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Abstract

It is presumed that individual differences, such as personal traits, demographic characteristics, and situational differences, have significant effects on the adoption behavior of information technology (IT) users, but they are not studied at length. This study analyzes the effects of two personal traits, user playfulness and technology anxiety, on IT adoption. In a pre-adoption field survey, the study found: 1) User playfulness affected a potential adopter's intention to adopt an IT, while technology anxiety did not directly influence this intention; 2) user playfulness affected only behavioral intention but not symbolic adoption; 3) user playfulness did not affect a potential adopter's attitude toward an IT, while technology anxiety negatively affected the attitude; and 4) user playfulness and technology anxiety were inversely related to each other.

Introduction and Background

Understanding the end-user behavior in IT adoption has become more important with the rapid penetration of information technologies (IT) in businesses and homes and with the spiraling costs of failed IT projects. Corporate IS organizations of the 21st century have to identify and manage all important factors that affect the IT adoption process. One of the leading models of the IT adoption process, the technology acceptance model (TAM), suggests that perceived usefulness and perceived ease of use significantly affect the potential end -users' attitude toward an IT and their intention to adopt the IT (Davis 1989; Davis et al. 1989). However, a question still remains largely unanswered. Why some individuals easily and quickly adopt a new IT and others delay and refuse to adopt it completely? (Agarwal et al. 1999).

Previous studies have found that some major causes of ineffective computer adoption and use are behavioral, not technical in nature (Turnage 1990; Venkatesh 2000; Webster et al. 1992). The TAM, however, does not include a construct related to behavioral aspects of individual differences (Agarwal et al. 1999). Individual differences can be at the level of personal traits, demographic characteristics, or situational differences. Demographic and situational differences, such as level of education, prior experience, user involvement, and training, have been found to have significant influence on attitude through beliefs about usefulness and ease of use (Agarwal et al. 1999; Jackson et al. 1997; Venkatesh et al. 1996). But the influence of personal traits, specifically user playfulness and technology anxiety, on adoption behavior has been understudied (Venkatesh 2000; Webster et al. 1992). Venkatesh (1999; 2000) found intrinsic motivation (conceptualized as playfulness) to have significant effect on training and ease of use. However, intrinsic motivation, which is defined as pleasure and satisfaction derived from a specific activity (Vallerand 1997), is different from user playfulness, which is a personal trait.

This study focuses on the impact of user playfulness and technology anxiety on the user's attitude toward an IT and intention to adopt the IT. IT adoption and focuses on the following questions. Do user playfulness and technology anxiety affect the user's attitude toward IT? Do they affect the user's intention to adopt IT? In the context of user playfulness and technology anxiety, does the attitude toward IT affect the intention to adopt IT? What is the relationship between user playfulness and technology anxiety?

This study differs from many other studies on IT adoption in the sense that this study focuses on pre-diction rather than post-diction. Most of the past research has been post-diction meaning that end-user beliefs and attitudes about a specific IT were examined after the IT was already adopted and used by the study participants (Christensen 1987; Davis 1989; Mathieson 1991; Moore et al. 1996; Taylor et al. 1995a; Taylor et al. 1995b; Thompson et al. 1991). Because the importance of studying user playfulness and technology anxiety rests in their predictive ability of the future behavior of adoption, this study was designed as

a pre-diction (pre-adoption) study. The study participants had not adopted or used the IT nor had the organization made any decision about adopting the IT at the time of the study.

The purpose of this study is to provide a better theoretical understanding of the antecedents of user acceptance and user resistance to the adoption of IT innovation in organizations. If the influence of personal traits, specifically user playfulness and technology anxiety, can be validated in the context of acceptance models, it can provide significant value to both practice and theory. In practice, individuals can be identified as high or low playful users or high and low technology anxious users and targeted or ruled out as potential leaders in the adoption process. In research, the connection among user playfulness, technology anxiety, and system designs can be further explored to increase the likelihood of adoption and post-adoption use by maximum number of users. In addition, if we can manipulate these traits through various stimuli, it would be then possible to facilitate the quicker acceptance and adoption of important IT innovations.

Research Model

Figure 1 shows the research model utilized to study the relationship between user playfulness, technology anxiety, attitude toward adopting an IT and the end-user's intention to adopt the IT. The research model is derived from the Theory of Reasoned Action (TRA) and various theories on innovation diffusion, user playfulness, and technology anxiety (Davis 1986; Fishbein et al. 1975; Parasuraman et al. 1990; Rogers 1983; Webster et al. 1992). TRA describes how the evaluations of behavioral consequences relate to the attitude toward the behavior and, in turn, the intention to adopt the behavior (Fishbein et al. 1975). In the context of IT adoption, a potential adopter's evaluation of an IT innovation forms the positive or negative attitude of the adopter toward the IT innovation; and this attitude affects the adopter's intentions to adopt or reject the IT. The focus of this research is not on the actual adoption behavior but on the intention to adopt. However, intention has been found to be a good indicator and predictor of actual behavior (Jackson et al. 1997; Szajna 1996). Thus, actual adoption is a consequence of the intention to adopt provided the IT is accessible or available to the adopter. Innovation diffusion is defined as the "process by which and innovation is communicated through certain channels over time among the members of a social system" (Rogers 1983, p.10). Thus, for an IT innovation to diffuse in organizations, it has to be adopted and tried by some early adopters. The research model hypothesizes the relationship among playfulness, technology anxiety, the attitude toward an IT innovation, and the intention to adopt the IT.
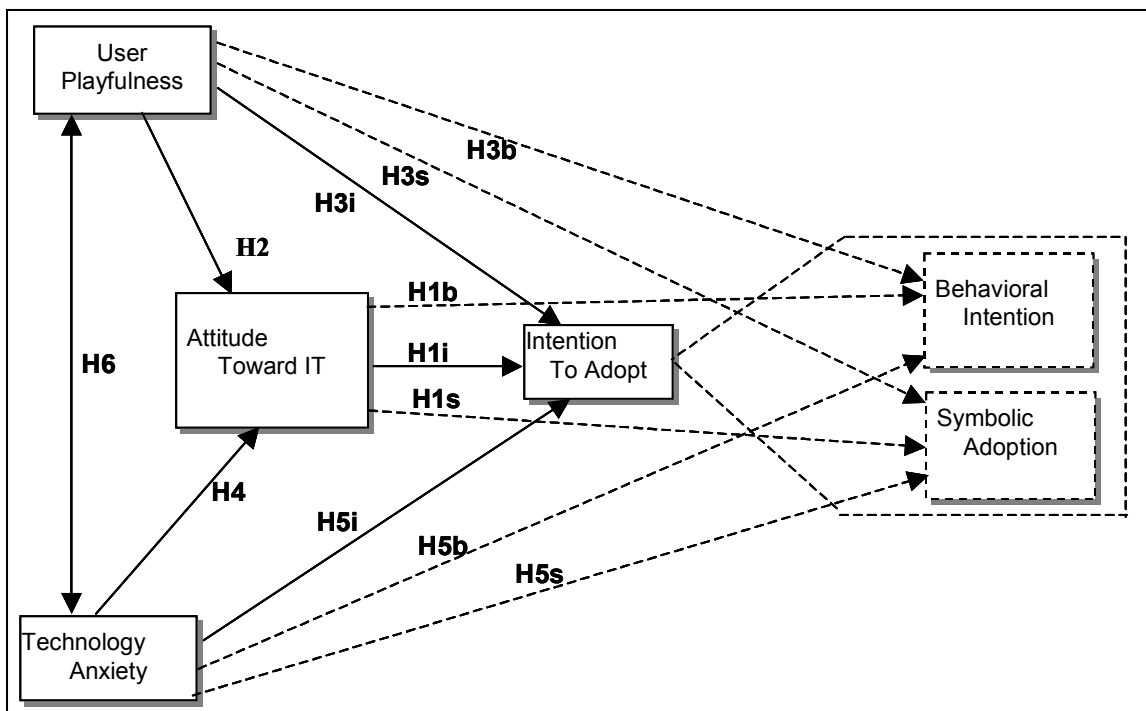

Figure 1. The Research Model

Playfulness is the degree of cognitive spontaneity, creativity, exploration, and inventiveness in microcomputer interactions (Webster et al. 1992). Due to the symbolic nature of human-computer interactions, playfulness is an appropriate construct to study these interactions and as a component to examine the end-user behavior and process of IT adoption. Playfulness is an ingredient of the creative individual's cognitive style. Playfulness of adults has been found to have a positive effect on individual creativity and exploratory behaviors during interactions with assigned tasks (Glynn et al. 1992).

Playfulness exists on multiple levels as a characteristic of individuals (Lieberman 1977), of interpersonal interactions (Goffman 1974), and of social systems (Blanchard 1986; March 1979). This research focuses on playfulness as a characteristic of individuals or a personal trait; that is, a predisposition to engage in activities in a spontaneous, fanciful, or non-serious manner to increase enjoyment (Glynn et al. 1992). Playfulness can be both state and trait based. S*tate*-based playfulness is defined in terms of an individual's interactions with the system, while *trait*-based playfulness defined in terms of the characteristics of individuals (Moon et al. 2001; Webster et al. 1992). By user playfulness, we refer to the trait-based playfulness. Trait is a stable characteristic of individuals, whereas state is affective or cognitive episodes that are experienced in the short run and tend to fluctuate over time. Unlike traits, states can be influenced by situational factors and by the interactions between the individual and the situation. Playfulness as a trait is relatively invariant to situational stimuli and has relatively enduring tendency (Yager et al. 1997).

Technology anxiety refers to an individual's tendency to be uneasy, apprehensive, or fearful about the current or future use of a technology (Parasuraman et al. 1990). With the continuous growth of computers in household and K-12 educational institutions, the anxiety level toward microcomputers in general is shifting from the fearful and awesome aspects to positive factors (Gardner et al. 1989). However, technology anxiety toward various IT applications including newer or different types of operating systems is still commonplace.

Like playfulness, technology anxiety can be situation-specific. For example, two students taking a test are feeling test anxiety; one student may have a relatively enduring tendency of anxiety (a trait of test anxiety), while another student may have the temporary "state" of test anxiety temporarily due to not knowing the answer of a specific question or due to the lack of previous-night sleep. The focus in this research is on technology anxiety as a personal trait.

Intention to adopt has two components: behavioral intention and symbolic adoption. Behavioral intention refers to the intention of a potential adopter to experiment with an IT innovation. Symbolic adoption refers to the extent to which a potential adopter has mentally accepted an IT innovation as a good idea and is positively embracing it, prior to even experimenting with it. These components are two separate entities and non-linear. In some cases: symbolic adoption follows behavioral intention, because the user influenced by curiosity tries the innovation and finds that the innovation is a good idea; symbolic adoption precedes behavioral intention, because the user has heard good things about the innovation and decides to try it; symbolic adoption coincides with behavioral intention because a user has heard some thing good while and is curious to try the innovation. Thus, both components may follow each other in some situations giving a feeling of linear stages or coincide in other situations giving a feeling of both being the same. Previous research in consumer behavior (Howard et al. 1969; Schiffman et al. 1987) and innovation diffusion (Kwon et al. 1987; Rogers 1983) has distinguished initial adoption behavior from continued use.

Previous studies have found that attitude toward an IT has significant influence on the user's intention to adopt the IT. This study also agrees and expects to find the same relationship.

> **H1**: *The expected user's attitude toward an IT influences the user's overall intention to adopt (H1i), on behavioral intention to adopt (H1b), and on symbolic adoption (H1s) of the IT.*

Some users are playful, while others are not. We expect that playful users will be more likely to have positive attitude toward an IT innovation and will intend to try the innovation. Thus, we postulate:

> **H2**: *User playfulness has a positive effect on the attitude toward an IT (H2)*

> **H3**: *User playfulness has a positive effect on the overall intention to adopt the IT (H3i), on behavioral intention to adopt (H3b), and on symbolic adoption (H3s).*

High level of technology anxiety makes a user anxious during the use of an IT. An anxious user is likely view the IT negatively and will try to avoid it. So, we postulate:

> **H4**: *Technology anxiety has a negative effect on the attitude toward an IT.*

> **H5**: *Technology anxiety has a negative effect on the intention to adopt the IT (H5i), on behavioral intention to adopt (H5b), and on symbolic adoption (H5s).*

Playful users are less likely to be anxious and less-playful users are more likely to be anxious about using IT and its impact on their work and life. So, we postulate:

> **H6**: *User playfulness and technology anxiety are inversely related to each other.*

Methodology

The data was collected in January of 1996 through a survey in a division of a large telecommunications company in the southeast United States. The division manufactures fiber optics cables for telecommunications services companies and had approximately 1200 employees working at the site of survey of which about 700 were personal computer (PC) users. Five hundred and fifteen (515) individuals were randomly selected from the population of PC users for the survey. Two hundred and twenty-four (224) responses were useful giving a final response rate of 43.5%. The organization supported the study by providing us the list of PC users, offering a covering letter, and access to their internal mail delivery system to administer the survey.

The study focused on the potential users of Microsoft's Windows 95 software. At the time of introduction, Windows 95 was considered an IT innovation because it formed an essential part of computing operations and involved many innovative features including completely redesigned user interface, plug and play, integrated browser, embedded multimedia player, networking capabilities, etc. We chose it because it was a new innovation coming to the market place which had yet to infiltrate this organization. Within the organization, most users had been using Windows 3.1 (97%-680 users), while some were still using MS-DOS (3%-20 users). The organization was contemplating (the decision was not then made) switching to Windows 95 and all respondents had little to moderate amount of knowledge about Windows 95 (contact the authors for additional details about other demographic characteristics). Because of the lack of the decision prior to the survey, this study examined potential adopters in a voluntary state of intention to adopt the software as opposed to a mandated adoption decision process. Many post-adoption studies are significantly affected by this, because individual employees are often forced to adopt an IT innovation for the sake of standardization. We tried to reduce such effects by selecting this organization. Potential adopters were defined as individuals who had the knowledge of Windows 95 but had not yet started using the operating system.

The selection of the survey site was based on several considerations. First, the organization had to have a significant number of individuals working in an end-user computing environment. Second, with our focus on attitude towards an IT and intent to adopt it, the organization needed to be in the early stages of introducing the IT. The stage prior to actual adoption is very important as our study assesses pre-adoption beliefs (attitudes and beliefs before adoption of an IT) as opposed to post-adoption beliefs (attitudes and beliefs after an IT has been adopted and is actually being used). The respondents need to be surveyed after they have acquired some knowledge of an IT and, thus, have developed beliefs and attitudes toward adopting the IT but before its actual adoption. Both of these requirements were satisfied by the selected organization.

Measurement of Variables

To measure user playfulness, technology anxiety, user attitude, and intentions, we utilized a questionnaire (contact the authors to get a copy of the questionnaire). The questionnaire was developed from the instruments used in various past studies. User playfulness focuses on cognitive spontaneity about their state of the mind when they use a PC. We used the Adult Microcomputer Playfulness Scale developed and used by Webster and Martocchio (1992). The respondents were asked to indicate their degree of agreement on a seven-point Likert-type scales on twenty-one items. A low score shows low playfulness, whereas a high score shows high playfulness. This instrument had demonstrated an internal consistency reliability ranging from .86 to .90 (Webster et al. 1992). Technology anxiety in this particular research refers to the anxiety of adopters in adopting and using PCs. We used the Computer Anxiety Rating Scale developed by Heinssen, Glass, and Knight (1987). We used the short-form with 10 negatively worded items. Again, the respondents were asked to indicate their degree of agreement on seven-point scales. A low score shows low computer anxiety, whereas a high score shows high computer anxiety. Heinssen, et al (1987) reported an internal consistency reliability of .87 and a test-retest reliability of .70 for the instrument. Attitude refers to an individual's general feeling of favorableness for the behavior, in this case, the adoption of Windows 95. We used the semantic differential technique (Osgood et al. 1955). The respondents were asked to rate three statements with three bi-polar adjective pairs measuring good-bad, positive-negative, and beneficial-harmful on seven-point Likert-type scales. Several other researchers have used this technique to measure

attitude (Christensen 1987; Davis 1986; Moore et al. 1991). Intention to adopt referred to behavioral intention and symbolic adoption. We used a four-item instrument developed from the modifications of previous studies (Adams et al. 1992; Davis 1989; Karahanna 1993). On a seven-point Likert-type scale, it measured the degree of individual's intention to adopt Windows 95. First and third questions measured behavioral intention; second and fourth questions measured symbolic adoption. In each question set, an average score was calculated and used in the analysis.

Although the measurements were directly adopted or modified from the measurements used and tested in previous studies, we pilot tested to improve their validity and reliability. Twenty-five respondents participated in the pilot test. The test also provided us their feedback on the length of the instrument, the format of the scales, construct validity, and any ambiguity in questions.

Results and Discussion

To test the hypotheses, we used the structural equation modeling (SEM) technique. SEM enables the examination of multiple and interrelated relationships within one analysis as opposed to a single relationship analyzed by multiple regression analysis (Hair et al. 1998). Figure 2 shows the results of the SEM analysis using AMOS (Arbuckle, 1994). The model was saturated or just-identified giving us the same number of sample moments as the number of the parameters to be estimated. The four variables are shown in the boxes and the arrows between them indicate the relationship between each. The first items in the brackets are the standardized estimates of the coefficients and the second items are the p-values.
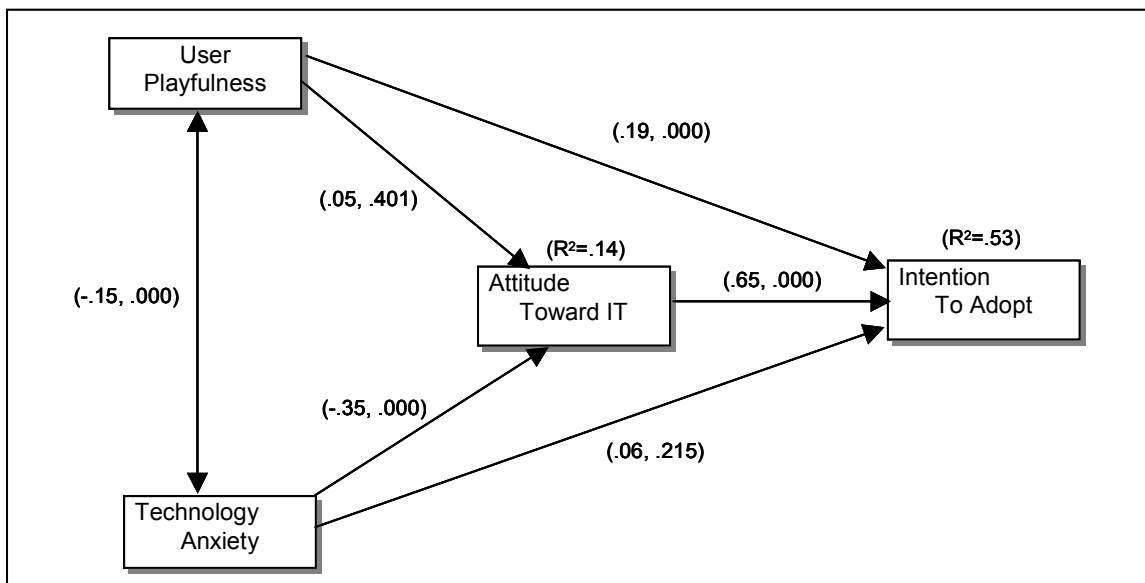

Figure 2. Structure Equation Model Results

The relationship between attitude toward IT and intention to adopt IT is significant (p-value=.000 and overall R^2=.53) and positive supporting the hypothesis H1i. Thus, a potential adopter's attitude toward an IT affects the adopter's intention to adopt.

The relationship between user playfulness and attitude toward IT is not significant (p-value=.401). This does not support the hypothesis H2. The relationship between user playfulness and intention to adopt IT is significant (p-value=.000) and positive supporting the hypothesis H3i. Thus, the playfulness of a potential adopter directly affects the adopter's intention to adopt. However, the playfulness does not affect the adopter's attitude toward the IT. This indicates that "playful" adopters are more likely to adopt an IT innovation regardless of their preconceived attitude toward the IT innovation.

The relationship between technology anxiety and attitude toward IT is significant (p-value=.000) and negative supporting the hypothesis H4. Thus, anxiety toward an IT negatively affects a potential adopter's attitude toward the IT. The relationship between technology anxiety and intention to adopt IT is not significant (p-value=.215). This does not support the hypothesis H5i. There is no direct effect of anxiety on a potential adopter's intention to adopt, though there is an indirect effect through attitude.

The relationship between user playfulness and technology anxiety is significant (p-value=.000) and negative supporting the hypothesis H6. This indicates that "playful" users are less likely to be anxious about an IT innovation. These findings concur with the findings of previous studies (Webster et al. 1992).

Figure 3 shows the results of two multiple regression analyses on behavioral intention and symbolic adoption with user playfulness, technology anxiety, and user attitude toward IT as independent variables. User playfulness (t-value=4.61; p-value=.000) and attitude toward IT (9.45; .000) have significantly effect and technology anxiety has no effect (0.86; .231) on behavioral intention of the potential adopter (R^2=.364; F-value=63.3; p-value=.000). While user playfulness (t-value=2.41; p-value=.021) and technology anxiety (1.32; 0.96) do not affect symbolic adoption, though attitude toward IT (15.3; .000) strongly affects symbolic adoption giving overall significant model (R^2=.538; F-value=128.8; p-value=.000). The results confirm the hypotheses H1b, H1s, and H3b and do not confirm H3s, H5b and H5s.
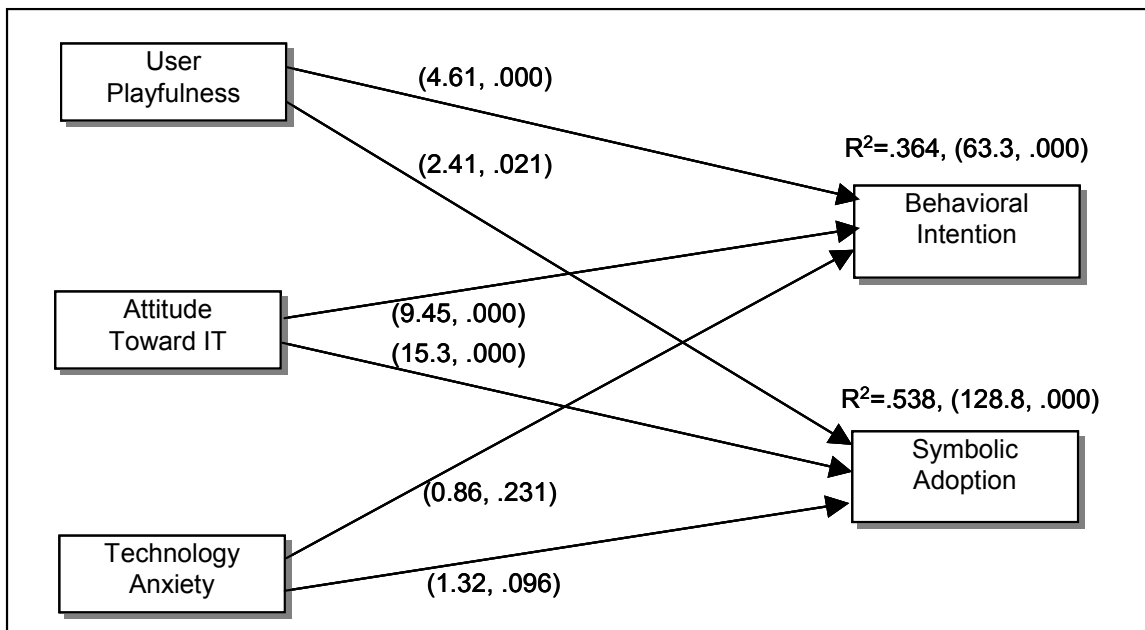

Figure 3. User Playfulness and Intention to Adopt

Because playfulness relates to an individual's inclination to experiment with an innovation, it is found to have positive affect behavioral intention. On the other hand, playfulness does not affect the perception of the adopter regarding the goodness of the innovation, suggesting that it may not affect symbolic adoption. Because technology anxiety does not have any effect on the overall intention to adopt, we found that it does not have any effect on the two components of the intention.

Conclusion

Identifying the pre-adoption criteria affecting attitude is an important question in IS research. Most of the past studies had examined users' beliefs and attitude about a specific IT only after they were already adopted and used. Consequently, the results of such studies identified sets of beliefs and attitudes about the continued use of the IT, rather than the beliefs and attitude that lead to the adoption of the IT. This study carefully focused on the later aspect by choosing an IT that was in the pre-adoption phase.

Like other studies (Karahanna 1993; Karahanna et al. 1999; Moore et al. 1996), this study provides a strong support for the integration of innovation diffusion model with the theory of reasoned action. User playfulness and technology anxiety are found to be strong influencing factors affecting the intention to adopt an innovation and the attitude toward the innovation, respectively, in the innovation adoption decision-making process.

The findings of this study imply that the organizations that employ individuals with low playfulness or individuals with high level of technology anxiety should be extra cautious in their approach to introducing new IT. Special training provisions, implementation of change agents, and introducing the new IT in phases may reduce the negative impact on adoption.

The findings also have strong implications for change management. Organizations, specifically those operating in highly dynamic environment and relying heavily on IT in business processes, have to continuously introduce and integrate emerging IT to maintain the competitive advantage. To be successful in managing this continual change, organizations have to employ people who are willing to change and embrace new IT. The findings suggest that the people with high level of playfulness and less technology anxiety are preferred candidates.

The data in this study was collected from a single organization. Efforts were made in the selection of the organization that the findings of the study would not be limited to this specific organization. The IT we chose—Windows 95—was also fairly common IT across majority of organizations. In addition, the study focus was on individual traits, attitudes, and intentions of end-users. To the extent that end-users are similar across organizations, the findings are likely to be generalizable to other end-users in other organization. However, the participating organization, like all organizations, had its own operational and cultural characteristics, which might have influenced the results. Some caution must be exercised in transferring the finding across different settings. A future study may also focus on other organizations and other IT to replicate or extend this study.

Using a questionnaire as the main data collection instrument lends itself to certain limitations. The length of a questionnaire might exhaust individuals' patience and tolerance and produce fatigue symptoms in respondents. As a result, attempts to finish the questionnaire may result in responses that might have been answered hastily. We attempted to minimize this via the pre-test phase where a sample of individuals were asked to give feedback regarding question ambiguity, length, and any other issues so as to be able to finalize the final questionnaire.

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