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Keywords: Computer playfulness, personal innovativeness, problematic technology use, Internet addiction, Big Five traits, technology acceptance, technology adoption

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Abstract

Cumulative IS studies have demonstrated that computer playfulness and personal innovativeness are two specific traits that can lead to a number of positive behavioral and affective outcomes. Little research has explored the possibility of their negative implications. As an initial effort to fill this gap in theory development and empirical research, this study builds on the recent psychological literature and uses samples of both students and working adults to explore this issue. Data from both samples indicate that personally innovative and playful individuals are more likely to exhibit problematic use, manifested as dependency on technology (e.g., excessive and compulsive use) and technology use for distraction (e.g., procrastination and avoidance of social and occupational responsibilities). To better situate the trait research in IS within the broader individual trait framework, this study also explored the theoretical foundation of the two IT traits in the Big Five traits, which were also found to explain significant variance in problematic use. Implications of these findings are discussed.

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Introduction

Individual traits refer to individual attributes that consistently distinguish people from one another in terms of their basic tendencies to think, feel, and act in certain ways (Ones, Viswesvaran and Dilchert 2005) and are reasonably consistent over time (Buss 1991). Trait research in IS has mostly been in the context of technology adoption and use and focused on domain-specific (as opposed to broad or general) traits for their higher ability to explain outcome variables (Webster and Martochhio 1992). Perhaps the two most extensively examined IT-specific traits are personal innovativeness and computer playfulness.[1]

Personal innovativeness with IT is a trait that reflects an intrinsic willingness to try out new technologies (Agarwal and Prasad 1998). *Computer playfulness*, as a trait, refers to the degree of cognitive spontaneity in microcomputer interactions. These two traits have been linked with a variety of positive user attitudes, beliefs and intentions related to technology adoption and use, such as improved learning in software training (Martochhio and Webster 1992), higher satisfaction and decision performance (Hess, Fuller and Mathew 2006), increased behavioral intentions to use technology and other positive attitudes toward technology (e.g., Agarwal and Karahanna 2000; Leonard-Barton and Deschamps 1988; Lewis, Agarwal and Sambamurthy 2003; Limayem and Khalifa 2000; Srite, Galvin, Ahuja and Karahanna 2007; Thatcher and

[1] Another frequently studied individual-level factor in this literature is computer self-efficacy (e.g., Compeau and Higgins 1995), which refers to an individual's *perception* (or *belief*) of his/her own ability to perform the behavior (Bandura 1977). Because self-efficacy is perceptual in nature and is not a stable trait, it is not examined in this study.

Perrewé 2002; Venkatesh 2000; Webster and Ahuja 2006; Yi, Fiedler and Park 2006). Although it has long been posited that these user traits can lead to certain negative effects (e.g., longer time to task completion, Sandelands 1988; and non-productive play, Webster and Martochhio 1992), little IS research has empirically investigated their possible linkages with unfavorable usage outcomes.

In fact, this observation likely applies to the broader literature, which can leave one with the impression that all technology adoption and use are favorable and should thus be encouraged. As IS research continue to explore the many benefits of technology use and identify the individual traits that may enhance these benefits, we also need to be mindful of the potential downsides to technology use and the related user traits. Such clear delineation is essential, and theory development in this area is clearly needed as we work toward a more complete and nuanced view.

This exploratory study represents an initial effort toward that direction by building on the recent psychology literature. In contrast to the positive affective and behavioral outcomes of technology use reported in IS research, the psychology literature has focused more on maladaptive and other dysfunctional behaviors, where recent investigations on the same technologies (e.g., personal computer, the Internet) has documented varying types and degrees of problematic usage outcomes (e.g., Brenner 1997; Chou, Condron and Belland 2005; Davis 2001; Scherer 1997; Shotton 1989; Yellowlees and Marks 2007; Young 1996).

Building on this psychology literature as well as previous IS research, we hope to bring the issue of negative usage outcomes to the attention of IT researchers. The objectives of this study are two fold. First, it aims to explore whether the two IT-specific traits lead to problematic technology use. Second, to further understand the phenomenon of problematic use, we also

examine its relationships with a few general traits, i.e., the Big Five factors, which are the most widely adopted personality framework but have not received much attention in IT despite that the importance of studying individual differences has long been recognized (e.g., Lucas 1973; Zmud 1979). Investigating the PI and CP in conjunction with the Big Five factors can also help us situate the two specific traits in the broader individual trait framework and the larger trait literature. Such effort can help us avoid "private" IS theories and work toward a cumulative tradition in this area (Keen 1980).

The rest of the paper is organized as follows. We first introduce the psychological literature on problematic technology use and develop research questions. We then describe our research methodology and present our results. The paper concludes with a discussion of contributions and implications of these findings. We begin in the next paragraphs with a review of the psychology research on problematic technology use.

Theoretical Background

Problematic Technology Use

Along with the numerous benefits brought by modern technologies, such as personal computers and the Internet, to organizations and the society as a whole, problematic usage behavior that some users demonstrate has increasingly caught the attention of psychological researchers and practitioners alike (Davis, Flett and Besser 2002). Among the many types of technologies that have been studied in the psychology literature are video games (Keepers 1990), amusement machines (Griffiths 1992), personal computers (Shotton 1989), and the Internet (Young 1996).

Problematic use can be manifested in various ways, including intense preoccupation with technology use (Chou 2001; Treuer, Fabian and Furedi 2001), poor impulse control (Beard and Wolf 2001; Treuer et al. 2001), excessive amounts of usage time, compulsive use, increased anxiety if use is restricted, decreased social interaction with ‘‘real’’ people, and increased post-usage loneliness, depression and guilt (Chou et al. 2005; Kraut et al. 1998; Nalwa and Anand 2003; Whang, Lee and Chang 2003). A variety of psychological and occupational consequences, such as neglect of academic, work, and domestic responsibilities and disruption of social relationships, have also been documented (e.g., Brenner 1997; Davis et al. 2002; Kraut et al. 1998; Shotten 1989; Young 1996; Widyanto and McMurran 2004).

The more severe cases of problematic technology use have been characterized as computer dependency, computer addiction (e.g., Shotten 1989), Internet addiction (e.g., Young 1996), Internet dependency (e.g., Scherer 1997), problematic Internet use (e.g., Davis 2001, Davis et al. 2002), and those who engage in such problematic use as “computer addicts” (Shotton 1989), “computer junkies” and “Internet addicts” (Beard and Wolf 2001).

Despite the continued debate regarding the extent of the phenomenon and how it should be labeled, there is a general agreement in the psychology literature over the nature of the phenomenon itself (Chou et al. 2005; Davis et al. 2002). Davis (2001) offered a cognitive-behavioral view of the phenomenon and conceptualized *problematic technology use* as behaviors and cognitions associated with technology use that result in negative personal and professional consequences for the user. Davis et al. (2002) theorized the construct as having four dimensions: diminished impulse control (i.e., compulsive technology use), loneliness/depression (i.e., negative affective consequences of not using technology), social comfort (i.e., perceived social comfort during technology usage), and distraction (i.e., procrastination and avoidance from

social and occupational responsibilities through technology use). A 36-item instrument has been developed to measure problematic use of the Internet (Davis et al. 2002).

It has been argued that problematic use may result when some psychological factor causes an individual to be vulnerable to dependence on technology use (Davis 2001). We next explore the trait factors that have been examined in the literature so far.

Trait-based explanations for problematic use

Though research to date has linked the amount of technology use (e.g., Internet) with general traits (e.g., Big Five factors, Landers and Lousbury 2006) as well as specific traits (e.g., work ethics, Landers and Lousbury 2006; need for cognition, Amichai-Hamburger et al. 2007), we are only aware of one study that has directly examined the relationship between problematic use and either of the two IT-specific traits, which found playfulness to be associated with excessive play of online games (Chou and Ting 2003). In addition to such direct evidence, there also exists some indirect evidence that can shed some light on their relationships.

For example, research found that problematic use is more prevalent among IT professionals (Thatcher, Wretschko and Fisher 2008) and "technologically sophisticated users" (Morahan-Marin and Schumacher 2000). If these individuals are presumably high on PI and CP, then there appears to be linkages between problematic use and these two IT traits.

Also, IS research has shown CP and PI as leading to flow experience (Csikszentmihaiyi, 1975) during technology use (also called cognitive absorption or engagement, Agarwal and Karahanna 2000, Webster and Martochhio 1992), which is a mental state also reported by those exhibiting more severe problematic use (e.g., concentration, time distortion, Chou et al. 2005).

Taken as a whole, the above findings point to a possible linkage between problematic use and these two IT-specific traits, which is our first research question.

RQ1: Are CP and PI related to problematic technology use?

PI and CP are likely not the only individual traits associated with problematic technology use. We next consider how general traits, such as the Big Five factors, could deepen our understanding of the phenomenon as well as the two IT-specific traits in relation to the larger individual trait framework.

Amongst the many different frameworks to study individual trait, the Five-Factor Model, or the "Big Five," including extraversion, agreeableness, conscientiousness, emotional stability, and openness to experience, has been regarded as the most agreed upon personality framework because of its consistency with various psychological theories, validity across age, gender and culture, and links to a biological component (Costa and McCrae 1992a/b; Goldberg 1993; Viswesvaran and Ones 2004; Zweig and Webster 2004). These factors theoretically capture the essence of one's personality (Digman 1990; McElroy et al. 2007) and are found in the organizational setting to be related to job performance (Barrick and Mount 1991), career success, counterproductive behaviors (Salgado 2002), occupational stress (Tokar et al. 1998), performance motivation, work-family conflict, job attitudes, and leadership behavior (Judge and Bono, 2000). See Table 1 for more detailed description of the Big Five traits.

Table 1: A Summary of the Big Five Individual Traits		
Trait	Definition (John and Srivastava, 1999)	Adjective Descriptors (McCrae and Costa 1987; Zhang 2003)
Extraversion	Extraversion conveys an energetic approach to the social and material world, including such traits as sociability, assertiveness, and enthusiasm	Active, assertive, energetic, expressive, gregarious, sociable, spontaneous, talkative
Agreeableness	Agreeableness contrasts a prosocial and communal orientation toward others with relationships of a more antagonistic nature	Altruistic, amiable, cooperative, empathic, helpful, sympathetic
Conscientiousness	Conscientiousness describes an individual's socially prescribed impulse control that facilitates task and goal oriented behavior, such as following norms and rules, delaying gratification, organizing, and planning	Careful, dependable, hard-working, purposeful, responsible, self-disciplined, scrupulous, strong-willed, thorough, trustworthy
Emotional stability (vs. Neuroticism)	Emotional stability, also known by its negative pole of neuroticism, contrasts even-temperedness with negative emotionality, encompassing feelings such as sadness, anxiousness, insecurity, anger and nervousness	Independent, placid, secure
Openness to experience	Openness to experience, or simply openness, describes the breadth, depth, originality and complexity of an individual's mental and experiential life	Adventurous, creative, curious, flexible, imaginative, intellectual, open-minded, variety-seeking

Though there exists evidence that the Big Five factors are related to the amount of Internet use -- more specifically, individuals low in extraversion, agreeableness, and conscientiousness engaged in higher levels of usage (Landers and Lounsbury 2006) – the relationship between Big Five and problematic use has not been extensively investigated. However, based on the Big Five definitions and associated adjective descriptors (Table 1), it is quite intuitive to conjecture that individuals high in conscientiousness, given their careful, responsible, and self-disciplined nature, are less likely to engage in excessive technology use while ignoring obligations and responsibilities in their work and life. By the same token, agreeable individuals are also less likely to exhibit problematic use (or indeed any other socially undesirable behavior) given their amiable and prosocial orientation. Individuals high in

emotional stability, with their even-temperedness, are less likely to procrastinate or seek escape through technology use; in contrast, neurotic people do spend extensive time online seeking a sense of belonging (Amiel and Sargent 2004). Problematic use is perhaps also less likely to be observed amongst those high in extraversion and openness to experience given their energetic approaches to social life and variety-seeking nature. This discussion leads to the second research question:

RQ2: Are the Big Five traits related to problematic technology use?

The two IT-specific user traits are likely to find some linkages with some general traits. For example, individuals high in openness are described as being imaginative, intellectual, curious (McCrae and Costa 1987) and open-minded (Zhang 2003). They tend to seek variety and intellectual stimulation, are better at grasping new ideas (Costa and McCrae 1988; McCrae and Costa 2003), and have more favorable attitudes toward learning (Barrick and Mount 1991). It is thus interesting to examine whether the two IT traits can find their foundation in openness to experience because they can be seen as a manifestation of openness in the context of technology use. The other four general traits (e.g., extraversion) may also be related to the two IT traits, but the linkages are less intuitive.

RQ3: Is openness to experience a general trait corresponding to PI and CP? Are the other Big Five traits related to PI and CP as well?

Next, we describe our methodology to address these research questions.

Method

Two survey studies were conducted to address the above research questions. Study 1 explores the relationships between the two IT-specific traits and problematic use with a sample

of undergraduate students. Study 2 examines the two specific traits along with the Big Five factors using a sample of working adults. Since much of the prior user trait research in IS has relied primarily on student subjects, such two-sample design will lend us further confidence in the validity and applicability of our findings. Similar to prior IS trait research (e.g., Agarwal and Karahanna 2000), the Internet was the target technology chosen for both surveys.

Measurement scales in Study 1 included computer playfulness (Webster and Martochhio 1992), personal innovativeness (Agarwal and Prasad 1998), and a measure of problematic Internet use, which, as discussed in details in the next section, was refined from Davis et al.'s (2002) 36-item PIU measure. In addition to the above scales, Study 2 also included items for Big Five factors (John and Srivastava 1999). All items were measured by seven-point Likert-type scales from "Strongly Disagree (1)" to "Strongly Agree (7)." We next discuss the procedure for instrument refinement.

Instrument refinement

Though the four-factor PIU instrument (Davis et al., 2002) demonstrates overall model fit, its discriminant validity was not explicitly tested. With inter-factor correlations ranging from .70 to .76 (Table 2) amongst the loneliness/depression (LD), diminished impulse control (DIC), and social comfort (SC) factors, these three factors are not sufficiently unique from one another because discriminant validity becomes problematic as factor correlations approach .71 (MacKenzie et al., 2005). Since they all manifest the user's dependency on Internet use (which is distinct from the fourth factor, *distraction*, which refers to the user's avoidance of responsibilities through Internet use), they tap the same latent construct, which can be labeled *dependency*. The PIU instrument can thus be reformulated into a two-factor model, including

dependency (DEP) and distraction (DIS). To validate the reformulated measure, significant item elimination from the original 36-item instrument was necessary to eliminate redundancy since the newly combined dependency scale contained 29 items. Thus, the instrument was first pilot tested to a small group of students to identify opportunities for refinement.

Table 2. Factor Correlations of Davis et al.'s (2002) PIU Instrument

Factor	Number of Items	LD	DIC	SC	DIS
Loneliness/Depression	6	1			
Diminished Impulse Control	10	**.71**	1		
Social Comfort	13	**.70**	**.76**	1	
Distraction	7	.59	.66	.58	1

Thirty-five undergraduate students from a junior-level class in a public university were asked to complete Davis et al.'s (2002) PIU instrument. Data from the 25 useable responses showed correlational patterns similar to those reported by Davis et al. (Table 2) – high correlations amongst items from the previous LD, DIC and SC scales (exceeding 0.7), along with moderate correlations with the DIS items, thus supporting the combination of LD, DIC and SC into a single factor.

To reduce redundancy in the DEP and DIS scales, similarly worded and highly correlated items were dropped as appropriate. To ensure convergent and discriminant validity, inter-item correlations were further examined to ensure that each item is more highly correlated with other items within the same scale than with those in the other scale. Throughout the elimination process, it was made sure that the domain coverage of the construct dimensions did not suffer as a result. This process resulted in a refined set of ten items (Table 3), to be validated with a large sample in Study 1.

Table 3. The Refined Two-Factor PIU Measure

Dependency	DIC02	When I am on the Internet, I often feel a kind of "rush" or emotional high.
	DIC04	People complain that I use the Internet too much.
	DIC06	When I am not online, I often think about the Internet.
	LD02	I am less lonely when I am online.
	LD05	I feel helpless when I don't have access to the Internet.
	SC01	I am most comfortable online.
	SC11	The Internet is more "real" than real life.
Distraction	DIS03	I find that I go online more when I have something else I am supposed to do.
	DIS06	I often use the Internet to avoid doing unpleasant things.
	DIS07	Using the Internet is a way to forget about the things I must do but don't really want to do.

Study 1: Student sample

An anonymous survey containing the refined PIU instrument was distributed to 288 students in another junior-level undergraduate class. A total of 267 students, including 173 males (65%) and 94 females (35%), returned useable responses. The participants had an average of 7.5 years of Web experience, and most were 20-22 years of age.

Instrument validation

LISREL 8.80 was used to evaluate the goodness-of-fit of the three alternative CFA models (Models 1-3 in Figure 1a – 1c) in relation to the hypothesized two-factor PIU model (Model 4 in Figure 1d). As shown in Table 4, of all four models evaluated, only the hypothesized second-order model (Model 4 in Figure 1d) demonstrated satisfactory fit. Figure 2 presents the estimates of parameters in this model.

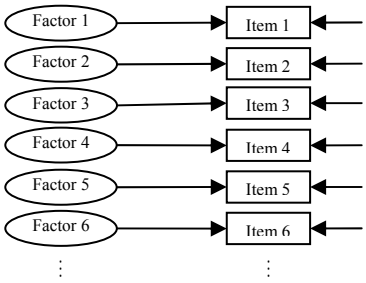

Figure 1 a. Model 1: Null

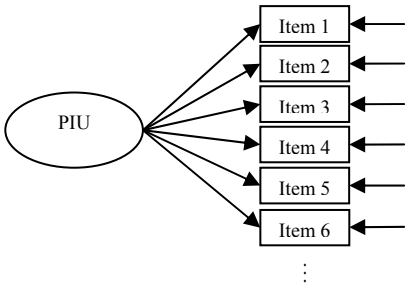

Figure 1b. Model 2: One first-order

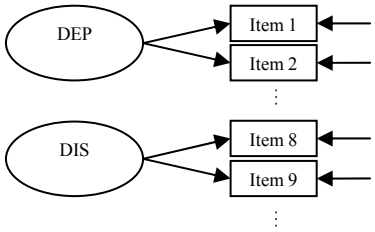

Figure 1c. Model 3: Uncorrelated two factors

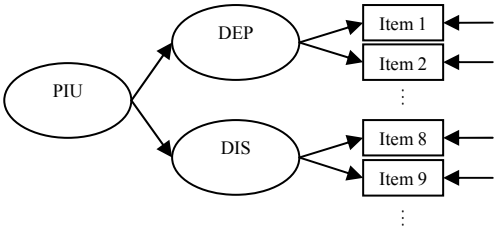

Figure 1d. Model 4: Second-order Model

Table 4. Goodness-of-fit Tests of Alternative Models (n = 267)

Criteria	Threshold	Model 1 Null	Model 2 One first-order factor	Model 3 Two uncorrelated first-order factors	Model 4 Second-order Model
χ^2		1624.43	178.94	134.60	78.03
d.f.		35	35	35	33
χ^2/d.f.	(< 3.00)	46.41	5.11	3.85	2.36
RMSEA	(< 0.08)	0.41	0.12	0.10	0.07
CFI	(> 0.90)	0.47	0.92	0.93	0.97
NFI	(> 0.90)	0.46	0.90	0.91	0.95
GFI	(> 0.90)	0.45	0.88	0.91	0.94
AGFI	(> 0.80)	0.14	0.81	0.86	0.91

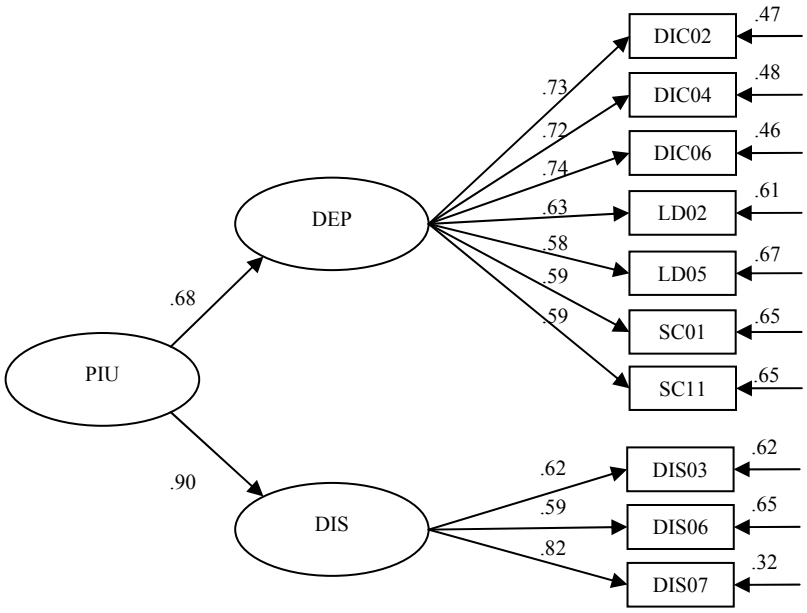

Figure 2. Parameter Estimates (Model 4, n = 267)

To demonstrate convergent validity/unidimensionality, one single latent variable must underlie each PIU scale. Separate CFA runs were conducted for the two scales. Results in Table 5 suggest an overall good fit for the Dependency scale since four fit indices (CFI, NFI, GFI, and AGFI) were more favorable than the recommended thresholds in Table 4, though χ^2/d.f. and RMSEA values were slightly higher than the recommended thresholds. The CFA model for the Distraction scale was saturated because of the number of indicators. The fit indices, calculated from a two-factor model including both scales, met all model fit thresholds (Table 4). Thus, the two-factor PIU measure demonstrates satisfactory convergent validity/unidimensionality.

Table 5. Convergent Validity/Unidimensionality (Student Sample n = 267)

Factor	Number of indicators	χ^2	d.f.	χ^2/d.f.	RMSEA	CFI	NFI	GFI	AGFI
DEP	7	45.08	14	3.22	0.091	0.97	0.96	0.95	0.91
DIS*	3	78.03	34	2.30	0.070	0.97	0.95	0.94	0.91
Note: *This model is saturated because of the number of indicators. Fit indices are thus not available. Fit indices presented here were calculated from a two-factor model including DEP and DIS.									

To establish discriminant validity, the two PIU factors were assessed in a pair of LISREL models, one with the two latent constructs allowed to freely covary (unconstrained model, χ^2 = 78.03), and the other with their covariance constrained to one (constrained model, χ^2 = 120.93). Since the unconstrained model represents significantly better fit ($\Delta\chi^2$ = 42.90, $p < .01$), and that the correlation between the DEP and DIS factors is .61, below the recommended upper threshold of .71 (MacKenzie et al., 2005), the two-factor PIU instrument thus possesses satisfactory discriminant validity.

In addition to convergent validity/unidimensionality and discriminant validity, the two-factor PIU instrument also possesses satisfactory reliability. Cronbach's alpha value is .84 for the Dependency scale, .73 for the Distraction scale, and .85 for the overall measure. Having demonstrated the psychometric properties of the new PIU measure, we moved on to examine the relationships between PIU and the two IT traits.

Regression analysis

Table 6 summarizes the descriptive statistics, scale reliability and correlation matrix for the student sample. Hierarchical regression analysis was performed to explore the relationship between the two IT traits and PIU. As shown in Tables 7 and 8, controlling for gender, both personal innovativeness and computer playfulness are significantly related to PIU, explaining 8.4% and 19.1% of its variance respectively. Thus, male and personally innovative, and playful individuals are more likely to experience problematic use.

Table 6. Descriptive Statistics, Scale Reliability and Correlation Matrix (Student Sample, *n* = 267)						
	Mean	s.d.	α	PI	CP	PIU
PI	4.07	1.33	.83	1.000		
CP	4.02	.97	.82	.609**	1.000	
PIU	3.21	1.04	.85	.318**	.465**	1.000

** Correlation is significant at the 0.01 level (1-tailed)
* Correlation is significant at the 0.05 level (1-tailed).

Table 7. Personal Innovativeness and PIU (Student Sample, *n* = 267)						
	Variables Added	*β*	*t*	*Sig.*	ΔR^2	*Total* R^2
Step 1	Gender	.138	2.30	.022	.019	.019
Step 2	Gender	.021	.34	.737		
	PI	**.313**	**5.07**	**.000**	**.084**	**.103**

Table 8. Computer Playfulness and PIU (Student Sample, *n* = 267)						
	Variables Added	*β*	*t*	*Sig.*	ΔR^2	*Total* R^2
Step 1	Gender	.138	2.30	.022	.019	.019
Step 2	Gender	.009	.15	.881		
	CP	**.461**	**8.15**	**.000**	**.191**	**.210**

Study 2: Working adult sample

An anonymous online survey was used to collect data from a diverse sample of working adults. Because the survey concerns problematic usage behavior, data collection through an employer-sanctioned survey is likely to be subjected to social desirability bias as employees may be reluctant to participate or answer truthfully. Participants were therefore recruited through *StudyResponse*, a nonprofit online research facilitator at Syracuse University, which maintains a large pool of research participants (over 95,000 individuals as of August 2005). A number of studies in IT and general management have also collected data from this participant pool (e.g., Barbeite and Weiss 2004; Piccolo and Colquitt 2006; Stanton et al. 2003).

StudyResponse forwarded our email invitation with a link to the online survey to 1,000 working adults randomly selected from the participant pool. To encourage participation, the respondents were entered into a random drawing to receive gift certificates from an online merchant. Useable responses were received from 184 working adults, including 86 males (47%) and 98 females (53%). The average participant was 37 years old (range of 18 to 68) with 11 years of work experience and a bachelor's degree. Approximately 84% of the respondents were employed full time.

The psychometric properties of the PIU instrument proved to be generally satisfactory for the employee sample (α = .91, χ^2/d.f. = 2.71, RMSEA = .097, CFI = .97, NFI = .96, GFI = .91, and AGFI = .85). Table 9 summarizes the descriptive statistics, scale reliability and correlation matrix for this sample.

Table 9. Descriptive Statistics, Scale Reliability and Correlation Matrix (*n* = 184)

		Mean	s.d.	α	1	2	3	4	5	6	7	8
1	Extraversion	4.03	1.11	.87	1.000							
2	Agreeableness	5.32	.96	.84	.345**	1.000						
3	Conscientiousness	5.00	.91	.80	.247**	.490**	1.000					
4	Emotional Stability	4.39	1.15	.89	.360**	.297**	.351**	1.000				
5	Openness	5.03	.93	.85	.348**	.545**	.456**	.263**	1.000			
6	PI	4.25	1.60	.90	.210**	-.011	-.065	.109	.221**	1.000		
7	CP	4.68	1.30	.94	.197**	.207**	.130*	-.038	.375**	.596**	1.000	
8	PIU	3.25	1.40	.91	-.190**	-.288**	-.297**	-.437**	-.320**	.382**	.296**	1.000

** Correlation is significant at the 0.01 level (1-tailed)
* Correlation is significant at the 0.05 level (1-tailed).

Regression Analysis

Hierarchical regression results shown in Table 10 suggest that young male technology users are more likely to experience PIU, and that after controlling for gender and age, the Big Five traits explained a significant amount of variance in PIU (ΔR^2 = 19.3%). Though only two of

these traits are significant when all five are entered into the equation simultaneously, all five are significant when examined individually in separate equations (Table 11). Since VIF values in all above regression equations are less than 2, far below the recommended upper threshold of 10 (Neter et al. 1996),.multicolinearity is not likely a major concern. Thus, the Big Five traits are related to problematic use such that neurotic and introverted individuals are more likely to exhibit problematic use, while open, conscientious and agreeable people are less likely so. Amongst the five traits, neuroticism and openness have the largest impact.

Results from Step 3 (Table 10) show that after parceling out the effects of age, gender and the Big Five traits, the two IT-specific traits explained another significant amount of incremental variance (ΔR^2 = 21.1%), thus corroborating with the finding from the Study 1 that the two IT traits are related to problematic use..The regression equation explained a total of 52% of variance in problematic use.

Table 10. Big Five Traits, IT-Specific Traits and Problematic Use (Employee Sample, *n* = 184)

Variables Added		*β*	*t*	*Sig.*	ΔR^2	*Total* R^2
Step 1	Gender	.182	2.599	.010		
	Age	-.278	-3.973	.000	.115	.115
Step 2	Step 1 +					
	Extraversion	.033	.465	.643		
	Agreeableness	.013	.157	.876		
	Conscientiousness	-.033	-.432	.667		
	Emotional Stability	-.368	-5.107	.000		
	Openness to Experience	-.185	-2.341	.020	.193	.309
Step 3	Step 2 +					
	CP	.182	2.499	.013		
	PI	.377	5.328	.000	.211	.520

Note: All VIF values < 2.

Table 11. Regression Results of the Big Five Traits on Problematic Use When Evaluated in Separate Equations (Employee Sample, *n* = 184)				
	β	*t*	*Sig.*	ΔR^2
Extraversion	-.168	-2.426	.016	.028
Agreeableness	-.211	-2.903	.004	.040
Conscientiousness	-.228	-3.251	.001	.049
Emotional Stability	-.409	-6.334	.000	.161
Openness	-.273	-4.008	.000	.072

Note: Age and gender were controlled in all five equations.

Also, based on observations of the correlation matrix (Table 9), openness is the Big Five trait that has the highest correlations with the two IT-specific traits, providing evidence for its conceptual linkages with these IT traits. It is also worth noting that extroversion is also significantly related to both IT traits.

Summary and Discussions

Building on recent psychology literature, this study developed the construct of problematic technology use. Complementing prior work that linked personal playfulness and computer playfulness with positive usage outcomes, this research provides initial evidence from student and employee samples that these two traits can also lead to problematic use. These results contribute to a more complete view of the implications of the two IT-specific traits and a deeper understanding of individuals' intrinsic motivation to use technology.

This research is among the first empirical IS studies to investigate the potential negative consequences of technology use. The construct of problematic technology use consists of two dimensions: dependency on technology (e.g., excessive and compulsive use) and technology use for distraction (e.g., procrastination and avoidance of social and occupational responsibilities). A ten-item measurement instrument has demonstrated its robustness across the student and

employee samples. We hope that the new instrument will pave the way for future work in this area.

In addition to the two IT-specific traits, the Big Five traits are also found to be significant predictors of problematic use, with neuroticism and openness showing the largest impact. One noteworthy observation of these results has to do with the relative explanatory power of the Big Five traits. Though the two IT-specific traits explained significant incremental variance over the Big Five (Table 10), neuroticism appeared to have more explanatory power in Study 2 than personal innovativeness in Study 1 (16.1% in Table 11 vs. 8.4% in Table 7). Thus, the commonly held belief that domain-specific traits possess superior explanatory power over general traits may require close examination in certain situations because what is commonly seen as a general trait (e.g., neuroticism) may turn out to be a quite specific one in your particular research context. Future trait research in IT must pay appropriate attention to general traits like the Big Five and make informed decisions about including or excluding a general trait in the research. The overall regression equation explained 52% of variance in problematic use.

This study also explored the linkages between the two IT-specific traits and the Big Five factors, a broader individual trait framework. Results suggest that CP and PI are manifestations of openness to experience in the context of technology use. These two traits are also significantly related to extraversion. These findings contribute to a deeper understanding of these two IT-specific traits and help situate them in the broader individual trait framework and trait literature.

This study used the Internet as the target technology. Just as the trait of playfulness is more fully manifested during the use of some technologies than others, all technologies are not equally prone to problematic use – possibly less likely for those of business use (e.g., ERP

software) than for those of personal or dual use (e.g., Blackberry PDA). Future research should further examine this boundary issue.

Data from the working adult sample may also be subject to self selection bias given the nature of an online survey. Study participants' behavior was self-reported during a single session. Thus, common method variance can be a potential bias. However, the corroborating results from the two surveys and the moderate to low levels of correlation coefficients amongst the many variables suggest that such bias is not likely a major threat in this study.

While much existing research on technology adoption and use has focused on performance gains for the employee and the organization, this study has focused more on the personal implications of technology use for the user (though these negative consequences identified can in turn threaten their work performance). In popular press, there already exists much anecdotal evidence that technologies such as the Blackberry PDAs, or "crackberries," can make work-life balance issues more challenging for its users and the associated legal considerations for the employer (Kakabadse et al. 2007). We hope that this work will stimulate more multi-faceted investigations on the implications of technology adoption and use for the various stakeholders.

Future research should further test and refine the measurement instrument for problematic use. It is also important to replicate the study in other settings and further delineate the positive as well as negative effects of these two traits. As IS researchers continue to assess benefits of technology adoption and use, more research attention should be given to the potentially negative consequences of technology use, which is necessary in order to achieve a thorough understanding of this phenomenon. We hope that our initial attempt at filling the gap in this literature stimulates future research in this area.

REFERENCES

Agarwal, R. and Karahanna, E. “Time flies when you’re having fun: Cognitive absorption and beliefs about information technology usage,” *MIS Quarterly* (24:4), 2000, pp. 665–694

Agarwal, R. and Prasad, J. “A Conceptual and Operational Definition of Personal Innovativeness in the Domain of Information Technology,” *Information Systems Research* (9:2), 1998, pp. 204-215

Amichai-Hamburger, Y., Kaynar, O. and Fine, A. “The effects of need for cognition on Internet use,” *Computers in Human Behavior* (23), 2007, pp. 880–891

Amiel, T. and Sargent, S.L. “Individual differences in Internet usage motives,” *Computers in Human Behavior* 20 (2004) 711–726

Bandura, A. "Self-Efficacy: Toward a Unifying Theory of Behavioral Change," *Psychological Review* (84:2), 1977, pp. 191-215

Barbeite, F. G., & Weiss, E. M. 2004. Computer self-efficacy and anxiety scales for an Internet sample: testing measurement equivalence of existing measures and development of new scales. *Computers in Human Behavior*. 20 (1), 1-15.

Barrick, M.R. and Mount, M.K. “The big-five personality dimensions and job performance: A meta-analysis,” *Personnel Psychology* (44), 1991, pp. 1-26

Beard, K.W., & Wolf, E.M. (2001). Modification in the proposed diagnosis criteria for Internet addiction. *CyberPsychology & Behavior, 4*, 377-383.

Brenner, V. (1997). Psychology of computer use: XLVII. Parameters of Internet use, abuse and addiction: The first 90 days of the Internet usage survey. *Psychological Reports, 80*, 879-882.

Buss, D.M. “Evolutionary personality psychology,” *Annual Review of Psychology* (42), 1991, pp. 459-491

Chou, C. (2001). Internet heavy use and addiction among Taiwanese college students: An online interview study. *CyberPsychology & Behavior, 4*, 573-585.

Chou, C., Condron, L. and Belland, J.C. “A review of the review on Internet addiction,” *Educational Psychology Review* (17:4), 2005, pp. 363-368

Chou, T.J. and Ting, C.C. “The Role of Flow Experience in Cyber-Game Addiction,” *CyberPsychology & Behavior* (6:6), 2003, pp. 663-675

Compeau, D.R. and Higgins, C.A. “Computer self-efficacy: Development of a measure and initial test,” *MIS Quarterly* (19:2), 1995, pp. 189-211

Costa, P.T., Jr. and McCrae, R.R. “Personality in adulthood: A six-year longitudinal study of self-reports and spouse ratings on the NEO Personality Inventory,” *Journal of Personality and Social Psychology* (54), 1988, pp. 853-863

Costa, P.T., Jr. and McCrae, R.R. “Four ways five factors are basic,” *Personality and Individual Differences* (13), 1992a, pp. 653-665

Costa, P.T., Jr. and McCrae, R.R. *Revised NEO Personality Inventory (NEO-PI-R) and NEO Five-Factor Inventory (NEO-FFI) Professional Manual*, Odessa, FL: Psychological Assessment Resources, 1992b

Csikszentmihaiyi, M. *Beyond Boredom and Anxiety,* Jossey-Bass, San Francisco, CA, 1975

Davis, R.A. “A cognitive-behavioral model of pathological Internet use,” *Computers in Human Behavior* (17), 2001, pp. 187–195

Davis, R.A., Flett, G.L. and Besser, A. "Validation of a new scale for measuring problematic Internet use: Implications for pre-employment screening," *CyberPsychology & Behavior* (5:4), 2002, pp. 331-345

Digman, J. M. "Personality Structure: Emergence of the Five-Factor Model," *Annual Review of Psychology* (41:1), 1990, pp. 417-440.

Goldberg, L.R. "The structure of phenotypic personality traits," *American Psychologist* (48), 1993, pp. 26-34

Griffiths, M.D. (1992). Pinball wizard: The case of a pinball machine addict. *Psychological Reports, 71*, 160-162.

Hess, T.J., Fuller, M.A., and Mathew, J. "Involvement and Decision-Making Performance with a Decision Aid: The Influence of Social Multimedia, Gender, and Playfulness," *Journal of Management Information Systems* (22:3), 2006, pp. 15-54

John, O.P. and Srivastava, S. "The Big-Five Trait Taxonomy: History, Measurement, and Theoretical Perspectives," in L. Pervin and O.P. John (eds.), *Handbook of Personality: Theory and Research* (2ed.), Guilford, NY, 1999

Judge, T. A. and Bono, J. E. (2000) "Five-factor model of personality and transformational leadership," *Journal of Applied Psychology*, 85(5), 751–765

Kakabadse, N., Porter, G., and Vance, D. "Addicted to technology," *Business Strategy Review*, 2007, 18:4, pp. 81-85

Keepers, G.A. (1990). Pathological preoccupation with video games. *Journal of the American Academy of Child and Adolescent Psychiatry, 29*, 49–50.

Keen, P.G.W. "MIS research: Reference disciplines and a cumulative tradition," *Proceedings of the International Conference on Information Systems*, 1980, pp. 9-18

Kraut, R., Patterson, M., Lundmark, V., Kiesler, S., Mukopadhyay, T., & Scherlis, W. (1998). Internet paradox: A social technology that reduces social involvement and psychological well-being? *American Psychologist, 53*, 1017-1031.

Landers, R.N. and Lounsbury, J.W. "An investigation of Big Five and narrow personality traits in relation to Internet usage," *Computers in Human Behavior* (22), 2006, pp. 283–293

Leonard-Barton, D. and Deschamps, I. "Management influence in the implementation of new technology," *Management Science* (34:10), 1988, pp. 1252-1265

Lewis, W., Agarwal, R. and Sambamurthy, V. "Sources of influence on beliefs about information technology use: An empirical study of knowledge workers," *MIS Quarterly* (27:4), 2003, pp. 657-678

Limayem, M. and Khalifa, M. "What Makes Consumers Buy from Internet? A Longitudinal Study of Online Shopping," *IEEE Transactions on Systems, Man & Cybernetics* (30:4), 2000, pp. 421-432

Lucas, H. C., Jr. *Computer Based Information Systems in Organizations*, Science Research Associates, Inc., Chicago, IL, 1973

MacKenzie, S.B., Podsakoff, P.M., & Jarvis, C.B. (2005). The problem of measurement model misspecification in behavioral and organizational research and some recommended solutions. *Journal of Applied Psychology, 90*, 710-730.

Martochhio, J.J. and Webster, J. "Effects of feedback and cognitive playfulness on performance in microcomputer software training," *Personnel Psychology* (45), 1992, pp.553-578

McCrae, R.R. and Costa, P.T. *Personality in Adulthood: A Five-Factor Theory Perspective* (2nd ed.), New York: Guildford Press, 2003

McCrae, R.R. and Costa, P.T. "Validation of the five-factor model of personality across instruments and observers," *Journal of Personality and Social Psychology* (52:1), 1987, pp. 81-90

McElroy, J.C., Hendrickson, A.R., Townsend, A.M., and DeMarie, S.M. "Dispositional factors in Internet use," *MIS Quarterly*, 31:4, pp. 809-820, 2007

Morahan-Martin, J. and Schumacher, P. "Incidence and correlates of pathological Internet use among college students," *Computers in Human Behavior* (16), 2000, pp. 13–29

Nalwa, K., & Anand, A.P. (2003). Internet addiction in students: A cause of concern. *CyberPsychology & Behavior, 6*, 653-656.

Neter, J., Kutner, M.H., Nachtsheim, C.J. and Wasserman, W. *Applied Linear Regression Models*, Chicago: Irwin, 1996

Ones, D.S., Viswesvaran, C. and Dilchert, S. "Personality at work: Raising awareness and correcting misconceptions," *Human Performance* (18:4), 2005, pp. 389-404

Piccolo, R. F., & Colquitt, J. A. 2006. Transformational leadership and job behaviors: The mediating role of core job characteristics. *Academy of Management Journal.* 49(2), 327-340.

Salgado, J. F. (2002) "The big five personality dimensions and counterproductive behaviors," *International Journal of Selection and Assessment, 10* (1), 117-125.

Sandelands, L.E. "Effects of Work and Play Signals on Task Evaluation," *Journal of Applied Social Psychology* (18:12), 1988, pp. 1032-1048

Scherer, K. (1997). College life on-line: healthy and unhealthy Internet use. *Journal of College Student Development, 38*, 655–664.

Shotton, M.A. *Computer Addiction? A Study of Computer Dependency*, Bristol, PA: Taylor & Francis, 1989

Srite, M., Galvin, J.E., Ahuja, M.K. and Karahanna, E. "Effects of individuals' psychological states on their satisfaction with the GSS process," *Information & Management* (44:6), 2007, pp. 535-546

Stanton, J. M., Stam, K. R., Guzman, I., & Caldera, C. 2003, October. Examining the linkage between organizational commitment and information security. *Proceedings of the IEEE Systems, Man, and Cybernetics Conference*. Washington, DC

Thatcher, A., Wretschko, G. and Fisher, J. "Problematic Internet Use among Information Technology Workers in South Africa," *CyberPsychology & Behavior* 2008, 11(6), pp. 785-787

Thatcher, J.B. and Perrewé, P.L. "An empirical examination of individual traits as antecedents to computer anxiety and computer self-efficacy," *MIS Quarterly* (26:4), 2002, pp. 381-396

Tokar, D.M., Fischer, A.R., and Subich, L.M. "Personality and vocational behavior: A selective review of the literature, 1993-1997," *Journal of Vocational Behavior* 53:115-153, 1998

Treuer, T., Fabian, Z., & Furedi, J. (2001). Internet addiction associated with features of impulse control disorder: Is it a real psychiatric disorder? *Journal of Affective Disorders, 66*, 283.

Venkatesh, V. "Determinants of perceived ease of use: Integrating control, intrinsic motivation, and emotion into the technology acceptance model," *Information Systems Research* (11:4), 2000, pp. 342-365

Viswesvaran, C. and Ones, D.S. (2004). "Importance of perceived personnel selection system fairness determinants: Relations with demographic, personality, and job characteristics," *International Journal of Selection and Assessment* (12:1), 2004, pp. 172-186

Webster, J. and Ahuja, J.S. "Enhancing the design of Web navigation systems: The influence of user disorientation on engagement and performance," *MIS Quarterly* (30:3), 2006, pp. 661-678

Webster, J. and Martocchio, J.J. "Microcomputer playfulness: Development of a measure with workplace implications," *MIS Quarterly* (16:2), 1992, pp. 201–226

Widyanto, L., & McMurran, M. (2004). The psychometric properties of the Internet Addiction Test. *CyberPsychology & Behavior, 7*, 443-450.

Whang, L.S., Lee, S., & Chang, G. (2003). Internet over-users' psychological profiles: A behavior sampling analysis on Internet addiction. *CyberPsychology & Behavior, 6*, 143-150.

Yellowlees, P.M. and Marks, S. "Problematic Internet use or Internet addiction?" *Computers in Human Behavior* (23), 2007, pp. 1447-1453

Yi, M.Y., Fiedler, K.D., and Park, J.S. "Understanding the Role of Individual Innovativeness in the Acceptance of IT-Based Innovations: Comparative Analyses of Models and Measures," *Decision Sciences* (37:3), 2006, pp. 393-426

Young, K.S. "Psychology of computer use: XL. Addictive use of the Internet: A case that breaks the stereotype," *Psychological Reports* (79), 1996, pp. 899-902

Zhang, L. "Does the big five predict learning approaches?" *Personality and Individual Differences* (34), 2003, pp. 1431-1446

Zmud, R. W. "Individual Differences and MIS Success: A Review of the Empirical Literature," *Management Science*, (25:10), 1979, pp. 966-97.

Zweig, D. and Webster, J. "What are we measuring? An examination of the relationships between the big-five personality traits, goal orientation, and performance intentions," *Personality and Individual Differences* (36), 2004, pp. 1693-1708

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