Personal Life Interrupted: Understanding the Effects of Technology-Mediated Interruptions from Work to Personal Life

Completed Research Paper

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Abstract

This study examines how technology-mediated work-related interruptions affect people's personal life in terms of the level of work-life conflict they experience and their ability to fulfill the responsibilities of their personal life. Based on interruption source, we differentiate between two types of interruptions that occur in one's personal life: other-initiated and self-initiated. Drawing on interruption research and micro-role transition theories, we conceptualize distinct effects of the two interruption types on outcome variables. Data were collected through surveys from 137 knowledge workers. The results reveal distinct effects of other-initiated and self-initiated interruptions on personal life. The frequency of other-initiated interruptions is found to be positively associated with work-life conflict and negatively associated with fulfillment of personal life responsibilities, whereas the frequency of self-initiated interruptions does not significantly affect personal life. The results also suggest that the effects of other-initiated interruptions on fulfillment of personal life responsibilities are partially mediated by work-life conflict. The study concludes with implications for research and practice.

Keywords: Technology-Mediated Interruption, Other-Initiated, Self-Initiated, Work, Personal Life.

Introduction

Technologies have wrought profound changes in professional and personal communications, changing our sense of time and location and blurring the boundaries between work and personal life. Mobile devices such as BlackBerry, iPhone and laptop have made the transition between work and personal life domains increasingly effortless and frequent. Many organizations have institutionalized telecommuting and flextime as alternative work arrangement. However, more and more transitions between the work and personal life domains occur on a moment-to-moment basis through technology-mediated interruptions. The ubiquitous nature of information and communication technologies that enable interruptions anywhere and at any time and the many applications via which interruptions can occur (e.g., phone, email, IM, text), have made technology-mediated interruptions the norm in the life of knowledge workers, whose work is highly autonomous, mobile, and communication-rich.

Information communication technologies have profoundly changed the way that people work and live in both positive and negative ways. Despite the gained convenience and efficiency due to mobile devices that extend temporal and spatial territories, the counterproductive effects associated with the same technologies have become more and more pronounced (Weber, 2004). Considered the number one Human Computer Interaction (HCI) problem of the future (McFarlane 2002), technology-mediated interruptions represent a productivity challenge faced by both individuals and organizations. There is a wealth of literature investigating the effects of technology-mediated interruptions within the work domain (e.g., Amabile 1998; Hallowell 2005; Hemp, 2009; Spira et al. 2005). However, less scholarly attention has been devoted to their effects on personal life, despite the fact that how work makes inroads into people's personal life through interruptions has drawn heated discussion in the popular media (e.g., Meece 2001; Scelfo 2010).

This study advances our understanding of technology-mediated interruptions in five important ways. First, it assesses technology-mediated work-related interruptions that occur in one's personal life (which we term work-to-nonwork [WTN] interruptions). Despite the prevalence of technology-mediated interruptions and the importance of the phenomenon to both the work and personal life of knowledge workers, extant studies focus largely on the effects of such interruptions on people's work. This research examines the effects of work-related technology-mediated interruptions on people's personal lives. Given that work and personal life are interdependent domains, it is important to examine the effects of technology-mediated interruptions on personal life as well in order to develop a more comprehensive understanding of the intertwining of work and personal life enabled by the ubiquitous nature of ICT devices.

Second, this study examines both other-initiated and self-initiated interruptions. The interruption literature is largely built upon a paradigm of other-initiated interruptions (Russell et al. 2007). Extant research has primarily focused on the effects of other-initiated interruptions and has largely ignored self-initiated interruptions and their effects. However, self-initiated interruptions are equally important, in terms of volume and consequences. About 40% of all interruptions are self-initiated (Czerwinski et al. 2004). Therefore, we posit that the effects of the same level of technology use will differ depending on who is initiating the technology-mediated interruption. We thus enrich the concept of "use" in technology-mediated interruptions to incorporate the initiator of the interruption answering a call by Burton-Jones and Straub (2006) to conceptualize use in richer ways that account for context.

Third, the study assesses the outcomes of technology-mediated interruptions at the domain level rather than at the task level. Interruptions inherently involve a potentially stressful situation, with contending demands between two tasks. They force people to allocate their personal resources between two sources of stimuli (i.e., the interruption and the ongoing task). Interruptions have important implications for task performance, which can be affected by various task characteristics, such as frequency (Monk 2004), timing (Ho et al. 2005), temporal strain, complexity, similarity (Eyrolle et al. 2000), mental load during task execution, task type (Bailey et al. 2008; Czerwinski et al. 2000), similarity in modality of the interrupted and the interrupting tasks (Latorella 1998). To date, interruption research focuses primarily on task-level outcomes such as task performance. There are very few studies that examine interruptions across domains and focus on domain-level outcomes (e.g., work-life conflict and nonwork performance), which constitutes the focus of this study.

Fourth, with very few exceptions (e.g., Latorella 1996), extant studies focus on interruptions that occur through a single technology such as BlackBerry (e.g., Mazmanian et al. 2006) and IM (e.g., Garrett and Danziger, 2008), rather than through multiple technologies. However, knowledge workers actually rely on a portfolio of communication technologies such as email, phone call, IM, and texting. These technologies collectively have constructed an always-on world for users who can receive an email on their laptops and respond to it on their smart phones. Therefore, assessing the cumulative effect of interruptions that occur through a variety of technologies can provide a more realistic approximation of WTN interruptions experienced by an individual and thus lead to a better understanding of how interruptions affect knowledge workers' personal life.

Finally, with few exceptions, the majority of individual-level research on technology use focuses on the positive consequences of such usage. Responding to a call for a better understanding of problematic use of technologies (Weber, 2004), the study examines both positive and negative effects of technology use.

Research Model and Hypotheses

Based on the source of an interruption (i.e., who initiates the interruption), we differentiate between other-initiated and self-initiated interruptions. An other-initiated interruption refers to an externally generated, discrete occurrence that is presented to an individual via technologies and that breaks the cognitive focus on an ongoing task (e.g., receiving a work-related phone call while having dinner at home). A self-initiated interruption refers to an internally generated, discrete occurrence that is initiated and performed by an individual through technologies and that breaks the cognitive focus on an ongoing task (e.g., checking email messages on one's BlackBerry during a movie).

Drawing upon the literature on interruptions (Latorella 1996; Latorella 1998; McFarlane 1997; McFarlane et al. 2002) and micro-role transition [1] (Ashforth et al. 2000), we theorize the effects of WTN interruptions on people's personal life in terms of work-life conflict and fulfillment of personal life responsibilities, which we term nonwork performance. Given the research interest in technology-mediated interruptions that cross the boundaries between work and personal life, this study assesses important outcomes both at the holistic level (i.e., work-life conflict as the cross-domain outcome) and at the atomistic level (i.e., nonwork performance as the within-domain outcome). The research model is presented in Figure 1.

Figure 1: Research Model
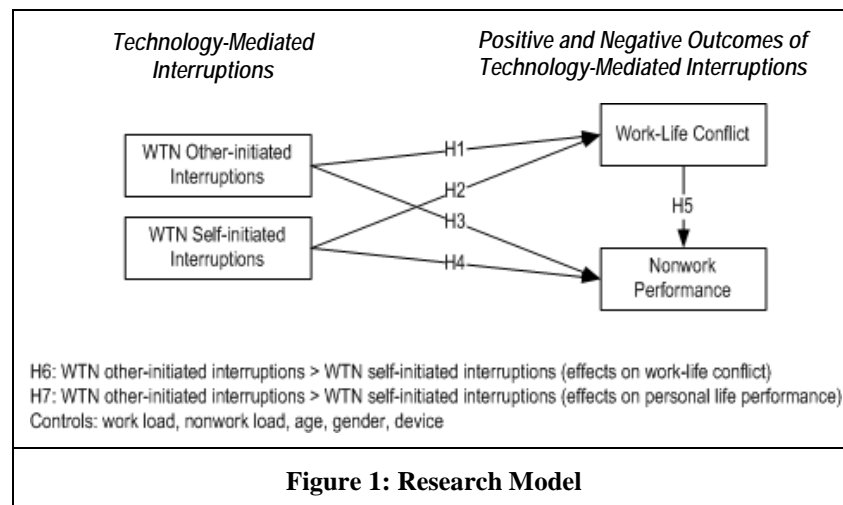
Work-Life Conflict

Conflict between work and personal life is a form of inter-role conflict due to the incompatible demands from people's work and personal life in some respect so that the participation in one makes participation in the other more difficult (Greenhaus and Beutell 1985). The conflict between work and personal life is bidirectional by nature (from work to life and from life to work). Given our interest in WTN interruptions, this study focuses on work-to-life conflict. Work-life conflict occurs when the general demands of, time allocated to, and strain produced from the work domain interferes with one's engagement in their personal life domain (Greenhaus and Beutell 1985; Netemeyer et al. 1996). Antecedents of work-life conflict each fall into three categories – work factors, personal life factors, and individual characteristics (Byron 2005). Given the increasingly blurred boundaries between work and personal life, technology-mediated interruptions of one's personal life by work (WTN interruptions) represent an important

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[1] Micro-role transitions are frequent and recurring daily role transitions (e.g. between different work roles or between work and personal life roles) as compared to macro-role transitions that refer to infrequent and permanent changes such as promotions and retirement (Ashford et al 2000). In particular, this study focuses on the transitions between work and personal life roles.

antecedent not included in these three categories – they originate in the work domain but occur in the personal life domain.

Crossing the boundary between work and personal life entails psychological (and physical, if any) transitions, which consume personal resources such as time and attention. Two important underlying sources of conflict between work and personal life are time-based and strain-based conflicts (Greenhaus and Beutell 1985), which directly result from the consumption of personal resources such as time and effort (i.e., mental and physical effort). First, both other-initiated and self-initiated WTN interruptions can foster time-based conflict. These interruptions force people to devote their personal time to work, making it more difficult for them to engage in personal life tasks. Second, both other-initiated and self-initiated WTN interruptions can also create strain-based conflict. They can make people more mentally preoccupied with work when they are in the personal life domain. When people attend to WTN interruptions, they make a transition from their personal life to the work domain, incurring transition costs – the mental efforts in adapting to norms and expectancies associated with work. For example, people activate different mental models, use different vocabularies, and behave in different manners during their interaction with family versus with colleagues. Each time they make a transition from personal life to work and momentarily assume work roles, they have to show work-appropriate mindset and behaviors, which significantly differ from what is considered appropriate in their personal life domain. When such transitions happen overly frequently, they will give rise to elevated levels of physical or psychological fatigue, undermining people's involvement in their personal life domain. Both other-initiated and self-initiated WTN interruptions extend work hours by invading one's personal life. There is empirical evidence that people who set fewer boundaries for using information communication technologies in their personal life report higher work-life conflict (Olson-Buchanan and Boswell, 2006). As reported by some studies on Blackberry users, prolonged work hours have found to be associated with elevated work-life conflict (e.g., Middleton, 2007; Williams, Pocock, and Skinner, 2008). Even if WTN interruptions do not significantly prolong work hours, not being able to completely switch off for long unbroken periods can still lead to work life imbalance (Roberts, 2007).

> H1: Frequency of other-initiated WTN interruptions will be positively related to work-life conflict.

> H2: Frequency of self-initiated WTN interruptions will be positively related to work-life conflict.

Nonwork Performance

WTN interruptions, involving concurrent tasks from work and personal life, affect performance in people's personal life through accumulated task-level effects. Performance refers to the fulfillment of the general demands and responsibilities associated with a particular domain (Frone et al. 1997). WTN interruptions provide an opportunity of shifting personal resources such as time and attention from personal life to work.

Concurrent tasks can mutually influence task performance through structural interference and capacity interference (Kahneman 1973). Structural interference arises when an other-initiated WTN interruption and the ongoing task in one's personal life compete for the same channel of processing, e.g., a phone call from clients when people are reading a bedtime story to their children. Even when individuals try to focus their attention on family 100% of the time, they can still be occasionally interrupted by information communication technologies such as the BlackBerry that prevent them from being fully committed to activities in personal life (Williams, Pocock, and Skinner, 2008). Capacity interference arises when the combined demands of WTN interruptions exceed the total capacity of nonwork domain. At an aggregate level, other-initiated WTN interruptions will negatively influence nonwork performance (i.e., meeting personal life demands) through both types of interference. Self-initiated WTN interruptions undermine nonwork performance through only capacity interference. When people initiate an interruption, they can easily avoid any structural interference. For example, individuals are very unlikely to call a colleague when they are engaged in a conversation with family members but they can easily glance at their BlackBerry to check their work emails.

> H3: Frequency of other-initiated WTN interruptions will be negatively related to nonwork performance.

> H4: Frequency of self-initiated WTN interruptions will be negatively related to nonwork performance.

Work-life conflict entails both time-based and strain-based conflict. Time-based conflict undermines people's nonwork performance by devoting more resources to work and leaving fewer resources to personal life. Time-based conflict arises from WTN interruptions that transfer the resources such as time and attention from personal life to work. It represents a form of resource drain in people's personal life, and therefore jeopardizes nonwork performance (Edwards and Rothbard 2000).

Strain-based conflict also undermines people's ability to fulfill the responsibilities and demands in their personal life. It compromises nonwork performance through narrowed attention, self-absorption, or reduced overall well-being (e.g., health, satisfaction) (Edwards and Rothbard 2000; Fredrickson and Joiner 2002; Greenhaus and Beutell 1985; Rothbard 2001).

The effects of time-based WTN conflict on nonwork performance result from people's intentional decision of resource allocation, whereas the relationship between strain-based WTN conflict and nonwork performance is non-intentional (Edwards and Rothbard 2000). In summary, WTN conflict affects nonwork performance by influencing people's ability to physically and/or psychologically engage in their personal life.

> H5: WTN conflict will be negatively related to nonwork performance.

Other-initiated Interruptions vs. Self-initiated Interruptions

Although the above discussion applies to both other-initiated and self-initiated interruptions, two distinctions between them suggest slightly different effects for these interruptions. First, self-initiated interruptions do not necessarily involve two communicating partners as other-initiated interruptions do. For example, people can interrupt the personal life domain with solitary work-related tasks such as booking a conference room, writing a report, or remotely checking the results of an experiment that is left running on a company server. As a result, a self-initiated interruption allows people greater control over its nature as well as its duration.

Second, people can decide the timing of self-initiated interruptions, whereas other-initiated interruptions can occur any time in the personal life domain. Specifically, people can choose an opportune time to initiate an interruption, taking into consideration its expected duration among other factors. For example, people are more likely to check work emails on a BlackBerry when they are waiting for a table at a restaurant than when they are talking with their children's schoolteachers. The foregoing discussion suggests that while both other-initiated and self-initiated WTN interruptions can increase work-life conflict and hinder nonwork performance, the effects of self-initiated interruptions are likely less detrimental than those of other-initiated interruptions.

> H6: Frequency of self-initiated WTN interruptions has a weaker effect on work-life conflict than frequency of other-initiated WTN interruptions.

> H7: Frequency of self-initiated WTN interruptions has a weaker effect on nonwork performance than frequency of other-initiated WTN interruptions.

Methodology

Empirical testing of the research model and hypotheses was conducted in two stages. In the first stage, we interviewed 16 knowledge workers on technology-mediated interruptions that they experienced in their work and personal life. The interviews total 20 hours and yield qualitative data that have informed our conceptualization and scale development.

In the second stage, the research model and hypotheses were empirically tested with a field study using a survey methodology for data collection. Through a web-based survey, we collected data from employees at a Fortune 1000 technology firm. A total of 137 completed surveys were returned, yielding a response rate of 33.7%. Results of unpaired t-tests suggested no significant differences between individuals who responded before and after the reminder alleviating to some extent concerns about non-response bias (Armstrong and Overton 1979). The respondents are fairly distributed across gender (59.4% female and 40.6% male) and age (53.5% below 50 and 46.5% over 50); most are not single (15% single and 85% married/significant other); and the majority use a device provided by the company (84.4% compared to 15.6% whose device is not provided by the company). A t-test was conducted to assess whether the single

group significantly differs from the relationship group (i.e., married or significant other), and whether those who use a company-provided device significantly differ from those who do not across the variables in our research model. The non-significant results across all constructs suggest that the two groups based on relationship status or company-provided device do not differ in terms of the variables included in the model.

All the variables in our model are measured with multiple items, which are summarized in Table 1.

Table 1. Constructs and Measurement	
Construct (Definition)	**Items[a]**
Frequency of WTN technology-mediated interruptions: (The frequency with which one is interrupted in their personal life by an occurrence through a technology device or application that comes from one's work and breaks the cognitive focus on an ongoing task. For other-initiated interruptions the occurrence is initiated by others; for self-initiated, it is initiated by self) **Source:** Developed based on the literature and the interviews conducted during the first stage of data collection.	***Frequency of WTN Other-initiated Interruptions*** Overall: During nonwork hours, how frequently are you interrupted by colleagues/other work contacts about work-related matters - [WTNO-overall] overall through technologies such as phone call, email, IM, texting etc.? Composite: Composite Index created by the following items: - [WTNO-phone] via phone call only - [WTNO-email] via email only - [WTNO-IM] via IM only - [WTNO-texting] via texting only
	Frequency of WTN Self-initiated Interruptions Overall: To what extent do you initiate interruptions yourself during nonwork hours to handle work-related matters - [WTNS-overall] overall through technologies such as phone call, email, IM, texting etc.? Composite: Composite Index created by the following items: - [WTNS-phone] via phone call only - [WTNS-email] via email only - [WTNS-IM] via IM only - [WTNS-texting] via texting only - [WTNS-other] via other applications to work during nonwork hours
Work-Life Conflict (occurs when the general demands of, time allocated to, and strain produced by the work interferes with one's engagement in personal life activities) **Source:** *Netemeyer et al. (1996)*	[WTNC1] The demands of my work interfere with my personal life.
	[WTNC2] Due to work-related duties, I frequently have to make changes to my plans for nonwork activities.
	[WTNC3] My work produces strain that makes it difficult to fulfill my nonwork responsibilities.
	[WTNC4] The amount of time my work takes up makes it difficult to fulfill nonwork responsibilities.
Nonwork performance (refers to the fulfillment of the general demands and responsibilities associated with personal life) **Source:** Ashforth et al. (1998); Kossek et al. (2001)	[NP1] My family thinks that I fulfill my family responsibilities very well.
	[NP2] My friends think that I fulfill the demands of my personal life very well.
	[NP3] My family thinks that I fulfill my family demands very well
	[NP4] I am viewed by my family/friends as fulfilling the responsibilities in my personal life very well
Work Role Overload (workload) (refers to an individual's perception of having too much work to do, but without enough working time to do them.) **Source:** Schaubroeck et al. (1989); Beehr et al. (1976)	[WL1] I never seem to have enough time to get all of my work done during work hours.
	[WL2] It often seems that I have too much work during work hours for one person to do.
NonWork load (refers to an individual's perception of having too many personal responsibilities to fulfill, but without enough personal time to do them.)	[NL1] I never seem to have enough time to get every nonwork task done during nonwork hours.
	[NL2] It often seems that I have too many nonwork-related demands for one person to do during nonwork hours.

Source: Schaubroeck et al. (1989); Beehr et al. (1976)	

[a]. Items measuring the two independent variables (i.e., frequency of WTN other- and self-initiated interruptions) are 7-point Likert scales, ranging from 1=very rarely, 4=occasionally, to 7=very frequently. All other items are 7-point Likert scales, ranging from 1=strongly disagree, 4=neutral, to 7=strongly agree.

Results

Measurement Model

Descriptive statistics for the constructs, including means and standard deviations are presented in Table 2. We used SmartPLS to assess the psychometric properties of the scales and to test the research model. To assess the psychometric properties of the scales, we examined the scales' internal consistency reliability and their convergent and discriminant validity. The composite reliability coefficients of all constructs range from 0.87 to 0.95 (see Table 2), and are above the recommended 0.7 guideline (Fornell and Larcker 1981). Thus our scales exhibit good reliabilities.

Table 2. Inter-construct Correlations											
	Mean (SD)	Relia bility	1	2	3	4	5	6	7	8	9
1. Freq. of other-initiated interruptions	2.69 (1.089)	0.93	0.94								
2. Freq. of self-initiated interruptions	2.39 (1.032)	0.89	0.66	0.90							
3. Work-Life Conflict	3.81 (1.695)	0.90	0.56	0.40	0.90						
4. Nonwork Performance	5.41 (1.265)	0.95	-0.41	-0.19	-0.45	0.91					
5. Work Load	4.55 (1.659)	0.94	0.42	0.38	0.57	-0.31	0.95				
6. Nonwork Load	3.88 (1.611)	0.87	0.20	0.11	0.26	-0.17	0.26	0.88			
7. Age	n/a	n/a	0.02	-0.09	0.13	0.04	0.07	-0.22	1.00		
8. Gender	n/a	n/a	0.20	0.16	0.25	-0.03	0.11	-0.05	0.21	1.00	
9. Device	n/a	n/a	0.04	0.09	0.08	-0.06	0.10	-0.04	0.16	0.18	1.00

We assessed discriminant validity through confirmatory factor analysis (CFA) and the average variance extracted (AVE) following Chin (1998). First, square root of the AVE (see Table 2) is compared to inter-construct correlation coefficients. The constructs exhibit good discriminant validity when they share more variance with their indicators (i.e., square root of AVE) than with each other (i.e., inter-construct correlation). As shown by Table 2, the square root of AVE (shaded leading diagonal) for every construct is larger than the inter-construct correlation (coefficients in the same row and in the same column). Second, indicator loadings on the intended constructs are compared to their loadings on other constructs in the model. Evidence of good discriminant validity is demonstrated when loadings are higher than cross-loadings. As shown by the of CFA results (Table 3), all the indicators load more strongly on their corresponding constructs than on other constructs. Therefore, collectively these results point to adequate convergent and discriminant validity of all the constructs in our model.

In addition, we conducted a CFA in Amos with all items loading on a common method factor in addition to their substantive factor to assess the presence of common method bias. Results show that all the loadings on the common method factor are non-significant and that the common method factor has an AVE of only 9.2%, compared to 51.3%-83.5% for trait factors.

Table 3. Item Loadings and Cross Loadings										
		1	2	3	4	5	6	7	8	9
Freq. of other-initiated interruptions	overall	0.94	0.57	0.52	-0.40	0.36	0.21	0.04	0.21	0.05
	composite	0.93	0.67	0.53	-0.36	0.42	0.15	0.00	0.17	0.02
Freq. of self-initiated interruptions	overall	0.57	0.89	0.35	-0.16	0.35	0.09	-0.09	0.13	0.07
	composite	0.62	0.91	0.38	-0.18	0.34	0.10	-0.07	0.15	0.09
Worklife Conflict 1		0.48	0.36	0.91	-0.49	0.56	0.24	0.06	0.18	0.13
Worklife Conflict 2		0.54	0.36	0.89	-0.31	0.47	0.22	0.18	0.28	0.01
Nonwork perf. 1		-0.34	-0.16	-0.38	0.93	-0.29	-0.16	-0.01	-0.02	-0.12
Nonwork perf. 2		-0.32	-0.15	-0.41	0.85	-0.31	-0.06	0.06	0.02	0.13
Nonwork perf. 3		-0.41	-0.20	-0.43	0.94	-0.30	-0.18	0.04	-0.03	-0.11
Nonwork perf. 4		-0.41	-0.17	-0.41	0.92	-0.23	-0.22	0.05	-0.08	-0.11
Work load 1		0.45	0.40	0.59	-0.32	0.96	0.22	0.04	0.11	0.11
Work load 2		0.33	0.32	0.49	-0.26	0.93	0.27	0.10	0.09	0.08
Nonwork load 1		0.26	0.16	0.26	-0.20	0.27	0.94	-0.21	-0.02	-0.05
Nonwork load 2		0.03	-0.01	0.17	-0.08	0.15	0.81	-0.19	-0.10	-0.01
Age		0.02	-0.09	0.13	0.04	0.07	-0.22	1.00	0.21	0.16
Gender		0.20	0.16	0.25	-0.03	0.11	-0.05	0.21	1.00	0.18
Device		0.04	0.09	0.08	-0.06	0.10	-0.04	0.16	0.18	1.00

1. Freq. of Other-initiated interruptions, 2. Freq. of Self-initiated interruptions, 3. Work-life Conflict, 4. Nonwork Performance, 5. Work Load, 6. Nonwork Load, 7. Age, 8. Gender, 9. Device

Hypothesis Testing

To test the structural model, we used SmartPLS with 250 bootstraps.[2] Table 4 and Figure 2 present the results of the PLS model. Power calculation suggests that our sample size is sufficient to detect the effects on work-life conflict and nonwork performance. The average observed power is over 0.9 for the model (at the significance level of 0.05).
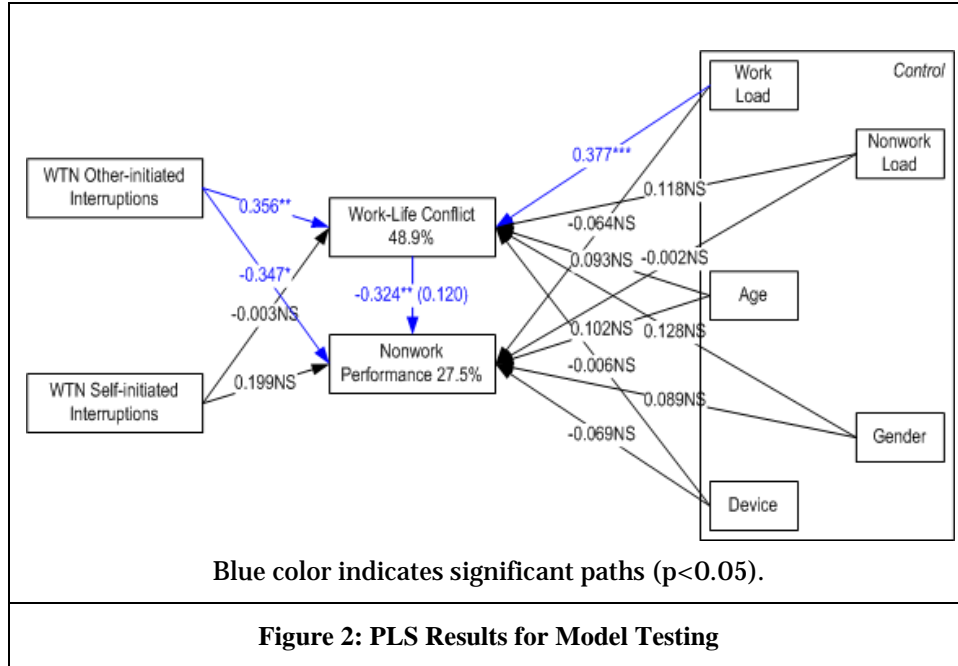
Table 4. PLS Results for Model Testing		
	Dependent Variables	
Independent Variables	Work-life conflict	Nonwork performance
Freq. of other-initiated WTN interruptions	**0.356 ** (0.108)**	**-0.347 * (0.143)**
Freq. of self-initiated WTN interruptions	-0.003 NS (0.093)	0.199 NS (0.125)
Work-life conflict		**-0.324 ** (0.120)**
Control Variables		
Work load	**0.377 *** (0.076)**	-0.064 NS (0.108)
Nonwork load	0.118 NS (0.078)	-0.002 NS (0.091)
Age	0.093 NS (0.082)	0.102 NS (0.088)
Gender	0.128 NS (0.070)	0.089 NS (0.093)

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[2] Statistical significance was assessed using two-tailed t-tests.

| *Device* | -0.006 NS (0.078) | -0.069 NS (0.074) |
| **R²** | 48.9% | 27.5% |

Path coefficient (standard error)

***p<0.001 **p<0.01 *p<0.05 NS – non-significant

Blue color indicates significant paths (p<0.05).

Figure 2: PLS Results for Model Testing

Work-to-Nonwork (NTW) Conflict

The model explains 48.9% of the variance in work-life conflict with WTN other-initiated interruptions (γ=0.356, t=3.30) and the control variable work load (γ=0.377, t=4.96) being significant predictors. Frequency of WTN other-initiated interruptions has a positive relationship with WTN conflict, supporting H1. However, support for H2 was not found, as the main effect of WTN self-initiated interruptions (γ=-0.003, t=0.03) is non-significant.

Nonwork Performance

The results show that frequency of other-initiated WTN interruptions (γ=-0.347, t=2.43) is negatively related to nonwork performance, supporting H3. However, H4 is not supported as the effect of self-initiated WTN interruptions (γ=0.199, t=1.59), was non-significant. Further, work-life conflict (γ=-0.324, t=2.70) is negatively related to nonwork performance, supporting H5. Collectively, the model explains 27.5% of the variance in nonwork performance. Sobel tests suggest that work-life conflict partially mediates the effects of other-initiated WTN interruptions on nonwork performance (test statistic=2.09, p=0.04), whereas it does not significantly mediate the effects of self-initiated WTN interruptions on nonwork performance (test statistic=0.032, p=0.97).

Other-initiated Interruptions vs. Self-initiated Interruptions

To statistically compare the effects of other-initiated WTN interruptions to self-initiated ones, a t-statistic was calculated using the formula[3] ($t = \dfrac{\gamma_1 - \gamma_2}{\sqrt{\dfrac{s_1^2}{n_1} + \dfrac{s_2^2}{n_2}}}$, where the denominator is the pooled standard error of the path coefficients γ_1 and γ_2). The significant t-statistics provide statistical support for both H6 and H7 that other-initiated WTN interruptions have a stronger effect on work-life conflict (t=3.56, p<0.001) and nonwork performance (t=4.07, p<0.001) than self-initiated WTN interruptions. This suggests that other-initiated interruptions affect one's personal life to a greater extent than self-initiated interruptions.

To assess endogeneity concerns on our results, we conducted an endogeneity test following the two-step econometric procedure developed by Heckman (1979). In the first step, we divided our respondents into two groups: individuals with scores above the mean on the frequency of interruptions coded as one, and individuals with scores below the mean on the same variable coded as zero. As there are two different types of interruptions, we divided our sample into two groups in two different ways. We estimated a probit model in SPSS to examine the effects of age, gender, and organization-provided device, which were expected to influence the level of interruptions that people may experience. Parameter estimates from the logistic regression were used to compute the individual probit scores. Lambda (i.e., the inverse Mill's ratio) was calculated based on the individual probit scores using the formula $\lambda_i = \varphi(\gamma_i\omega_i)/\Phi(\gamma_i\omega_i)$, where γ_i represents the vector of independent variables and parameter estimates from the probit model, and Φ represents the standard normal distribution function (Greene, 2003). We calculated two lambda variables based on the formula. In the second step, we entered the two lambda variables simultaneously as a correction factor into the PLS model to account for endogeneity. The inclusion of the lambda variables as additional predictors in the model does not change the pattern of our results, and neither of the lambda variables was statistically significant in predicting our dependent variables. This alleviates concerns of endogeneity as a threat to the validity of our results.

Discussion

The study provides a nuanced conceptualization of WTN technology-mediated interruptions, and categorizes them into two types based on their source (i.e., other-initiated and self-initiated). Drawing on interruption studies in HCI and micro-role transition theories, we developed a research model that examines how the two types of interruptions affect work-life conflict and people's nonwork performance. Results based on survey responses from 137 knowledge workers from a single organization indicate that the source of an interruption is consequential as reflected by the distinct outcomes associated with each type of interruption.

Other-initiated and self-initiated work interruptions during people's time off have distinct effects on the corresponding outcomes, suggesting that the source of an interruption makes a difference. Other-initiated interruptions are associated with more negative outcomes in people's personal life than self-initiated interruptions. Whereas frequency of other-initiated WTN interruptions is a significant antecedent to both work-life conflict and nonwork performance, self-initiated WTN interruptions have no effect on either. As we discussed earlier, this may be due to people having greater latitude to control the timing and duration of self-initiated interruptions than other-initiated ones. As a result, they significantly reduce the probability that occurrences of such interruptions create a tension between work and personal life domains. This is consistent with the notion that people who initiate an interruption often benefit more from it than people who receive the interruption (Rennecker et al. 2005).

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[3] Chin, W. W., (2000). Frequently Asked Questions – Partial Least Squares & PLS-Graph. http://disc-nt.cba.uh.edu/chin/plsfaq.htm (accessed on 10 November 2011).

One important finding of the study is that other-initiated WTN interruptions have both direct and mediated effects on nonwork performance. This suggests two ways that other-initiated WTN interruptions can affect nonwork performance. First, other-initiated WTN interruptions affect people's nonwork performance (i.e., the outcome of people's engagement in their personal life) by influencing their ability to engage in their personal life (an indirect effect via work-life conflict). Second, other-initiated WTN interruptions can also negatively affect nonwork performance without engendering WTN conflict. Given the high flexibility and permeability of the boundaries between work and personal life, more and more work and personal life tasks can be performed anywhere at any time. Therefore, WTN interruptions do not necessarily hinder people's engagement in their personal life activities. They nonetheless affect the quality and effectiveness of such engagement through task-level factors such as the increased resumption costs, elevated error rate, or reduced level of absorption.

Despite the negative connotation that is often associated with interruptions in both academic literature and popular media, frequency of self-initiated WTN interruptions does not significantly influence work-life conflict or nonwork performance. This suggests that not all interruptions are necessarily counterproductive. Control over the timing and the duration of self-initiated WTN interruptions represents one explanation for this lack of support for our hypothesized negative consequences associated with these interruptions. Although WTN interruptions (other-initiated and self-initiated) represent a way of shifting resources from personal life to work, self-initiated interruptions allow people to make such resource transfer at an opportune time and in a reasonable magnitude. Even if WTN interruptions collectively claim a significant portion of people's resources allocated to personal life, most interruptions are communicative or information seeking in nature. For example, people can seek the latest information on a meeting (e.g., change of location or time) or respond to a colleague's inquiry through interruptions. When people carefully weave self-initiated WTN interruptions into their personal life, they can avoid engendering any felt conflict between work and personal life and avoid sacrificing nonwork performance.

Limitations

Implications of our findings need to be interpreted in light of the limitations of the study. First, given the cross-sectional nature of research design, causality statements are based on our theoretical development and not time-ordering of our measurement. Future studies can take a longitudinal approach to more fully assess causality. Second, our model was tested within a single organization. Though this has the advantage of controlling for many organizational level variables (e.g., organizational culture) and though the research site was not an atypical organization in terms of its culture or nature of knowledge workers, generalizability of the results requires replication across different organizations and industries. Furthermore, the study was conducted in the United States where there is a lot of emphasis on instrumental values and more blurring of work and personal life. An interesting direction for future research is to examine these relationships in cultures where there is a higher separation between work and personal life. This will assess the generalizability of the findings across cultures.

Contributions and Implications for Research and Practice

This study contributes to research and practice in several ways. The contribution to research is three-pronged. First, this study examines negative effects of information communication technologies. Research on individuals' technology use focuses predominantly on the positive consequences, with the exception of a few studies that investigate Internet addiction. In response to the call for research on problematic use of technologies (Weber, 2004), we hypothesized and tested negative effects of technology-mediated interruptions.

Second, it represents one of the first studies that offer a nuanced view of technology-mediated interruptions – by differentiating other-initiated and self-initiated WTN interruptions and by examining their effects on people's personal life. The increasingly pronounced consequences associated with ubiquitous technologies have generated a body of research on technology-mediated interruptions. However, prior research focuses predominantly on interruptions that are generated and occur in the work domain. Although the distinction between other-initiated and self-initiated interruptions has been theoretically recognized (Miyata et al. 1986), there is a paucity of empirical research on it. In particular, this study provides empirical evidence of the distinct outcomes associated with these interruptions.

Moreover, making the distinction based on the source of interruption also enriches the research on individuals' technology use in that diverse outcomes can emerge from using the same technology across the domains of work and personal life.

Third, the research contributes to the literature of micro-role transitions by examining technology-mediated interruptions as a transitory form of role transition as opposed to institutionalized ones such as telecommuting and flextime. Modern technologies have greatly shaped how knowledge workers define work and personal life and how they demarcate boundaries between the two domains. Although telecommuting and flextime represent important arenas where work and personal life interact, more and more such interaction occurs during transitions between work and personal life that occur on the fly through such technology-mediated interruptions. Therefore it is critical to understand technology-mediated interruptions in the context of how the new generation of knowledge workers dynamically interweaves their work and personal life domains.

Our study has important implications for practice. First, the study highlights the detrimental effects of other-initiated interruptions, which have negative effects on both work-life conflict and on nonwork performance. As such, organizational norms surrounding work-related technology-mediated interruptions during time off work should be consciously developed. But equally importantly, knowledge workers, who are also more prone to technology-mediated interruptions, should have interruption management tools available to erect boundaries when they deem necessary. Knowledge workers should also be made aware of different ways in which interruptions can be managed. Identifying effective interruption management mechanisms would be an important direction for future research in this domain.

Moreover, it requires the efforts of both communication partners to mitigate the negative effects. Of other-initiated interruptions on people' People who initiate interruptions should minimize the number of unnecessary communications (e.g., combining related topics to generate fewer messages, or flagging emails with exclamation marks or red flags only when necessary). People who receive interruptions should actively engage in some interruption management techniques to keep interruptions under control (e.g., color-coding email senders as a filter tool, or simply resisting the temptation to check IM messages every time there is a new message alert).

The research model and the hypotheses developed in this study provide avenues for future research. First, further research is needed to understand how knowledge workers can manage interruptions. Technology-mediated interruptions are an unavoidable outcome of today's technologies. The seemingly effortless use of these technologies has brought a challenge – how to maintain the proper focus on the tasks while responding to the demands delivered via a large diversity of devices and applications. Therefore, how to manage the constant technology-mediated interruptions represents a major challenge faced by knowledge workers. Interruption management mechanisms can be based on technologies, social norms, and self-discipline and each of these may be differentially efficacious in mitigating negative effects of interruptions. Future research on this topic would be beneficial. Second, a follow-up study should be conducted to identify the factors that account for the distinct effects of other-initiated and self-initiated interruptions on personal life. This will enable researchers to understand how use of the same communication technologies can generate distinct outcomes, and allow practitioners to develop different sets of tools that enable knowledge workers to optimize their experience in both domains.

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