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The Affect Effect: State Affect, Cognitions and IT Usage

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ABSTRACT

This study presents state affect as a necessary theoretical and empirical component of information systems (IS) research models addressing the cognitions regarding, and usage of, information technology (IT). We position state affect as a powerful predictor of trusting cognitions and explain how state affect may also directly impact IT use. We tested our research model using data from 376 users of Microsoft Excel. Results indicate that positive and negative affect influence various trusting cognitions as well as directly impact post-adoptive use intentions. Our findings offer particular implications IS research models intending to comprehensively model cognitions and attitudes regarding IT and IT usage.

KEYWORDS

Affect, state affect, cognitions, trust, IT use, post-adoptive IT use

INTRODUCTION

MIS researchers strive to publish manuscripts offering significant practical and theoretical contributions, as built on rigorous research methodologies. Through considered application of methodological techniques, we attempt to generate unbiased results that validly guide future research endeavors and contribute to a cumulative information systems (IS) tradition. With this aim, research in this field must consider factors that might bias or confound results stemming from errors in the analysis process. A social science researcher may account for, and eliminate, a large amount of error in the analysis process, be it random or systematic, but this is only true when the researcher is cognizant of what the source of the error actually is (Churchill, 1979).

One source of variance not commonly accounted for in information systems research is the user's general sense of feeling at the time of the study, also known as their **state affect.** State affect refers to of how an individual feels over time, such as a brief period of time or a day, and helps individuals' frame responses to a variety of situations both personal and professional. One common dichotomy of state affect is positive affect and negative state affect, which capture a generally positive or negative feeling over the course of a day or a moment in time. State affect plays a vital role in everyday life and in most social interactions and relationships (Forgas, 1995, 2017; Forgas & George, 2001), including users' relationships with information technology (IT) (Zhang & Milic, 2015). State affect is a well-established driver of human behavior across fields (Diener & Emmons, 1984; Kelly & Barsade, 2001), though its impact is rarely accounted for in IS studies.

Though previous MIS studies conclude that IT use involves both cognitive (Agarwal & Karahanna, 2000; Burton-Jones & Gallivan, 2007; Burton-Jones & Straub, 2006; Venkatesh, Morris, Davis, & Davis, 2003) and emotional (Beaudry & Pinsonneault, 2010; Zhang & Milic, 2015) aspects of the human psyche and influences behaviors, our literature base does not clearly disentangle the relationship between cognitions and state affect. By not accounting for the role of state affect, little is understood about how state affect can influence our studies and analyses (Agarwal &

Karahanna, 2000; Komiak & Benbasat, 2006; Van der Heijden, 2004) and bias results. Furthermore, in order to create a comprehensive and holistic understanding of the nomological network impacting user behavior and engagement with information technology, we must carefully consider the role and impact of state affect. When neglecting something as complex as the respondent's feelings over the period of a study, internal validity might suffer and researchers may generate erroneous results that will, in turn, make it difficult to develop appropriate implications for practice (Shadish, Cook, & Campbell, 2002). Thus, we investigate the following research question: *How do positive and negative state affects influence an individual's cognitive beliefs and intentions to use technology?*

To address this question, we first define the state affect construct and present a new model that examines the relationships between moods, cognitive beliefs, and post-adoption use. By illuminating the interplay between affect, cognitions, and behavioral intentions, our study potentially has many important implications for theory and practice. From a theoretical standpoint, discovering the factors that impact intentions to continue, explore, or adapt IT usage behaviors is important for learning how technologies become embedded within work processes. From a practical perspective, understanding the factors that influence post-adoption IT use could offer researchers actionable guidelines for improving future research endeavors.

THEORETICAL PERSPECTIVE

Researchers have acknowledged that IT use involves both cognitive and emotional aspects (Cenfetelli, 2004; Komiak & Benbasat, 2006); however, the majority of technology diffusion research focuses on cognitive responses to new ITs, often labeling these mental processes as "beliefs" or "attitudes" (Davis, Bagozzi, & Warshaw, 1989; Wixom & Todd, 2005). Many cognitive constructs and variables, however, actually measure outcomes of using technology. In this study, we investigate trusting cognitions because they reflect a more complex, richer response to an information technology, including individuals' perceptions of a technology's capability, reliability and helpfulness (Thatcher, McKnight, Baker, Arsal, & Roberts, 2011).

Although trust has been defined in a variety of papers and contexts (McKnight et al. 1998; Thatcher et al., 2011), this study defines *trust in IT* as reflecting a users' willingness to depend upon an IT, reflected in beliefs about the attributes of the IT in question (McKnight, Carter, Thatcher, & Clay, 2011). For example, if a user believes that eBay is a trustworthy online auction website, they will be likely to patronize the site, and less likely to do so if it is perceived to be untrustworthy.

Over time, MIS scholars have recognized the importance of emotions, moods and state affect (Beaudry & Pinsonneault, 2010; Van der Heijden, 2004). *State affect* is a measure of how an individual feels over a day or at a moment in time (Diener & Emmons, 1984). State affect as a construct is a well-established driver of individual behavior (Bitner, 1992; George, 1991; Kelly & Barsade, 2001). As a result, we expect that state affect should meaningfully impact cognitions and behaviors of IT users, which deepens our understanding of user mental models, reduce bias and enhance validity.

In total, we contend that state affect is both theoretically and methodologically critical for IS researchers to consider when studying the intentions and behaviors of IT users. As a result, we conduct a study of post-adoptive cognitions and behaviors to establish the relevance of state affect to IS research. In this post-adoptive IT use context, research has identified several outcomes that could reflect this interplay of cognition and affect, including behavioral outcomes like *intentions to explore* (Nambisan, Agarwal, & Tanniru, 1999), where a balance between exploitative and explorative use is necessary for long-term gains (Burton-Jones & Straub, 2006); and *deep structure usage,* which usage that implements and executes an individuals' knowledge of a system and a task (Burton-Jones & Straub, 2006).

HYPOTHESIS DEVELOPMENT

Cognitions are widely accepted to prime and shape IT user behaviors (Davis, 1989; Ortiz De Guinea & Markus, 2009; Taylor & Todd, 1995; Venkatesh et al., 2003), including work which finds that trust in the attributes of a technology impact post-adoptive behaviors (McKnight et al., 2011; Salam, Iyer, Palvia, & Singh, 2005; Schlosser, White, & Lloyd, 2006; Thatcher et al., 2011). For example, if an IT user trusts that their workplace computer is reliable, capable of completing tasks, and helpful in doing so, they will behave in a number of ways towards the computer. Since these cognitions are well-established influences on both pre- and post-adoptive behaviors, we anticipate these relationships as expected baselines. Formally, we hypothesize:

> H1: *An individual's trust in a specific technology's helpfulness, capability, and reliability will be positively associated with (a) deep structure usage and (b)intentions to explore.*

However, cognitions do not comprehensively address the user's mindset and behaviors regarding technology usage. In fact, an increasing number of research studies also provide plenty of empirical evidence that a person's affective state influences behavior and intentions to behave in a certain manner, as well as thinking (Broekens, Kosters, & Verbeek, 2007; Rose, Futterweit, & Jankowski, 1999; von Hecker & Meiser, 2005). We argue that individuals experiencing positive affect will be more comfortable with a technology and more fully leverage the techniques and tools in the technology that they are familiar with. On the other hand, we anticipate that those experiencing negative affect may exhibit feelings of dissatisfaction or frustration and look for new ways to leverage the technology in order to alleviate their frustrations. Thus, we hypothesize:

H2. Positive affect will be positively associated with deep structure use.
H3. Negative affect will be positively associated with intention to explore.

However, theory suggests that focusing on cognitions and state affect only tells part of the story about post-adoptive IT use (Forgas, 1995, 2017). It may seem intuitive that, most simply, the user will form cognitions and then behave according to those thoughts. In other words, cognitions occur within the context of the state affect experienced by the individual (Bower, 1991; Clore, Schwarz, & Conway, 1994; Forgas, 1995). Accordingly, we argue that a user's current state affect can influence whether he/she expresses trusting beliefs about an IT, including its helpfulness, capability, and reliability. We anticipate that users experiencing positive affect will be more likely to trust technology, whereas those experiencing negative affect will be more suspicious of the technology and less trusting. On this basis, we hypothesize:

H4. Positive affect will be positively associated with an individual's trust in a specific technology's helpfulness, capability, and reliability.
H5. Negative affective will be negatively associated with an individual's trust in a specific technology's helpfulness, capability, and reliability.

Further, while state affect has been shown in studies to prime cognitions that lead to behavior, research shows that, for some behaviors, affect may influence behavior or intentions to behave over and above cognitions alone (Forgas, 1995). This notion has been heavily studied in both psychology and marketing, where researchers have manipulated subjects' moods and studied their subsequent actions (Bitner, 1992; Forgas, 1995; Gardner, 1985). Studies show that the influence of affective states on behaviors will not be fully mediated by cognitions (Forgas, 1995). This implies that positive affect and negative affect will exert direct effects on intended IT use behaviors even in the presence of trust in the IT, and so we hypothesize:

H6. In the presence of trust in a specific technology, positive affect will exert a direct positive influence on individuals' deep structure use of IT.
H7. In the presence of trust in a specific technology, negative affect will exert a direct positive influence on individuals' intentions to explore an IT.

METHODOLOGY

To assess the effect of state affect on individuals' trusting beliefs and behavioral intentions, we conducted a survey of undergraduate students enrolled in an information systems course at a large university in the northwestern United States. In the course, the students use MS Excel to help analyze business problems. A total of 376 students completed a survey. Of those, 19 surveys were removed due to missing or bad data. Of the sample, 215 (60.2%) were male and 142 (39.8%) female. 140 (39.2%) reported under 2 years of experience with Excel, 108 (30.3%) reported between 2 and 5 years of experience, and 109 (30.5%) reported over 5 years of experience. Education level was reported at high school (n=46, 12.9%), some college (n=231, 64.7%), Associate's Degree (n=71, 19.9%) and Bachelor's Degree (n=9, 2.5%).

We used a multi-step process to check the validity of our constructs. All analysis was performed using the R packages 'psych' (v1.8.12) (Revelle, 2018) and 'lavaan' (v0.6-3) (Rosseel, 2012). First, we ran a principal component analysis (PCA) using Promax rotation. We dropped 6 of the 20 Positive Affect and Negative Affect Schedule (PANAS) items due to low loading and high cross-loading. All other items loaded highly (> 0.65) and had low cross-loadings (< 0.20) with their constructs. Next, we used confirmatory factor analysis to further assess the validity of our constructs. All items loaded on their respective constructs at a significance level of $p < 0.001$. Finally, we examined reliability and the average variance extracted (AVE) of our constructs (see Table Y). For each construct, AVE and alpha exceed the recommended values of > 0.5 and > 0.7, respectively. While there is some correlation between constructs in the off-diagonal elements, the square root of the AVE is greater than any of these values. Given the above analysis, we believe there is sufficient evidence to support our measurement model.

Construct	Composite Reliability	Cronbach's Alpha	1	2	3	4	5	6	7
1: Positive Affect	0.88	0.88	**0.71**						
2: Negative Affect	0.87	0.87	0.21	**0.71**					
3: Capability	0.91	0.91	0.13	-0.19	**0.88**				
4: Reliability	0.89	0.89	0.12	-0.21	0.60	**0.81**			
5: Helpfulness	0.92	0.92	0.18	-0.12	0.47	0.49	**0.87**		
6: Intent to Explore	0.94	0.94	0.20	0.06	0.33	0.18	0.36	**0.89**	
7: Deep Structure Usage	0.92	0.92	0.17	-0.06	0.49	0.41	0.38	0.32	**0.83**
*Square Root of the Average Variance Extracted is reported in the diagonal									

Table 1. Reliability and Correlation of Constructs

STRUCTURAL MODEL

After evaluating the constructs, we fit the structural model using the 'lavaan' package. Significant relationships are shown in Figure 1. Non-significant relationships are not shown for clarity. The overall model fit statistics are CFI: 0.90 and RMSEA: 0.07, which meet or exceed the recommended values of >= 0.9 and < 0.1.

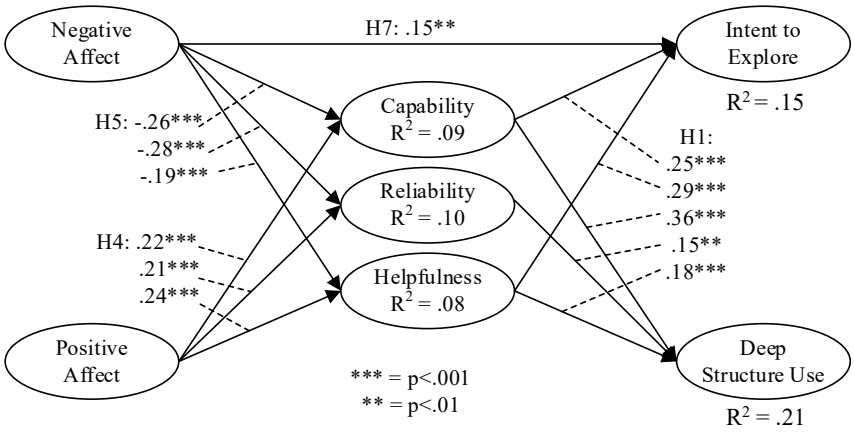

Figure 1. Structural Model

Figure 2 represents the relationships of positive and negative affect without the mediation of the trusting beliefs. In this model, it can be seen that the total effects of positive affect are significant with respect to intent to explore and deep structure usage. In the presence of trusting beliefs, the direct effects of positive affect are not significant. This suggests that trusting beliefs fully mediate the relationship between positive affect and intent to explore and deep structure usage. Negative affect has no significant relationship with intent to explore or deep structure usage when trusting beliefs are not present. This is likely because of the inconsistent mediation (MacKinnon, Fairchild, & Fritz, 2007) that negative affect has with intent to explore. The indirect effect has a negative relationship while the direct effect has a positive one. The total effect is cancelled out and results in a non-significant total effect.

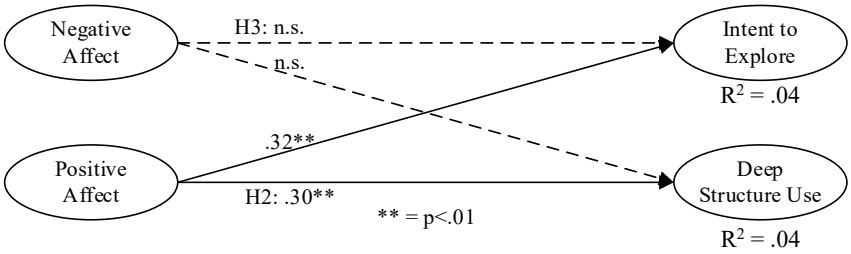

Figure 2. Total Effect Model

Our findings indicate that both positive and negative state affect significantly impact the trusting beliefs regarding information technology, as well as use, including intention to explore and deep structure usage. Our hypotheses were generally supported except for H3 and H6. As expected, negative affect reduces trusting beliefs, but increases intention to explore above and beyond the influence of cognitive beliefs, though it is not significant when trusting beliefs are not included in the model (H3). Similarly, as we anticipated, positive affect increase trust and encourages deep structure usage, but did not impact these outcomes in the presence of trusting cognitions (H6) implying a mediation effect.

DISCUSSION

Our study sought to learn how state affect, an individual's self-reported measure of how he/she is feeling at the time, influences how individuals think and behave. Accordingly, we developed and tested a research model positing that state affect impacts cognitions, in the form of trusting beliefs, and post-adoptive IT usage intentions. We demonstrated how affective states and cognitions work together in a complex relationship and studied this phenomenon in an IT context where cognitions were represented by trusting beliefs in an IT's capability, helpfulness, and reliability, and behaviors were represented by intentions to explore with IT and deep structure usage. Upon completing our statistical analysis, our findings indicate that state affect plays a critical role in the formation of cognitions, which influence behavior, but also that state affect directly impacts cognitions.

Our study has a number of implications for the field and for practice. For one, our research adds an interesting new element to post-adoption research by showing that state affect is an important variable that interacts with individual beliefs about technology usage and has an influence on post-adoptive behaviors above and beyond individual cognitions. This research demonstrates the importance of positive and negative state affect in understanding how employees will act in a given situation (such as towards a new IT). When employees are in a positive state of affect, they are more open to really exploiting the myriad of features an IT might offer (deep structure usage), but when employees are in a negative state of affect, they might instead intend to explore the information technology for a different solution instead. Overall, our research implies that a comprehensive model of user behavior must explicitly account for state affect.

With this in mind, we suggest a solution that researchers might apply when conducting subsequent research studies: provide a measure of state affect in any questionnaire that must be distributed to the sample population. In this study, the PANAS scale was utilized to capture a variety of state affects that an individual might report having at that given moment. At the least, state affect might serve as a control variable to rule out alternative explanations for the occurrence of a relationship and as a result, internal validity should improve. For MIS, state affect might serve as another variable to consider when examining why individuals behave the way they do towards information technologies as well and warrants further explanation as well, but across an assortment of scales, accounting for an individual's state affect might be the difference between a supported or an unsupported hypothesis. In the future, we recommend that researchers devote time to adapting and adding state affect scales to study questionnaires to account for this important variable.

R^2 = .04

LIMITATIONS

Since our analysis was conducted using a student sample, there are concerns regarding generalizability. While this is an important concern, state affect influences all individuals, not just student populations. We have no cause to believe the general population would respond any differently, since our study primarily focuses on an element of the individual psyche. However, future research endeavors in this subject matter might consider using an organizational environment

or a broader population sample. Additionally, given that our sample was collected via a single instrument at a single point in time, common method bias may be a threat to internal validity.

CONCLUSION

In this paper, we presented state affect as a key factor that must be theoretically and empirically considered when IS researchers wish to conceptualize and test how individuals evaluate and use information technology. Future research should capitalize on this work by more explicitly theorizing and testing how state affect interacts with other cognitions and attitudes in influencing the mindsets and behaviors of IT users.

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