

TAKING ON THE ‘DARK SIDE’ – COPING WITH TECHNOSTRESS

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Abstract—Technostress is stress that individuals experience due to their use of information technology. It is associated with critical workplace consequences including reduced productivity. While the negative consequences are well known, what is less understood is how individuals can cope with technostress to alleviate them. We report on two studies that explain how organizational IT users can cope with technostress. The first is a qualitative study conducted in the UK by interviewing thirty executives/knowledge workers. Here, we identified seven coping behaviours that individuals engage in, in response to technostress. The second is a survey of 846 US employees who use IT in their workplace. Here, we examined the effects of these coping behaviours on the relationship between technostress creating conditions and the individual’s IT-enabled productivity. We interpret our results to explain how employees and organizations can tackle technostress.

Index Terms— Technostress, coping, IT-enabled productivity

1 INTRODUCTION

RECENT years have seen the emergence and rise of the phenomenon of ‘technostress’ in the workplace. Technostress is stress that individuals experience due to their use of Information Technology (IT). Factors that create technostress include, for example, IT-related overload due to which individuals do more work just to use IT, invasive effects of IT that make individuals always reachable, and IT induced interruptions that blur the work-home boundary [1][2][3]. These factors are serious because they are associated with a number of adverse workplace consequences including reduced job satisfaction and productivity [4], greater job-related anxiety and depression [5], as well as increased burnout and exhaustion [1].

At the same time however, pervasiveness of workplace IT (e.g. smartphones, laptops and enterprise workflow systems), perhaps implies inescapability from technostress as well. Research provides evidence of wide-ranging and negative effects of technostress [4]. Likewise, anecdotal evidence shows that even everyday workplace applications such as email can generate stress for employees [6], and have led to governmental action [7] in certain countries. These observations indicate that the likelihood of employees experiencing technostress creating conditions due to use of workplace IT is high. It is thus important for them to find ways to cope with them and alleviate their negative effects. Yet, coping with technostress is poorly understood [8][4].

Emerging and nascent research shows that organizational IT users are increasingly engaging in self-shaped coping behaviours such as emotional coping to mitigate

the effects of conditions that create technostress. (e.g. [9]). However, there is absence of research that provides an empirically tested understanding of a reasonable range of coping behaviours that employees can engage in to alleviate the productivity reducing effects of conditions that create technostress. The objective of this paper is thus to (1) explain how organizational IT users can cope with technostress; and (2) provide practical recommendations for how organizations can help their employees do so.

2 BACKGROUND AND RESEARCH METHODS

In order to frame the individual’s actions to mitigate the effects of technostress creating conditions, we consider perspectives from coping theory [10]. Coping describes individuals’ cognitive and affective behaviors to deal with stressful situations [11]. Coping behaviors can be characterized in two ways.

The first characterization is of their nature [12]. When the stressful situation is not avoidable, such as in the case of technostress, individuals can react in two ways. They may instinctively express negative emotions about it or disengage from it. However, alongside or instead of that, given the inevitability of the stressful situation, they may also deliberately develop capacity and resilience to master it, by accumulating new skills and capabilities.

The second characterization of coping behaviors is of their mitigating effects [11][13]. Such effects can reduce the strength of the relationship between the technostress creating conditions and their negative outcomes. They can also directly reduce the strength of the negative outcomes emanating from technostress creating conditions. Either ways, they extenuate the adverse effects of technostress creating conditions.

In this paper, we report on the results of two different research studies. **In study 1**, we conducted qualitative face-to-face interviews with 30 executives/knowledge workers

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from two private sector firms in the UK, from the construction and telecom industries, to examine their coping behaviors for technostress. The interviewees' organizational roles included senior executives and directors, office administration (e.g. HR, finance, payroll), and design and innovation. Every interviewee used office IT applications such as document sharing, enterprise workflow, financial packages, word processing, spreadsheets and email for their work. Typical work tasks included general office work (e.g. administration, answering tenders, filing, managing calendars and setting up meetings), payroll processing, and supervision. Examples of interview questions are (1) Do you find your office IT (e.g. smartphone, email, workflow applications) stressful? When and why?; (2) Does your work get hampered because of IT? Why and How?; (3) How you do to handle the stress? The interviews lasted from 45 to 60 minutes, and were recorded and transcribed. By using coding and content analytic techniques (e.g. Miles and Huberman [14]), we were able to identify and describe seven IT-related coping behaviors that the interviewees adopted in reacting to technostress creating conditions.

In study 2, we quantitatively assessed the effects of the seven coping behaviors through a survey of 846 organizational IT users in the US. In particular, we examined the efficacy of the coping behaviors by statistically analyzing their influence on the relationship between technostress creating conditions and an important negative outcome, the reduction in the individual's work productivity with technology [4][3]. Technostress creating conditions (assessed through Techno-overload, Techno-invasion, Techno-complexity and Techno-insecurity), and IT-enabled productivity, were adapted from Tarafdar et al. [3]. The coping behaviors were adapted from the interviews and supported by the literature as follows - venting and distancing [15]; IT use skills and IT use autonomy [16]; positive IT outlook [15]; time related demarcations [17]; and work and non-work IT separation [18]. All items were measured on a five-point Likert scale (e.g. 1 – strongly disagree to 5 – strongly agree).

The survey was conducted through an online panel to reach employees from multiple industries, all in the U.S. 1049 respondents filled in the survey, of which 846 were usable responses; the rest were deleted due to missing data. The male-female split was 48%-52%. The age split was - 40% between 20 to 35 years, 26% between 36 to 50 years and 34% between 51 to 65 years. All construct items had standardized loadings ≥ 0.45 and composite reliability ≥ 0.7 . The discriminant and convergent validity were good in that for all constructs in each model, the average variances extracted (AVE) was ≥ 0.5 and the square root of AVE was greater than the inter-construct correlations.

3 FINDINGS

The findings of our two studies reveal the coping behaviors individuals engage in, in response to technostress (Study 1) and their effects on the relationship between technostress creating conditions and the individual's IT-enabled productivity (Study 2).

3.2 Findings of study 1

We found that individuals engaged in three categories of coping, which, together included seven specific coping behaviors. We summarize the behaviors in Table 1 with exemplar interview quotations and elaborate on them below:

(1) Reducing IT-related emotions and distress. This category helped individuals to work off their anger and frustration. It included two behaviors. The first was expressing emotions by venting and airing out their feelings. For instance, interviewees described how they ranted, swore, shouted and even cried with anger at the IT devices (alone or in company). The second was being mentally diverted out of the stressful situation by focusing on other activities and not on the stress causing IT.

(2) Developing IT capacity. This category helped employees to develop capacity to deal with technostress by building IT use skills and a positive outlook toward IT. It included two coping behaviours. The first was to become more skilled and get better at using IT. For instance, interviewees had learned to use different IT applications and IT devices simultaneously thus managing interruptions. The second was to develop of a positive mental orientation about IT that helped to reinterpret the stressful IT situation in an optimistic and constructive light. Such constructive reasoning provided resilience in the face of situations creating technostress.

(3) Developing IT use demarcations. This category helped employees to regulate and manage boundaries and develop demarcations with respect to the use of IT. It included three coping behaviours. The first was of exercising control over how the individual used IT. For instance, interviewees divided their IT use into periods by taking breaks between using different applications. The second was setting aside specific times for IT-related activities such as checking email. The third was the individual demarcating the boundary between work and non-work IT use. For instance, interviewees had demarcated technology-free times and areas at home. As such, coping effectively was not about shutting out the technology altogether, but about carefully deciding how and when to use it.

3.2 Findings of study 2

In Study 2 we examined the mitigation effects of the seven coping behaviors described in Study 1. Specifically, we tested statistically for how each coping behavior affected the relationship between technostress creating conditions and IT-enabled productivity, and the individual's IT-enabled productivity as shown in Figure 1. For each coping behavior, we tested a structural equation model examining its effect on (1) the relationship between technostress creators and IT-enabled productivity as a moderator; and (2) IT-enabled productivity. The goodness of fit of each model exceeded the cut-off criteria for four fit indices: the comparative fit index CFI (cutoff ≥ 0.900 , our values between 0.918 and 0.933), the Tucker-Lewis index TLI (cutoff ≥ 0.900 , our values between 0.909 and 0.926), the root mean square error of approximation RMSEA (cutoff ≤ 0.060 , our values between 0.051 and 0.057), and the standardized root

Table 1: Coping Behaviours

Focus of Coping	Coping Behaviour and Description	Exemplar interviewee quotation
Reduce IT-related emotions and distress	Venting: Expressing negative emotions	<i>“Sometimes I get frustrated if I, for example, cannot find how to change the line spacing. So I swear at the screen and eventually work out what to do.” – Senior Executive</i>
	Distancing: Diverting from the IT use situation and switching to other activities	<i>“There are times when I will shut things out, for example, do something else like go to a meeting.” – HR Manager</i>
Develop IT capacity	Positive IT outlook: Being optimistic about technostress situations	<i>“I’m never going to go home at the end of the day with a clear deck of email, with everything finished. ... Keeping positive and remembering how it used to be before and how much longer everything took to coordinate people’s diaries and organize meetings [before all these IT tools were there] is important.” – Assistant to a senior executive</i>
	IT use skills: Developing competence in IT use	<i>“So what I do is have is my InDesign, Excel, Word and email open all together [on different screens]. ... I can keep an eye out for whatever emails are coming in while I’m working on something else. I have learned to work with these applications so that I can be in and out of everything.” - Purchasing manager</i>
Develop IT use demarcations	IT use autonomy: Having control over IT use	<i>“So say I’m trying to write something creative for a marketing message, you get mind block after a while so you have to go and do something else. [I have the autonomy such that] I’ll go format a document [on another application] and then I’ll come back to it.” – Marketing manager</i>
	Time related demarcations: Setting aside specific times for particular types of IT use	<i>“So for example you could be doing something and you can be instantly bombarded with instant messages, they’re there in front of you. Similarly with emails... If I’m doing a particular task I will turn my email off and I will put in my schedule for the day particular slots where I will look and respond to emails.” - Executive</i>
	Work and non-work IT use separation: Demarcating work and non-work IT use	<i>“So when I’m at home for instance I will put [my phone] down on the kitchen table and leave it there in case people want to get hold of me urgently. [But] I won’t check [email if no one calls me], and I’ve just had to discipline myself not to be doing emails 24 hours a day, seven days a week.” - Executive</i>

mean square residual SRMR (cutoff ≤ 0.080 , our values between 0.066 and 0.073). For each model, the path co-efficients (β values) are shown in Figure 1. They indicate the direction (positive or negative), strength (numerical value) and the statistical significance (number of stars) of the respective relationship.

We found that technostress creating conditions had a negative effect in that they decreased IT-enabled productivity. However, we also found that the coping behaviors helped tackle the negative effect of the technostress creating conditions in three distinct ways. One, some of them diminished the negative effect of the technostress creators on productivity (i.e. showed a beneficial moderating effect). Two, some directly increased the individual’s IT-enabled productivity (i.e. showed a beneficial direct effect). Three, others did both.

4. LESSONS FOR EMPLOYEES AND ORGANIZATIONS: EFFECTIVE COPING WITH TECHNOSTRESS

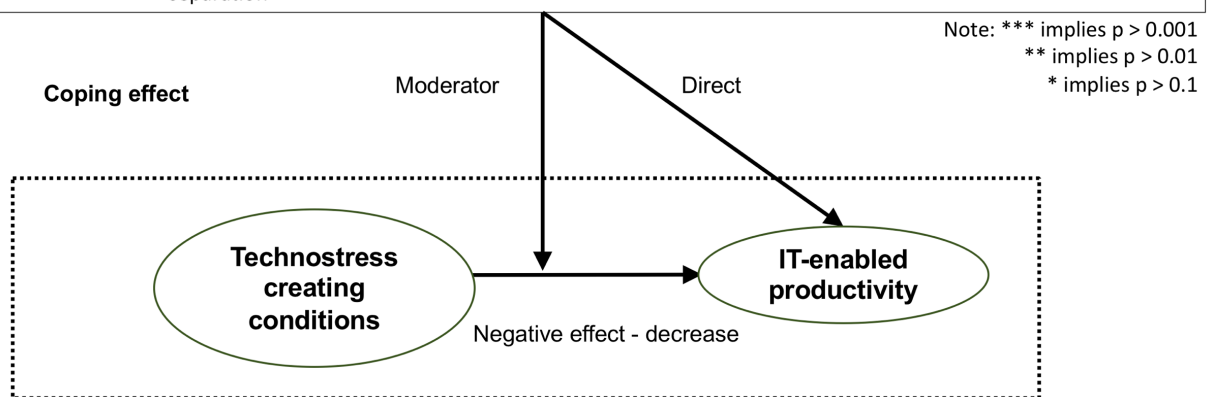
Next, we discuss how each of the examined coping behaviors can help employees retain their work productivity with technology. Then, we explain how organizations can help their employees cope effectively with technostress.

4.1 How employees can cope effectively with technostress

Workplace stress has been consistently regarded as a leading cause of burnout and low job satisfaction. A wealth of research now shows that technology use can create such

Figure 1: How Coping Behaviours Help in Alleviating the Productivity Reducing Effects of Technostress Creating Conditions

Focus of coping	Coping behavior	Coping efficacy	
		Moderator	Direct
Reduce IT related distress	Venting	Decreases negative effect ($\beta = -0.3***$)	Decreases ($\beta = -0.24***$)
	Distancing	Decreases negative effect ($\beta = -0.22***$)	Does not change ($\beta = -0.04ns$)
Develop IT capacity	Positive IT outlook	Does not change ($\beta = 0.13ns$)	Increases ($\beta = 0.47***$)
	IT use skills	Decreases negative effect ($\beta = -0.15*$)	Increases ($\beta = 0.53***$)
Develop IT use demarcations	IT use autonomy	Decreases negative effect ($\beta = -0.22***$)	Increases ($\beta = 0.38***$)
	Time related demarcations	Decreases negative effect ($\beta = -0.20**$)	Increases ($\beta = 0.39***$)
	Work and non-work IT use separation	Decreases negative effect ($\beta = -0.29***$)	Increases ($\beta = 0.20***$)



stress, i.e. technostress. Over the past decade or so, technostress has become a pervasive workplace phenomenon with many negative workplace consequences, which scholars have taken to investigating with remarkable vigour. However, end users of IT are beginning to realize that it is now time to take this phenomenon head-on and tackle it, by adopting some of the coping behaviours we describe below.

Venting. We found that technostress creating conditions did less damage on the individuals' productivity when they let their negative feelings out by venting, or separated themselves from the stressful IT use situation through distancing. Venting can be an effective coping behavior because it helps individuals let out their frustration with IT to their co-workers and friends, who may be experiencing the same feelings. Thus, they are less affected by the stress. However, venting also reduced the individual's productivity. Expression of negative feelings regarding IT can be emotionally exhausting and physically draining, and leave less energy for accomplishing actual work tasks. This is why venting might not be an optimal way to tackle technostress. Employees might find it useful to discuss the potentially frustrating technostress experiences with their colleagues in an optimistic way that is flavoured for example, with a hint of humour.

Distancing. This involves behaviors such as switching to a different task, or moving away from the current IT task creates a temporary separation and relief from the stressful

IT use situation. Thus, the effects of the latter are diminished. Employees could, therefore, switch to an alternative work task when faced with a stressful IT situation.

Positive IT outlook. An overall positive outlook toward IT directly increased IT-enabled productivity. This is because it helps individuals to improve their perception of IT. When a stressful IT use situation occurs, they can reason with themselves and remind themselves of the benefits of IT. This can have a counter-balancing positive effect on IT-enabled productivity. This is why employees can tackle technostress by equipping themselves with a positive IT outlook and considering the benefits of IT use, even when they are facing difficulties in the use of IT for work.

IT use skills. Individuals with well-developed IT use skills believe in their abilities to use IT effectively. When faced with technostress situations they can react in two ways. One, their self-belief in their IT use ability can provide a buffer to diminish the extent to which technostress creators can reduce their productivity. Two, their ability enables them to work harder at using IT better and more effectively which increases their IT-enabled productivity, thus countering its decrease due to technostress creators. Employees should therefore remember to update their IT skills by devoting time for self-development and/or IT-related trainings that are offered by their own organization or by external training agencies.

IT use autonomy. When the individual's IT use autonomy, that is his or her control over how s/he uses IT is high, technostress creating situations can appear less threatening

because s/he has the flexibility and options to use IT in preferred ways. The adverse effect of these situations on his or her productivity is less. Further, IT use that is autonomous provides the individual with the wherewithal for different ways of using IT, potentially accomplishing more work than would otherwise be possible, thus increasing IT-enabled productivity and countering its decrease due to technostress creators.

Time related demarcations. Setting time related demarcations for IT-enabled office work is an effective way to tackle technostress. It can help the individual both to focus uninterruptedly on particular work tasks if they want to and to exercise control over when they use specific applications such as work email. The first directly improves their productivity from use of IT. The second helps them deal more effectively with technostress creating conditions such as interruptions, thus dampening their negative effects on IT-enabled productivity. Employees may find it helpful to set specific times when they access, for example their work emails. Keeping to such IT-use schedules can help them reduce IT-related interruptions and tackle technostress.

Work and non-work IT use separation. Work and non-work IT use separation sets limits on the extent to which an individual decides to use work IT during non-work or leisure hours. This enables employees to engage in down time from work IT applications, rejuvenate and thus increase their IT-enabled productivity, even in the face of technostress creating situations. It also helps to reduce the extent to which their IT-enabled productivity is negatively affected by technostress creating conditions. We suggest that employees set clear boundaries of work-related use of IT. For example, they may consider not to use IT for work during family time and just before going to sleep.

4.2 How organizations can help employees cope with technostress

As we suggest above, there is a turn now, toward employees adopting coping behaviours to deal with technostress. Organizations, in their turn should actively guide and help employees in their coping efforts by framing appropriate organizational policies as we show in Table 2. While employees may be facing technostress situations and wanting to tackle them, they may be unaware of potential coping behaviours that are available to them. Thus, the first thing to do is to inform and educate employees about the different coping behaviours that we have described, as possible options they can engage in. Organizations can further help employees understand the relative advantages and applicability of each behavior and provide appropriate training for each. For example, they can arrange for training and discussion sessions conducted by IT and HR on how to develop the seven coping behaviors.

Second, organizations can guide employees as to which behaviours may be appropriate for whom, depending on the employee's role. For example, the coping behavior of time related demarcations may be more appropriate for those doing shift-based work such as manufacturing than for those who are in customer facing functions such as sales and who receive constant streams of communications

from customers that they might need to immediately respond to. Finally, we suggest that organizations develop flexible IT use policies that enable employees to adopt the coping behaviours that they find effective and suitable, individually. Such policies include for example, encouraging employees to frame their own email management strategies and use IT in ways that they find effective, rather than mandating one size fixed all strategies for everyone. In doing all of this, organizations can pivot away from current broad-brush policies for combating technostress to more considered and individual-appropriate coping behaviours, and encourage employees to engage in them.

To conclude, in identifying multiple coping behaviours, we speak to urgent and wide-ranging interest in helping individuals coping with technostress in the workplace. We provide research-based insights that organizations can use, to guide employees to develop their technostress coping strategies with a view to making them equipped and capable vis-a-vis dealing with technostress.

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REFERENCES

- [1] Ayyagari, R., Grover, V. & Purvis, R. (2011). Technostress: Technological antecedents and implications. *MIS Quarterly*, 35(4), 831–858.
- [2] Barber, L. K., & Santuzzi, A. M. (2015). Please Respond ASAP: Workplace Telepressure and Employee Recovery. *Journal of Occupational Health Psychology*, 20(2), 172–189.
- [3] Tarafdar, M., Tu, Q., Ragu-Nathan, B. & Ragu-Nathan, T.S. (2007). The impact of technostress on role stress and productivity. *Journal of Management Information Systems*, 24(1), 301–328.
- [4] Tarafdar, M., Cooper, C.L. & Stich, J.F. (2019). The technostress trifecta-techno eustress, techno distress and design: Theoretical directions and an agenda for research. *Information Systems Journal*, 29 (1), 6–42.
- [5] Sprigg, C. A., & Jackson, P. R. (2006). Call Centers as Lean Service Environments: Job- Related Strain and the Mediating Role of Work Design. *Journal of Occupational Health Psychology*, 11(2), 197–212.
- [6] BBC.com (2018). Microsoft warns firms of technology 'distractions'. Accessed from: <http://www.bbc.co.uk/news/technology-4294586>.
- [7] Fortune.com (2017). New French Law Bars Work Email After Hours. Accessed from: <http://fortune.com/2017/01/01/french-right-to-disconnect-law/>.
- [8] Pirkkalainen, H. & Salo, M. (2016). Two decades of the dark side in the information systems basket: Suggesting five areas for future research. In: *Proceedings of the European Conference on Information Systems (ECIS)*.
- [9] Pirkkalainen, H., Salo, M., Makkonen, M., & Tarafdar, M. (2017). Coping with Technostress: When Emotional Responses Fail. In *ICIS2017: Proceedings the 38th International Conference on Information Systems*. Association for Information Systems (AIS).
- [10] Lazarus, R.S. (1966). *Psychological stress and the coping process*. New York: McGraw-Hill.
- [11] Lazarus, R.S. & Folkman S. (1984). *Stress, appraisal, and coping*.

Table 2: Guidelines for Organizational Policy and Action

Organizational Policy	Examples of Organizational Actions
Inform and educate employees	<ul style="list-style-type: none"> ▪ Inform employees about different kinds of coping behaviours available to them ▪ Arrange training sessions on coping behaviours conducted by IT and HR departments ▪ Incentivise employees for informally sharing their coping related experiences and best practices for with colleagues ▪ Educate employees regarding different outcomes from different kinds of coping behaviours (e.g., benefits and disadvantages)
Identify fit between employees and various technostress coping behaviours	<ul style="list-style-type: none"> ▪ Identify coping behaviours that are aligned with the employee's roles, work tasks and responsibilities, and skills ▪ Charge each function/department to help employees understand their specific work conditions and job requirements and consider appropriate coping strategies. For example, R&D staff could set aside specific times for checking messages, while project managers and customer service personnel would need to check them constantly. ▪ Encourage employees to take a holistic approach to technostress coping that includes both work and non-work milieus.
Encourage employees to develop a personal technostress coping strategy	<ul style="list-style-type: none"> ▪ Create flexibility for employees to shape their own use of work IT ▪ Motivate employees to try out different coping behaviours based on their own experiences and preferences ▪ Help employees implement their chosen coping behaviours

New York: Springer Publishing Company.

- [12] Folkman, S. & Moskowitz, J.T. (2004). Coping: Pitfalls and promise. *Annual Review of Psychology*, 55, 745–774.
- [13] Tugade, M. M. (2010). 10 Positive Emotions and Coping: Examining Dual-Process Models of Resilience, *The Oxford handbook of stress, health, and coping*, 186.
- [14] Miles, M.B., & Huberman, A. M. (1994). *Qualitative Data Analysis*, Sage Publications, Thousand Oaks, CA, USA.
- [15] Carver, C. S., Scheier, M. F., & Weintraub, J. K. (1989). Assessing coping strategies: a theoretically based approach. *Journal of personality and social psychology*, 56(2), 267.
- [16] Fishbein, M., & Ajzen, I. (2011). *Predicting and changing behavior: The reasoned action approach*, Taylor & Francis.
- [17] Galluch, P., Grover, V., & Thatcher, J. (2015). Interrupting the workplace: Examining stressors in an information technology context. *Journal of the Association for Information Systems*, 16(1), 1–47.
- [18] Kossek, E. E., Lautsch, B. A., & Eaton, S. C. (2006). Telecommuting, control, and boundary management: Correlates of policy use and practice, job control, and work-family effectiveness. *Journal of Vocational Behavior*, 68(2), 347–367.

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