxiety	Anxiety about the implications of computer use such as the loss of important data or fear of other possible mistakes.
Personal Innovativeness in Information Technology	The willingness of an individual to try out any new information technology.
Negative Affectivity	The general experience of negative emotions such as guilt or shame regardless of the situation.
Trait Anxiety	The general feeling of anxiety when confronted with problems or challenges.

Computer Anxiety

Computer anxiety (CA) refers to fears about the implications of computer use such as the loss of important data or fear of other possible mistakes (Sievert et al. 1988) and, as such, it is the product of combinations of psychological variables such as neuroticism and locus of control (Marakas et al. 2000). Theory and research suggests that an individual's computer anxiety is dynamic in that it may be influenced by dispositional and environmental factors (Marakas et al. 2000). Individuals who have more confidence in their capabilities tend to demonstrate lower levels of CA. Studies (for example, Kinzie et al. 1994) have demonstrated that CA has a strong relationship with CSE and technology use. Results suggest that as anxiety grows, individuals demonstrate lower levels of CSE and a weaker proclivity to use computers.

The Relationship between Computer Anxiety and Computer Self-Efficacy

Social learning theory (SLT) suggests that self-efficacy and anxiety influence each other (Bandura 1977, 1997). SLT suggests that as individuals experience higher anxiety, they may report lower levels of efficacy; however, as their efficacy levels rise, individuals report a corresponding decrease in anxiety (Bandura 1997). Even though the relationship is reciprocal, SLT research has found that efficacy beliefs are the primary influence on how individuals make decisions about their ability to perform tasks or interpretations of experiences (Bandura 1997, p. 137). For example, Zimmerman (1995) found that academic self-efficacy mediated the relationship between math anxiety and classroom performance. Consistent with SLT, management information systems research has modeled computer self-efficacy and computer anxiety as having a reciprocal relationship (Marakas et al. 1998). Although we acknowledge the reciprocal relationship, we agree with Bandura (1997) that efficacy beliefs are the *primary* influence on behaviors and that it makes sense to model computer anxiety as an antecedent to computer self-efficacy. Because stable traits have been found to affect CA and CSE (e.g., Harris 1999; Watson and Clark 1984), we believe it is important to model how CA may mediate the relationship from stable (both situation-specific and broad) traits to CSE.

> **Hypothesis 1:** Computer anxiety will have a negative relationship with computer self-efficacy.

Stable Individual Differences

Theory suggests that stable, situation-specific and broad traits may demonstrate distinct relationships with dynamic individual differences, such as CSE and CA. Stable, situation-specific traits predispose individuals to respond consistently, but within a fairly narrow context or toward specific targets (e.g., using new technology).

When compared to situation-specific traits, broadly conceptualized traits may exert a less pervasive influence on dynamic individual differences (Day and Silverman 1989). Because broad traits lack specific targets, Bandura (1997) argues that they may not shed light on the development of efficacy within specific domains. However, within the organizational stress literature, research suggests that broad affective dispositions, such as negative affectivity and trait anxiety, are predictors of situation-specific anxiety (Watson and Clark 1984; Watson et al. 1989). Due to their consistent influence, stress researchers have recommended including broad traits in studies that examine stress and stress-linked outcomes such as anxiety. In light of these divergent opinions, it is important to consider the influence of both situation-specific traits (i.e., personal innovativeness in IT) as well as broad traits (i.e., trait anxiety and negative affectivity) on dynamic IT-specific individual differences (i.e., CA and CSE).

Personal Innovativeness in IT

Personal innovativeness refers to individuals' willingness to change (Hurt et al. 1977), and it is believed to be a function of individuals' tolerance of risk (Bommer and Jalajas 1999). If individuals are more willing to take risks, they are more likely to engage in innovative behavior (Agarwal and Prasad 1998a). Personal innovativeness in information technology (PIIT) is "the willingness of an individual to try out any new information technology" (Agarwal and Prasad 1998b, p. 206). Consistent with recent research, PIIT is conceptualized as a situation-specific, stable trait (i.e., it is expected to have a stable influence across situations involving information technology).

Because traits shape individuals' perceptions of their capabilities (Lord et al. 1986), the present study examines PIIT's role as an antecedent to computer self-efficacy and computer anxiety. Research suggests that highly innovative individuals more frequently seek out new, mentally, or sensually stimulating experiences (Uray and Ayla 1997; Venkatramen 1991). In general, innovative individuals tend to demonstrate higher levels of self-confidence about performing new tasks or when entering new situations (Kegerreis et al. 1970). In the context of IT, this suggests that individuals who are high in PIIT are more likely to seek out "stimulating experiences," and demonstrate more confidence in their capacity to use a new technology (Agarwal et al. 2000). Alternately, individuals who report lower levels of PIIT should have less tolerance for risk, and be more likely to report general computer anxiety (Harris 1999). Hence,

> **Hypothesis 2a:** Personal innovativeness in information technology will have a positive relationship with computer self-efficacy.

> **Hypothesis 2b:** Personal innovativeness in information technology will have a negative relationship with computer anxiety.

Negative Affectivity and Trait Anxiety

Neuroticism may influence individuals' dispositions to respond to information technology (Marakas et al. 2000). Negative affectivity (NA) and trait anxiety (TA) measure different aspects of neuroticism (Watson and Clark 1984). NA is a broad stable trait that influences emotions and behavior (Hochwarter et al. 1998; Watson et al. 1984). High NA individuals more frequently report anger, "distress, discomfort, and dissatisfaction over time and regardless of the situation, even in the absence of any overt or objective source of stress" (Watson and Clark 1984, p. 483). Evidence suggests that high NA individuals react more strongly to negative environmental stimuli than their low NA peers (Fiske and Taylor 1991). When thinking about different situations, high NA individuals are more likely to dwell on mistakes or inadequacies than their low NA peers. When extended to the domain of information technology, these findings suggest that NA should demonstrate a direct positive association with computer anxiety. Hence,

> **Hypothesis 3:** Negative affectivity will have a positive relationship with computer anxiety.

TA refers to a general tendency to experience anxiety when confronted with problems or challenges (Spielberger et al. 1970). TA is relatively enduring such that individuals are more likely to experience anxiety over time and across situations (Tellegen 1985). Although an aspect of neuroticism, high TA individuals may not be predisposed to experience emotions associated with NA such as anger, sadness, or a sense of rejection (Spector et al. 2000; Watson sand Clark 1984). Thus, although correlated, NA and TA remain conceptually distinct constructs. Anxiety about using computers is considered to be a form of a domain-specific trait anxiety. Thus, it is expected that TA will demonstrate a direct, positive association with CA. Hence,

> **Hypothesis 4:** Trait anxiety will have a positive relationship with computer anxiety.

The theoretical model (see Figure 1) identifies the proposed links among broad and situation-specific personality traits, computer anxiety, and computer self-efficacy. PIIT, NA, and TA are proposed to have direct effects on computer anxiety. Because it is situation-specific, PIIT is also proposed to have a direct effect on computer self-efficacy. Computer anxiety has a direct negative effect on individuals' computer self-efficacy (Weil and Wugalter 1990) and is proposed to serve as a mediator between stable traits and computer self-efficacy.

> **Hypothesis 5:** Computer anxiety will mediate the relationships between the stable traits of personal innovativeness, negative affectivity, and trait anxiety and computer self-efficacy.

Method

Sample

The sample consisted of students at a large public university in the Southeastern United States. Respondents completed self-reported questionnaires the first week of spring semester during regularly scheduled class times. As an incentive, respondents received extra credit in a required introductory computing course. A total of 280 surveys were distributed and a total of 235 responses (83%) were received. Due to missing data, 211 responses (75%) were used in this analysis. The sample consisted of 120 males, 179 respondents who own a computer, an average age of 24 years old (std. dev = 3.45), 3 years of college (std. dev. = .94), 2.5 computer courses (std. dev. = 2.05), and 7.16 years of computer experience (std. dev. = 3.74).

Measures

Computer self-efficacy was measured using 10 items developed by Compeau and Higgins (1995b), and computer anxiety was measured using four items drawn from the Computer Anxiety Rating Scale (Heinssen et al. 1987). Regarding the individual trait measures, trait anxiety was measured using four items from Lehrer and Woolfolk (1982), negative affectivity was measured using 10 items from the positive and negative affect scale (PANAS) (Watson et al. 1988), and personal innovativeness in IT was measured using four items developed by Agarwal and Prasad (1998a, 1998b). Construct means and standard deviations may be found in Table 2. A more detailed description of the measures can be found in Appendix A.

Data Analysis

To test the model, we used partial least squares (PLS), a structural equation modeling (SEM) technique. PLS allows researchers to integrate measurement and structural models (Bollen 1989). The measurement model examines hypothesized links between indicators and latent constructs, whereas the structural model estimates hypothesized paths between exogenous (independent) and endogenous (dependent) latent constructs.[2]

Results

Measurement Model

To assess reliability and validity using PLS, researchers typically calculate a block of indicators' composite reliabilities, average variance extracted (AVE) (Barclay et al. 1995; Chin 1998). Interpreted like a Cronbach's alpha internal consistency reliability estimate, a composite reliability of .70 or greater is considered acceptable for research (Fornell and Larcker 1981). The AVE measures the variance captured by the indictors relative to measurement error (Fornell and Larcker 1981), and it should be greater than

[2]The model was estimated using PLS Graph Version 2.91.03.04 (Chin and Frye 1996). Each construct was modeled as reflective. To test the statistical significance of the path coefficients, a bootstrapping procedure was used to generate 100 samples of 211 cases. Then, a T-test was conducted (d.f. = 99) between the full sample and the mean of subsamples to test for significance.

Table 2. Means, Standard Deviations, Reliabilities and Correlation of Constructs

Construct	Mean	Std. Dev.	Composite Reliability	Correlation of Constructs and Average Variance Extracted				
				(1)	(2)	(3)	(4)	(5)
(1) Computer Self-Efficacy	7.5	2.08	0.93	**0.75**				
(2) Computer Anxiety	2.87	1.04	0.94	-0.32	**0.86**			
(3) Trait Anxiety	3.12	1.28	0.88	-0.15	0.22	**0.82**		
(4) Negative Affectivity	1.85	0.65	0.90	-0.21	0.22	0.61	**0.71**	
(5) Personal Innovativeness	4.65	1.12	0.81	0.26	-0.30	-0.08	-0.03	**0.82**

* Diagonal elements in the correlation of constructs matrix are the square root of the average variance extracted. For adequate discriminant validity, diagonal elements should be greater than corresponding off-diagonal elements.

.50 to justify using a construct (Barclay et al. 1995). Results indicate adequate composite reliabilities and AVEs (see Table 2).

To evaluate discriminant and convergent validity, we examined the correlation of constructs and factor loadings. When the square root of each construct's AVE is greater than the correlation of the construct to other latent variables, the correlation of constructs demonstrates discriminant validity. A second way to evaluate discriminant validity is to examine each indicator's factor loadings (Chin 1998). Indicators should load higher on the construct of interest than on any other variable. Due to low factor loadings for two items, NA was reduced to an eight-item scale. The revised model's correlations of constructs (see Table 2) and factor loadings (see Table 3) demonstrate adequate discriminant and convergent validity.

Structural Model

A bootstrapping procedure was used to generate t-statistics and standard errors (Chin 1998). Interpreted like multiple regression, the R^2 indicates the amount of variance explained by the model (Barclay et al. 1995). To evaluate the full model, R^2 values were calculated for computer anxiety and computer self-efficacy. Structural model results are presented in Figure 2.

CA demonstrated a direct, statistically significant, negative relationship with CSE (H1 $p < .01$). Individuals who experienced more CA were less likely to report high levels of CSE, thus supporting Hypothesis 1.

PIIT demonstrated a direct, statistically significant, positive relationship with CSE (H2a $p < .01$). Individuals who reported higher levels of PIIT were more likely to report high levels of CSE. Additionally, PIIT had a direct negative relationship with CA (H2b $p < .01$). These results support Hypotheses 2a and 2b.

NA did not demonstrate a direct, statistically significant relationship with CA, thus Hypothesis 3 was not supported. In this sample, individuals with high NA were no more likely to experience CA than were their peers. TA demonstrated a direct statistically significant relationship to computer anxiety (H4 $p < .025$), supporting Hypothesis 4.

Due to findings for NA and TA, we conducted supplemental analyses. Because they are conceptually related, we examined the correlation between NA and TA and found them to be correlated at .61. High correlations between constructs may result in collinearity that magnify or obscure relationships between constructs. To formally test for collinearity's presence, we calculated the variable inflation factor (VIF) for constructs in the model. Tabachnik and Fidell (1996) suggested

Table 3. Factor Loadings and Cross Loadings for the Measurement Model*

Items	Computer Self-Efficacy (CSE)	Negative Affectivity (NA)	Trait Anxiety (TA)	Computer Anxiety (CA)	Personal Innovativeness in IT (PIIT)
CSE1	**0.86**	-0.20	-0.15	-0.27	0.06
CSE2	**0.84**	-0.07	-0.13	-0.28	0.10
CSE3	**0.83**	-0.17	-0.10	-0.27	0.02
CSE4	**0.83**	-0.14	-0.10	-0.28	0.14
CSE5	**0.80**	-0.16	-0.04	-0.21	0.16
CSE6	**0.78**	-0.14	-0.29	-0.26	0.02
CSE7	**0.77**	-0.09	-0.21	-0.27	0.11
CSE8	**0.76**	-0.07	-0.15	-0.16	0.02
CSE9	**0.70**	-0.19	-0.30	-0.38	0.13
CSE10	**0.67**	-0.24	-0.31	-0.40	0.07
NA1	-0.13	**0.80**	0.09	0.20	-0.33
NA2	-0.22	**0.76**	0.11	0.15	-0.37
NA3	-0.00	**0.74**	0.19	0.23	-0.24
NA4	-0.02	**0.73**	0.06	0.21	-0.35
NA5	-0.24	**0.71**	0.05	0.22	-0.36
NA6	-0.06	**0.70**	0.07	0.17	-0.37
NA7	-0.23	**0.70**	0.03	0.03	-0.50
NA8	-0.08	**0.65**	0.21	0.02	-0.30
TA1	0.20	0.24	**0.84**	0.19	0.07
TA2	0.13	0.02	**0.82**	0.14	-0.01
TA3	0.27	0.25	**0.81**	0.21	-0.02
TA4	0.10	0.08	**0.74**	0.19	-0.04
COMPA1	-0.30	0.21	0.17	**0.87**	-0.19
COMPA2	-0.33	0.19	0.27	**0.86**	-0.02
COMPA3	-0.21	0.21	0.12	**0.85**	-0.17
COMPA4	-0.34	0.19	0.18	**0.83**	-0.13
PI1	0.09	-0.47	-0.04	-0.19	**0.82**
PI2	0.05	-0.35	-0.02	-0.04	**0.78**
PI3	0.10	-0.45	-0.01	-0.20	**0.76**
PI4	0.09	-0.38	-0.10	-0.17	**0.71**

*Negative affectivity was included to demonstrate discriminate validity for the items. Because it is an additive scale, it was collapsed into a single indicator in the final mode.

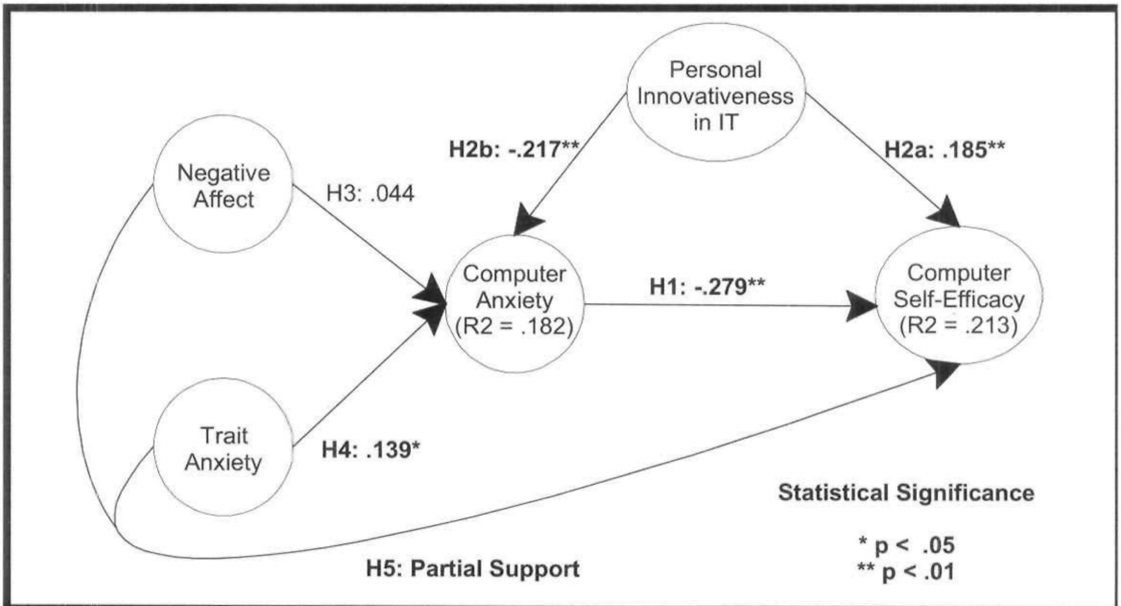

Figure 2. Structural Model

that when VIF's exceed 10, collinearity biases result. Because the VIF's did not exceed 1.7, our analysis indicates collinearity did not influence results. As a further test, we estimated a separate model that tested the affect of NA on CA in the absence of TA. Results suggest that NA did not directly effect CA (p = n.s.). Despite its high correlation with NA, results suggest that TA has a distinct negative effect on CA.

Finally, we found partial support for our mediation hypothesis (H5). We tested for mediation in three steps (Baron and Kenny 1986). First, we separately tested the direct effects of CA, PIIT, TA and NA on CSE. Although TA (p = n.s.) and NA (p = n.s.) were not significant correlates of CSE, CA ($p < .01$) and PIIT ($p < .01$) demonstrated direct relationships to CSE. Then, we simultaneously tested paths from CA, PIIT, TA, and NA to CSE. CA ($p < .01$) and PIIT ($p < .01$) remained significant correlates of CSE. Finally, we added paths from TA, NA, and PIIT to CA. PIIT demonstrated a significant relationship to CA ($p < .01$) and CSE ($p < .01$). TA's relationship to CA was significant ($p < .05$), but it did not demonstrate a significant relationship to CSE (p = n.s.). Hence, support was not found for direct effects of broad, stable traits on CSE. However, our results suggest that CA partially mediates the relationship from PIIT (a situation-specific, stable trait) to CSE.

Because efficacy beliefs have been conceptualized as having a reciprocal relationship with anxiety, we conducted supplemental analyses testing the relationship from PIIT, NA, and TA to CA that controlled for CSE's influence. Even though CSE ($p < .01$) was a significant correlate, results support the notion that PIIT ($p < .01$) and TA ($p < .05$) demonstrate direct effects on CA. Controlling for CSE explained an additional .06 of the variance in CA.

Limitations

Before discussing the results and the implications of this study, it is important to consider the study's limitations. The primary limitation relates to external validity. Sampling was limited to voluntary respondents enrolled in classes in a business school of a large Southeastern university. Therefore, the results might have limited generalizability to the individuals outside of the sample population in the nonacademic world. Further research is needed to assess the extent to which this study's results are applicable in diverse organizational and task settings.

Another limitation of this study concerns internal validity. Measures were gathered through self-reports at a single point in time. Self-report measures may suffer from common method variance that could inflate observed relationships between constructs. However, James et al. (1979) suggested that common method variance is a concern when there appears to be a systematic inflation in the correlation of constructs matrix. Examination of the matrix in Table 2 demonstrates that correlations were varied across constructs at relatively low levels. Although negative affectivity and trait anxiety were correlated at .61, formal tests for collinearity suggested the correlation did not significantly influence results. Thus, common method variance does not appear to be a significant flaw in this study.

It is also important to note that respondents had not yet actually interacted with the technology required by their course. We do not know what effect participation in the training course will have on computer self-efficacy or anxiety. Prior research suggests that a "treatment" or training will directly influence individuals' beliefs about their specific capabilities (Agarwal et al. 2000). Future research should extend this study longitudinally to evaluate the influence of broad and situation-specific traits on links between computer self-efficacy and anxiety over time.

Discussion

Overall, our findings provide insight into the nomological net among dynamic individual differences, situation-specific stable traits, and broad stable traits that relate to IT acceptance and use. With the exception of NA, analysis supported most of the hypothesized relationships and results complement prior research on computer anxiety and computer self-efficacy. Where many studies focus on social explanations for efficacy (Compeau and Higgins 1995a; Martocchio 1992), this study extends prior research by demonstrating how stable traits relate directly to computer self-efficacy or indirectly through computer anxiety.

Not surprisingly, our findings suggest situation-specific, stable traits influence IT-specific dynamic individual differences. Consistent with Agarwal et al. (2000), this study found PIIT to be a positive correlate with CSE. This study extends PIIT's nomological net by demonstrating it has a negative relationship with CA. Given research has demonstrated that CSE and CA are important antecedents to computing beliefs (Venkatesh and Davis 1996) and attitudes (Harris 1999), future research should examine if the effect of personal innovativeness on beliefs, (e.g., the ease of use of IT, and negative or positive attitudes toward computing) is mediated by computer self-efficacy and computer anxiety.

More importantly, our findings illustrate how stable traits relate to CA and CSE. Contrary to expectations, NA did not have a significant relationship with CA. However, consistent with prior research (Weil and Wugalter 1990), TA demonstrated a positive association with CA. Further, NA and TA did not demonstrate significant direct effects on CSE. However, CA partially mediated PIIT's influence on CSE. In light of PIIT's significant direct effect on CSE, these findings provide support for Bandura's (1997) argument that stable, situation-specific traits may provide insight into situation-specific efficacy beliefs. However, this finding does not suggest that broad traits are not relevant to our understanding of CSE. Rather, it suggests that researchers need to select traits that most directly relate to the dependent variable of interest (Spector et al. 2000).

These findings also suggest that it is important to distinguish between types of neuroticism. Although NA and TA have both been considered types of neuroticism, only TA had a positive association with CA. High NA individuals experience a generalized anxiety and dissatisfaction, regardless of the situation. High TA individuals, however, experience anxiety when confronted with specific challenges or problems such as using information technology. Given these differences, perhaps focusing on traits that are more reactive to specific challenges (e.g., TA) will demonstrate more predictive validity than traits that are more general in nature (e.g., NA) when examining IT use in organizations.

Overall, findings shed light on how stable traits may affect CA and CSE. Research suggests that training interventions frequently exacerbate participants' computer anxiety (Marakas and Hornik 1996) and that training may sensitize participants to possible mistakes and lead them to report higher levels of CA. Thus, trait anxiety may serve as a contributor to the "cycle of computer anxiety" identified in prior research (Marakas and Hornik 1996; Weil and Wugalter 1990). To gain a richer understanding of the role of personality in IT, future research is needed to examine how different stable traits (both broad and situation-specific) relate to constructs, such as CA or CSE, that influence actual computer use.

Practical Implications

For the practicing professional, this research may have implications for implementing computer-training programs. Understanding the sources of self-efficacy or anxiety that influence IT training's effectiveness may help us design and place employees in training programs. We have identified two stable individual differences (i.e., PIIT and TA) that are associated with CA and one stable situation-specific trait (i.e., PIIT) that are associated with both CA and CSE. Because traits should exert a stable influence on dynamic individual differences (i.e., their influence doesn't change with training) (Chen et al. 2000), it may be possible to use trait measures to place groups of employees in training programs. This would enable course designers to develop techniques that address the unique needs of different groups of IT users. For example, if participants are high on PIIT, training may emphasize the new or interesting features of a new technology. If course design addresses participants' predispositions to respond to stimuli (i.e., feel computer anxiety or self-efficacy), training will be more likely to lead to transferring lessons from the classroom to the workplace (Karl et al. 1993).

Conclusion

This study is a first step in developing a more robust understanding of individual differences that may inform managers' decisions, enhance trainings' effectiveness, and extend our understanding of factors linked to computer usage. This study articulated and tested a conceptual model that posited three stable traits (i.e., PIIT, NA, and TA) would influence two dynamic (i.e., CA and CSE) individual differences. Although there were no effects for NA, support for the relationships between PIIT and TA with CA were supported. Given CA and CSE's influence on computing beliefs (Marakas et al. 1998; Venkatesh and Davis 1996), results underscore the importance of extending the nomological net surrounding dynamic individual differences in the IT context. By identifying how stable dispositional traits influence more dynamic, malleable individual differences such as CSE and CA, we may develop a more comprehensive model of how organizations encourage IT acceptance and use.

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Appendix A

Measures Used in the Study

Computer Self-Efficacy (Mean = 7.5, Standard Deviation = 2.08)

Computer self-efficacy was measured using 10 items developed by Compeau and Higgins (1995b). When using this measure, researchers have reported reliabilities that range from 0.95 (Compeau and Higgins 1995a) to 0.91 (Agarwal and Karahanna 2000). Also, Agarwal and Karahanna reported a mean value of 7.32 (std. dev. = 1.7) for the Compeau and Higgins CSE measure. Consistent with prior research, analysis of the data indicates a reliability of 0.93 and mean of 7.5 (std. dev. = 2.08) for the CSE measure.

To collect the data, respondents were asked to assess the magnitude and strength of their ability to use an unfamiliar computer software package. First, they indicated whether they believed they could perform a task or not. Second, respondents assessed their level of confidence in the ability to perform tasks. Responses could range from 1 = not confident to 10 = very confident. Individuals with high computer self-efficacy should have higher confidence in their capacity to perform tasks than those with lower computer self-efficacy. The items were:

Indicate if you could use the software under the condition by circling YES or NO. For each condition answered "Yes," respondents rated confidence by writing in a number from 1 to 10, where 1 indicate "Not at all confident," and 10 indicates "Totally confident."

I could complete my job using the technology if ...

1. ... there was no one around to tell me what to do
2. ... I had never used a package like it before.
3. ... I had only the software manuals for reference.
4. ... I had seen someone else using it before trying it myself.
5. ... I could call someone for help if I got stuck.
6. ... someone else helped me get started.
7. ... I had a lot of time to complete the job for which the software was provided.
8. ... I had just the built-in help facility for assistance
9. ... someone showed me how to do it first.
10. ... I had used similar packages like this one before to do the job.

Computer Anxiety (Mean = 2.87, Standard Deviation = 1.04)

Computer anxiety was measured using four items drawn from the Computer Anxiety Rating Scale (Heinssen et al. 1987). Respondents evaluated whether computers were intimidating or inspired apprehensive feelings (on a scale of 1 to 7). Compeau and Higgins (1995b) identify these items as best capturing anxiety associated with computer use. Although Compeau and her colleagues have used this measure twice, they did not report means or standard deviations for this measure of computer anxiety in either *MIS Quarterly* article (see Compeau and Higgins 1995b; Compeau et al. 1999). However, Compeau and her colleagues do report composite reliabilities ranging from of 0.92 (Compeau et al. 1999) to 0.87 (Compeau and Higgins 1995b). In the current study, data analysis indicates a composite reliability of 0.94.

1. I feel apprehensive about using computers.
2. It scares me to think that I could cause the computer to destroy a large amount of information by hitting the wrong key.
3. I hesitate to use a computer for fear of making mistakes that I cannot correct.
4. Computers are somewhat intimidating to me.

Trait Anxiety (Mean = 3.12, Standard Deviation = 1.28)

Trait anxiety was measured using four items drawn from Lehrer and Woolfolk (1982). The original 10-item trait anxiety scale included items such as fear for misfortune to one's family or social sanctions. When evaluating the scale's psychometric properties, Lehrer and Woolfolk reported reliabilities ranging from 0.84 to 0.91. They did not report means or standard deviations in their study. In this study, items were selected that evaluated individuals' general preoccupation with problems. Similar to Lehrer and Woolfolk's study, the reduced scale reliability was 0.88. Respondents were asked to report feelings of anxiety and mental preoccupation with problems experienced during a typical day (on a scale of 1 to 7).

1. I picture some future misfortune.
2. I can't get some thoughts out of my head.
3. I keep busy to avoid uncomfortable thoughts.
4. I have to be careful not to let my real feeling show.

Negative Affectivity (Mean = 1.85, Standard Deviation = 0.65)

Negative affectivity was measured using 10 items from the positive and negative affect scale (PANAS) (Watson et al. 1988). Participants evaluated the degree to which they generally experience emotions such as hostility, guilt, or shame. Possible responses ranged from 1 (very slightly or not at all) to 5 (extremely). In a recent study, Miles and Perrewé (2001) used the full 10-item measure of NA and reported a mean of 1.58 (std. dev. =.62) and Cronbach's α of .88. In the current study, the 10-item measure's mean was 1.80 (std. dev. =.55) with a Cronbach's α of .81. After two items were dropped from the measure due to low factor loadings indicated by an asterisk, NA's mean was 1.85 (std. dev. = .65) with the Cronbach's α of .85. Because of the comparable reliability and standard deviation estimates, we are comfortable with the psychometric properties of the reduced NA measure.

1. scared
2. irritable
3. ashamed
4. distressed
5. hostile
6. jittery
7. afraid
8. guilty
9. upset *
10. nervous *

*Dropped due to low factor loading.

Personal Innovativeness in IT (Mean = 4.65, Standard Deviation = 1.12)

Personal innovativeness in IT was measured using four items developed by Agarwal and Prasad (1998a, 1998b). In a recent study of cognitive absorption and technology acceptance, Agarwal and Karahanna (2000) used these items and reported comparable values for the mean (4.87, std. dev. = 1.07) and reliability (composite reliability = 0.87). The items reflect an individual's propensity to experiment with existing and new information technologies (on a scale of 1 to 7).

1. If I heard abut a new information technology, I would look for ways to experiment with it.
2. Among my peers, I am usually the first to try out new information technologies.
3. In general, I am hesitant to try out new information technologies.
4. I like to experiment with new information technologies.