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User disposition and extent of Web utilization: A trait hierarchy approach

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Abstract

As it evolves, the World Wide Web (the Web) increasingly reveals the potential to enhance new aspects of our daily lives. While some take full advantage of the Web's diverse and cutting edge offerings, others choose to limit the extent of their utilization to a small subset of the Web's available functions. Recognizing this variation, a growing body of research investigates the drivers of usage behavior on the Web. Individual differences, namely broad personality and IT-specific traits, are highlighted within this stream as important predictors of Web use. Although substantial progress has been made, an important issue still facing trait research in this area is the absence of a theory-grounded basis for inter-relating broad personality and IT-specific traits. As a result, the accumulation of extant trait research is characterized by a disjointed assortment of trait constructs lacking clear theoretical linkages with one another. Additionally, while numerous studies have investigated isolated Web usage behaviors, an important outcome that remains under-investigated is the extent of an individual's utilization of the Web overall. Addressing these issues, the current study leverages the hierarchical view of traits to develop a theory-grounded, integrative model of broad personality and IT-specific traits. After developing the hierarchical model, the integrated network of traits is positioned as a direct antecedent of Web utilization and empirically tested via a two-stage field survey of 230 Web users. The results corroborate most of the hypotheses, providing support for the hierarchical view and extending the knowledge base on Web-user behavior. Overall, this study unifies disjointed personality and IT-specific trait constructs and offers theoretical guidance for future studies, introducing a much-needed ground for cumulative tradition within this stream.

Keywords: Trait hierarchy; Web utilization; IT-specific traits; Personality; Individual differences

1. Introduction

The World Wide Web (the Web) is capable of enhancing more aspects of our daily lives than ever before. Web 3.0 and Enterprise 2.0 are transforming the way many of us manage information and collaborate (McAfee, 2006). Meanwhile, governments, schools, and healthcare providers are progressively relying on the Web as a platform for delivering essential services (Agarwal et al., 2009). Despite the pace at which it is evolving, however, the benefits and advantages offered by the Web are not equally realized by everyone who uses it, as Web utilization patterns vary widely across the user base (Thatcher et al., 2007). To some, the Web is treated simply as a tool for getting the news or corresponding via email. For others the Web is an indispensible utility, impacting several aspects of their daily lives (Hoffman et al., 2004). Recognizing these differences, the pressing question for research on digital (in)equality is shifting from '*who can(not) find access to the Web?*', to '*what are people doing on the Web?*' (DiMaggio et al., 2004). Among the factors investigated by researchers addressing this latter question are individual differences, which have been highlighted as an important category of variables that predict user behavior on the Web (McElroy et al., 2007).

Individual differences refer to factors such as cognitive style, personality, and demographic variables that influence

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users' beliefs about and use of information technology (Agarwal and Prasad, 1998). A variety of individual difference factors have been incorporated into models, explaining user outcomes in the information technology (IT) domain. For Web usage in particular, personality—referring to the stable set of characteristics and tendencies that determines peoples' commonalities in thoughts, feelings, and actions—has been identified as an especially salient predictor, even over cognitive style (McElroy et al., 2007). A popular approach to describing personality-related differences in information systems (IS) is by way of traits, which capture enduring predispositions to respond to stimuli in a consistent manner (Thatcher and Perrewe, 2002).

Traits are fundamentally distinguished in IS as broad or IT-specific (Thatcher and Perrewe, 2002). Whereas broad traits do not account for differences attributable to the situational context, IT-specific traits are tuned to the computing context and other circumstances such as IT experience and training (Agarwal and Prasad, 1999). Given their generality, broad traits are capable of predicting a wide range of behaviors with moderate levels of accuracy; in contrast, IT-specific traits are highly accurate predictors within the IT context, but very poor predictors outside that context (Hampson et al., 1986). IT-specific traits are further distinguished as either stable or dynamic (Thatcher and Perrewe, 2002). Stable IT-specific traits represent static aspects of human behavior within the domain of IT, whereas dynamic IT-specific traits represent consistent responses to IT-specific stimuli but are more malleable over time (Chou and Chen, 2009). Dynamic traits are closer to performance outcomes and their influence on behavior may increase or decline through environmental factors, training, or other interventions (Thatcher and Perrewe, 2002; Chou and Chen, 2009).

Along with broad personality traits, four IT-specific traits (personal innovativeness in the domain of information technology (PIIT), computer playfulness, computer self-efficacy, and computer anxiety) have emerged as exhibiting consistent relationships with various user behaviors in the domain of IT (Venkatesh, 2000; Agarwal and Prasad, 1998; Hackbarth et al., 2003; Yi et al., 2006a, 2006b). Overall, the literature views PIIT and computer playfulness as stable IT-specific traits; and computer self-efficacy and computer anxiety as dynamic IT-specific traits (Thatcher and Perrewe, 2002). In research on individual Web usage, personality and IT-specific traits have been used to predict acceptance and use of a variety of isolated Web functions including social media, e-commerce, e-banking, and online learning (Picazo-Vela et al., 2010; Li and Chignell, 2010; Correa et al., 2010; Lian and Lin, 2008; Saade and Bahli, 2005). Overall, the cumulative findings highlight the predictive efficacy of traits in this context.

As evidenced above, substantial progress has been made in the IS literature toward understanding what people are doing on the Web and the role of traits in explaining why they do it. While this is the case, two key opportunities remain for extending this line of work. First, this stream of research currently lacks a theory-driven basis for modeling and inter-relating the current assortment of broad personality and IT-specific traits used to predict user behavior on the Web. As a result, the current state of research in this area can be characterized by a disjointed assortment of traits lacking clear theoretical linkages with one another. More integrative research is needed to understand the nomological network among personality and IT-specific traits that drive user behavior in this context (Thatcher and Perrewe, 2002; Jashapara and Tai, 2006; Marakas et al., 2007). Thus the opportunity exists to introduce a theoretical basis for integrating the current assortment of trait constructs, which could guide future research by providing a comprehensive nomological network of traits for positioning new constructs and laying the groundwork for a cumulative tradition within this stream.

Second, although much research has focused on isolated Web-application adoption and use decisions, the Web is a very complex technology that comprises a vast array of independent functions and applications. As a result, a clear understanding of user behavior on the Web cannot be achieved via simple measures of adoption and use. This notion is reflected in calls that have been made for studies that move beyond dichotomous adoption decisions or simple and shallow use (Chin and Marcolin, 2001) toward more integrative understanding of the various ways individuals apply complex technologies to their lives (Hsieh and Wang, 2007). As the functionality of the Web evolves and new Web applications continue to emerge and redefine this complex technology, an integrative approach to measuring Web usage is more appropriate. Accordingly, we examine the *extent of Web utilization* as an outcome, which goes beyond a dichotomous adoption decision involving a single Web site, and instead captures the pattern of an individual's usage behavior across the Web.

In an effort toward building a more integrated view of user disposition and Web usage behavior, the current research first develops a model of traits that brings together broad personality traits and IT-specific traits in a theory-grounded manner. Rooted in the hierarchical view of personality (Allport, 1961; Eysenck, 1947; Paunonen, 1998), a three-tier hierarchical model of traits in the IT domain is developed. Atop the hierarchy, the *cardinal* level comprises traits that capture the master qualities of the individual that form the foundation of behavior (Allport, 1961). One level closer to manifest behavior, the *central* level of the hierarchy comprises traits that are stable over time but are situation-specific, influenced by the interaction of cardinal traits and the broader (IT) context (Allport, 1961; Buss, 1989; Paunonen, 1998). At the lowest level of the hierarchy and closest to manifest behavior, the *secondary* level comprises traits that reflect consistent but malleable response patterns over time, influenced by the interaction of central traits and the immediate context (Allport, 1961; Borkenau and Muller, 1991; Buss, 1989; Mowen and Spears, 1999).

After developing the integrated hierarchical model of broad personality and IT-specific traits, an overarching research model that positions the trait hierarchy as a direct antecedent of the extent of Web utilization is constructed. A large field survey and partial least squares (PLS) estimation are used to confirm the research model. Overall, this study seeks to contribute to the research on individual differences and Web usage by developing a more integrative understanding of personality-based individual differences, and how the network of broad and IT-specific traits works to influence Web usage behavior.

2. Theoretical background

2.1. The hierarchical view of traits

Two related theoretical principles have strongly influenced the development of research on human traits in a number of reference disciplines including psychology, marketing, and management. The first principle asserts that traits differ from one another in a property called *breadth* (Hampson et al., 1986). Trait breadth captures the degree of specificity in which a given trait describes and summarizes individuals' observable behaviors and internal experiences, which can be accomplished at different levels (John, 1991; Hampson et al., 1986). More specifically, trait breadth captures the range of prototypical acts that are associated with the trait (Borkenau and Muller, 1991). Broader traits account for extended ranges of prototypical acts whereas narrower traits are much more limited in range of prototypical acts.

Because traits can account for individual and situational differences simultaneously (Woszczynski et al., 2002; Chou and Chen, 2009), trait breadth is largely a function of the degree of situational variance captured by the trait (Mowen and Spears, 1999). Situation-specific traits are considered narrower than broad traits because of the limited contextual scope in which the behavior manifests. For example, the broad trait openness to experience captures the tendency to be creative, imaginative, and intellectually curious (McCrae and Costa, 1997). Similarly, the IT-specific trait computer playfulness captures an individual's propensity toward intellectual curiosity and cognitive spontaneity in their interactions with technology (Webster and Martocchio, 1992). However, while both traits capture an individual's propensity toward creative and spontaneous behavior, the situational variance captured by computer playfulness limits the context and scope of prototypical acts representing the trait. As a result, openness is considered a broader trait than playfulness.

Extending the first theoretical principle, the second principle asserts that traits possessing different levels of breadth are *hierarchically* related, with broader traits driving variance in narrower situation-specific traits (Allport, 1961; Hampson et al., 1986). Taken further, personality scholars theorize that three hierarchical tiers of traits exist, distinguished along the lines of trait breadth (Allport, 1961; Buss, 1989; Mowen and Spears, 1999). Within the hierarchy, subordinate traits can have theoretical and empirical associations with more than one higher-level trait (Mowen and Spears, 1999); however, the effects of cardinal level traits on secondary traits should be fully mediated through central traits (Allport, 1961; Buss, 1989; Eysenck, 1947). The benefits of measuring users' dispositions at multiple hierarchical levels pertain to both understanding and predicting behavior (Costa and McCrae, 1995; Paunonen, 1998). Broad traits at the top of the hierarchy are necessary for representing a given domain of user disposition while situation-specific traits lower in the hierarchy maintain high diagnostic value (Buss, 1989). As a result, researchers advocate incorporating cardinal, central, and secondary traits together to better understand the underlying mechanisms of manifest behavior (Allport, 1961; Buss, 1989; Mowen and Spears, 1999).

2.2. The hierarchy of broad personality and IT-specific traits

Applying the hierarchical view of traits to the domain of IT, we propose a three-tier hierarchical structure among broad personality traits, stable IT-specific traits, and dynamic IT-specific traits. Broad, stable traits form the cardinal level of the hierarchy. Immediately under the cardinal level, the central level of the hierarchy comprises stable IT-specific traits. Finally, at the lowest level of the hierarchy, the secondary level comprises dynamic IT-specific traits. Together, the three hierarchical tiers form an integrated network of personality-based individual differences driving behavior in the domain of IT. Fig. 1 below presents an illustration of the hierarchy.

2.2.1. The cardinal tier: Broad personality traits

In one of the first works on identifying the cardinal tier of the trait hierarchy, Allport (1961) suggested that there may be between 5 and 10 cardinal traits. There is now considerable agreement among personality scholars that five global personality factors adequately summarize the domain of personality (McCrae and Costa, 1987). Each of the five factors reflects a different aspect of disposition,

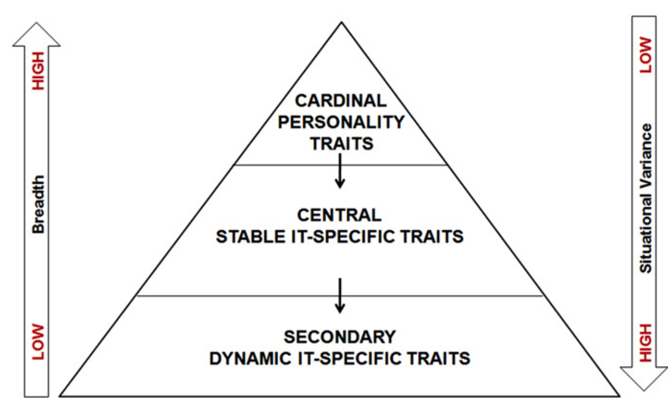


Fig. 1. Hierarchical model of personality and IT-specific traits.

while the five factors collectively capture the context-independent core of personality; therefore, we represent the cardinal level of the trait hierarchy via these five factors.

Neuroticism: Neuroticism captures the tendency to show poor emotional adjustment in the form of stress (Judge and Ilies, 2002). Neurotics are emotionally volatile, generally impulsive, and prone to experiencing fear and anxiety (Conte and Jacobs, 2003). In the IS literature, highly neurotic individuals have been described as prone to being nervous, moody, and easily irritated (Woszczynski et al., 2002).

Openness to experience: Openness to experience describes the extent to which individuals are intelligent, knowledgeable, creative, curious, and imaginative (Goldberg, 1992). Generally speaking, open individuals are not only able to grasp new ideas, but they enjoy the process (McCrae and Costa, 1997). Highly open individuals are characterized by needs for variety (Maddi and Berne, 1964) as well as for cognition and understanding (Jackson, 1984). They actively seek out new experiences motivated, at least in part, by the novelty of discovery (McCrae and Costa, 1997).

Conscientiousness: Conscientiousness reflects a sense of self-identity, and the choice to engage in behaviors that are consistent with one's own perceived identity (Hogan and Ones, 1997). As a result, conscientiousness leads to behaviors reflecting impulse control (Hogan and Ones, 1997), methodic tendencies, and cautiousness (Costa and McCrae, 1992). Conscientiousness is also associated with tendencies to be neat and organized (Conte and Jacobs, 2003).

Extraversion: Individuals scoring highly on extraversion are outgoing, adventurous, confident, and enthusiastic (Watson and Clark, 1997). While extraversion has been closely linked to an individual's social tendencies, more recent research suggests that this relationship is more complex (Lucas and Diener, 2001). Specifically, extraverts strongly prefer pleasant situations over unpleasant situations, regardless of the social nature of the situation (Lucas and Diener, 2001). Thus, extraverts enjoy all types of pleasant situations that accommodate adventurous, outgoing behavior.

Agreeableness: Like extraversion, agreeableness has a strong social component; however, agreeableness focuses on trusting and altruistic tendencies (Judge and Ilies, 2002). Qualities associated with agreeableness include being flexible, trusting, good-natured, and tolerant (Graziano and Eisenberg, 1990). Highly agreeable individuals tend to comply readily with the perceived norms in their social settings (Digman, 1989).

2.2.2. The central tier: Stable, IT-specific traits

In line with the hierarchical view, the central tier comprises stable traits that are tailored to the domain of IT, but are less idiosyncratic to specific configurations of the individual and situation (Webster and Martocchio, 1992). While important situational variance is captured by traits at this level, they are relatively stable over time (Thatcher and Perrewe, 2002; Jashapara and Tai, 2006). Two stable IT-specific traits consistently identified in the literature are PIIT and computer playfulness.

PIIT: The construct of PIIT is theoretically grounded in innovation diffusion theory (Rogers, 2003) and is defined as the willingness of an individual to try out any new information technology (Agarwal and Prasad, 1998). The items in the construct reflect an individual's likelihood and willingness of experimenting with (and thus experiencing) new technologies, as well as being an initial adopter. While PIIT is tailored to the IT context, the construct is conceptualized as "a relatively stable descriptor of individuals that is invariant across situational considerations" (Agarwal and Prasad, 1998, p. 206). Following past research (e.g., Agarwal and Prasad, 1998; Thatcher and Perrewe, 2002; Yi et al., 2006a), PIIT is conceptualized here as a stable, IT-specific descriptor that is not idiosyncratic to specific configurations of individual and technological factors.

Computer playfulness: Computer playfulness captures a user's propensity to interact spontaneously, inventively, and imaginatively while interacting with a computer (Webster and Martocchio, 1992). Individuals rating highly in computer playfulness are prone to experiencing cognitive spontaneity in their interactions with technology (Webster and Martocchio, 1992). As a stable IT-specific trait, playfulness represents a relatively static characteristic of the individual that slowly changes over time (Hackbarth et al., 2003; Yager et al., 1997).

2.2.3. The secondary tier: Dynamic, IT-specific traits

At the bottom of the hierarchy, the secondary tier comprises IT-specific traits that are relatively more idiosyncratic to specific configurations of the user and the situation (Allport, 1961; Buss, 1989; Mowen and Spears, 1999). These traits are closest to manifest behavior and tend to serve as summaries of users' internal experiences or behavioral outcomes while engaging IT. Moreover, these traits are more responsive to environmental factors such as training and experience, and can diminish or increase over time (Thatcher and Perrewe, 2002). Two well-researched dynamic IT-specific traits that we use to represent the secondary tier are computer anxiety and computer self-efficacy.

Computer anxiety: Computer anxiety represents the tendency for an individual to be apprehensive or fearful about current or future use of computer technology (Igbaria and Parasuraman, 1989; Thatcher and Perrewe, 2002). Theory and past research suggest that computer anxiety is a dynamic IT-specific trait in that it is influenced by stable traits and environmental factors (Marakas et al., 2000; Thatcher and Perrewe, 2002). Moreover, computer anxiety is receptive to increased experience with the technology and tends to be relatively malleable over time (Hackbarth et al., 2003).

Computer self-efficacy: Derived from social learning theory (Bandura, 1977), computer self-efficacy is an individual difference variable that captures an individual's judgment about his/her own competence with a computer (Compeau and Higgins, 1995). Like computer anxiety, computer self-efficacy is influenced by stable traits and the immediate environment, and can change over time as experience is gained (Marakas et al., 2007).

3. Research model

3.1. Overview

Leveraging the hierarchical view, the conceptual model guiding this research (Fig. 2) positions the trait hierarchy as an integrated set of dispositional factors influencing utilization. Following past research (Amiel and Sargent, 2004; McElroy et al., 2007), we position the network of traits as a direct driver of user behavior on the Web.

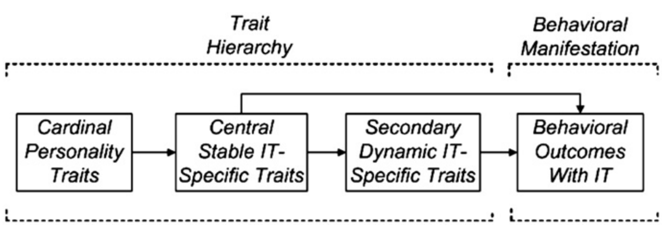


Fig. 2. Conceptual model.

Furthermore, the psychology literature suggests that the effects of stable differences on task performance are more indirect, through dynamic individual differences (Chen et al., 2000). Therefore, our application of the trait hierarchy underscores the partial mediating role of secondary IT-specific traits in this context.

The research model (Fig. 3) is derived from the conceptual model and positions the newly-developed trait hierarchy as a system of traits driving Web utilization. Prior studies on Web utilization have had limited success in understanding the role of individual traits, as utilization was assessed with regard to a single site (e.g., Yi and Hwang, 2003) or through a proxy measure such as behavioral intention (e.g., Agarwal and Prasad, 1998). Given the inclusive, integrative character of the trait hierarchy we examine in the present research and the complex nature of the Web, a more comprehensive measure of utilization is appropriate. Accordingly, the proposed model positions the extent of Web utilization—defined as post-adoptive behavior reflecting the extent to which an individual takes advantage of the various operational functions of the Web——as the dependent variable against which the effects of the three-tier traits are examined. Rooted in the post-adoption behavior literature (e.g., Hsieh and Wang, 2007; Lippert, 2007; Lippert and Forman, 2005; Thatcher et al., 2007), the construct epitomizes an individual user's collective adoption and usage decisions across the Web's portfolio of available functions. Accordingly, the construct is operative

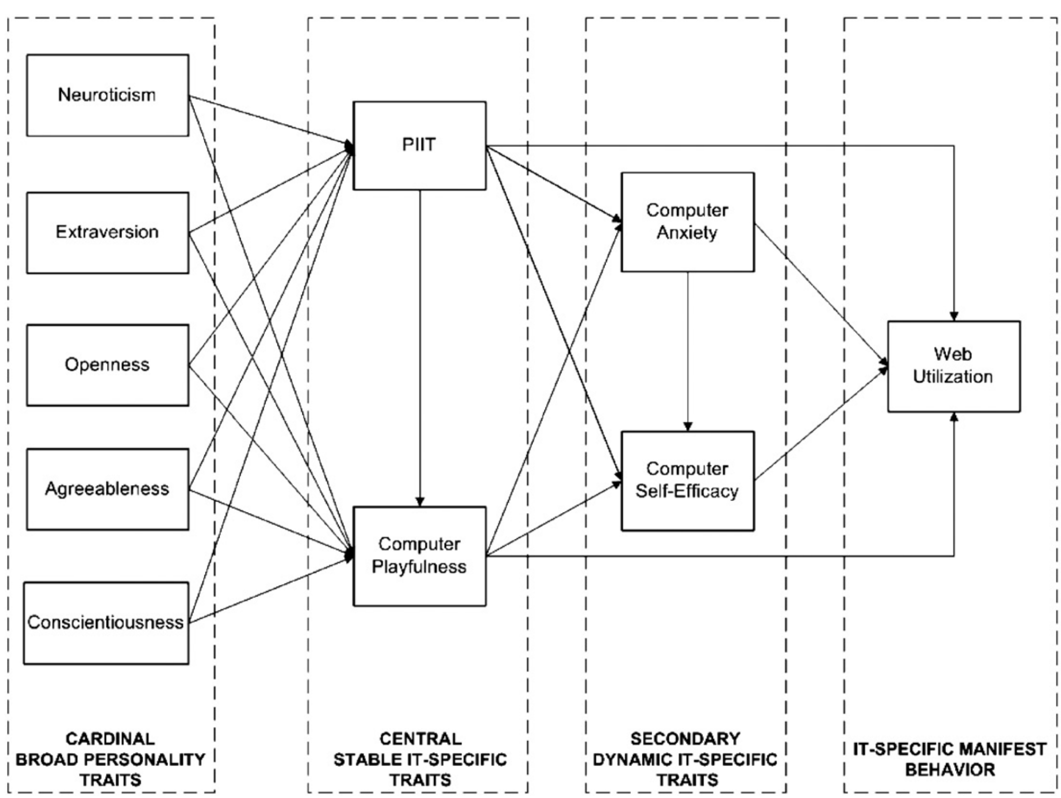


Fig. 3. Research model.

at the functional level, as opposed to application level (Lippert and Forman, 2005; McElroy et al., 2007).

3.2. Cardinal influences

3.2.1. Neuroticism

Given the predominant characteristics of highly neurotic individuals, neuroticism should have a direct negative influence on an individual's propensity to demonstrate innovative behaviors, captured by PIIT (Nov and Ye, 2008). Because highly neurotic individuals are more likely to become frustrated and insecure about uncertain, stressful situations, they will be less likely to cope with learning curves associated with new technologies, limiting any tendency toward innovativeness.

In addition to a negative influence on PIIT, neuroticism should have a direct negative influence on computer playfulness as well. Past psychology research has found a significant negative correlation between neuroticism and the playfulness trait (Paunonen, 1998). Given the similarity between the general trait playfulness and the IT-specific trait computer playfulness, it is likely that neuroticism has a similar influence on computer playfulness. Therefore, we expect the cardinal trait neuroticism to have a negative relationship with computer playfulness.

H1a. *Neuroticism has a negative effect on PIIT*

H1b. *Neuroticism has a negative effect on computer playfulness*

3.2.2. Openness to experience

Because open individuals tend to hold positive attitudes toward learning (Barrick and Mount, 1991), we expect that this cardinal trait will positively influence the propensity toward innovative behavior. Furthermore, the need for variety exhibited by open individuals can serve as motivation to engage in new innovations. Thus, we expect openness to have a direct positive influence on PIIT.

Similarly, openness to experience should also positively influence computer playfulness. Past research in psychology on the link between openness to experience and playfulness (Costa and McCrae, 1988) has found a strong correlation between the constructs. With its roots in playfulness, computer playfulness should similarly be influenced by openness to experience. The creative, curious, and imaginative behaviors exhibited by open individuals should manifest in the computing context as inventive and creative interaction with IT. Thus, it is plausible that openness to experience directly influences an individual's propensity to experience playful behaviors when interacting with IT (Woszczynski et al., 2002).

H2a. *Openness to experience has a positive effect on PIIT*

H2b. *Openness to experience has a positive effect on computer playfulness*

3.2.3. Extraversion

PIIT has a strong social dimension that should be influenced by extraversion. Rogers (2003) points out, "one motivation for many individuals to adopt an innovation is the desire to gain social status" (p. 230). Both extraversion and PIIT capture motivation toward social dominance; therefore, extraversion is expected to have a positive influence on PIIT. Furthermore, extraversion's roots in adventurous behaviors, both in and out of social situations, suggest that extraverts will be more likely to try out new technologies. As an outlet for adventurous behavior, new innovations are likely to appeal to extraverted individuals.

The same rationale can be applied to computer playfulness as well. Specifically, the outgoing and adventurous behaviors captured by extraversion should influence an individuals' predisposition toward spontaneous, inventive interaction with technology. Thus, we also expect that extraversion will have a positive effect on computer playfulness.

H3a. *Extraversion has a positive effect on PIIT*

H3b. *Extraversion has a positive effect on computer playfulness*

3.2.4. Agreeableness

There is a well-established linkage between trust and technology acceptance in the literature (Pavlou, 2003; Wang and Benbasat, 2005). More specifically, past research has directly related personal innovativeness with disposition to trust, following the rationale that both interpersonal constructs reflect confidence and optimism (McKnight et al., 2002). A major facet of the personality factor agreeableness is trusting disposition (Judge and Ilies, 2002); thus, it is reasonable to expect that agreeableness will have a direct impact on an individual's tendency to experiment with new, unfamiliar innovations. Following this rationale and past research, we expect agreeableness will have a positive influence on PIIT.

Individuals scoring highly on agreeableness should also tend to score highly on computer playfulness. The cheerful and cooperative disposition associated with the agreeable person should lead to more tolerance of the nuances of technology and difficulties encountered while using IT (Woszczynski et al., 1998). This tolerance should lead to more creative, spontaneous behaviors when interacting with technologies. As a result, we expect agreeableness to have a positive effect on computer playfulness.

H4a. *Agreeableness has a positive effect on PIIT*

H4b. *Agreeableness has a positive effect on computer playfulness*

3.2.5. Conscientiousness

Two important behavioral tendencies subsumed by conscientiousness are lack of spontaneity and tendency toward cautiousness (Costa and McCrae, 1992). The cautious, methodic behaviors associated with conscientiousness are in stark contrast with the highly innovative individual's tendency to demonstrate spontaneous, risky behaviors with technology. Because conscientious individuals prefer the predictable and safe over the spontaneous and risky, it is expected that conscientiousness has a direct negative influence on PIIT.

Similarly, conscientiousness goes against the cognitive spontaneity that underlies playfulness in individuals. The safe and deliberate approach captured by conscientiousness should have a negative influence on computer playfulness, as these users are more likely to avoid spontaneous, imaginative engagement of the Web. As a result, it is expected that conscientiousness has a direct negative influence on computer playfulness.

H5a. *Conscientiousness has a negative effect on PIIT*

H5b. *Conscientiousness has a negative effect on computer playfulness*

3.3. Central influences

3.3.1. PIIT

PIIT and computer playfulness share a common grounding in creativity and curiosity. As a result, it is plausible that a relationship exists between these two constructs. The competence and knowledge that characterize the innovative individuals should promote more spontaneous and creative usage behaviors after the technology has been adopted.

Because individuals rating highly in PIIT are more willing to tolerate risk (Agarwal and Prasad, 1998), they should be less likely to report general computer anxiety (Thatcher and Perrewe, 2002). Desire for the rash, daring, and risky when it comes to technology use is counter to the negative affective response associated with computer anxiety. As a result, individuals reporting lower levels of PIIT have less tolerance for risk and are less prone to having confidence about using technology overall (Chou and Chen, 2009; Thatcher and Perrewe, 2002).

Highly innovative individuals often possess advanced technical knowledge and skills (Rogers, 2003). These individuals are also more likely to seek out stimulating experiences, and demonstrate more confidence in their capacity to use a new technology (Agarwal et al., 2000; Thatcher and Perrewe, 2002). Thus, in the IS field, individuals who rate highly on PIIT tend to feel more confident about their IT capability independent of their experience (Chou and Chen, 2009; Thatcher and Perrewe, 2002).

In addition to its influence on secondary traits, PIIT is expected to bear direct influence on a user's extent of Web utilization. As it continually evolves, the Web provides a virtual playground for experimenting with new innovations. Highly innovative individuals are more likely to experiment with the diverse array of functions on the Web, and apply them to daily life. As a result, PIIT is expected to directly influence a user's extent of Web utilization.

H6a. *PIIT has a positive effect on computer playfulness*

H6b. *PIIT has a negative effect on computer anxiety*

H6c. *PIIT has a positive effect on computer self-efficacy*

H6d. *PIIT has a positive effect on Web utilization*

3.3.2. Computer playfulness

Research has empirically demonstrated that a negative correlation exists between computer playfulness and computer anxiety (Hackbarth et al., 2003). People partially rely on their state of physiological arousal in forming judgments of their level of anxiety or vulnerability to stress (Yi and Hwang, 2003). Individuals predisposed to exploring technologies and interacting spontaneously and imaginatively with technology should be more likely to enjoy the experience of engaging in technology, and ultimately demonstrate lower levels of computer anxiety (Jashapara and Tai, 2006). This rationale is consistent with the hierarchical view and leads us to expect a negative relationship between computer playfulness and computer anxiety.

Past research also indicates that an individual's capacity for cognitive spontaneity when interacting with computers is positively related to his/her efficacy beliefs (Webster and Martocchio, 1992). According to social learning theory (Bandura, 1977) and self-efficacy theory (Bandura, 1997), emotional arousal is an important source of self-efficacy formation. As a result, past research has linked enjoyment with self-efficacy formation (Yi and Hwang, 2003). Because computer playfulness provides a measure of an individual's hedonic predisposition in the use of information systems (Van der Heijden, 2004), it is conceivable that computer playfulness will similarly drive computer self-efficacy.

Computer playfulness should also have a positive influence on extent of Web utilization. Playful individuals tend to underestimate the risk involved in system use because they enjoy the process (Lee et al., 2007). Overall, users who generally enjoy using the Web are more likely to interact with a broader range of the Web's features. Therefore, computer playfulness is hypothesized to directly influence extent of Web utilization.

H7a. *Computer playfulness has a negative effect on computer anxiety*

H7b. *Computer playfulness has a positive effect on computer self-efficacy*

H7c. *Computer playfulness has a positive effect on Web utilization*

3.4. Secondary influences

3.4.1. Computer anxiety

According to social learning theory (Bandura, 1977), physiological state is one of the major sources of self-efficacy. People sense their own emotional arousal and physical reactions in stressful situations, and these factors partially impact the judgment of their capability in successfully coping with the situation. In the computing context, individuals who are anxious about using the various features of a computer will be less likely to believe themselves as capable of using a computer to accomplish their tasks (Chou and Chen, 2009; Thatcher and Perrewe, 2002; Thatcher et al., 2007). Therefore, we expect computer anxiety to have a negative direct impact on computer self-efficacy.

Computer anxiety has been shown to inflate an individual's fear or apprehension experienced while using the Web (Thatcher et al., 2007). Users who are anxious about using the Web are more likely to limit their exposure to the unknown aspects of the Web in order to reduce any negative affect. While anxiety levels can change over time with increased experience (Hackbarth et al., 2003), we expect the negative influence of computer anxiety on Web utilization to remain consistent. Therefore, we hypothesize:

H8a. *Computer anxiety has a negative effect on computer self-efficacy*

H8b. *Computer anxiety has a negative effect on Web utilization*

3.4.2. Computer self-efficacy

Higher levels of self-confidence with IS use can influence interaction with the Web and lead to more active engagement of the Web's advanced features and applications. Self-efficacy theory (Bandura, 1997) views the percept of self-efficacy as a key regulatory mechanism in guiding human behaviors and higher levels of self-confidence as a precondition for acquiring sub-skills underlying the behavioral accomplishments. Past research shows that higher levels of computer self-efficacy lead to more favorable attitudes toward the Web (Durndell and Haag, 2002). Favorable attitudes can encourage deeper exploration of the Web's available features and consequently increase Web utilization. These notions are supported by past research that has found significant effects of computer self-efficacy on actual use of a Web-based system (Yi and Hwang, 2003). Therefore, we expect computer self-efficacy to have a positive effect on Web utilization.

H9a. *Computer self-efficacy has a positive effect on Web utilization*

4. Research methodology

4.1. Sampling frame

The sampling frame for this study comprised of working professionals enrolled in full-time and part-time MBA programs at a large research university in the eastern United States. These individuals are highly representative of individuals exposed to the Web's various functions inside and outside the workplace, and should be aware of its vast offerings. Furthermore, these individuals likely have the resources and inclination to engage in many of the routine behaviors facilitated by the Web, such as e-commerce activities, online learning, social networking, etc.

4.2. Survey procedure

A two-phase survey approach incorporating a two-week time lag between phases was used to collect the data. The first phase of data collection began with measures of user demographics and the big five factors of personality. Measures of neuroticism, openness, conscientiousness, extraversion, and agreeableness were captured using the 10-item marker scales from Goldberg's (1999) international personality item pool (IPIP), which has demonstrated high convergent and low discriminant correlations with other well-known proprietary markers (Lim and Ployhart, 2006). The IPIP scales are widely used in the psychology and organizational behavior literatures, and provide an effective low-cost alternative to proprietary measures of personality (Goldberg, 1999; Lim and Ployhart, 2006). The first-phase survey concluded with measures of PIIT (Agarwal and Prasad, 1998), computer playfulness (Webster and Martocchio, 1992), computer self-efficacy (Compeau and Higgins, 1995), and computer anxiety (Hackbarth et al., 2003).

In the second-phase survey, measures of Web utilization were captured. Following past studies on IT utilization (Lippert, 2007; Lippert and Forman, 2005), Web utilization was measured in terms of how frequently respondents' usage of the Web was geared toward accomplishing different tasks. Common tasks frequently accomplished via the Web include email/communications, gathering news and information, and buying and selling products and services, etc. (Hoffman et al., 2004). Recognizing that multiple Web applications exist for accomplishing each of these tasks, each of the survey items focused on the task accomplished, rather than a specific Web application used (Lippert and Forman, 2005). Seven main tasks that are commonly accomplished via the Web were identified and incorporated into the scale. Each task captures a distinct functional use of the Web while these seven items collectively measure the extent of Web utilization (Table 1). Because Web utilization is conceptualized as the composite of unique Web function adoption decisions and these decisions do not need to be necessarily highly correlated, Web utilization was modeled as a formative construct (Bollen and Lennox, 1991; Petter et al., 2007; Yi and Davis, 2003).

Of the 414 invited to participate in the survey 260 returned usable first-round responses. Following the two week time window, these 260 participants were subsequently invited to participate in the second-round survey. A total of 230 second-round surveys were returned complete, resulting in an overall response rate of 56%. A detailed breakdown of respondents' characteristics is provided in Table 2.

Table 1
Measurement items.

Construct/source	Item
Conscientiousness Goldberg (1999) 7-point Likert scale anchored by *Very Inaccurate* and *Very Accurate*	*How accurately does each statement describe you?* *Am always prepared.* Pay attention to details. Get chores done right away. Like order. Follow a schedule. Am exacting in my work. Leave my belongings around. Make a mess of things. Often forget to put things back in their proper place. Shirk my duties.
Neuroticism Goldberg (1999) 7-point Likert scale anchored by *Very Inaccurate* and *Very Accurate*	*How accurately does each statement describe you?* *Am relaxed most of the time.* Seldom feel blue. Get stressed out easily. Worry about things. Am easily disturbed. Get upset easily. Change my mood a lot. Have frequent mood swings. Get irritated easily. Often feel blue.
Openness to experience Goldberg (1999) 7-point Likert scale anchored by *Very Inaccurate* and *Very Accurate*	*How accurately does each statement describe you?* *Have a rich vocabulary.* Have a vivid imagination. Have excellent ideas. Am quick to understand things. Use difficult words. Spend time reflecting on things. Am full of ideas. Have difficulty understanding abstract ideas. Am not interested in abstract ideas. Do not have a good imagination.
Extraversion Goldberg (1999) 7-point Likert scale anchored by *Very Inaccurate* and *Very Accurate*	*How accurately does each statement describe you?* *Am the life of the party.* Feel comfortable around people. Start conversations. Talk to a lot of different people at parties. Don't mind being the center of attention. Don't talk a lot. Keep in the background. Have little to say. Don't like to draw attention to myself. Am quiet around strangers.
Agreeableness Goldberg (1999) 7-point Likert scale anchored by *Very Inaccurate* and *Very Accurate*	*How accurately does each statement describe you?* *Am interested in people.* Sympathize with others' feelings. Have a soft heart. Take time out for others. Make people feel at ease. Feel others' emotions.[**] Feel little concern for others.[**] Insult people.[**] Am not interested in other people's problems.[**] Am not really interested in others.[**]
PIIT Agarwal and Prasad (1998) 7-point Likert scale anchored by *Strongly Disagree/Strongly Agree*	If I heard about a new information technology, I would look for ways to experiment with it. Among my peers, I am usually the first to try out new information technologies.

Table 1 (*continued*)

Construct/source	Item
	In general, I am hesitant to try out new information technologies. I like to experiment with new information technologies.
Playfulness Webster and Martocchio (1992) 7-point Likert scale anchored by *Strongly Disagree* and *Strongly Agree*	*In general, when I interact with the World Wide Web, I feel….* Spontaneous Unimaginative Flexible Creative Playful Unoriginal Uninventive
Computer anxiety Chua et al. (1999) 7-point Likert scale anchored by *Strongly Disagree* and *Strongly Agree*	A computer does not scare me I have lots of self-confidence when it comes to working with a computer I get a sinking feeling when trying to use a computer I would feel comfortable working with a computer Generally, I feel okay about trying new features of a computer I am no good with a computer I am not the type to do well with a computer I do not feel threatened when others talk about computers
Computer self-efficacy Compeau and Higgins (1995) 7-point Likert scale anchored by *Strongly Disagree* and *Strongly Agree*	*I could accomplish the task…* …if there were someone giving me step by step instructions …if there were no one around to tell me what to do as I go …if I had only the manuals for reference …if I had seen someone else doing the task before trying it myself …if I could call someone for help if I got stuck …if someone else had helped me get started. …if I had a lot of time to complete the task …if I had only the built-in help facility for assistance …if someone showed me how to do it first …if I had used a similar system before to do the same task**
Web utilization 7-point Likert scale anchored by *Very Infrequently* and *Very Frequently*	*How frequently is your use of the World Wide Web geared toward…* …researching/evaluating products or services? …buying products or services? …selling products or services? …personal/professional social networking? …catching up on the news? …managing personal finances? …finding specific information for business needs?

**Item dropped from the analysis due to non-significant ($p > .05$) loading.

5. Data analysis

Given the theory-building nature of the current study and the large number of items associated with the personality constructs in the model, the PLS estimation technique (Chin, 1998), as applied in the software package SmartPLS version 2.0.M3 (Ringle et al., 2005), was used to assess the measurement and structural models. PLS uses a component-based approach to analyzing structural models with multi-item latent constructs (Chin, 1998; Gefen et al., 2000), is capable of estimating complex models with both formative and reflective constructs, and is an appropriate

Table 2
Respondents' characteristics.

Please indicate the age range that applies to you.	**Response rate (%)**	**How many years of experience do you have working with computers?**	**Response rate (%)**
20–29	53.91	5 years or less	53.48
30–39	29.57	6–10 years	28.26
40–49	10.88	More than 10 years	18.26
50 or older	5.64		
Please indicate your gender.	**Response rate (%)**	**How many hours per week do you spend using the World Wide Web?**	**Response rate (%)**
Male	57.39	Under 10 h/week	7.40
Female	42.61	10–19.9 h/week	42.17
		20–29.9 h/week	21.74
		30–40 h/week	16.52
		Over 40 h/week	12.17

Table 3
Construct means, standard deviations, and internal consistencies.

Construct	Mean	StDev	α-Value	Composite reliability
Openness	4.40	0.76	0.90	0.91
Neuroticism	2.13	0.83	0.93	0.94
Extraversion	4.12	1.19	0.96	0.95
Agreeableness	4.08	0.60	0.80	0.85
Conscientiousness	4.18	0.95	0.90	0.92
PIIT	4.75	1.39	0.90	0.93
Computer self-efficacy	5.40	1.23	0.95	0.95
Computer anxiety	1.56	0.73	0.88	0.91
Playfulness	5.08	0.92	0.86	0.90

technique for theory building (Chin et al., 2003). It has been suggested that the PLS algorithm used to analyze the data in the present study requires at least 10 times as many data points as the maximum number of indicators in the most complex construct or the maximum number of latent constructs leading to a given latent construct (Gefen et al., 2000). The data set used to empirically test the conceptual model of the present study exceeds this requirement.

5.1. Measurement model results

For the Web utilization construct, which was conceived as formative, the validation steps prescribed by Petter et al. (2007) were followed to ensure that the measurement items were psychometrically sound. Specifically, we assessed construct validity by conducting principal component analysis to examine the item weightings. The results of principal components analysis indicated all formative items had significant weights on the latent construct, as reported in Table 4. In addition, variance inflation factor (VIF) analysis was conducted for each of the items in the model (Petter et al., 2007). VIFs were calculated using SPSS version 16 for Windows by regressing the items for Web utilization on the remaining items in the model. Petter et al. (2007), as well as Diamantopoulos and Siguaw (2006) recommend a conservative cutoff value of 3.3, with values of VIF that exceed10 indicating a multicollinearity problem. The results of VIF analysis indicated no problems of multicollinearity in the data.

For the reflective constructs in the model, the psychometric properties of the measures were assessed by examining internal consistency reliabilities, and convergent and discriminat validities (Gefen and Straub, 2005; Yi and Davis, 2003). Internal consistency reliability, which is concerned with how well the measurement items of a given latent construct fit together, was assessed using Cronbach's alpha and composite reliability scores. As depicted in Table 3, all of the reflective constructs in the model met and exceeded the suggested cutoff of .7 for Cronbach's alpha and composite reliability (Nunnally, 1978; Straub et al., 2004), indicating adequate internal consistency reliability.

The PLS approach to confirmatory factor analysis (CFA), as outlined by Gefen and Straub (2005), was employed to assess the convergent and discriminant validities of the reflective measures in the model. Convergent validity is concerned with how strongly each measurement item correlates with its assumed theoretical construct (Gefen and Straub, 2005). In contrast to covariance-based SEM approaches, which compare item loadings to prespecified cutoff values, adequate convergent validity is demonstrated in the PLS approach to CFA when each of the measurement items loads significantly ($p < .05$) on its intended latent construct (Gefen et al., 2000; Gefen and Straub, 2005). As illustrated in Table 4, although the constructs were measured using established and validated scales, five items of agreeableness and one item of computer self-efficacy showed nonsignificant loading scores. As a result, these items were removed in subsequent analysis. All the other measurement items show significant loading scores.

In contrast to convergent validity, discriminant validity is concerned with how different the latent constructs in the model are from each other. Discriminant validity was assessed by comparing the loading of each measurement item on its intended construct, with that item's loading on every other factor in the model. The cross loadings matrix provided by SmartPLS was used for this analysis, and all retained items loaded higher on their intended constructs by multiple magnitudes than on any other factor in the model, demonstrating good discriminant validity (Gefen and Straub, 2005). Further testing of discriminant validity was accomplished via average variance extracted (AVE) analysis, which involved examining whether the square root of the AVE for each construct was larger than the inter-construct correlations (Fornell and Larcker, 1981). As illustrated in Table 5, all constructs in the model shared more variance with their indicators than with any of the

Table 4
Item loadings/weights and significance levels.

OPN			NEU			EXT			AGR			CON		
Item	Load	t-Val	Item	Load	t-Val	Item	Load	t-Val	Item	Load	t-Val	Item	Load	t-Val
OPN1	0.66	12.36	NEU1	0.57	7.41	EXT1	0.85	7.17	AGR1	0.70	2.39	CON1	0.73	5.74
OPN2	0.55	6.18	NEU2	0.77	19.16	EXT2	0.77	7.34	AGR2	0.75	2.27	CON2	0.50	2.97
OPN3	0.67	13.39	NEU3	0.82	26.16	EXT3	0.83	4.07	AGR3	0.75	1.96	CON3	0.77	4.67
OPN4	0.76	19.47	NEU4	0.76	17.18	EXT4	0.85	4.29	AGR4	0.60	2.48	CON4	0.66	4.03
OPN5	0.80	17.50	NEU5	0.78	18.34	EXT5	0.85	4.18	AGR5	0.82	2.05	CON5	0.83	9.20
OPN6	0.84	22.24	NEU6	0.82	23.42	EXT6	0.84	4.77	AGR6	0.01	0.03	CON6	0.84	8.72
OPN7	0.79	16.88	NEU7	0.84	24.77	EXT7	0.77	3.61	AGR7	0.14	0.37	CON7	0.82	8.83
OPN8	0.82	21.30	NEU8	0.84	28.94	EXT8	0.82	3.86	AGR8	0.17	0.04	CON8	0.56	5.81
OPN9	0.75	14.41	NEU9	0.78	19.18	EXT9	0.81	3.64	AGR9	0.06	0.15	CON9	0.71	7.27
OPN10	0.77	15.78	NE10	0.77	11.51	EXT10	0.82	3.97	AG10	0.10	0.29	CON10	0.82	9.40
PIIT			CSE			CA			PLAY			UTIL		
Item	Load	t-Val	Item	Load	t-Val	Item	Load	t-Val	Item	Load	t-Val	Item	Weight	t-Val
PIIT1	0.91	47.08	CSE1	0.88	11.80	CA1	0.75	4.85	PLA1	0.69	7.46	RES	0.48	2.98
PIIT2	0.86	28.48	CSE2	0.91	13.65	CA2	0.87	10.25	PLA2	0.74	5.77	BUY	0.62	2.77
PIIT3	0.81	11.93	CSE3	0.90	13.61	CA3	0.64	4.48	PLA3	0.75	8.58	SELL	0.36	3.60
PIIT4	0.91	32.16	CSE4	0.87	16.39	CA4	0.87	10.00	PLA4	0.79	9.09	SOC	0.62	4.01
			CSE5	0.82	9.48	CA5	0.79	8.40	PLA5	0.67	8.79	NEWS	0.59	2.27
			CSE6	0.73	7.64	CA6	0.78	6.32	PLA6	0.77	5.45	FINA	0.61	4.96
			CSE7	0.84	12.39	CA7	0.78	5.50	PLA7	0.78	5.70	BUS	0.44	3.67
			CSE8	0.72	10.21	CA8	0.46	3.86						
			CSE9	0.86	12.65									
			CSE10	0.34	1.86									

Notes. Weights are presented for measurement items of the UTIL construct as it is conceptualized as a formative in nature. The items in shaded cells were removed from scales due to non-significant loadings ($p > .05$); OPN=openness; NEU=neuroticism; EXT=extraversion; AGR=agreeableness; CON=conscientiousness; PIIT=personal innovativeness in IT; CSE=computer self-efficacy; CA=computer anxiety; PLAY=computer playfulness; UTIL=Web utilization.

Table 5
Correlations and discriminant validities among latent constructs.

	OPN	NEU	CON	EXT	AGR	PIIT	CA	CSE	PLAY	UTIL
OPN	0.71									
NEU	−0.04	0.77								
CON	0.38	−0.04	0.73							
EXT	0.52	−0.08	0.39	0.81						
AGR	0.06	−0.14	0.06	0.22	0.73					
PIIT	0.24	−0.11	−0.17	0.19	0.13	0.87				
CA	−0.17	0.19	0.17	−0.09	−0.05	−0.51	0.75			
CSE	0.30	−0.13	−0.02	0.18	0.02	0.57	−0.58	0.84		
PLAY	0.22	−0.13	−0.02	0.11	0.23	0.48	−0.43	0.36	0.74	
UTIL	0.31	0.13	0.14	0.22	0.02	0.30	−0.19	0.43	0.27	0.71

Notes. The numbers on the diagonal (in shaded cells) are the square root of the variance shared between the constructs and their measures. Off diagonal elements are correlations among constructs. For discriminant validity, diagonal elements should be larger than off-diagonal elements. OPN=openness; NEU=neuroticism; CON=conscientiousness; EXT=extraversion; AGR=agreeableness; PIIT=personal innovativeness in IT; CA=computer anxiety; CSE=computer self-efficacy; PLAY=computer playfulness; UTIL=Web utilization.

other constructs, further indicating good discriminant validity. Overall, the results of testing indicated that the psychometric properties of the measurement model are sufficiently strong for valid testing of the proposed structural model.

5.2. Testing for common method variance

Because the trait variables were measured together, it is possible for common method variance (CMV) to have influenced the measurement outcomes. Testing for CMV was first conducted using Harman's one-factor test (Podsakoff and Organ, 1986). All items for cardinal, central, and secondary traits were included in a principal components factor analysis. Substantial method variance is signaled by the emergence of either a single factor or one factor that explains a majority of the total variance accounted for (Podsakoff et al., 2003). The results revealed multiple factors, with no single factor accounting for the majority of the variance in the data (first factor accounting for 14.5% of variance), indicating that problems associated with common method variance are not significant (Podsakoff and Organ, 1986).

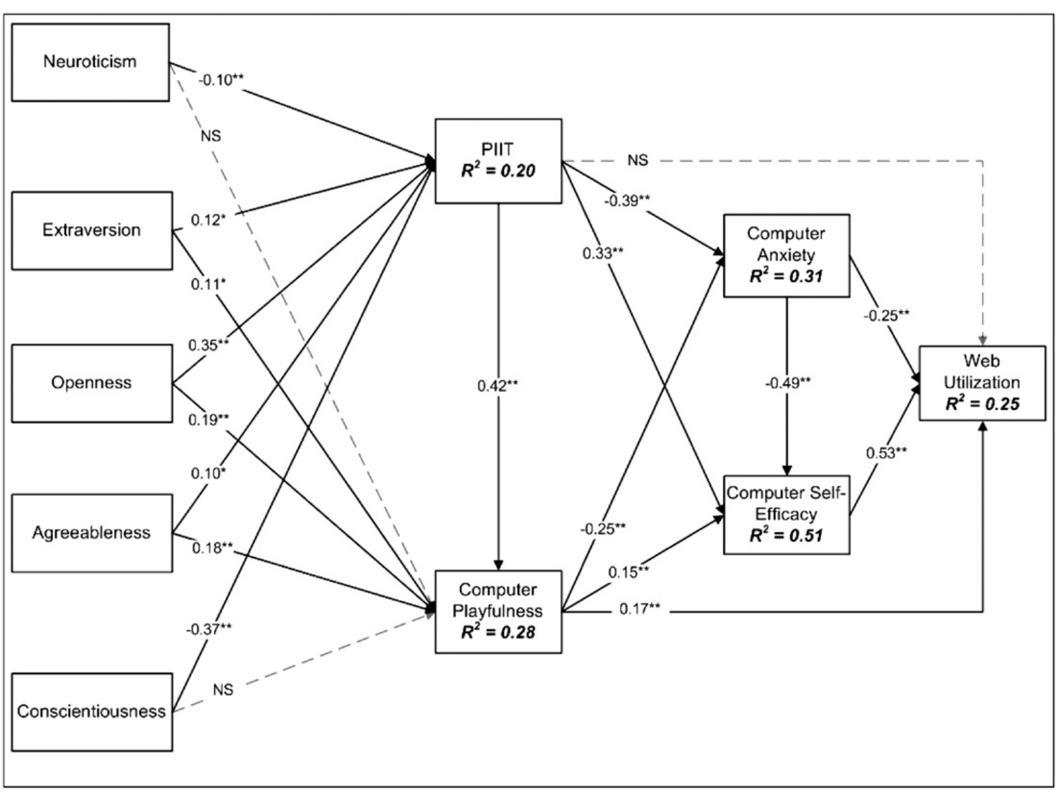
A second test of CMV was conducted using the PLS approach as outlined by Liang et al. (2007) and Vance et al. (2008). In this analysis, each reflective indicator is converted into a single-indicator construct, which is linked to the original construct as well as a CMV factor. Squared values of factor loadings are interpreted as percentage of indicator variance explained by that factor. If CMV factor loadings are insignificant and substantive factors account for substantially more variance explained than the CMV factor, it can be concluded that CMV is unlikely a serious concern (Liang et al., 2007). From this analysis, of the 80 paths from the CMV factor to single-indicator constructs only 8 were significant; meanwhile, all of the substantive factor loadings were significant at $p < .01$. The average of the substantively explained variance of the indicators was .60 and the average method-driven variance was less than .01. As a result, it was determined that common method variance was not a serious concern.

5.3. Structural model results

Assessment of the structural model was accomplished by examining standardized path coefficients and the variance explained in the dependent constructs, as derived from a bootstrapping procedure (Chin, 1998). SmartPLS does not calculate any goodness-of-fit values. Rather, path coefficients and R^2 values are evaluated to assess model validity (Gefen et al., 2000). As illustrated in Fig. 4, the results provide support for all but three (H1b, H5b, H6d) of the study's hypotheses.

5.4. Formal testing for mediation

To further examine the mediating role of secondary traits in the hierarchy, formal testing of mediation was conducted following the procedure outlined by Baron and Kenny (1986). This approach to mediation testing compares three competing models: one relating the independent variable to the mediator(s); another relating the independent variable to the dependent variable; and an integrative one relating the independent variable and mediator(s) to the dependent variable (Baron and Kenny, 1986). Mediation is established when (1) the independent variable significantly affects the mediator(s) in the first equation, (2) the independent variable significantly affects the dependent variable in the second equation, and (3) the mediator significantly affects the dependent variable while the previously significant effect of the independent variable



Notes: * path significant at p < .05; ** path significant at p < .01; ' NS' indicates non-significant path

Fig. 4. Structural model results. *Notes*: * path significant at $p < .05$; ** path significant at $p < .01$; ' NS' indicates non-significant path.

on the dependent variable becomes no longer significant or substantially decreases in the third equation.

The statistical method for testing multiple mediators is a straightforward extension of the single mediator case, and mediators can be tested individually or simultaneously (MacKinnon, 2000). One advantage of testing multiple mediators simultaneously is the ability to determine whether the effects of each mediator are independent of the other mediators' effects. Thus, for this analysis we tested multiple mediators simultaneously. Two separate multiple-mediation tests were conducted—one for each of the central tier traits—positioning computer anxiety and computer self-efficacy as mediators between the central tier and Web utilization. Fig. 5 below presents the results of each test. Overall, the results of multiple mediation testing are in line with past research (Chen et al., 2000) supporting the mediating role of the secondary tier of the hierarchy. More specifically, the results of model testing here suggest that the secondary traits of computer anxiety and computer self-efficacy fully mediate the influence of PIIT on Web utilization; but serve as partial mediators between computer playfulness and Web utilization.

6. Discussion

A primary objective of this study was to apply the hierarchical view of traits to the IS literature and develop an integrated view of broad personality, and stable and dynamic IT-specific traits. In doing so, this study responds to calls for more integrative research on the nomological network among individual differences that drive user behavior in the IT domain (Jashapara and Tai, 2006; Marakas et al., 2007; Thatcher and Perrewe, 2002). While several past IS studies have examined isolated subsets of user traits and subsequent Web usage behaviors, this is the first study to our knowledge that establishes and empirically tests a theory-grounded basis for systematically integrating personality and IT-specific traits in research models predicting user behavior.

Consistent with the hierarchical view, this study highlighted two distinct routes through which the broad personality traits influence IT-specific traits, depending on whether the IT-specific traits are stable or dynamic. Specifically, the results suggest that broad personality traits bear direct influence on stable IT-specific traits and indirectly influence dynamic IT-specific traits, through stable IT traits. Overall, these results build on past research but highlight another important difference between stable and dynamic IT-specific traits.

In addition to addressing the overarching relationships between broad personality and IT-specific traits, this study extends the knowledge base on the deeper psychological foundations of two important IT-specific traits—PIIT and computer playfulness. Extending the work of Nov and Ye (2008) who linked openness to PIIT, this study examined the influence of the other four personality factors on PIIT. Overall, the significant results highlight the social, cognitive, and affective aspects of this complex construct.

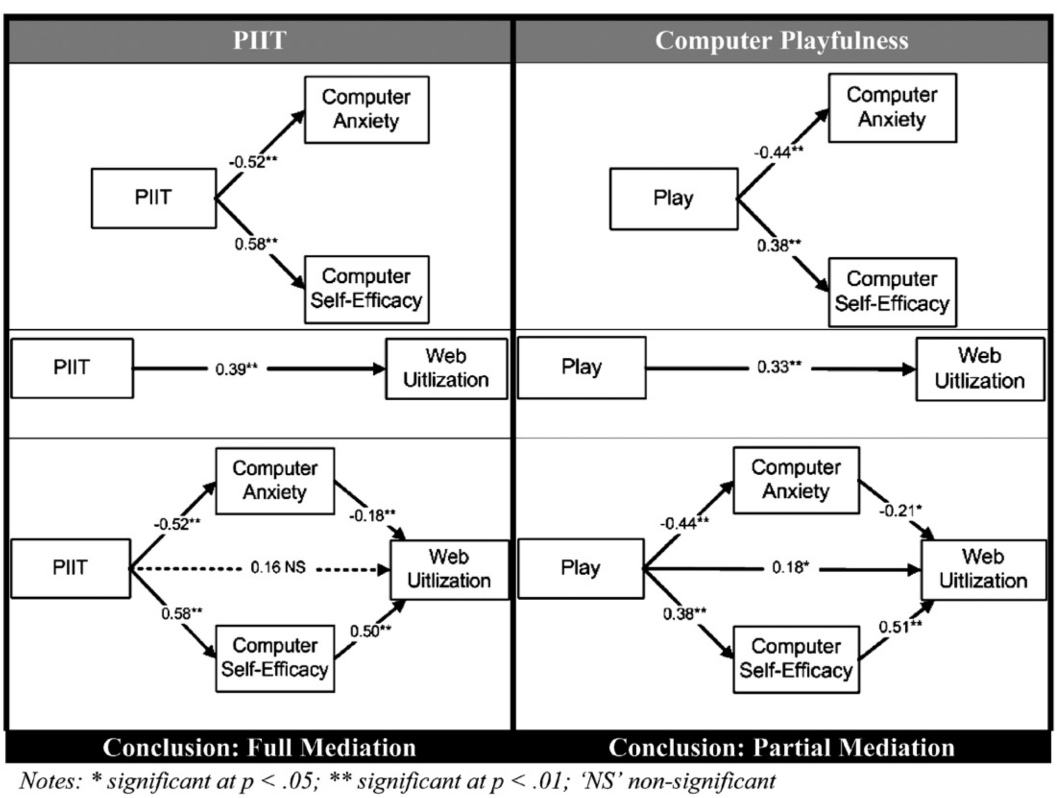


Fig. 5. Multiple mediation testing results. *Notes*: * significant at $p < .05$; ** significant at $p < .01$; 'NS' non-significant.

Inconsistent with hypothesis H6d, PIIT was not found to have a direct effect on Web utilization over and above the effects of the mediators in the model. Although PIIT did not have a significant effect on Web utilization in the presence of computer playfulness, computer anxiety, and computer self-efficacy, it did have a significant effect on each of these three variables, thus influencing Web utilization through its indirect effects. Formal mediation testing further confirmed that PIIT did not have any significant effect on Web utilization above and beyond the secondary mediators. The results collectively show that PIIT is a distal determinant of Web utilization, echoing the findings of Yi et al.'s study (2006a, 2006b) on the effect of PIIT on user acceptance of technology. Yi et al.'s study (2006a, 2006b) used a different set of mediators in examining the effect of PIIT on user intention to use a technology but found also that PIIT didn't have a significant direct effect in the presence of those mediators.

Furthermore, this study is the first to our knowledge to examine the deeper psychological foundation of computer playfulness. To our surprise, the largely social factors of agreeableness, extraversion, and openness were significantly related to computer playfulness but the more internal factors of neuroticism and conscientiousness were not. Computer playfulness is rooted in the psychological trait playfulness (Webster and Martocchio, 1992), which depicts a multi-faceted construct encompassing five dimensions—cognitive spontaneity, social spontaneity, physical spontaneity, manifest joy, and sense of humor (Martocchio and Webster, 1992). While the development of computer playfulness is primarily rooted in the cognitive spontaneity dimension of this psychological trait (Webster and Martocchio, 1992; Martocchio and Webster, 1992), our results suggest that there is a substantial social dimension of computer playfulness that can outweigh the cognitive aspects of the trait. Future research is invited that further explores the psychological roots of the computer playfulness construct.

The second main objective of this research was to gain deeper understanding of Web usage behavior by presenting an integrated measure of Web use that considers the broad spectrum of independent functions offered by the Web. Specifically, we linked user disposition to the extent of Web utilization, which reflects an individual user's collective adoption and usage decisions across the Web's broad portfolio of available functions. In doing so, we followed past calls for research that moves beyond simple and shallow use, toward more complete understanding of the various ways individuals apply complex technologies to their lives (Hsieh and Wang, 2007).

Overall, the results provide new insights into how broad personality traits and IT-specific traits jointly influence Web utilization. Consistent with the hierarchical view, the results of this study suggest that IT-specific traits mediate the influence of personality traits on the extent of Web utilization. Further, this research has found that dynamic IT-specific traits mediate the effect of stable IT-specific traits on Web utilization. Formal mediation testing confirmed this mediating role. Taken together, the findings are in line with past psychology research, which suggests that broad, stable individual differences are more distant from task performance and the effects of stable differences on task performance are more indirect through dynamic individual differences (Chen et al., 2000). Future research models incorporating these different classes of traits should be cognizant of the hierarchical relationships among them.

The findings from this research hold important practical implications as well. Recent IS research indicates that users respond in a human-like manner to social cues exhibited by computer applications, and perceived personality similarity between the user and the system can have important impacts on usage behavior (Al-Natour et al., 2006; Hess et al., 2005; Hess et al., 2009). Building on this work, our study develops a more-complete understanding of the structure of personality, enabling more precise engineering of social cues within Web sites. With broader understanding of personality and *how* traits jointly influence user behavior, designers can be more precise in exhibiting desired personalities and social cues, encouraging trust, and deeper user involvement with the decision aide.

Taken further, this research presents one of the most complete profiles of personality as it relates to broad Web utilization. Users that currently apply a diverse set of the Web's offerings to their daily lives should be more apt to accept and use new Web-based innovations. By uncovering this dispositional profile, the findings of this study can aid Web designers in promoting diffusion of their Web-based innovations by targeting a dispositional profile that is more apt to incorporate them into daily life. Extending the work on personality similarity and social presence (Al-Natour et al., 2006; Hess et al., 2005, 2009), this study uncovers the key personality-based influences in a segment of users proven to accept and use a wide variety of the Web's offerings, thereby equipping Web designers with knowledge about *which* traits and social cues to exhibit in their sites to create perceived personality similarity with this group. For example, the results suggest that more dominant traits influencing usage of a wide variety of the Web's applications are openness to experience and extraversion. Meanwhile, neuroticism has generally a very low, negative influence on this behavior. These results suggest that social cues exuding adventurous, creative, and expressive behavior will be more effective at retention than cues tailored toward reducing anxiety or conscientiousness.

7. Limitations and future research

In light of the findings garnered from this study, certain limitations of this work should be pointed out. First, this study employed an MBA student sample to test the research model, which can sometimes limit the generalizability of the findings. However, provided this study's focus on Web utilization an MBA student sample should not be seen to attenuate the results. Specifically, these Web users are highly likely to possess the resources and inclination to engage in many routine behaviors that can be facilitated by the Web. It is also possible that MBA students will present a relatively homogeneous dispositional profile, influencing the results. While this is possible, calculated means and standard deviations of the construct scores suggest that a relatively wide range of personality scores is represented in the sample. Thus, we believe that despite employing an MBA student sample, the findings can shed light on the role of personality in Web usage behavior. Nonetheless, the sampling frame for this study should be considered when interpreting the results.

A second limitation of this study relates to the use of a single method of data collection. All data were collected using a survey-based methodology in a relatively short period of time. Consequently, some level of bias might have influenced the results. We attempted to control for bias by separating the measurement of the predictor and criterion variables via a two-stage survey approach. Further, we conducted stringent tests for common method variance while performing the data analyses, showing that bias is not playing a significant role in the data. However, the results should be interpreted with this possible limitation in mind.

Several opportunities exist to build on the current study. For one, we related the trait hierarchy to Web usage behavior, utilizing a single sampling frame. Future research is invited that tests the validity of the trait hierarchy in predicting Web utilization across different sampling frames. In addition, future research could link the trait hierarchy with contemporary IS theories to understand how networks of traits influence other key outcomes in the computing context including user satisfaction, trust, and IS continuance. Finally, future research should leverage the newly-developed trait hierarchy for identifying and introducing new trait constructs. Because subordinate traits can have theoretical and empirical associations with more than one superordinate trait, many more traits should exist at the central and secondary levels (Mowen and Spears, 1999). Thus, the current set of central and secondary IT-specific traits does not provide a complete picture of the psychological origins of user behavior. Future research should work to fill the gaps in the knowledge base by identifying new central and secondary IT-specific traits.

8. Conclusion

This research provided a theory-grounded, integrated hierarchical model of broad and IT-specific traits, which was then positioned as a system of antecedents driving the extent of Web utilization. The results provide substantial support for the hierarchical view and pave the way for a more unified approach to the study of traits in IS. Echoing the recommendations of trait researchers in reference disciplines (Allport, 1961; Buss, 1989; Mowen and Spears, 1999), we recommend that future IS research on user disposition incorporate networks of traits representing all three tiers to adequately understand the underlying dispositional mechanisms of user behavior in the computing context. The trait hierarchy developed here should also be used as a nomological network of interrelated traits for positioning new constructs. Overall, this study integrates a number of disjointed trait constructs and demonstrates how the system of traits drives manifest user behavior, aiding the establishment of a much-needed cumulative tradition in this stream.

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