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Research Note

How Does Personality Matter? Relating the Five-Factor Model to Technology Acceptance and Use

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The five-factor model (FFM) of personality has been used to great effect in management and psychology research to predict attitudes, cognitions, and behaviors, but has largely been ignored in the IS field. We demonstrate the potential utility of incorporating this model into IS research by using the FFM personality factors in the context of technology acceptance. We propose a dispositional perspective to understanding user attitudes and beliefs, and examine the effect of user personality—captured using the FFM's big five factors—on both the perceived usefulness of and subjective norms toward the acceptance and use of technology. Using logged usage data from 180 new users of a collaborative technology, we found general support for our hypotheses that the FFM personality dimensions can be useful predictors of users' attitudes and beliefs. We also found strong support for the relationships between intention to use and system use.

Key words: personality; five-factor model; technology acceptance; system use; collaborative technology
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1. Introduction

For many years, the issue of individual characteristics received little attention in the IS literature, a state of affairs that is sometimes traced back to Huber's (1983) statements discouraging the study of cognitive style as a basis for decision support system (DSS) design. Robey's (1983) reply, while agreeing that DSS fit to cognitive style is not a suitable design objective, made the important point that individual differences could affect user satisfaction with a system and ultimately its effectiveness. This was consistent with the findings in Zmud's (1979) seminal article that individual cognitive and attitudinal differences do relate to MIS success. Cognitive style is just one of many individual characteristics that could potentially affect technology acceptance. Related work (e.g., Agarwal and Prasad 1999) has found that other individual differences, such as role with regard to technology and level of education, appear to affect beliefs about usefulness and ease-of-use.

One domain of individual differences that has received limited attention in the IS literature is personality. However, recent advances in personality psychology suggest that a fruitful way to integrate individual traits into IS models and theories would be to adopt the five-factor model (FFM), a parsimonious and comprehensive framework of personality. A renewed focus on traits in the management literature has demonstrated that the big five personality traits comprising the FFM are associated with a number of organizational processes, behaviors, and outcomes (cf. Barrick and Mount 1991, Barrick et al. 2001, Bono and Judge 2004, Judge et al. 2002). We believe that several streams of IS research may benefit by incorporating the big five factors into theoretical models. A primary aim of our research is to present an example of the integration of IS theory and the FFM: we examine in more depth the relationship of personality—through the FFM—to technology acceptance.

We choose to examine the relationship between personality and technology acceptance for several reasons. First, technology acceptance models are well-accepted and validated in the IS literature, with a long

history of extensions that have been well-summarized by Venkatesh et al. (2003). Second, the basic concept underlying the user acceptance model places significant focus on individual reactions to technology, in which personality can be expected to play a part. Finally, the theory of reasoned action, which is the basis for technology acceptance models, explicitly incorporates personality as an external variable affecting an individual's beliefs.

2. Prior Research and Study Hypotheses

In this section, we present the prior literature in the areas of personality and technology acceptance and propose the hypotheses tested in this study. We first present an overview of personality theory and the FFM. Next, because the technology acceptance model (TAM) is well-established in the IS field, we present a brief overview of the relevant literature. Finally, we extend this work by integrating the FFM into TAM by presenting theory and hypotheses focusing on the relationship between the big five factors and technology acceptance.

2.1. Personality and the Five-Factor Model

People's attitudes, beliefs, cognitions, and behaviors are in part determined by their personality; another way of stating this is that psychological predispositions have main effects upon a number of individual-level variables. Personality reflects the unique facets of each human being, the traits that define our essence, and it is reflected in all of our thoughts and actions. Because traits play a ubiquitous role in human cognition and behavior, it is reasonable to expect that personality will play a part in an array of IS-related processes and outcomes. Researchers interested in incorporating personality into IS theories are confronted with an overwhelming number of potential personality variables; perhaps one reason so few IS theories integrate personality is the lack of grounded theory to guide a researcher in choosing which specific traits to include in a particular model. Fortunately, recent advances in personality theory have illuminated these choices.

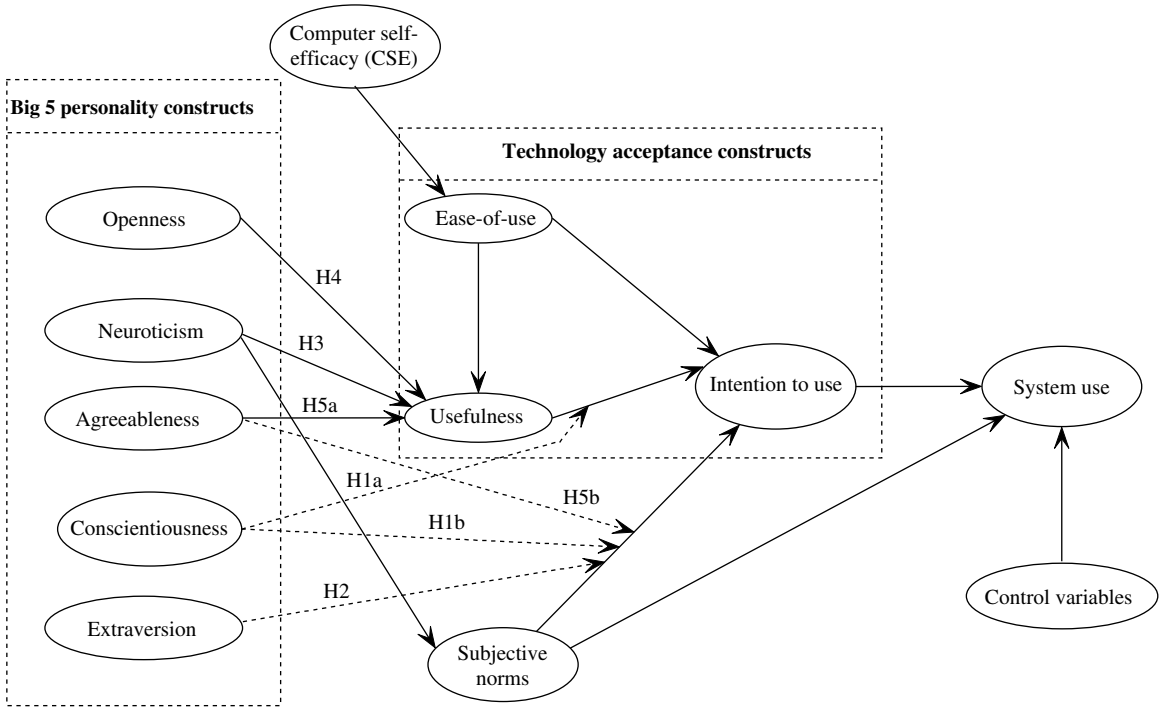
There is considerable agreement among personality psychologists that the domain of personality can be described by five superordinate constructs (Digman 1990). This theoretical approach to personality classification has come to be known as the FFM, and the dimensions are often referred to as the big five. The FFM is considered to be a comprehensive and parsimonious model of personality (Costa and McCrae 1992) and the most useful taxonomy in personality research (Barrick et al. 2001). It has been described as a breakthrough that has restored confidence in personality psychology (Costa and McCrae 1980) and as "...the model of choice for the researcher wanting to represent the domain of personality variables broadly and systematically" (Briggs 1992, p. 254). Prior to the introduction of the FFM, personality research was harshly criticized as being too disjointed and lacking a classification scheme or theoretical basis to help interpret findings on literally thousands of isolated personality traits (Barrick et al. 2001). The FFM collapses all personality traits into five broad factors and, as such, presents a concise yet comprehensive framework for studying personality.

Although researchers have used different labels to describe these five factors, representative labels are (a) conscientiousness, or the degree of organization, persistence, and motivation in goal-directed behavior; (b) extraversion, described by being sociable, gregarious, and ambitious; (c) neuroticism, or emotional instability, characterized by insecurity, anxiousness, and hostility; (d) openness to experience, represented by flexibility of thought and tolerance of new ideas; and (e) agreeableness, represented by a compassionate interpersonal orientation. Next, we develop, through both theoretical arguments and empirical support, hypotheses concerning the influence of big five personality factors on technology acceptance. The research model incorporating these hypotheses, as well as a measure of system use and related control variables (discussed in detail below), is shown in Figure 1.

2.2. Personality and Technology Acceptance

The specific role of personality in technology acceptance models can best be determined by analyzing the theoretical underpinnings of TAM. Because TAM is an adaptation of the theory of reasoned action (TRA) (Davis 1989), that literature guided our thinking about how personality might influence TAM relationships. The TRA treats personality as an external

Figure 1 Research Model



variable that can only affect behavior indirectly (Ajzen and Fishbein 1980). The term "external" was used by Ajzen and Fishbein (1980) to offer the possibility that other exogenous or external variables might affect the established TRA relationships between beliefs, attitudes, intentions, and behavior. Personality is an exogenous variable in a model linking external variables to behavior; in particular, personality is hypothesized to lead to beliefs related to the behavior. In developing their theory, Ajzen and Fishbein (1980) used two of the big five factors—extraversion and neuroticism—as examples of personality traits that may play a role in decisions to engage in a particular behavior. Extending this logic to TAM, theoretical arguments based on the TRA suggest that personality factors would be related to specific beliefs about the perceived usefulness of a particular technology and to subjective norms.

We also conjecture that personality traits will be related to subjective norms (SN), classically defined as a person's perception that most people who are important to him think he should or should not perform the behavior in question (Fishbein and Ajzen 1975, p. 302). The TRA holds that SN predicts behavioral intentions, and this relationship has received empirical support (e.g., Srite and Karahanna 2006). We therefore include SN as a relevant non-TAM predictor of intention while exploring the strength of the relationship between personality traits and SN in this connection.

Personality psychologists generally agree that personality is linked to actual behavior through cognitive processes that determine one's motivation to engage in a particular act (Barrick et al. 2002). Subjective norms are one such cognition, representing a person's perception of social pressure to perform or not perform a behavior under consideration. People will generally intend to perform a behavior when they have a positive attitude toward it and when they believe that important individuals think they should do so (Ajzen 1988). However, the theory of reasoned action also proposes that attitudes and subjective norms are influenced by more distal factors such as personality traits (Ajzen 1988, Connor and Abraham 2001). For example, Hampson et al. (2006) found that personality traits were related to intentions to use alcohol through the development of attitudes and subjective norms, which are more proximal cognitions. At least one study examined the relationships among these constructs in the context of one

of the big five personality factors; the relationship between conscientiousness and intentions to protect one's health have been shown to be mediated by the proximal cognitions represented in the theory of reasoned action (Conner and Abraham 2001). Thus, we hypothesize that personality traits will be associated with two behavior-specific cognitions about whether or not to use a new technology: perceived usefulness and subjective norms.

Conscientiousness. Conscientious personalities are intrinsically motivated to achieve, perform at a high level, and take actions to improve their job performance. The hallmark of the conscientious personality is self-control reflected in a need for achievement, order, and persistence (Costa et al. 1991); these traits are fundamental components of intrinsic motivation at work and high levels of job performance (Barrick and Mount 2000). Barrick and Mount (1991) pointed out the ubiquitous nature of this factor in arguing that it is difficult to conceive of a job in which the traits associated with the conscientiousness dimension would not contribute to job success (p. 21). Thus, because conscientiousness reflects an intrinsic motivation to improve job performance wherever possible, we expect conscientious people to be more likely to carefully consider whether technology provides an opportunity to further on-the-job achievement and then act based on that assessment; conscientiousness will be related to the enactment of intentions.

This dispositional tendency will increase or diminish the extent to which perceived usefulness and subjective norms result in intentions to use the technology. In particular, people with a highly conscientious personality will be more likely to carefully consider ways in which the use of technology would allow them to be more efficient and perform at a higher level at work. If this processing results in positive beliefs about the technology—that the technology will facilitate effective job performance—then conscientiousness will magnify those beliefs and increase behavioral intentions. Conversely, if a person concludes that a technology is not useful, conscientiousness will also increase those beliefs and decrease behavioral intentions.

Similarly, conscientiousness will interact with subjective norms in determining intentions. Because conscientious people are intrinsically motivated to succeed, they will carefully consider and weight the opinions of trustworthy others as they consider whether or not to use a new technology. If conscientious personalities think that significant others believe that the technology should be used, they will form stronger intentions to use the technology. Conversely, they will also carefully consider and process negative subjective norms, the condition where trusted others do not believe that a new technology should be used. In this case, intentions to use the technology will be lower. Those who are lower on the conscientiousness dimension are not as inclined to carefully process and weight additional information, so the effect of other opinions on behavioral intentions will be lessened.

Hypothesis 1A (H1A). *Conscientiousness will moderate the relationship between perceived usefulness of technology and intentions to use the technology such that the relationship is stronger for individuals with higher conscientiousness*.

Hypothesis 1B (H1B). *Conscientiousness will moderate the relationship between subjective norms and intentions to use the technology such that the relationship is stronger for individuals with higher conscientiousness*.

Extraversion. The TRA explicitly identifies extraversion as an example of a personality trait that will have an effect on one's beliefs about a particular behavior. Those high in extraversion are social, active, and outgoing, and place a high value on close and warm interpersonal relationships (Watson and Clark 1997). A meta-analysis found that more extraverted personalities are particularly high performers in jobs with a social component, such as management and sales (Barrick and Mount 1991). Extraversion is also associated with effectiveness in a team setting and with greater training proficiency (Barrick et al. 2001).

The desire to gain social status is one of the most important motivations for individuals in deciding to adopt an innovation (Rogers 1983). Venkatesh and Davis (2000) suggest, with their extended TAM2, that when important members of a person's social network believe that he or she should perform a behavior, he or she will be motivated to do so in order to establish or maintain a favorable social image. Furthermore, enhanced power and influence resulting from performing behaviors that are viewed as

desirable by one's social network will lead to indirect improvements in job performance due to image enhancement. Those high in extraversion are naturally inclined to care about their image and other social consequences of behaviors, and therefore are more likely to form intentions to act based upon their perceptions of the opinions of significant others.

Hypothesis 2 (H2). *Extraversion will moderate the relationship between subjective norms and intentions to use the technology such that the relationship is stronger for individuals with higher extraversion.*

Neuroticism. People low in neuroticism are emotionally stable and well-adjusted; in contrast, those high in neuroticism are anxious, self-conscious, paranoid, and prone to negative emotions and negative reactions to work-related stimuli. Empirical research suggests that neuroticism is negatively associated with several constructive elements of work behavior, including job performance (Barrick and Mount 2000), job satisfaction (Smith et al. 1983), perceived career success (Judge et al. 1999, Seibert and Kraimer 2001), and voice behavior (the tendency to offer constructive change-oriented communication intended to improve a situation; LePine and Van Dyne 2001). Ajzen and Fishbein's (1980) TRA identified neuroticism as one of the personality variables affecting beliefs about behavior.

Neuroticism is reflected in a negative reaction to both life and work situations, and this will generalize to beliefs about the perceived usefulness of technology. Neurotic personalities are likely to view technological advances in their work as threatening and stressful, and to have generally negative thought processes when considering it. In particular, because technology use at work calls attention to the self and offers the potential for other people to monitor work or collect information about work habits, neurotics will form negative beliefs about the technology. Furthermore, neuroticism predicts both negative and positive affect; thus, people high in neuroticism can be expected to consistently respond to and evaluate a stimulus negatively, while those low in neuroticism are more likely to respond and categorize the same stimulus in a more positive fashion.

Hypothesis 3 (H3). *Neuroticism will be negatively associated with beliefs about the perceived usefulness of technology.*

Openness to Experience. Individuals described as high on the openness-to-experience dimension of personality are willing to try new and different things. They actively seek out new and varied experiences, and value change (McCrae and Costa 1997). Because rapid change and diversity are now the norm in business organizations, openness to experience will be increasingly important in explaining work-related behavior (Hough and Furnham 2002). Meta-analytic results demonstrated that openness is consistently associated with training proficiency and engaging in learning experiences (Barrick et al. 2001).

Those low on this dimension prefer stability and the status quo, and inherently feel very uncomfortable with change. Thus, those individuals high in openness are more likely to hold positive attitudes and cognitions toward accepting job-related technology in part because of their predisposition to embrace new approaches to work; they are less threatened by the change implied in adopting technology. This burning desire to do varied things that is the core facet of openness to experience will influence their judgment about the utility of the technology. Behavioral decision theory shows that people tend to seek and weight more heavily information that is in agreement with their beliefs and desires while discounting information inconsistent with their preferences, a phenomenon known as the confirmatory bias (Bazerman 1994). Therefore, more open personalities will strongly weight arguments that are consistent with their innate preference to use the new technology.

Hypothesis 4 (H4). *Openness to experience will be positively associated with beliefs about the perceived usefulness of technology.*

Agreeableness. The agreeable personality is described as being kind, considerate, likable, helpful, and cooperative (Graziano and Eisenberg 1997). Meta-analytic results suggest that agreeableness has significant predictive validity in jobs involving considerable interpersonal interaction and teamwork, especially when the interaction involves helping and cooperating with others (Barrick et al. 2001). Thus, agreeableness will be most strongly related to technology beliefs when that technology fosters collaboration, cooperation, and task accomplishment. Compared to

those low in this dimension of personality, agreeable personalities are more likely to be accommodating and cooperative when asked to consider a new technology, and to focus more on positive and cooperative dimensions of the technology rather than those elements that may be less facilitative of performance.

However, agreeableness will also reveal itself by relating to intentions to use the technology when such use is seen as influencing the way one is viewed by others. Social influence has been shown to play an important role in the technology acceptance process (e.g., Malhotra and Galletta 2005, Venkatesh and Morris 2000). Attitudes, cognitions, and behaviors are influenced by perceptions of how others will evaluate a particular behavior; this is a key theoretical reason behind the inclusion of subjective norms in TAM2 (Venkatesh and Davis 2000). A related social influence concept is that of image (Moore and Bensbasat 1991, Venkatesh and Davis 2000), which refers to the extent to which an innovation is perceived as enhancing one's status in a social system. Both subjective norms and image are important determinants of behavioral intentions because they reflect the influence of others and the importance of having others think positively of us. The big five dimension of agreeableness represents a person's sensitivity to and consideration toward the thoughts and opinions of others; therefore, agreeableness will moderate the relationship between subjective norms and intentions to use the technology.

Hypothesis 5A (H5A). *Agreeableness will be positively associated with beliefs about the perceived usefulness of technology.*

Hypothesis 5B (H5B). *Agreeableness will moderate the relationship between subjective norms and intentions to use the technology such that the relationship is stronger for individuals with higher agreeableness.*

3. Research Methods

3.1. Collaborative Technology

For our purposes, we define a collaborative system as an integrated collection of modular functions that support both synchronous and asynchronous communication and cooperative work for groups that may be colocated or distant. In this study, we use a commercial collaborative system named eproject. As the name suggests, eproject organizes team efforts around specified projects, offering several common collaborative features such as announcements, discussions, document version control, and polling as well as a number of project management features such as task assignment and issue management (for further details, see www.eproject.com). The implementation studied here assigned subjects to a number of eprojects determined by the core curriculum, and left them free to create others on an ad hoc basis. The base level assignment involved a separate eproject for each core course, where the subjects were assigned tasks and provided access to documents, discussions, and other modules at the instructor's discretion.

All subjects received the same hands-on training covering all anticipated uses of eproject, including various methods of version control to support document collaboration, proper use of a threaded discussion tool, creation of new projects, invitation to join projects, and methods of assigning tasks and updating task status. Technical support was provided for each core course to automatically (without instructor intervention) maintain the related eprojects so that all assignments appeared as tasks assigned to students and all documents appeared in the projects for electronic distribution. This technical support also extended to establishing online discussions and making use of other modules as directed by the instructor.

3.2. Sample

The subject pool included 180 subjects, of which 119 (66%) were MBA students and 61 (34%) were Executive MBA (EMBA) students, all enrolled in their first year of courses at the time of the study. 83% of the subjects were male and 17% female, with an average age of 30 years (age range: 21 to 49), and an average of 7.3 years of work experience (work range: none to 30 years). The data were collected over the course of the first semester for both MBA and EMBA students. A one-way analysis of variance (ANOVA) of differences in responses between males and females in the sample supports the conclusion that gender does not play a significant part in our research model and results.

At the time of the study, both the MBA and EMBA programs assigned students to a single team for all courses. All team projects associated with any course

were thus assigned to these standing teams. Each subject was therefore also a member of an eproject created specifically for each of those teams, though there was no requirement that it be used. Required use of the platform, once the training was complete, was limited to the core-course eprojects, primarily involving document retrieval and task management in those projects.

The training was administered during orientation to the programs and the TAM, customer self-efficacy (CSE), and related surveys were electronically administered immediately after the training session while the students were still in the computer lab. The survey collecting personality measures was electronically administered approximately one month later in a core course in which all subjects were enrolled. Because the big five personality dimensions are considered stable traits that do not shift over time (Costa and McCrae 1992), the timing of this portion of the surveys was not critical. Subjects received a nominal amount of course credit for completing the surveys. The response rates for the surveys ranged from a low of 90% for the five-factor model to a high of 92% for the TAM survey. Nonresponse bias tests were conducted separately for each survey instrument using GMAT scores and our system-use measure (described below) because those data were available for all subjects. No significant differences were found in either case for the distributions of those two measures using single-tail t-tests at the 0.05 significance level.

3.3. The System-Use Measure

Historically, TAM studies have varied in whether they linked use intentions to actual or self-reported use. Several studies (e.g., Straub et al. 1995, Szajna 1996) have provided general support for the finding that self-reported use might not be an appropriate surrogate for system use. This concern was also highlighted in Lee et al.'s (2003) recent review of the TAM literature, and the unifying studies presented by Venkatesh et al. (2003) rely on system use measures. We include in our model the relationship between intention to use and system use. We measure actual system use based on user activity log files, kept for the 14-week duration of the fall semester.

Our use construct is made up of three separate measures. The first is an overall use measure that counts each individual action a user undertakes in eproject, but excludes all actions undertaken in the set of eprojects that were created specifically to manage core courses because some portion of core-course use would have been required. The second looks at use levels, again counting each action of each user but only in the assigned team eprojects. As explained earlier, each subject was administratively assigned to a set team for the semester-long data collection period—there were no other such teams formed for the students and no other online team eprojects established for the students. Though teamwork was required in most courses, there was no requirement that the team eproject be used in completing that work—there was no faculty supervision or evaluation of the collaborative project space itself, only of the final deliverables. However, it can be assumed that use may have been subject to peer pressure from group members, underscoring the importance of subjective norms.

These first two measures capture use of the type that March (1991) describes as *exploitation*, that is, the usage measured reflects the degree of incorporation of the eproject collaborative system in the performance of tasks in the MBA and EMBA programs. Our third measure captures use of the type that March (1991) calls *exploration*, capturing the extent to which subjects developed or joined new projects that extended beyond the standard set of assigned projects. While March's (1991) *exploitation versus exploration* provides one perspective underlying our use measures, there are other lenses to understand IT use as well, such as the emergent perspective (Jasperson et al. 2002).

Each subject started with a fixed set of projects and a fixed network size, which we define as the number of others the subject could reach through those projects—initially any other member of their core courses or of their assigned team. A subject's network size would only increase beyond that if they originated or joined new projects; thus, the variance in the network size achieved by the end of the semester reflects the extent to which the subject engaged in exploratory use of the collaborative platform with users beyond their original eproject network. The factor-analytic score, representing the aggregate of these three use components, is termed "system use."

All the subjective scales employed in this study are extracted from prior literature. We measured TAM

constructs of intention to use, usefulness, and ease-of-use with an instrument used by Davis (1989), which has been regularly employed in TAM literature (e.g., Venkatesh et al. 2003, Straub et al. 1995). Following Venkatesh and Davis (2000), we adapt our measure of subjective norm (SN) from Taylor and Todd (1995). CSE was measured with a 10-item scale developed by Compeau and Higgins (1995). The measure is designed to obtain a self-evaluation of one's ability to use a computer to accomplish a task. The FFM constructs were measured with the neo-five-factor inventory (NEO-FFI) (Costa and McCrae 1992), a well-validated measure of the big five that has been extensively used in previous research (cf. George and Zhou 2001, Tepper et al. 2001).

3.4. Control Variables

Computer Self-Efficacy. Compeau and Higgins (1995) defined computer self-efficacy (CSE) as a judgment of one's capability to use a computer. The concept of CSE is an extension of the work of Bandura (1986), who proposed a relationship between personal self-efficacy beliefs and behavior that has since been empirically validated in a number of domains. Multiple studies (Compeau and Higgins 1995, Compeau et al. 1999) have found that CSE is positively related to self-reported use. Using a different instrument to measure CSE, Igbaria and Iivari (1995) found no *direct* effect on self-reported use. Extensive reviews of empirical CSE research (Agarwal and Karahanna 2000, Marakas et al. 1998) suggest that CSE affects perceived ease-of-use of systems. Therefore, we include CSE as a control variable. CSE was measured with a 10-item scale developed by Compeau and Higgins (1995). The measure is designed to obtain a self-evaluation of one's ability to use a computer to accomplish a task.

Control Variables for System Use. Because prior work experience (measured in months as well as salary), incoming GPA, and GMAT scores are commonly understood to relate to behavior and success in MBA and EMBA programs, we include them to test whether the intention to use eproject had an impact on system use beyond what might be explained by these incoming measures. Finally, we computed and controlled for a measure of average team use, that is, the use of the system by other team members. Conceivably, individuals who are on teams that use the technology more frequently might use it themselves more often.

3.5. Scale Properties

The statistical properties of the scales used in this paper have been documented in various studies. Our own examination of the psychometric properties of the scales revealed that all scales had acceptable reliabilities (Cronbach's alpha > 0.7). As further preparation toward computing a series of structural equation models on our data, we computed a confirmatory factor analysis (CFA) in order to test the measurement model. We wanted to be certain that the constructs were empirically distinct from one another and that specific items measured the constructs that they were intended to measure. CFA allows for simultaneous testing of unidimensionality, convergent validity, and discriminant validity of the scales employed in the study.

Unidimensionality or the extent to which the items of a construct are associated with one another and represent a single concept is assessed by examining the statistical significance of every factor loading. Convergent validity was evaluated using the Bentler-Bonnet (1980) coefficient. Discriminant validity can be assessed by comparing two CFA models for each pair of constructs. The first model constrains the correlation between the pair of constructs to be equal to one, while the second model allows the correlation to vary. The difference in Chi-square for the two models is an indication of whether the two constructs are distinct.

The factor loadings from the CFA model were all significant ($p < 0.01$), providing support for unidimensionality of constructs employed in the study. The Bentler-Bonnet coefficient was above the threshold of 0.90, indicating support for convergent validity. Finally, for every pair of constructs, the Chi-square difference test was significant ($p < 0.01$). Thus, the scales employed demonstrate sufficient discriminant validity. In subsequent structural modeling, we treat the five personality factors and the three elements of TAM as separate factors.

4. Results

Table 1 presents the descriptive statistics and correlations between the variables employed in the study.

Table 1 Correlations

Variables	Mean	SD	1	2	3	4	5	6	7	8	9	10	11
1. System use	0	1.0											
2. Intention to use	5.94	1.16	0.22										
3. Usefulness	5.41	1.20	0.18	0.70									
4. Ease-of-use	4.49	1.26	0.11	0.32	0.30								
5. Agreeableness	3.48	0.54	0.03	0.18	0.14	−0.06							
6. Consciousness	3.92	0.56	0.06	0.07	0.17	−0.02	0.01						
7. Extraversion	3.77	0.51	0.09	0.12	0.13	−0.02	0.21	0.28					
8. Neuroticism	2.30	0.64	−0.17	−0.16	−0.17	−0.03	−0.15	−0.3	−0.3				
9. Openness	3.59	0.55	0.04	0.09	−0.04	−0.08	0.14	0.06	0.2	−0.13			
10. CSE	7.25	1.56	0.09	0.18	0.09	0.39	0.0	0.03	0.20	−0.06	0.20		
11. GMAT	654.10	59.07	−0.12	0.15	0.08	0.15	−0.08	0.02	−0.12	−0.1	0.12	0.08	
12. Subjective norms	5.20	1.05	0.25	0.69	0.68	0.22	0.15	0.10	0.20	−0.12	0.0	0.09	0.27

Notes. Four other control variables (incoming GPA, work experience [months], work experience [$ salary], and average team use) were also used in the analyses. For purposes of brevity, they are not shown in the correlation table.

The hypotheses presented earlier were tested within a structural equation modeling (SEM) framework using LISREL 8.0 (Jöreskog and Sörbom 1989) that allows for simultaneous estimation of the measurement and structural models.

Results of the structural equation model and the model fit obtained relative to the various standard goodness of fit measures are presented in Table 2. The path coefficients can be viewed as standardized regression coefficients with their significance indicated next to them. First, we observe support for Hypotheses H1A and H1B (at the 0.05 level), indicating that the relationships between perceived usefulness and intention to use technology and subjective norms and intention to use technology are stronger for individuals who are more conscientious. Second, we find statistical support for the important role of extraversion in moderating the relationship between subjective norms and intention to use technology such that this relationship is stronger for extroverts. We had hypothesized direct effects between neuroticism and perceived usefulness (H3), which was supported at the 0.05 level. Interestingly, we did not observe a statistically significant relationship between openness and perceived usefulness. We discuss this finding in greater detail later in this section. Finally, agreeableness was significantly related to perceived usefulness of the technology (H5A) while also moderating the relationship between subjective norms and intention to use technology. Overall, we find strong support for the hypotheses presented in the study with the exception of H4.

Table 2 Results of SEM Analysis of Hypothesized Model

Hypothesis	Path	Std. parameter estimate	Significant/ *N* significant
H1 Conscientiousness	(a) Moderates relationship between perceived usefulness and intention to use technology	0.19	Sig. (*)
	(b) Moderates relationship between subjective norms and intention to use technology	0.16	Sig. (*)
H2 Extraversion	Moderates relationship between subjective norms and intention to use technology	0.15	Sig. (*)
H3 Neuroticism	Is negatively associated with perceived usefulness	−0.20	Sig. (*)
H4 Openness	Is positively associated with perceived usefulness	0.02	NS
H5 Agreeableness	(a) Is positively associated with perceived usefulness	0.13	Sig. (*)
	(b) Moderates relationship between subjective norms and intention to use technology	0.19	Sig. (*)

Notes. Squared multiple correlation: Usefulness = 0.18, ease of use = 0.15, intention to use = 0.69, use = 0.39. Model fit criteria: Chi sq/df = 1.34, RMSEA = 0.033, NNFI = 0.89, CFI: 0.92, GFI = 0.93, AGFI = 0.90.

*Significant at the 0.05 level.

We also found statistical support for the original TAM relationships. Specifically, perceived usefulness and ease-of-use were both positively related to intention to use. Further, perceived ease-of-use also had an indirect effect on intention to use through perceived usefulness. These results, not reported in detail, corroborate earlier work in this area. We also examined the relationship between intention to use and system use. We found a strong positive relationship between intention to use and system use (coefficient = 0.19 statistically significant at the 0.05 level).

Finally, we also looked at the explanatory power of the FFM constructs over and above the established constructs of TAM and CSE. With usefulness as the dependent variable, including the FFM constructs increased the squared multiple correlation (SMC) from 9% to 18%. For intention to use, the SMC increased from 59% to 69%. In light of the statistically significant relationships, this provides evidence of the practical significance of adding the FFM constructs. The overall model fit indices presented at the bottom of Table 2 indicate that the hypothesized model provides a good fit to the data.

4.1. Alternate Model

A surprising finding was that the relationship between openness and usefulness did not find statistical support. This observation calls for a closer examination of this relationship. To understand this dimension of personality, we specified an alternate model. Essentially, the question we sought to answer was whether openness might have an impact on intention to use over and beyond its impact on perceived usefulness.[1] In the structural model, this implies estimating a path from openness to intention to use technology. Our SEM analysis indicated a statistically significant and positive relationship (coefficient = 0.12 significant at the 0.05 level) between openness and intention to use technology. The increase in SMC as a result of this additional path was 0.04. It is interesting to note that despite initial TRA-based work that presented personality as an external variable that might affect intention to use only through usefulness and ease-of-use, we find evidence that certain aspects of personality might have a more direct impact on intention to use technology as well. It is also possible that the relationship between openness and perceived usefulness might be more complex than a simple linear relationship. Further research is called for to understand this dimension of personality and its link to technology acceptance.

[1] The authors thank the associate editor and an anonymous reviewer for suggesting this alternate model.

4.2. Summary of Results

The primary objective of this paper was to examine the effect of the big five personality characteristics on the TAM constructs of usefulness, subjective norms, and intention to use. The mechanisms by which the FFM constructs affected technology adoption were: (1) direct impact on perceived usefulness, (2) direct impact on subjective norms, (3) moderating the relationship between perceived usefulness and intention to use technology, and (4) moderating the relationship between subjective norms and intention to use technology. Overall, we found statistical support for most of these associations.

Consistent with current trends in personality research (e.g., Barrick and Mount 1991, Barrick et al. 2001), we have found that the big five personality dimensions are related to key dimensions of technology acceptance. We hypothesized that the five personality factors would be associated with perceptions about the usefulness of a particular technology as well as moderate the relationships between usefulness and intention to use, and between subjective norms and intention to use. With the exception of openness, we find evidence that generally supports these hypotheses. Because usefulness has been well-documented in the literature as a key driver of intention to use technology, these findings shed light on the nature of the factors that significantly affect intention to use and actual use of a new technology.

We found evidence for all but one of the hypotheses presented in the study. Interestingly, as discussed above, the openness dimension had an impact on intention to use beyond perceptions of usefulness or ease-of-use. In any case, this warrants further research as the insignificant linear relationship we found may conceal a significant but more complex relationship between the openness-to-experience construct and technology acceptance.

5. Discussion, Implications, and Conclusions

Recent personality research has emphasized the relationship of personality variables to established, well-understood models. At the same time, IS research scholars have proposed that future research move beyond the technology acceptance model. This study can be viewed as responding to both of these mandates by finding that the well-documented body of literature on personality might have significant ramifications on TAM constructs.

The findings of this study have several theoretical and practical implications. On the theoretical front, they highlight the role of individual differences and personality in technology acceptance. We hope that this spurs research examining the role of personality on other established models in IS research, such as user satisfaction or usability. The predictive power of other IS models may be enhanced by incorporating personality variables, and the FFM appears to be a useful framework for identifying the relevant domains of personality.

One practical implication of this study is that it sheds light on the types of people who hold positive beliefs about the usefulness of a collaborative system. TAM suggests that these beliefs are associated with intentions to use the technology and, ultimately, to actual use. Thus, for jobs where use of a collaborative system is an important element of success, organizations could benefit from knowledge of the types of people who are likely to have positive beliefs toward the collaborative system. The company could look for these traits as part of a broader selection process, probing for the traits we identified along with other job-related qualifications in an interview or using established big five selection tests. The big five traits are often included as part of a selection system, in part because of their direct and indirect relationship with job performance and other work-related behaviors (Barrick et al. 2001).

There are training implications as well; people who are inclined to hold negative beliefs toward collaborative systems based on their personality might benefit from training and should be selected for training programs designed to overcome their natural inclination. Our findings suggest that training has to be carefully designed to not only educate users about the technology but also make the *usefulness* of the technology apparent, especially to people with certain personality profiles. In other words, the fact that people possessing certain personality dimensions value usefulness can be exploited by companies to derive a greater acceptance of technologies. By the same token, extra effort might be required to convince certain personality types about the usefulness of technologies.

Incentive systems could also be designed to target those people with a natural inclination to avoid using the system. We propose that in cases where the personality of users might inhibit them from using the system extensively, suitable reward systems might need to be in place to encourage them to start using the technology and experience its usefulness. Incentives are a powerful tool for changing behavior and can induce people to engage in tasks that they would resist in the absence of an incentive system (Steers and Porter 1991).

A final implication might arise from the design of organizational change management initiatives in the face of new technology introductions or technology updates. Nowhere is the organizational inertia to change more visible than in the context of technologies. The implication from this study is that it is unlikely that "one size will fit all" in terms of technology-related change management policies or initiatives. One of the factors that affect the equation is the personality of the individual users. Therefore, a cognizance or awareness on the part of management about the various types of personalities and how they view technologies can lead to designing better change management strategies overall.

This research study has some limitations that must be acknowledged. One potential limitation might stem from the use of a student sample and its implications for the generalizability of the results. We should be cautious in generalizing from student-based studies to working adults, especially when student participation represents a departure from their normal work or school life. However, given that the students in this study were engaged in naturally occurring tasks and using a collaborative system that offered support for their day-to-day performance on tasks assigned by their supervisors (professors), we believe the concern of generalizability is less of an issue. When people engage in a task that is meaningful to them,

an accurate description of participants' judgments is more likely (Fredrickson and Mitchell 1984). Further, the participants in this study were graduate students from MBA and EMBA classes with an average of over seven years of full-time work experience, and may well be among the workers most likely to make use of such collaborative systems in their careers. Therefore, we believe that despite examining a student sample, the findings of our study can shed light on technology acceptance in organizational settings. Future studies might sample working adults and extend this model to examine if system use leads to improved individual and ultimately organizational performance.

However, we must also be careful not to generalize the results to technologies beyond groupware or collaborative systems. A further limitation is that the relationships specified and tested in the study are meant to represent only associations between constructs and not causal relationships. Future research in this area can examine both attitudes and behavior in a longitudinal setting to address the question of causality. Finally, we have not systematically assessed the relationships between the big five factors and a complete nomological network of potential predictors of usefulness.

In general, this study makes the case that theories which incorporate individual differences (in our case, personality) have a role to play in MIS research. Future research might include examining the adoption patterns of early adopters versus late adopters, and the impact of personality on TAM after the system has been in use for an extended period of time. Additional personality variables might also be fruitfully examined in the context of identifying additional antecedents of TAM.

Personality has been largely ignored in the MIS literature over the past two decades. However, the field of personality psychology has significantly advanced since that time, and the FFM has sparked renewed theory and empirical investigation in other disciplines. We believe that studies linking the big five factors to other MIS variables, such as outcomes in group decision support systems (GDSS), effectiveness of virtual teams, perceptions of service quality and end-user satisfaction, would enhance the precision of IS theory. Other opportunities for future research include identifying additional moderators of the personality-use relationship, examining the influence of personality on particular activities in collaborative systems, and collecting longitudinal data tracking positive and negative experiences with collaborative systems.

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