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# Blackberry Addiction: Symptoms and Outcomes

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## ABSTRACT

Pervasive information technologies, such as Blackberries, enable organizational users to interact with their working environments anytime and from anywhere. While such technologies can contribute to increased productivity, they can also drive addictive behaviors and negative consequences. An empirical study of 241 mobile email users revealed that their levels of addiction to mobile email increase their perceived work overload and technology-family conflict, work overload reduces their organizational commitment, and technology-family conflict diminishes the perceived usefulness of mobile email. Work overload together with technology-family conflict foster work-family conflict. Overall, this study distinguishes between technology-related and work-related conflict with one's family, and validates several negative consequences of technology addiction. Implications for research and practice are offered.

## Keywords

Mobile email, work-family conflict, technology-family conflict, usefulness, adoption, technology addiction, work overload, organizational commitment.

## INTRODUCTION

Pervasive information systems are technologies that can be used almost anytime and from anywhere, thus, not constraining employees to the physical premises of their organizations. For example, users of mobile email applications (e.g., Blackberry) can access work-related email while driving their cars, dining with their families or on vacation on a tropical island. On the one hand, these technologies can augment one's productivity; on the other hand, they may potentially promote negative outcomes, such as addiction, work overload, and conflict.

The negative consequences of using such pervasive technologies have received strong media and practitioner attention. For example, some people argue that addiction to Blackberry devices is "similar to drugs" yielding the term "Crackberry" (Mcintyre, 2006). Others believe that employees who become addicted to the use of Blackberry devices are likely to file lawsuits against their employers in the future (Fox News, 2006). Some organizations have even gone so far as to attempt a ban on Blackberry usage during certain times of the day (May, 2008). Overall, the practitioner literature emphasizes the potential addictiveness of such technologies, and some undesirable outcomes of their usage.

The academic literature has started tapping into this realm only in recent years. Several negative outcomes of the use of pervasive technologies have been explored (e.g., Middleton and Cukier, 2006), and the concept of problematic technology use (or pathological usage disorder) has been developed in leisure contexts, such as the Internet and video games (e.g., Davis, Flett and Besser, 2002, Ferraro, Caci, D'Amico and Di Blasi, 2007). Nevertheless, little emphasis has been given to the organizational and family-related consequences of a pathologically excessive use of organizational technologies, such as mobile email. The present study attempts to bridge this knowledge gap and establishes a nomological network which captures a range of negative consequences of addiction to pervasive organizational technologies.

Because pervasive organizational technologies are being used in both organizational and leisure settings, this study investigates the consequences that pertain to the triangle of (1) users' families; (2) users' organizations; and, (3) the

technology itself. The factors pertaining to user families include work-family conflict and technology-family conflict. The work-family conflict concept captures the irreconcilable demands from work and family (Frone, Russell and Cooper, 1992). Similarly, the technology-family conflict concept refers to the friction between family tasks and the usage of the pervasive technology. The organizational factors this study focuses on include perceived work overload (one's perception that he or she has too much to do (Frone et al., 1992)) and organizational commitment (the degree to which an individual identifies with his or her organization) (Cohen, 1992). Perceived usefulness of the pervasive technology (an assessment of the subjective probability that using a technology will increase ones' performance) (Davis, 1989)) is included as a technology-related factor that is affected by addiction.

The proposed research model builds upon several theories and models. It integrates parts of work-family interface theories and models, such as Moore's turnover intention model (Moore, 2000) and its extensions (Ahuja, Chudoba, Kacmar, McKnight and George, 2007) with technology acceptance model (TAM) (Davis, 1989) factors as well as with the technology addiction literature (Lin, 2004). The model posits that addiction to a pervasive technology can foster a conflict between one's technology use and his or her family needs, which in turn, (1) reduce the usefulness one attributes to the technology and (2) augment the friction between individuals and their families. Furthermore, the model suggests that addiction to a pervasive technology increases an individual's work overload, which in turn, can (1) reduce his or her organizational commitment and (2) increase work-family conflict.

By integrating addiction theories with organizational behaviors and technology-related perceptions, the proposed model makes several important contributions that are discussed in detail in this manuscript. This study empirically validates that the excessive use of pervasive technologies, such as Blackberry, may foster negative organizational, family-related, and technology-related outcomes. The proposed theory may guide future research in this realm and provide the basis for new managerial practices. Since managers often overlook the negative consequences of technology overuse, this study demonstrates the viability of negative outcomes, and thus calls for further managerial attention to the way pervasive technologies are managed, and are used by employees.

To achieve this study's goals, the next (i.e., second) section outlines the development of the theoretical background, model and hypotheses. The third section describes the validation of the proposed model that was done through a survey of Blackberry users in several organizations and by subjecting the data to Partial Least Squares (PLS) analysis. The last section offers discussion and conclusion.

## **THEORETICAL BACKGROUND**

Users of modern technologies may present problematic excessive usage behaviors, some of which are considered pathological and require treatment (Young, 2007). The terms addiction (Griffiths, 1999), problematic use (Davis et al., 2002), and over-use (Whang, Lee and Chang, 2003) have been proposed interchangeably for describing such behaviors. Technological addiction is a type of non-substance addiction, which involves excessive interaction with a technology under conditions of psychological dependency (Griffiths, 1999). Technological addiction, similar to other behavioral addictions, can be manifested through the following symptoms: (1) salience (i.e., dominating a person's thoughts and behaviors); (2) relief (i.e., doing the activity produces thrill or relief); (3) tolerance (i.e., the activity needs to be conducted to a greater extent to produce positive emotions); (4) withdrawal (i.e., inability to perform the activity results in negative emotions); (5) relapse and reinstatement (i.e., attempts to reduce the engagement in the activity are doomed to fail); and, (6) conflict (i.e., the activity produces conflicts with other individuals and tasks) (Brown, 1997).

Addictive behaviors have been examined in many technology contexts, including the Internet (Young, 1998), video games (Griffiths, Davies and Chappell, 2003), and pinball machines (Griffiths, 1992). A review of such studies reveals that technology addiction is a multifaceted concept that can be observed through various behavioral symptoms, most of which fall under Brown's (1997) criteria for addiction. Such behaviors include poor impulse control (Beard and Wolf, 2001), perceptual distortion and repetitive behaviors (Chou and Ting, 2003), dysfunctional social behaviors, escapism through usage, loneliness, depressed mood, and compulsivity (Whang et al., 2003).

Thus far, research has focused primarily on identifying antecedents of technology addiction, such as demographics and personality factors (Hur, 2006, Lin, 2004), as well as on finding addiction manifestations (Whang et al., 2003). The latter line of research has been used for developing scales for measuring addiction (Charlton and Danforth, 2007, Young, 1998), and distinguishing between addiction, as a pathological problem, and high engagement, which does not include withdrawal symptoms (Charlton and Danforth, 2007). Nevertheless, the extant body of research provides little insight on potential family, work, and technology-related outcomes of addiction to a pervasive organizational technology. Therefore, the following sections develop theory and hypotheses pertaining to such consequences of technology addiction.

## Effects of Technology Addiction

Addiction symptoms include increased usage of a technology and inability to decrease the activity due to psychological dependency. Furthermore, addicts tend to compromise their social lives (i.e., family and friends) and neglect themselves. In many cases, they prefer the excitement of using the technology over intimacy with their partners (Ferraro et al., 2007). Many of these behavioral aspects of addiction can affect individuals' relationships with their families. In the case of pervasive technologies, the increased and pervasive nature of usage (i.e., while driving, lying in bed, or on vacation) can exacerbate conflicts with individuals' families because less time is spent with the families and on family-related tasks, and more time is spent on interacting with the pervasive technology. Following attribution-theory (Jones and Davis, 1965), family members of a heavy user of a pervasive technology may attribute the cause of the technology-family friction solely to the pervasive technology, but not to the potentially unreasonably high expectations from the family. The emergence of this conflict is in line with Brown's (1997) conceptualization of addiction, which identifies a conflict between an addict and its surrounding entities as a symptom of addiction.

To capture the conflict between one's family and the technology he or she uses, this study builds on the work-family conflict literature (e.g., Duxbury and Higgins, 1991) and employs a construct called "Technology-Family Conflict" (TFC). Whereas work-family conflict is an inter-role conflict in which pressures from work and family are irreconcilable (Ahuja et al., 2007), technology-family conflict is defined as irreconcilable task demands from the family and a pervasive technology. That is, technology and family-related tasks compete for an individual's time, thus exacerbating tension. Note that conflict may also arise between one's family tasks and many other non-technology related activities, such as work, sport, studying, and hobbies. The work-family conflict concept can be modified in such cases to capture the conflict at hand. For example, Markel and Frone (1998) used the work-family conflict construct to conceptualize and capture the conflict between one's work and school. In the present study, the friction between family and technology is conceptualized and captured, and the following hypothesis is suggested:

**H1:** Addiction to an organizational pervasive technology has a positive effect on technology-family conflict.

Addiction to a pervasive organizational technology may also affect one's work environment in general, and specifically his or her perceived work overload. The latter term refers to one's perception that he or she has too much to do (Frone et al., 1992). Using a pervasive technology, employees can be reached anywhere and communicate anytime. Thus, when a pervasive device is provided by an employer, there may be an implicit expectation from the recipient to communicate in a timely fashion (e.g., respond to requests even when off work), and potentially to complete more tasks (i.e., working hours are extended to all day, all week). Furthermore, because such technologies may be used on the go (e.g., mobile email), users may compromise the quality of their work, and feel busy or rushed (e.g., answering emails using Blackberry while driving, walking or in a meeting). These effects may be augmented when users are addicted because even when the implicit demand for timely communications is not there, they may still prefer to use the pervasive technology, and are likely to use it excessively. Thus, the following hypothesis is suggested:

**H2:** Addiction to an organizational pervasive technology has a positive effect on perceived work overload.

## Effects of Technology-Family Conflict

Recall that technology-family conflict captures the friction between the usage of a pervasive technology and one's family. This friction may help shaping individuals' beliefs regarding the technology, and especially the perceived usefulness of this technology. Perceived usefulness refers to one's assessment of the subjective probability that using a technology will increase his or her performance (Davis, 1989). The fact the one's family perceives a technology to be disruptive, may diminish users' beliefs regarding the usefulness of this technology. On the one hand, the pervasive technology helps performing work-related tasks effectively and efficiently. On the other hand, it interferes with other tasks and infringes one's work-life balance. Furthermore, some users may attribute the friction between the pervasive technology and their families to the technology itself, thus reducing its perceived usefulness. It has been demonstrated that employees appraise stressful events using attributions (Peeters, Schaufeli and Buunk, 1995). The self-serving bias in attribution theory suggests that individuals praise themselves in cases of positive outcomes, but they hold other individuals, factors, or technologies responsible in cases of failures (Miller and Ross, 1975, Weiner, Frieze, Kukla, Reed, Rest and Rosenbaum, 1972, Peterson, Semmel, von Baeyer, Abramson, Metalsky and Seligman, 1982). When a technology-family conflict arises as a result of excessive usage of a pervasive technology, users may attribute the negative outcomes to the technology but not to themselves. This in turn may negatively affect their perceptions of the technology usefulness. Taking these issues into account, the following hypothesis is suggested:

**H3:** Technology-family conflict has a negative effect on the perceived usefulness of an organizational pervasive technology.

Technology-family conflict may also be used as a basis upon which one form's a conflict with his or her family. The irreconcilable task demands from the family and the pervasive technology may increase the friction between individuals and their families. Therefore, a family member's disruptive and excessive interactions with the technology may be perceived, in part, as work-sessions when in fact a user is expected to spend his or her time with the family. When individuals use a pervasive technology in their spare time, their family members perceive them as being actually at work that causes a work-family conflict. Thus, the following hypothesis is suggested:

**H4:** Technology-family conflict has a positive effect on work-family conflict.

**Effects of Perceived Work Overload**

Perceived work overload may have many negative organizational consequences (e.g., vandenBerg and Schalk, 1997). In this study, the focus is on two outcomes, namely work-family conflict, and organizational commitment. The former term has already been defined. The latter term describes the degree to which an individual is involved in, and identifies with, his or her organization (Cohen, 1992). This is an important concept because it is negatively linked with turnover intention, thus positively affecting retention (Igarria and Greenhaus, 1992).

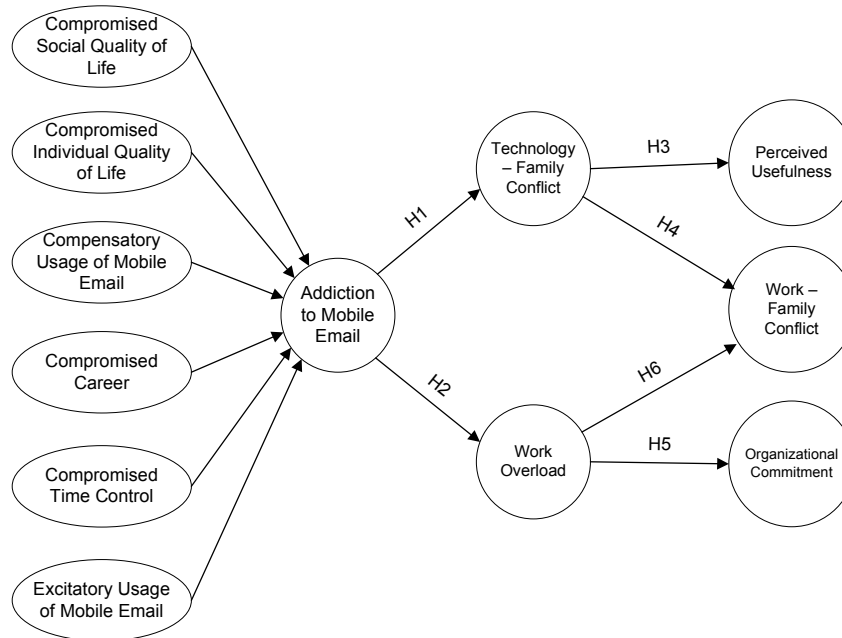
It is argued that individuals who perceive to be overworked tend to reduce their organizational commitment. This follows the fairness paradigm, which posits that individuals adjust their effort and relational intentions when they are faced with what is perceived to be an unfair exchange relationship (Adams, 1965). It can get to the extent that individuals steal from their employers as a reaction to unfair treatments (Greenberg, 1990). This study suggests that work overload is being perceived as an inequity in an exchange relationship, which may lead to a decline in one's relational commitment. Indeed, it has been demonstrated that organizational commitment is influenced by work experience antecedents (Cohen, 1992), and specifically, indirectly affected by perceived work overload (Ahuja et al., 2007). Furthermore, work overload correlates negatively with professional commitment (Wallace, 1997). Thus, it is hypothesized:

**H5:** Perceived work overload has a negative effect on one's organizational commitment.

Perceived work overload, as a proxy for the actual work overload, may also augment the friction between one's family-related tasks and work-related issues. Overworked individuals may feel stressed and exhausted (Moore, 2000), which may negatively affect their well-being and the time spent on family activities. In line with these notions, it has been shown that perceived work overload leads to a higher level of work-family conflict (Ahuja et al., 2007, Parasuraman, Purohit, Godshalk and Beutell, 1996). Thus, the following hypothesis is proposed:

**H6:** Perceived work overload has a positive effect on one's work-family conflict.

The proposed research model is depicted in Figure 1. The addiction dimensions are discussed in the next section.



**Figure 1: Research Model**

## METHODOLOGY AND RESULTS

The pervasive IT artifact chosen for this study is mobile-email, because (1) it represents a growing lucrative market that may be of interest to organizations, mobile service providers, handset providers, and software developers, (2) there is anecdotal evidence that the pervasive nature of mobile email can lead to addictive behaviors (Mcintyre, 2006), and (3) mobile email is an organizational technology that brings work home, thus interfering with family and leisure life. Therefore, a broad range of organizational-related and family-related consequences may be examined simultaneously.

To test the model, a survey of actual users of mobile email was conducted. 550 mobile email users in three organizations were approached through a personalized email message asking them to voluntarily complete an online questionnaire. 450 individuals have clicked through to read the invitation, and 241 completed questionnaires were obtained at the response rate of 44%, which is acceptable. The sample included 60% male and 40% female respondents. Additional demographic and mobile email usage information is provided in Table 1.

	N	Min	Max	Mean	Std. Deviation
Typical number of mobile email messages sent daily	240	0	200	20	26
Typical number of mobile email messages received daily	240	0	500	52	59
Typical time spent interacting with mobile email during working hours (daily)	240	0	480	42	66
Typical time spent interacting with mobile email during evening time (daily)	240	0	240	23	32
Typical time spent interacting with mobile email while commuting (daily)	237	0	240	11	24
Typical time spent interacting with mobile email on weekends (daily)	240	0	480	38	64
Typical time spent interacting with mobile email while vacationing (daily)	234	0	600	32	70
Typical monthly MB of mobile email data	151	0	1000	53	122
Typical monthly payment (\$US) for data services	176	0	300	54	48
Average daily % of time out of office	224	0	100	39	26
Average daily % of time out of organizational premises	224	0	100	19	24
Age	235	18	68	38	13

**Table 1: Attributes of Sample**

### Measures

All measures used for assessing the model's constructs were adapted from existing research instruments. Note that the scale for addiction, adapted from the Internet Addiction Disorder Scale (Young, 1998), captures a composite (second-order) construct which has six facets (symptoms). The use of a second-order factor is advantageous because it allows balancing bandwidth and fidelity by capturing the broad spectrum of construct facets, while measuring each one in an internally consistent manner (Jackson, Colquitt, Wesson and Zapata-Phelan, 2006).

Further note that different scales were chosen for measuring work-family conflict and technology-family conflict. This was done for two reasons. First, the Adams et al. scale (1996) has good psychometric properties and its items fit the examined context. In contrast, the time-based conflict scale by Stephenson and Sommer (1996) was used for measuring technology-family conflict, because its items present a better fit to the conflict elements between ones family and the technology he or she uses. Second, the use of two separate scales can mitigate potential common-method bias.

All items were reported on a seven-point Likert-type scale. Addiction and work overload measures captured frequencies with which individuals experience certain feelings and behaviors, and accordingly were anchored with "Once a year or less" (1) and "Daily" (7). The rest of the scales captured agreement with the given statements, and thus were anchored with "Strongly Disagree" (1) and "Strongly Agree" (7). Table 2 presents sample items and their sources.

Construct	Measure Source	No. of Items	Sample Item
Compromised Social Quality of Life	The Internet Addiction Disorder scale (Young, 1998)	5	How often do you snap, yell, or act annoyed if someone bothers you while on your mobile email?
Compromised Individual Quality of Life		5	How often do you neglect household chores to spend more time on your mobile email?
Compensatory Usage of Mobile Email		3	How often do you check your mobile email before something else that you need to do?
Compromised Career		2	How often does your job performance suffer because of your mobile email?
Compromised Time Control		2	How often do you find that you stayed on your mobile email longer than intended?
Excitatory Usage of Mobile Email		2	How often do you prefer the excitement of the mobile email over intimacy with partners or friends?
Addiction to Mobile Email		Second - order factor	
Technology-Family Conflict	Builds on the work-family conflict scale by Stephenson and Sommer (1996)	4	The use of mobile email takes up time that I feel I should spend with my family and friends.
Work Overload	(Moore, 2000)	4	I feel that the amount of work I do interferes with how well it is done.
Organizational Commitment	(Tsui, Pearce, Porter, & Tripoli, 1997)	4	For me, this is the best of all possible organizations for which to work.
Work-Family Conflict	(G. A. Adams et al., 1996)	5	The demands of my work interfere with my home and family life.
Perceived Usefulness	(F. Davis, 1989)	4	Using mobile email enhances my effectiveness in my job.

Table 2: Measures Used

### Measurement Model

PLS Graph was used for model estimation because it allows modeling of second-order formative constructs. The repeated indicators approach (also known as the Hierarchical Components Model) was employed for modeling the second-order addiction composite. This approach is acceptable for Partial Least Squares (PLS) estimation (Turel, Serenko and Bontis, 2007, Lohmoller, 1989).

At the first stage of analysis, a controlled model that included age and sex was analyzed. Since none of these control variables emerged as significant, they were removed from further analysis. Table 3 outlines item statistics. Two items (ORGC4 and TFC3) were dropped for reliability reasons. All other items exhibited adequate psychometric properties. After excluding these two items, both the measurement and structural models were re-estimated. For the new measurement model, all constructs had Cronbach's Alpha above 0.7, all item loadings explained over 50% of their construct variances, corrected item-to-total correlations exceeded the cut-off point of 0.35, and residual variances were low. Table 4 presents construct statistics and further supports construct validity because the measures of composite reliability and Average Variance Extracted (AVE) were over 0.7 and 0.5, respectively. The matrix of loadings and cross-loadings (Table 5) further supports the discriminant and convergent validities of the model. It reveals that all items load higher on their respective constructs. In addition, Table 6 demonstrates that the square root of AVE exceeds inter-construct correlations. This further confirms the model's validity (Fornell and Larcker, 1981). Overall, it was concluded that the measurement model exhibits acceptable psychometric properties.

Construct	Item	Mean	Std. dev	Loading	Error	Item-total correlation
Perceived Usefulness	PU1	5.83	1.22	0.915	0.163	0.839
	PU2	5.92	1.12	0.907	0.177	0.849
	PU3	5.83	1.15	0.934	0.127	0.870
	PU4	6.14	1.06	0.882	0.223	0.802
Work-Family Conflict	WFC1	4.08	1.87	0.935	0.125	0.897
	WFC2	3.76	1.84	0.962	0.075	0.936
	WFC3	3.85	1.86	0.948	0.101	0.919
	WFC4	3.68	1.81	0.934	0.127	0.890
	WFC5	4.00	1.84	0.871	0.241	0.815
Organizational Commitment	ORGC1	5.18	1.51	0.862	0.075	0.876
	ORGC2	5.45	1.38	0.825	0.144	0.850
	ORGC3	4.99	1.60	0.943	0.110	0.845
	ORGC4*	5.79	1.20	0.516	0.734	0.546
Technology-Family Conflict	TFC1	2.14	1.38	0.929	0.137	0.713
	TFC2	2.19	1.45	0.928	0.139	0.709
	TFC3*	2.70	1.78	0.535	0.434	0.444
	TFC4	2.14	1.29	0.752	0.714	0.641
Work Overload	WO1	3.78	1.89	0.850	0.277	0.758
	WO2	3.53	1.88	0.884	0.219	0.798
	WO3	4.48	1.88	0.915	0.162	0.849
	WO4	4.26	1.85	0.911	0.170	0.838
Addiction	second order construct					
Compromised Social Quality of Life	SocQual1	2.19	1.57	0.827	0.317	0.752
	SocQual2	1.79	1.39	0.848	0.280	0.774
	SocQual3	1.48	1.11	0.864	0.254	0.772
	SocQual4	2.24	1.52	0.837	0.300	0.757
	SocQual5	1.55	1.20	0.852	0.275	0.771
Compromised Individual Quality of Life	IndQual1	1.59	1.26	0.848	0.282	0.734
	IndQual2	1.53	1.29	0.763	0.417	0.658
	IndQual3	1.43	1.12	0.848	0.281	0.750
	IndQual4	1.46	1.17	0.858	0.265	0.758
	IndQual5	1.42	1.08	0.793	0.372	0.691
Compensatory Usage of Mobile Email	CompnUse1	3.12	1.96	0.809	0.346	0.635
	CompnUse2	2.73	1.97	0.873	0.238	0.728
	CompnUse3	1.67	1.42	0.862	0.258	0.631
Compromised Career	CompWrk1	1.49	1.12	0.914	0.164	0.662
	CompWrk2	1.33	0.92	0.920	0.154	0.662
Compromised Time Control	TimeCtrl1	2.21	1.53	0.869	0.244	0.586
	TimeCtrl2	1.62	1.19	0.907	0.177	0.586
Excitatory Usage of Mobile Email	Excitement1	1.20	0.72	0.941	0.115	0.780
	Excitement2	1.26	0.93	0.946	0.106	0.780

Table 3: Item Statistics (\* - dropped items)

	Unidimensional constructs					Second-order construct					
	PU	WFC	ORGC	TFC	WO	SocQual	IndQual	CompnUse	CompWrk	TimeCtrl	Excite
Arithmetic mean (used items)	5.93	3.87	5.21	2.16	4.01	1.85	1.49	2.51	1.41	1.92	1.23
Cronbach's Alpha	0.93	0.96	0.94	0.94	0.92	0.91	0.88	0.81	0.80	0.74	0.88
Composite Reliability	0.950	0.970	0.961	0.910	0.939	0.926	0.913	0.885	0.914	0.882	0.942
Average Variance Extracted (AVE)	0.827	0.866	0.891	0.774	0.793	0.715	0.677	0.719	0.841	0.789	0.890

Table 4: Construct Statistics (used items)



	PU	WFC	ORGC	TFC	WO	SocQual	IndQual	CompnUse	CompWrk	TimeCtrl	Excite
PU1	.919	.210	.225	.055	.154	.229	.223	.291	.134	.203	.113
PU2	.903	.268	.287	.078	.184	.248	.258	.302	.188	.172	.142
PU3	.938	.176	.249	.056	.151	.213	.222	.288	.122	.167	.106
PU4	.879	.283	.267	.117	.179	.270	.280	.331	.220	.224	.171
WFC1	.016	.935	-.234	.327	.370	.262	.129	.093	.186	.116	.035
WFC2	-.043	.962	-.252	.353	.387	.263	.203	.110	.267	.160	.107
WFC3	-.010	.948	-.215	.330	.364	.255	.229	.144	.257	.166	.110
WFC4	-.059	.934	-.199	.384	.425	.273	.207	.097	.234	.115	.070
WFC5	.005	.870	-.161	.283	.359	.237	.166	.085	.180	.077	.030
ORGC1	.163	-.190	.962	-.054	-.122	.039	.022	-.003	-.059	-.085	-.082
ORGC2	.200	-.172	.927	-.091	-.111	-.020	-.024	-.030	-.100	-.063	-.082
ORGC3	.150	-.185	.947	-.097	-.139	.024	.013	.031	-.049	-.045	-.035
TFC1	-.060	.204	-.035	.948	.093	.421	.342	.265	.384	.202	.171
TFC2	-.082	.198	-.004	.945	.111	.433	.342	.268	.365	.200	.146
TFC4	-.204	.025	-.193	.728	-.066	.177	.136	.050	.192	.112	.122
WO1	.007	.469	-.157	.261	.852	.205	.212	.142	.272	.216	.125
WO2	-.071	.395	-.214	.283	.886	.250	.230	.121	.328	.187	.121
WO3	.015	.500	-.110	.251	.917	.239	.098	.066	.113	.112	.011
WO4	.015	.479	-.174	.273	.913	.258	.108	.060	.125	.099	.007
SocQual1	.061	.041	-.064	.556	.033	.828	.510	.369	.460	.314	.192
SocQual2	.004	.054	-.006	.479	.063	.855	.592	.524	.578	.370	.298
SocQual3	-.034	.100	-.046	.573	.060	.868	.729	.523	.727	.523	.513
SocQual4	.058	.115	-.010	.503	.107	.843	.546	.492	.519	.434	.315
SocQual5	-.063	.136	.036	.512	.117	.852	.673	.498	.671	.477	.423
IndQual1	-.040	.147	.023	.590	.099	.696	.849	.429	.653	.298	.340
IndQual2	.057	.045	.082	.279	.015	.459	.766	.553	.499	.110	.369
IndQual3	-.042	.107	.026	.434	.006	.648	.855	.516	.677	.307	.388
IndQual4	.029	.115	-.062	.448	-.001	.649	.859	.536	.725	.346	.410
IndQual5	-.003	.046	-.036	.324	-.018	.563	.794	.547	.606	.370	.572
CompnUse1	.196	.121	.090	.276	.083	.483	.457	.812	.362	.255	.116
CompnUse2	.227	.027	.044	.364	-.021	.486	.471	.875	.360	.299	.131
CompnUse3	.088	.034	-.066	.383	-.097	.562	.667	.864	.511	.245	.345
CompWrk1	-.023	.234	-.030	.664	.142	.744	.703	.516	.915	.321	.352
CompWrk2	-.165	.011	-.080	.447	.016	.574	.694	.367	.905	.522	.695
TimeCtrl1	.090	.093	-.022	.386	.064	.588	.444	.403	.474	.870	.339
TimeCtrl2	-.030	-.006	-.097	.448	.041	.628	.615	.413	.644	.909	.619
Excitement1	-.089	.042	-.108	.349	-.021	.525	.715	.378	.650	.552	.941
Excitement2	-.125	.038	-.095	.394	-.024	.547	.702	.396	.756	.481	.946

Table 5: Loadings and Cross-Loadings

	PU	WFC	ORGC	TFC	WO	SocQual	IndQual	CompnUse	CompWrk	TimeCtrl	Excite
PU	.909										
WFC	-.061	.931									
ORGC	.180	-.236	.944								
TFC	-.150	.362	-.085	.880							
WO	.009	.665	-.183	.299	.891						
SocQual	-.029	.336	.035	.615	.280	.846					
IndQual	-.027	.281	.078	.511	.233	.737	.823				
CompnUse	.193	.167	.120	.404	.144	.604	.637	.848			
CompWrk	-.143	.360	.007	.621	.310	.735	.799	.492	.917		
TimeCtrl	.000	.312	.009	.470	.314	.682	.600	.458	.632	.888	
Excite	-.154	.204	.007	.394	.159	.568	.783	.410	.747	.547	.943

Table 6: Construct Correlations

**Structural Model**

Bootstrapping with 250 re-samples was done to estimate the structural model. All model’s relationships were supported at the 0.01 significance level (see Figure 2). That is, our findings lend support to the research model.

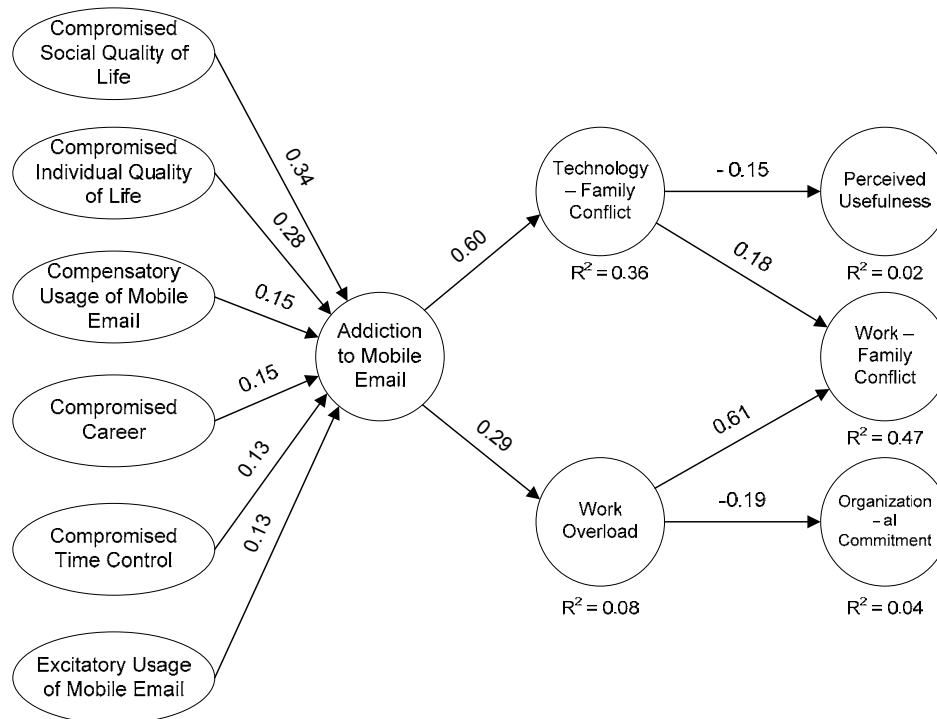


Figure 2: Structural Model (all paths were significant at the 0.01 level)

## DISCUSSION AND CONCLUSION

The model accounted for a significant portion of the variance in work-family conflict, and marginal (but statistically significant) portions of the variance in perceived usefulness and organizational commitment. That is, addiction to mobile email, as captured by six symptoms, accounts for reduction in perceived usefulness and organizational commitment, and augments conflict between users and their environments. Hypotheses 1 and 2 focused on the direct effects of addiction to mobile email. The data demonstrates that addiction explains 36% of the variances in technology-family conflict and 8% of the variance in perceived work overload. Highly addicted individuals develop higher levels of friction between the technology use and their family-related tasks, and perceive their work overload to be higher. This demonstrates that the concept of technology-family conflict is valid and has the potential to affect organizational and technology-related perceptions and behaviors. Thus, it deserves further attention from IS researchers.

Hypotheses 3 and 4 dealt with the outcomes of technology-family conflict. Specifically, they argued that technology-family friction may diminish the levels of usefulness attributed to the technology, and foster work-family conflict. As expected, the effect of technology-family conflict on perceived usefulness was negative. This helps us better understand the antecedents of perceived usefulness, which is a central concept in MIS research. Future research may further examine how individual disorders affect user assessments of technologies.

Finally, hypotheses 5 and 6 examined the effects of perceived work overload on organizational commitment and work-family conflict. They posited that work overload reduces one's organizational commitment, and increases the levels of work-family conflict. Both hypotheses were supported. Work overload explains 4% of the variance in organizational commitment. Furthermore, work overload together with technology-family conflict explain 47% of the variation in work-family conflict.

The findings also suggest several implications for practice. Because the excessive use of pervasive organizational technologies can lead to undesirable outcomes, and not just to productivity gains, managers should regulate the use of mobile email. Our study provides several potential avenues of action by pointing to factors that managers should control in order to reduce the negative outcomes of usage of pervasive organizational technologies. For example, organizations can have an implicit or explicit policy of mobile email use that will ensure controlled usage when outside of the office. Employees can be educated about the potential issues of excessive use and be asked to self-regulate their usage of mobile email.

Overall, this study extends past research by integrating addiction disorder concepts from the cyber psychology literature with focal organizational behaviors and technology-related perceptions. The established nomological network calls for further examination of the mostly overlooked issue of the consequences of addiction to pervasive technologies. It also provides the

basis for innovative managerial practices, through which organizations can try and reduce the levels of addiction and their consequences.

In conclusion, addiction to pervasive technologies is an important area to study, as evident by the growing body of academic literature and consistent practitioner interest in this topic. In this study, we extended prior research by establishing several key consequences of addiction to mobile email. The findings suggest that addiction to organizational pervasive technologies can affect one's family life, work, and the way he or she perceives the technology. Thus, the overuse of such pervasive technologies can potentially lead to undesirable outcomes which should be carefully weighed against the potential productivity gains. Given the continued interest in mobile email as well as the growing customer base of users, further research is warranted.

## REFERENCES

1. Adams, G. A., King, L. A. and King, D. W. (1996) Relationships of job and family involvement, family social support, and work-family conflict with job and life satisfaction, *Journal of Applied Psychology*, 81, 4, 411-420.
2. Adams, J. S. (1965) Inequity in social exchange, In: *Advances in experimental social psychology*, Vol. 2 (Ed, Berkowitz, L.) Academic Press, New York, NY, USA, pp. 267-299.
3. Ahuja, M. K., Chudoba, K. M., Kacmar, C. J., McKnight, D. H. and George, J. F. (2007) IT Road Warriors: Balancing Work-Family Conflict, Job Autonomy, and Work Overload to Mitigate Turnover Intentions, *MIS Quarterly*, 31, 1, 1-17.
4. Beard, K. W. and Wolf, E. M. (2001) Modification in the proposed diagnostic criteria for internet addiction, *Cyberpsychology & Behavior*, 4, 3, 377-383.
5. Brown, R. I. F. (1997) A theoretical model of the behavioral addictions—applied to offending, In: *Addicted to crime*(Eds, Hodge, J. E., McMurrin, M. and Hollin, C. R.) Wiley, Chichester, UK.
6. Charlton, J. P. and Danforth, I. D. W. (2007) Distinguishing addiction and high engagement in the context of online game playing, *Computers In Human Behavior*, 23, 3, 1531-1548.
7. Chou, T. J. and Ting, C. C. (2003) The role of flow experience in cyber-game addiction, *Cyberpsychology & Behavior*, 6, 6, 663-675.
8. Cohen, A. (1992) Antecedents of organizational commitment across occupational groups- A meta-analysis, *Journal of Organizational Behavior*, 13, 6, 539-558.
9. Davis, F. (1989) Perceived usefulness, perceived ease of use, and user acceptance of information technology, *MIS Quarterly*, 13, 3, 319-340.
10. Davis, R. A., Flett, G. L. and Besser, A. (2002) Validation of a new scale for measuring problematic Internet use: Implications for pre-employment screening, *Cyberpsychology & Behavior*, 5, 4, 331-345.
11. Duxbury, L. E. and Higgins, C. A. (1991) Gender Differences In Work-Family Conflict, *Journal Of Applied Psychology*, 76, 1, 60-74.
12. Ferraro, G., Caci, B., D'Amico, A. and Di Blasi, M. (2007) Internet addiction disorder: An Italian study, *Cyberpsychology & Behavior*, 10, 2, 170-175.
13. Fornell, C. and Larcker, D. F. (1981) Evaluating structural equation models with unobservable variables and measurement error, *Journal of Marketing Research*, 18, 1, 39-50.
14. Fox News (2006), Professor: Blackberry addiction lawsuits likely in future, [www.oxnews.com](http://www.oxnews.com), accessed on Feb. 2, 2008
15. Frone, M. R., Russell, M. and Cooper, M. L. (1992) Antecedents and outcomes of work family conflict - Testing a model of the work family interface, *Journal of Applied Psychology*, 77, 1, 65-78.
16. Greenberg, J. (1990) Employee theft as a reaction to underpayment inequity - The hidden cost of pay cuts, *Journal of Applied Psychology*, 75, 5, 561-568.
17. Griffiths, M. D. (1992) Pinball wizard: The case of a pinball machine addict, *Psychological Reports*, 71, 1, 160-162.
18. Griffiths, M. D. (1999) Internet addiction: Fact or fiction?, *The Psychologist*, 12, 5, 246-251.
19. Griffiths, M. D., Davies, M. N. O. and Chappell, D. (2003) Breaking the stereotype: The case of online gaming, *Cyberpsychology & Behavior*, 6, 1, 81-91.
20. Hur, M. H. (2006) Demographic, habitual, and socioeconomic determinants of Internet addiction disorder: An empirical study of Korean teenagers, *Cyberpsychology & Behavior*, 9, 5, 514-525.
21. Igbaria, M. and Greenhaus, J. H. (1992) Determinants of MIS employees turnover intentions- A structural equation model, *Communications of the ACM*, 35, 2, 34-49.
22. Jackson, C. L., Colquitt, J. A., Wesson, M. J. and Zapata-Phelan, C. P. (2006) Psychological collectivism: A measurement validation and linkage to group member performance, *Journal of Applied Psychology*, 91, 4, 884-899.
23. Jones, E. E. and Davis, K. (1965) From acts to dispositions: The attribution process in person perception, In: *Advances in experimental social psychology*, Vol. 2 (Ed, Berkowitz, L.) Academic Press, New York, pp. 219-266.

24. Lin, X. H. (2004) Internet addiction disorder, on-line behavior and personality: An exploratory study, *International Journal of Psychology*, 39, 5-6, 272-272.
25. Lohmoller, J.-B. (1989) *Latent variable path modeling with Partial Least Squares*, Physica-Verlag, Heidelberg, Germany.
26. Markel, K. S. and Frone, M. R. (1998) Job characteristics, work-school conflict, and school outcomes among adolescents: Testing a structural model, *Journal of Applied Psychology*, 83, 2, 277-287.
27. May, K. (2008) Blackberry blackout imposed on PS, *Ottawa Citizen*, Friday, February 01, A1.
28. McIntyre, S. (2006) Blackberry addiction 'similar to drugs' In *Daily Mail* DailyMail.co.uk. accessed on Aug. 22, 2007
29. Middleton, C. A. and Cukier, W. (2006) Is mobile email functional or dysfunctional? Two perspectives on mobile email usage, *European Journal of Information Systems*, 15, 3, 252-260.
30. Miller, D. T. and Ross, M. (1975) Self-serving biases in the attribution of causality: Facts or fiction?, *Psychological Bulletin*, 82, 2, 213-225.
31. Moore, J. E. (2000) One road to turnover: An examination of work exhaustion in technology professionals, *Mis Quarterly*, 24, 1, 141-168.
32. Parasuraman, S., Purohit, Y. S., Godshalk, V. M. and Beutell, N. J. (1996) Work and family variables, entrepreneurial career success, and psychological well-being, *Journal of Vocational Behavior*, 48, 3, 275-300.
33. Peeters, M. C. W., Schaufeli, W. B. and Buunk, B. P. (1995) The role of attributions in the cognitive appraisal of work-related stressful events: An event-recording approach, *Work and Stress*, 9, 4, 463-474.
34. Peterson, C., Semmel, A., von Baeyer, C., Abramson, L. Y., Metalsky, G. I. and Seligman, M. E. P. (1982) The Attributional Style Questionnaire, *Cognitive Therapy and Research*, 6, 3, 287-300.
35. Stephens, G. K. and Sommer, S. M. (1996) The measurement of work to family conflict, *Educational And Psychological Measurement*, 56, 3, 475-486.
36. Turel, O., Serenko, A. and Bontis, N. (2007) User acceptance of wireless short messaging services: Deconstructing perceived value, *Information & Management*, 44, 1, 63-73.
37. vandenBerg, P. T. and Schalk, R. (1997) Type A behavior, well-being, work overload, and role-related stress in information work, *Journal of Social Behavior and Personality*, 12, 1, 175-187.
38. Wallace, J. E. (1997) It's about time: A study of hours worked and work spillover among law firm lawyers, *Journal of Vocational Behavior*, 50, 2, 227-248.
39. Weiner, B., Frieze, I., Kukla, A., Reed, L., Rest, S. and Rosenbaum, R. M. (1972) Perceiving the causes of success and failure, In: *Attribution: Perceiving the causes of behavior* (Eds, Jones, E. E., Kanouse, D. E., Kelly, H. H., Nisbett, R. E., Valins, S. and Weiner, B.) General Learning Press, Morristown, N.J., pp. 95-120.
40. Whang, L. S. M., Lee, S. and Chang, G. (2003) Internet over-users' psychological profiles: A behavior sampling analysis on Internet addiction, *Cyberpsychology & Behavior*, 6, 2, 143-150.
41. Young, K. S. (1998) Internet addiction: The emergence of a new clinical disorder, *Cyberpsychology & Behavior*, 3, 2, 237-244.
42. Young, K. S. (2007) Cognitive behavior therapy with Internet addicts: Treatment outcomes and implications, *Cyberpsychology & Behavior*, 10, 671-679.