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EXPLAINING INFORMATION TECHNOLOGY USERS' WAYS OF MITIGATING TECHNOSTRESS

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EXPLAINING INFORMATION TECHNOLOGY USERS' WAYS OF MITIGATING TECHNOSTRESS

Research paper

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Abstract

Technostress refers to the inability of an individual to deal with information technology (IT) in a healthy manner. Researchers, practitioners, and medical professionals have emphasized the omnipresence of technostress and its severe outcomes, including poor well-being and burnout. Despite the importance of the phenomenon, prior research has paid limited attention to how technostress can be mitigated. The few existing studies examine organizational mitigation mechanisms, but we could not find any studies that focus on individual IT users' own ways of mitigating technostress outside of work. To address the research gap, we conducted a qualitative study to uncover users' ways of mitigating technostress caused by personal/leisure IT. As a theoretical contribution, we offer a new perspective on technostress by applying an approach of stress interventions and refining it to the technostress context. This enabled us to uncover three fundamentally different mitigation types that IT users can utilize. As such, our findings go beyond the organizational mechanisms that prior studies have focused on. As a practical contribution, our resulting model presents ways for individual IT users to decrease technostress.

Keywords: Technostress, Mitigation, Intervention, Coping, IT use.

1 Introduction

Information technology (IT) has greatly benefited as well as entertained humans. However, IT use also has negative consequences that hinder the *"grand vision of an [IT]-enabled bright society"* (Lee, 2015, iii; Lee, 2016, 1). One well-recognized negative consequence is technostress, which is the inability of an individual to deal with IT in a healthy manner, resulting in stress (Ayyagari et al., 2011; Brod, 1982; Ragu-Nathan et al., 2008). An example of technostress is stress caused by a deluge of notifications from personal devices (Galluch et al., 2015). Another is stress caused by the perceived pressure to be constantly available through various online communication channels (Ayyagari et al., 2011). Researchers, practitioners, and medical professionals have highlighted the omnipresence of technostress and its severe outcomes: nearly half of users consider it stressful to constantly check their

smartphones (Tarafdar et al., 2013), and technostress has been found to reduce well-being and contribute to burnout (Pawlowski et al., 2007; Srivastava et al., 2015).

Substantial research has identified technostress creators and technostress outcomes in both organizational/work and personal/leisure IT contexts.[1] However, there is little research exploring ways to mitigate technostress (Tarafdar et al., 2015b, 2015c; Pirkkalainen and Salo, 2016). The few existing studies that have examined technostress mitigation are at the organizational level, such as studying helpdesk support for users with work-related technostress (Arnetz, 1996; Fuglseth and Sørebø, 2014; Galluch et al., 2015; Hung et al., 2011; Ragu-Nathan et al., 2008; Tarafdar et al., 2011, 2015a).

Yet, no studies have focused on individual IT users' own ways of mitigating technostress outside of work. Studying them is important particularly in the personal/leisure IT context, because a huge number of people use IT for non-work purposes, those people are responsible for managing their own technostress, and they do not necessarily have access to organizational resources for mitigating it. Thus, uncovering ways for IT users to systematically treat their technostress can have wide benefits for individuals, firms, and societies by preventing personal strain, reducing sick leave and burnout, and saving on healthcare costs (Ayyagari et al., 2011; Maier et al., 2015a; Srivastava et al., 2015).

Given the research gap and the importance of the topic, our aim is to uncover and explain individual IT users' own ways of mitigating technostress. Thus, our research question is: How can users mitigate technostress caused by personal/leisure IT use? To answer this question, we conducted a qualitative study with narrative interviews, because this enables context-specific insights into previously uncovered phenomena (Berg, 2004; Klein and Myers, 1999; Venkatesh et al., 2013). We utilized a theoretical frame by complementing the basis of technostress research with an approach of stress interventions (Lamontagne et al., 2007).

As a theoretical contribution, we demonstrate how the approach of stress interventions (Lamontagne et al., 2007) can be applied and refined for use in a new domain to answer the call for research on technostress mitigation (Tarafdar et al., 2015b, 2015c; Pirkkalainen and Salo, 2016). More specifically, we uncover how IT users can utilize three fundamentally different ways to mitigate technostress. With such findings, we go beyond the organizational mechanisms that prior studies have identified (e.g., Arnetz, 1996; Ragu-Nathan et al., 2008; Tarafdar et al., 2011, 2015a). As a practical contribution, our resulting model aims to help IT users and other relevant stakeholders in treating technostress.

2 Related Research and Theoretical Background

This section develops a research framework by reviewing the relevant literature on (1) technostress and (2) stress interventions and coping. From the technostress literature, we extract the idea of what creates technostress (stressors) and its outcomes (strains). However, the literature does not sufficiently explain how technostress can be mitigated. Thus, we draw from the literature on stress interventions and coping. In particular, we apply an approach of stress interventions to identify three different mitigation types.

2.1 Technostress Research

Underlying the vast majority of technostress research is a consensus about the two main concepts of technostress: stressors (technostress creators) and strains (technostress outcomes). Prior technostress research has mainly focused on understanding these two concepts. Researchers have been able to iden-

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[1] By the personal/leisure IT context, we refer to situations where the use of IT reflects non-organizational and non-work-related purposes. The personal/leisure context differs from the organizational/work context in that IT use is often fundamentally voluntary, and users' own decisions, emotions, and responsibilities are highlighted (Kim et al., 2007; Venkatesh et al., 2012).

tify several stressors, including IT-related overload, intrusiveness, complexity, insecurity, and uncertainty (Ragu-Nathan et al., 2008; Srivastava et al., 2015; Tarafdar et al., 2007, 2011). Similarly, they have found that strains include poor well-being, exhaustion, lack of productivity, poor job performance, decreased organizational commitment, and burnout (Maier et al., 2015a; Pawlowski et al., 2007; Ragu-Nathan et al., 2008; Srivastava et al., 2015; Tarafdar et al., 2007). Researchers have used similar theories to capture these concepts. For example, the transaction theory of stress (used by, e.g., Ragu-Nathan et al., 2008) has similar characteristics to the person-environment fit model (used by, e.g., Ayyagari et al., 2011) (Edwards and Cooper, 1990).

In line with previous research, we employ the transaction theory of stress (Lazarus, 1966; Lazarus and Folkman, 1984). The transaction theory benefits this research in two ways: (1) it helps us to identify fundamentally different forms of mitigation, and (2) it functions as a useful basis for technostress research (Tarafdar et al., 2015a). According to the theory, stress is created by demand conditions faced by an individual (stressors) and involves individuals' responses to the stressors (strains). Stress occurs when these demand conditions exceed an individual's resources for dealing with them (Lazarus, 1966; Lazarus and Folkman, 1984). Lazarus (1966, 1993) highlights that it is not the demand conditions per se but rather an individual's perception of them that can make a situation stressful. For example, two individuals could see a similar situation differently. Overall, the concept of stress refers to the overall transaction between the stressors and the strains, as illustrated in Figure 1.
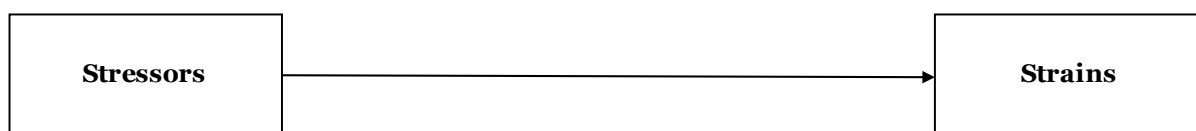

Figure 1.   Basis of technostress research: illustration of the transaction theory of stress.

We summarize previous technostress research in Table 1.[2] Only a few studies have gone beyond the concepts of stressors and strains to examine mitigation mechanisms that could help reduce technostress. Arnetz (1996) investigated the effect of organizational stress-management programs. Hung et al. (2011) studied the influence of organizational stress management training, job control, and organizational rewards. Ragu-Nathan et al. (2008), Tarafdar et al. (2011), and Fuglseth and Sørebø (2014) studied similar organizational support structures (e.g., technical support provision and IT involvement facilitation) to reduce work-related technostress. Finally, Galluch et al. (2015) studied the effects of IT users' control over work IT on episodic stressors, and Tarafdar et al. (2015a) addressed the positive effect of self-efficacy and IT competence on organizational performance.

All these technostress mitigation studies are at the organizational level. None of the articles focus on the responsibilities and actions of individuals in the personal/leisure context. Understanding individuals' own mitigation mechanisms outside the work context is crucial for two reasons: (1) personal/leisure IT users are responsible for their own well-being and (2) do not usually have access to organizational resources. Therefore, we next complement the basis of technostress research by drawing from studies on interventions and coping related to other types of stress.

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[2] We followed the general suggestions for literature searches by Webster and Watson (2002): We first searched for technostress articles published in the IS basket of eight journals during 1995-2015 (AIS, 2011). We then searched backward and forward from their citations as well as run keyword searches to cover various fields and outlets. While every review may *"miss some articles"* (Webster and Watson, 2002, xvi), we aimed to ensure that our review included relevant articles that examined technostress mitigation.

Article	Context	Stressors	Strains	Mitigations
Ahmad et al. 2012	Organizational	IT stressors	Reduced commitment	-
Arnetz 1996	Organizational	-	Mental strain	Organizational program
Ayyagari et al. 2011	Organizational	IT / task	Strain	-
Bichteler 1987	Organizational	IT / task	Technostress and resistance-behavior	-
Brod 1982	Organizational	IT / task	IT resistance	-
D'arcy et al. 2014	Organizational	Security policy	ISP-violating behavior	-
Fuglseth & Sørebø 2014	Organizational	IT stressors	Reduced satisfaction	Organizational support
Galluch et al. 2015	Organizational	Interruptions	Strain	Work IT control
George 1996	Organizational	Monitoring	Stress	-
Hsiao et al. 2017	Personal / leisure	Compulsive use	Technostress	-
Hudiburg 1989	Education	Increased IT use	Technostress	-
Hung et al. 2011	Organizational / mobile	IT / mobile stressors	Job stress, reduced productivity	Organizational stress management
Hung et al. 2015	Organizational / mobile	IT / mobile stressors	Reduced productivity	-
Koch et al. 2012	Organizational	IT use	Stress	-
Kupersmith 1992	Organizational	IT use	Technostress	-
Lee et al. 2014	Personal / leisure	Compulsive mobile use	Technostress	-
Leung & Zhang 2017	Work/home	IT use, work/home aspects	Technostress	-
Maier et al. 2015a	Personal / leisure	SNS stressors	SNS exhaustion	-
Maier et al. 2015b	Personal / leisure	Social overload	SNS exhaustion	-
Moody & Galletta 2015	Personal / leisure	Information scent	Stress	
Pawlowski et al. 2007	Organizational	IT / task	Reduced performance	-
Ragu-Nathan et al. 2008	Organizational	IT stressors	Reduced commitment	Organizational support
Salanova et al. 2013	Organizational	Job demands	Strain and addiction	-
Shu et al. 2011	Organizational	IT dependence	Technostress	-
Srivastava et al. 2015	Organizational	IT stressors	Job burnout	-
Tams et al. 2014	Personal / leisure	Task-related stressors	Reduced performance	-
Tarafdar et al. 2007	Organizational	IT stressors	Reduced productivity	-
Tarafdar et al. 2011	Organizational	IT stressors	Reduced satisfaction	Organizational support
Tarafdar et al. 2015	Organizational	IT stressors	Reduced IT/work performance/innovation	Work IT competence, self-efficacy, org. support
Tu et al. 2005	Organizational	IT stressors	Reduced productivity	-
Wang et al. 2008	Organizational	Organizational factors	Technostress	-
Weinert et al. 2013	Organizational	IT stressors	Strain	-
Yan et al. 2013	Organizational	IT and work-related stressors	Strain	-

Note: Only empirical findings related to technostress mitigation are reported in the table.

Table 1.   *Summary of technostress studies.*

2.2   Intervention and Coping Research

Scholars across various disciplines, such as psychology, sociology, and medicine, have studied stress for decades. A part of their research has focused on how individuals can reduce or deal with stress. These studies can be sorted into two streams: coping research and intervention research.

Coping with stress. The coping literature enables us to acknowledge the general principles of technostress mitigation. The concept of coping is defined as *"cognitive and behavioral efforts exerted to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person"* (Lazarus and Folkman, 1984, 141). Many researchers have studied coping with major negative life events, such as severe illnesses, divorce, and unemployment (Lazarus and Folkman, 1984) as well as minor negative life events like small interpersonal disputes (Neupert et al., 2015). Researchers have utilized the concept of coping to explain information systems (IS) phenomena other than (techno)stress, such as users' reactions to new IT (Beaudry and Pinsonneault, 2005) and the underutilization of IT (Fadel and Brown, 2010). Only few researchers have proposed that coping might reduce technostress (Weinert et al., 2013) and provided preliminary insights into users' coping with certain work-related episodic stressors within different situations of using work IT (Galluch et al., 2015). However, these studies present only limited forms of coping with technostress and do not focus on the personal/leisure IT context.

According to the theoretical knowledge on coping, there are two main coping principles: problem-focused coping and emotion-focused coping (Lazarus and Folkman, 1984). It is noteworthy to mention that problem-focused and emotion-focused efforts may also appear in combination (Folkman and Moskowitz, 2004). With problem-focused coping, an individual attempts to directly address and influence the stressor at hand. Problem-focused efforts are usually portrayed as instrumental and concrete acts by individuals. Examples of problem-focused efforts include minimizing and eliminating the stressor (Carver et al., 1989; Litman, 2006). In contrast, an individual can engage in emotion-focused coping by handling emotions to indirectly influence stress. Emotion-focused efforts are more abstract, and they may have various forms with different kinds of effects (Folkman and Moskowitz, 2004). Examples of two different emotion-focused efforts include the processing of emotions and escape-avoidance (Carver et al., 1989; Litman, 2006).

Stress interventions. The literature on stress interventions helps us to understand technostress mitigation in relation to the stressors and strains of the transaction theory of stress. Interventions are defined as *"actions with a coherent objective to bring about change or produce identifiable outcomes"* (Rychetnik et al., 2002, 119). Researchers have focused on stress interventions within various contexts, including job stress (Lamontagne et al., 2007), parenting stress (Hastings and Beck, 2004), and war stress (Solomon and Mikulincer, 1990).

There are three types of interventions: stressor reduction, stressor toleration, and recovery from strain (Lamontagne et al., 2007). Stressor reduction interventions (primary) focus on the long-term removal or reduction of the stressor (Hurrell and Murphy, 1996; Lamontagne et al., 2007). For example, a mobile user can reduce the number of notifications by adjusting the notification settings. Stressor toleration (secondary) aims to enable people to modify their reactions to stressors (Hurrell and Murphy, 1996; Lamontagne et al., 2007). For example, an individual can learn to have a calmer attitude toward IT use. Finally, stressor recovery (tertiary) enables short-term recovery from strain that has already occurred (Hurrell and Murphy, 1996; Lamontagne et al., 2007). For example, an individual could vent and swear to unload emotional strain caused by IT.

These three types of intervention map onto the model of stressors and strains. They suggest a systematic way of identifying technostress mitigations: stressor reduction targets stressors, recovery targets strains, and toleration targets the relationship between stressors and strains. In sum, Figure 2 illustrates our research framework. The use of such a broad framework sensitizes us to the theoretically important constructs but, at the same time, gives us room to examine stress mitigation in the specific context of technostress (Klein and Myers, 1999). Technostress is a specific context of stress, because several characteristics of IT use enable, for example, an ongoing flow of push notifications, constant connectivity for 24/7 communication, and the users' abilities to flexibly modify the features of their IT (Ayyagari et al., 2011; Galluch et al., 2015). Thus, we aim to refine the framework for the technostress mitigation context in our empirical study.
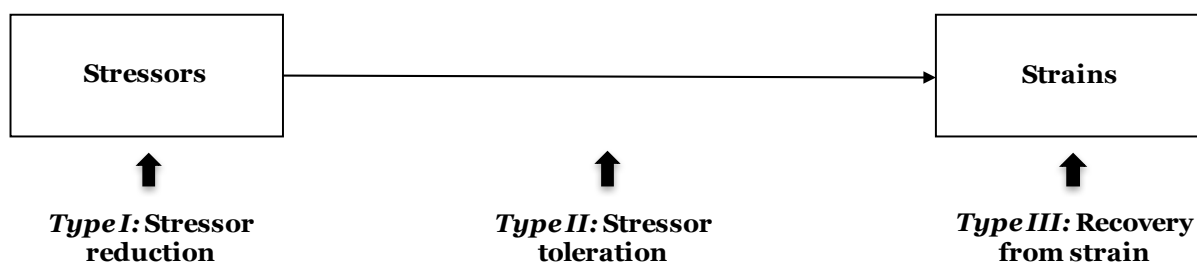
Figure 2.   Summary of our research framework: illustration of the transaction theory of stress complemented by the three intervention types.

3   Method

We conducted a qualitative study with narrative interviews. We chose this research approach, because it is suitable for generating context-specific knowledge for previously unmapped topics and the early stages of theory development (Berg, 2004; Klein and Myers, 1999; Venkatesh et al., 2013). Our study links theory and data iteratively: we first utilized open coding of the data, then applied a theoretical framework to guide our further data analysis, and finally used our data to refine the framework for the technostress context.

3.1   Data Collection

In total, we collected data by interviewing 32 users of personal/leisure IT who had experienced technostress and mitigated it. We used pre-screening to carefully select suitable participants and to ensure that all participants had mitigated technostress in one or multiple ways. We utilized purposeful sampling (Patton, 1990): We started by interviewing technostressed users of a popular social networking site. As we noted that the interviewees had also applied similar mitigation techniques with other kinds of personal/leisure IT, we wanted to broaden our focus to develop a model that would fit many kinds of personal/leisure IT. As a result, we continued by interviewing technostressed users of various kinds of software (e.g., news and games) and hardware (e.g., smartphones and computers). The age of the interviewees ranged from 20 to 80 years. Half were women, and half were men. The interviewees were Finnish and varied in terms of IT use experience. Altogether, they had varying occupational statuses, including employed (e.g., an athlete, a software developer, a priest, and an entrepreneur), unemployed, student, and retired.

We chose to conduct the interviews in a narrative form (Myers, 1997). Researchers in IS and other fields have found narratives useful for explaining IT use and human behavior (Pentland, 1999; Schwarz et al., 2014). Narratives—which are descriptions of events comprising a beginning, middle, and end—are best acquired from individuals who have directly experienced the studied phenomenon (Pentland, 1999; Schwarz et al., 2014). Thus, collecting narratives from the users allowed us to examine their perceptions about their original situation with technostress (beginning), their ways of mitigating it (middle), and the resulting situation after their mitigations (end). We structured the interviews to uncover real-life stories: we asked the users to thoroughly describe how their stressful situations and events with IT had originated and affected them, how they had dealt with and mitigated them, and how their mitigations had influenced their stress. Within this general structure, we asked various detailed questions about examples, practices, perceptions, and consequences. We aimed to minimize recall bias by anchoring questions and responses in events that had actually happened and instructing the interviewees to think carefully about their past experiences. To contextualize our data (Klein and Myers, 1999), we asked each interviewee to describe their background as well as what types of IT they generally use, for what purposes, and to what extent.

With all interviews, we followed the main guidelines set by Myers and Newman (2007). For example, we remained flexible and, when necessary, added questions to our interview scheme (available upon request). We collected data until we believed a sufficient level of saturation had been reached and no significantly new information emerged for the purpose of this study. The interviews lasted 47 minutes on average and contained altogether over 117,000 words. All interviews were recorded and transcribed for the relevant parts with the permission of the interviewees.

3.2 Data Analysis

Our unit of analysis was the individual user's perception of technostress mitigation. We first utilized open coding (Berg, 2004; Strauss and Corbin, 1990) to label all interview text that reflected technostress mitigation. With the help of NVivo software, we attached labels to relevant sets of words, sentences, or sets of sentences. Examples of these labels included *"adjusting notification settings"* and *"learning a calmer attitude toward IT use."* As we conducted coding, we constantly compared whether the newly analyzed data supported or challenged our previous analyses. Although one of the authors was primarily responsible for the initial coding, we utilized hand-written memos and discussed the possibility of multiple interpretations (Klein and Myers, 1999).

We then revisited the codings using our research framework (indicated in Figure 2), because it helped us to position fundamentally different mitigation mechanisms in relation to stressors, strains, and the relationship between them. During this process, we sorted the codes under the three mitigation types. For example, "*adjusting notification settings*" was sorted under Type I, because it targeted stressors, while *"learning a calmer attitude toward IT use"* was sorted under Type II, because it focused on the relationship between stressors and strains. After this process, we paid attention to the similarities and differences within the codes under each type to create compiling categories. For example, *"adjusting notification settings," "adjusting privacy settings,"* and *"conducting virtual cleaning"* were among the codes that belonged to a category labeled *"modification of IT features,"* because they focused on altering the features of the IT. As a result, we had formed two categories for Type I and Type III and one category for Type II. Finally, we went through the categories and paid attention to the recurrent patterns in the data. We observed that the categories of Type I were problem-focused, because they directly addressed the stressors, while the categories of types II and III were emotion-focused, because they focused on handling emotions (Lazarus and Folkman, 1984).

Altogether, our analysis enabled us to maintain the idea of the hermeneutic circle by moving back and forth between the interviewees' technostress-specific responses and the generic knowledge and literature (Klein and Myers, 1999). We assessed our analysis by comparing our data and the emerging categories, drafting sketches and memos, and using cross-checks from the other authors (Berg, 2004). Regarding triangulation, we ensured that the main insights recurred in multiple interviews (Klein and Myers, 1999). The analysis prepared us to present our results as follows.

4 Results

Overall, the interviewees had suffered from technostress resulting from personal/leisure IT use related to several hardware devices like laptops, mobile phones, and gaming consoles as well as software applications like social networking sites, instant messaging applications, and online games. The manifestations of technostress included, for example, mental exhaustion caused by push notifications and interruptions, pressure to be constantly available online, time management difficulties due to excessive IT use, and sleep disturbance from late-night IT use.

Our results are summarized in Figure 3. According to our data, users had applied three technostress mitigation types: stressor reduction (Type I), stressor toleration (Type II), and recovery from strain (Type III). Stressor reduction focuses on the problem at hand: it prevents direct exposure to IT-related stressors by removing or reducing them. Stressor toleration focuses on the users' emotional side, as it

refers to the modification of one's reactions to IT-related stressors, making them less bothersome. Finally, users can still recover from strains if they cannot reduce or tolerate stressors. Such recovery aims at restoring the users' strained emotional state back to normal but does not address the original stressor. According to our data, types I and II functioned mainly as appropriate ways to decrease technostress, while Type III provided only temporary "first aid" for a situation gone bad and potentially involved two-edged effects (i.e., pros and cons). In the following sections, we present our detailed results with examples from the interview data.
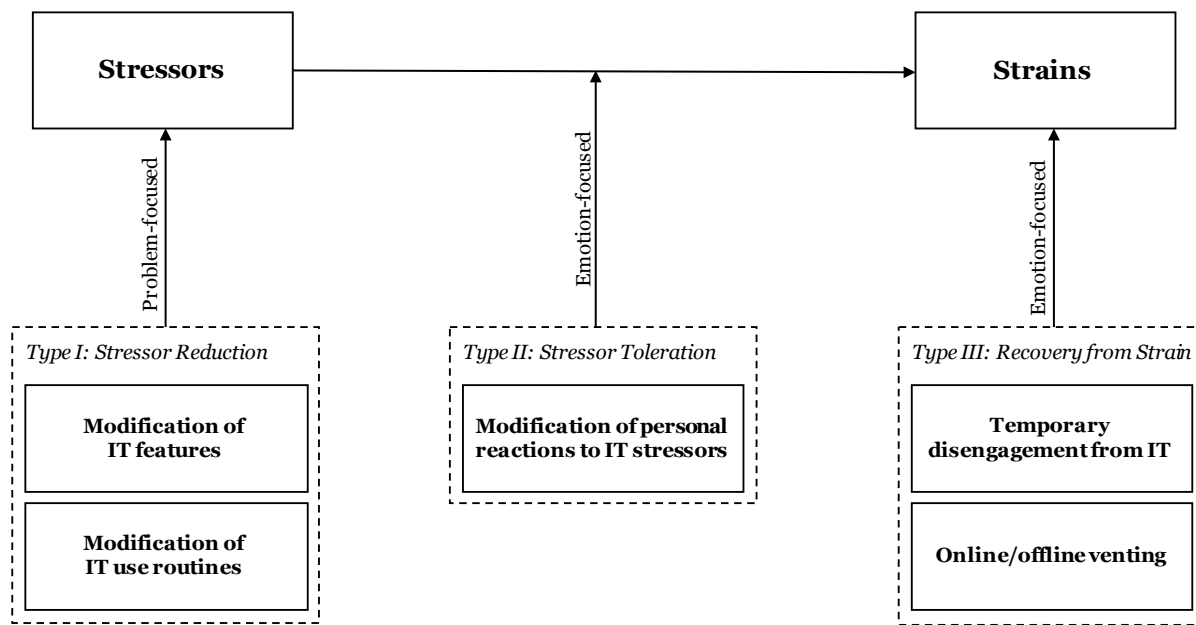

Figure 3. *Summary of our resulting model: IT users' own ways of mitigating technostress.*

4.1   Type I: Stressor Reduction

Based on our data, users achieved long-term stressor reduction by (1) modifying the IT features that they perceived as stressful or (2) modifying their own IT use routines that they found stressful. These approaches addressed the problems directly and were thus based on the problem-focused approach: technostress decreased when the source of stress decreased.

Modification of IT features. Users were able to modify their IT features, which allowed them to make concrete and stable changes to eliminate the stressors. As the constant flow of push notifications and interruptions were some of the most common stressors, users had performed several detailed acts to tackle them. They had turned their notifications off, assigned different applications with different notification settings, and extracted non-stressful notifications by assigning them with specific sounds. For example, one interviewee described how he had turned off the push notifications that interrupted and aggravated him:

> *...there are those [notifications and sounds] that are not important, and they bother me and even make me angry. So I have just disabled those [notifications and sounds], because having my own peacefulness is one of the most important things to me.*

Such procedures were similar with different kinds of stressors: users who felt strain because of privacy issues adjusted their privacy settings according to their preferences, while users who were stressed because of "virtual mess" conducted virtual cleaning by removing unused applications from their

desktop. For instance, one user noticed that the bright light from his laptop stressed him by disturbing his sleep. He addressed it by using software that dims the device at night:

> *I quite clearly associated [nightly IT] usage with some sort of sleep problems. ...I noticed that if I couldn't fall asleep because of [IT] use, it was usually because of my laptop. ...[now] I use [the application named] Flux on my laptop. The idea is that it dims or reduces the blue light of the screen [at night to make sure my sleep is not disturbed like it used to be]. But, that is to say, using Flux has been very good for me.*

Modification of IT use routines. Users reduced their exposure to stressors by changing their own routines and their ways of using IT. The interviewees reduced their stressful IT use routines by undertaking several rather determined acts: not using IT in situations such as family dinners, decreasing occasions and durations of smartphone use, and switching to a less stressful alternative. For example, one user had experienced stress and time management problems due to his excessive social networking usage. He decreased these by monitoring and reducing his online time:

> *I noticed that browsing [the social networking site] was not like... It was more stressful, it was no longer enjoyable. ...I've tracked ... which distracting applications I use. I've got one of these [tracker apps]. I've monitored over half a year how much I use, for example, [the social networking site] each day. ...I intended to resolve [the problem] by trying to reduce my use of it. ...I have reduced it quite a bit... I've been fairly successful with it... In the beginning [my daily use] was 1-2 hours all the time... Now it's less than 30 minutes [a day].*

Some of the users made more radical changes to their IT use routines. For example, one of the interviewees was a hardcore PC gamer but sold all his gaming equipment because of the stress he derived from it. This modification involved giving up something valuable for something else with greater value: less stress.

> *Back then I really enjoyed PC gaming. ...[but] I noticed that when I played an intensive game that required lots of concentration, my brains were not resting like [they should have been]. I was swinging to a stressful state, even when I should have been taking it easy. ...I noticed that I was living in a kind of loop. I always ended up in a corner [where I had my PC gaming equipment]. ...I could only end it by getting rid of [the equipment]. ...I threw all of it away... including my large PC desk and the PC itself.*

4.2   Type II: Stressor Toleration

In cases where the stressors were beyond users' reach or users did not want to eliminate them, it was possible to build tolerance and resilience to the stressors over the long term. Our data indicate that this was done by learning to handle the emotions triggered by the stressors. Thus, instead of directly addressing the problematic stressors, users addressed and processed their thoughts and feelings through an emotion-focused approach. Thus, users achieved tolerance by altering their personal reactions to IT stressors.

Modification of personal reactions to IT stressors. Interviewees emphasized that they had developed better tolerance by training themselves to control their reactions. One key aspect for the interviewees was to revisit the role of IT in their lives and decrease their dependency on IT: if they were less dependent on their technological hardware and software, the stressors created by them were perceived less important and caused milder reactions. In practice, several interviewees had learned to have a lighter and calmer attitude toward IT use, since it helped them to be less distracted by the IT stressors that would take place anyway. This was achieved, for example, by thinking critically about their own reactions toward IT, desensitizing oneself to technological events, gaining technological understanding, and questioning the importance of IT. The following example illustrates a comparison between an interviewee's former and current reaction to the stressor:

> *I became aware of what disturbs and annoys me. ...[Push notifications] do not [any longer] annoy me, but earlier they caused me to immediately react to them. Similar to when a phone it rings, I have to answer it, I thought that when I receive an email, I have to read it. I've [now] maybe conditioned myself*

> *so that I don't need to check [the incoming email] immediately. ...[laughs], maybe it's like becoming aware of such an automatic mental structure of being conditioned to do something. Then I just stop doing it like that. ...[nowadays] I just make a mental note that "well, an email [arrived]" and proceed with what I was doing [in the first place]. So there's no action taking place.*

The interviewees tended to take some time to conduct such personal growth and changes in their reactions, which made these mitigations stable rather than temporary. As a result of response modification, users still dealt with the very same stressors as before but could do it now with less perceived strain. As an example, an interviewee described how she had grown to revisit her attitude and learned to control her rage against new technology:

> *Adopting new [IT] devices, software, and technology has caused almost excessive stress for me [laughs]. ...I argue that [nowadays] when an emotional reaction arises in me, I feel it, and I've learned to process it better. It's perhaps more like, uh, mental growth... So it's seeing a feeling, recognizing that feeling but not being that feeling.... It's not an immediate feedback to that [IT] device in question, but it's more like I've taken control over my own reaction.*

4.3   Type III: Recovery from Strain

If users could not reduce stressors or build tolerance to them, they still were able to mitigate technostress in a temporary manner by minimizing the level of their strain. Indeed, the interviewees faced many kinds of strains, such as anger at complex devices, sadness from IT making them feel distant, or regret for using too much IT. The two main ways to recover from strain included (1) temporary disengagement from IT and (2) online/offline venting.

Temporary disengagement from IT. Users got short-term relief for their strain when they escaped from their strained IT situations. This was perceived as helpful at least temporarily, because such disengagement gave them space and time away from the strain. In practice, the interviewees disengaged themselves from IT by temporarily walking away from their IT, shutting off their device, and avoiding thinking about the IT that caused the strain. For example, one interviewee described her thoughts after a painful situation had already occurred:

> *If I have a [stressful] moment, then I, for instance, turn the laptop off and do something else. I just try not to think about that issue too much. Maybe, it's like, I think that there is the real world and there is the Internet world. And, like, [the Internet world] is not a part of the real world.*

Users perceived that such disengagement was useful when their strain was particularly high as long as the disengagement was occasional. Every now and then, strain avoidance enabled them to soothe their increased emotional charge. Yet, prolonged disengagement tended to bring about risks for additional problems. For example, one user felt relieved when he occasionally escaped when the strain caused by intensive social networking and instant messaging applications was too nerve-racking. In particular, he deliberately avoided thinking about the strain and, instead, filled his mind with thoughts of other issues. However, when he had been escaping the situation for too long, he started to miss out on staying in touch with his friends and information about up-to-date news and events.

Online/offline venting. Many of the interviewees vented and aired out emotions about their strain in online (e.g., via instant messaging and discussion forums) and offline settings. Whether by oneself or with other people, emotional venting gave the interviewees momentary relief, since it helped them unload their emotional strain instead of bottling up their frustration. Swearing and groaning were recurrent ways that the interviewees let their steam off in a rather impulsive manner (e.g., *"After that [buggy incident], I thought that 'Oh he#l, this [application] is sh*#ty!'"*). For example, one user described how he just vents about his strain with IT (although he could, in principle, address the original stressor by changing his mobile operator):

> *When I, like, had some space [in my day] to take care of some issues [on my IT device], but I couldn't do it [due to network issues]. My schedule becomes f#*%ed up. The frustration arises, like "damn, it is*

> *the fault of this technology that I can't do this." Whether it's because of Wi-Fi or my mobile operator's connection. My operator was recently changed, and it breaks up more than before, so it makes me blind with rage.*

Fierce expression of emotions after strain also had its downsides, which could cause additional problems. Immoderate and repetitive venting and swearing could increase personal negativity or hurt others. This is demonstrated by a rare case, where the impulsive venting of emotions had been drastic and brought about material damage and losses:

> *I'm known from my outbursts of rage with [IT] devices. ...I think it's a pathological reaction in me, that terrible rage [toward technologies that don't understand what I want to do with them]. ... I've broken a vacuum cleaner and a few television antennas. Like actually broken so that they have ended up in the garbage can after that [laughs]. Q: "Does it help, by the way?" A: "Umm, yes it gives me a momentary relief."*

Altogether, Table 2 presents a summary of the three main mitigation types and their five technostress mitigation categories with examples.

	Description	**Examples**
Type I: Stressor reduction	*Preventing exposure to IT-related stressors by reducing or removing them*	
Modification of IT features	Eliminating the attributes of the IT that are perceived stressful	- Disabling redundant notifications from the IT - Adjusting the privacy settings of an application
Modification of IT use routines	Decreasing one's stress-inducing ways of using IT	- Decreasing excessive spare time spent with the IT - Switching to a less stressful alternative application
Type II: Stressor toleration	*Enduring IT-related stressors by altering one's own responses to them*	
Modification of personal reactions to IT stressors	Regulating one's own responses triggered by IT stressors	- Learning a calmer attitude toward IT use - Bypassing notifications from the IT device
Type III: Recovery from strain	*Treating IT-related strain symptoms once they have emerged*	
Temporary disengagement from IT	Distracting oneself temporarily from IT-induced strain by avoidance	- Walking away from the IT - Avoiding thinking about the IT-induced strain
Online/offline venting	Offloading emotional strain by venting feelings about the IT that has caused it	- Airing out emotions by swearing at the IT - Unleashing emotions by wrecking the IT

Table 2.   Summary of technostress mitigations, their descriptions, and examples.

5 Discussion

Our study aims to extend the current knowledge by addressing the less understood component of technostress: mitigation. In this way, we offer an initial answer to the call for research that explains technostress mitigation (Tarafdar et al., 2015b, 2015c; Pirkkalainen and Salo, 2016). Specifically, our study takes the first steps toward explaining the previously unmapped area of individuals' own ways of mitigating technostress. Such new knowledge is important, because many personal/leisure IT users experience technostress but have no mitigation options other than their own mechanisms.

5.1 Implications for Theory

This study aims to make a contribution to IS research by applying and refining theory for use in a new domain (Straub, 2009). Indeed, we offer a new perspective to technostress by applying a model of

stress interventions (Lamontagne et al., 2007) and refining it for the technostress context by breaking down technostress-specific mitigations. The results of this study extend the current technostress knowledge by distinguishing three different mitigation types. Thus, this study uncovers fundamentally different strategies that users and other relevant stakeholders can use to reduce technostress.

Our model contributes by going beyond the organizational mitigation that prior technostress studies have focused on (Arnetz, 1996; Fuglseth and Sørebø, 2014; Galluch et al., 2015; Hung et al., 2011; Ragu-Nathan et al., 2008; Tarafdar et al., 2011, 2015a). There are two implications related to this. First, we offer a first look at the users' own ways of mitigating technostress in the context of personal/leisure IT. This knowledge can help researchers to theorize about technostress in non-organizational contexts, which have been stated to be increasingly important contexts for IS research (Venkatesh et al., 2012). Second, extending the picture conveyed by previous studies, our study demonstrates that IT users should not be depicted as helpless sufferers of technostress whose mitigation depends solely on external or organizational mechanisms. Instead, we found that users are able to mitigate technostress internally on their own. Therefore, we suggest that researchers integrate users' own ways of mitigation into their technostress models and theories in both personal/leisure and organizational contexts.

Our findings indicate that each of the three mitigation types is based on a different logic. Type I is problem-focused, as it is based on users' direct actions to the stressful demand conditions at hand: stressor reduction or removal makes the demand conditions (and, thus, stress as the overall transaction) to dissolve. For example, if users turn off their push notifications, then the stress created by notifications does not exist anymore. Indeed, such logic makes Type I more explicit than the other types. This suggests that Type I could be easier to communicate and more straightforward to implement in practice. Type II is emotion-focused, involving users' mental abilities to control their reactions to lessen the strain-causing effect of the stressor. While the user may be exposed to the stressors, the stressors create less strain when they are tolerated. For example, if users can develop their abilities to regulate their reactions to push notifications, the notifications cause them less strain than previously. As Type I is based on the concrete modification of IT features and routines, Type II is based on the more abstract procedures of attitude modification. This suggests that Type II involves self-reflection, is more personal, and, thus, may be harder to explicitly communicate and implement than the other types. Finally, Type III mitigation is emotion-focused, and it stipulates that technostress has already been experienced, as stressors have caused strain. Type III hence seems to let users only neutralize their strain but does not affect the stressors or their effect on the strain. For example, users can ease their inbound strain by venting their worst feelings away. Altogether, these three different types and their logics could be utilized not only when studying technostress but also other negative consequences of IT use, including IT addiction and anxiety (Tarafdar et al., 2015b; Pirkkalainen and Salo, 2016).

This study also derives insights for those IS researchers who utilize the concept of coping and its theory (e.g., Lazarus and Folkman, 1984). Our findings indicate that problem-focused efforts are often appropriate for eliminating the original stressor. They can cause additional problems only in rare circumstances: for example, a user who turns notifications off from their smartphone may not be able to stay in touch with friends. However, emotion-focused efforts have more obvious mixed effects: while Type II tended to be helpful, Type III was perceived as both providing relief and creating additional stress. Our finding of this dual nature of emotion-focused coping has been noted in psychology: the active processing of emotions can decrease stress, while prolonged disengagement or immoderate expressions may increase stress (Folkman and Moskowitz, 2004). Within IS, there is a void of knowledge about these differences in emotion-focused efforts. Thus, IS research could benefit from adopting the distinction of (at least) the two different effects of emotion-focused coping that our study identified.

5.2 Implications for Practice

As a practical implication, users can tackle technostress more effectively by understanding the three main types of technostress mitigation. Based on our findings, we recommend that users focus on

stressor reduction and stressor toleration, because these types were found to be more helpful than recovery from strain. Such preference has also been found with other types of stress (Lamontagne et al., 2007). Further, we believe that the most effective way to mitigate technostress is combining both stressor reduction and toleration. This way, individuals can minimize their exposure to stressors by removing most of them (e.g., redundant push notifications) and harness their emotional resources for tolerating the few that they choose to receive (e.g., urgent push notifications from family members).

Sometimes stressor reduction is not possible (e.g., an individual has to use a heart monitoring device prescribed by a doctor) or desirable (e.g., one wishes to read all Facebook posts from friends' timelines even though it may create stress). In such cases, individuals can still tolerate the stressors or recover from the strains. As an example of tolerating the stressors, individuals can lessen the effect of the stressors by pursuing a more positive reinterpretation of the situation. As an example of recovery from strain, individuals can temporarily ease their suffering by briefly venting their emotions instead of keeping them inside. Medical research has confirmed such recovery methods can help; venting and cursing, for instance, can temporarily reduce perceived pain (Stephens et al., 2009). However, Type III mitigations are two-edged, and users should be cautious that they do not engage in prolonged disengagement, continuous rumination, or immoderate venting.

Understanding users' own ways of mitigating technostress can also be useful for other stakeholders, such as the psychologists and families of the technostressed individuals. We believe that members of such support networks can learn about technostress mitigation and facilitate it in practice. The findings of this study can also be helpful for organizations, because they can inform managerial actions. It would be worthwhile to acknowledge that employees' own ways may play a central role in technostress mitigation. For example, employees can potentially utilize their own ways to treat the common manifestation of technostress caused by work-related IT use at home (Leung and Zhang, 2017). The negative outcomes of technostress (e.g., reduced performance and burnout) are clearly present in organizations (Galluch et al., 2015; Ayyagari et al., 2011), but mitigation may be challenging to facilitate. Therefore, it is critical to identify and provide supportive strategies that not only provide efficient recovery from strain but also enable personalized guidance that is targeted at reducing the amplitude of stressors. Our study explains the types of individuals' actions that should be carefully considered and integrated into organizations to avoid negative consequences of IT use.

5.3   Limitations and Future Topics

Our study has certain limitations. First, although collecting data about past experiences may relate to recall and re-interpretation issues (Folkman and Moskowitz, 2004) and does not include physiological measures, such self-reported/perceptual data are considered reliable for technostress research (Ayyagari et al., 2011; Ragu-Nathan et al., 2008). Second, our study focused on users' behavioral actions rather than their personality traits, situations, and psychological conditions. Individuals' traits and ways of using IT for different purposes could influence how technostress is perceived and mitigated. Thus, future research could uncover the role of specific psychological and contextual aspects that could expose even further manifestations of technostress and varying circumstances of mitigation. Third, as the interviewees were Finnish, some of our findings may relate to culture and nationality. Researchers could study cultural differences regarding technostress mitigation in the future. Fourth, short-term recovery from strain (Type III) can, in some cases, lead to long-term stressor reduction (Type I). Though our study did not seek to cover such transitions, they remain one of the topics for further research. Finally, future research could compare the three mitigation types with a quantitative approach.

Given the widespread nature of technostress and its implications for individuals, organizations, and societies, it is vital to understand the actions IT users themselves can undertake to mitigate technostress. Such knowledge can potentially help a huge number of technostressed individuals. To this end, we aim to open avenues for future research by providing our initial model explaining the three types of technostress mitigation.

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