DELIBERATE OR INSTINCTIVE?

PROACTIVE AND REACTIVE COPING FOR TECHNOSTRESS

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Abstract. Employees in organizations face technostress—that is, stress from information technology (IT) use. Although technostress is a highly prevalent organizational phenomenon, there is a lack of theory-based understanding on how IT users can cope with it. We theorize and validate a model for deliberate proactive and instinctive reactive coping for technostress. Drawing from theories on coping, our model posits that the reactive coping behaviors of distress venting and distancing from IT can alleviate technostress by diminishing the negative

effect of technostress creators on IT-enabled productivity. The proactive coping behaviors of positive reinterpretation and IT control can help IT users by influencing the extent to which reactive coping behaviors are effective, and by positively influencing IT-enabled productivity. The findings of a cross-sectional survey study of 846 organizational IT users support the model. The paper provides a new theoretical contribution by identifying ways in which organizational IT users can cope with technostress.

Keywords: Technostress, Coping, Proactive coping, Reactive coping, Information systems use

INTRODUCTION

Technostress is the stress that individuals experience from their inability to cope with the demands of IT use [4]. It is an important organizational phenomenon because it is associated with negative outcomes, such as reduced job satisfaction, productivity, innovation, and organizational commitment for individuals [57, 45, 59], and with increased burnout [54] and exhaustion [4]. Technostress is associated with the use of workplace IT devices (such as laptops, smartphones and tablets) and IT applications, that organizational IT users pervasively apply in their daily work tasks [4, 56, 58]. Thus, technostress is an unavoidable and ongoing aspect of organizational work, which suggests a critical need for organizational IT users to be able to cope with it in order to mitigate its negative consequences. Coping describes the individuals' cognitive and affective behaviors to address, manage, and deal with stressful situations [33]. However, coping is an under-studied aspect of technostress [56]. It is, therefore, the focus of our study.

We draw from the literature on coping to theoretically frame our study. The literature suggests two types of interlinked coping behaviors that are relevant when individuals experience ongoing stressful situations—proactive and reactive coping. *Proactive coping* behaviors are those that have to do with an individual's preparation to deal with ongoing

stressful situations through personal growth and resource accumulation [2, 20, 50]. For example, individuals experiencing ongoing technostress at work might deliberately equip themselves to deal with it by looking for the positive aspects of IT use at work or by accumulating new skills related to IT use. The concept of proactive coping holds that individuals experiencing ongoing stressful situations can build resilience for them [2, 20, 50]. *Reactive coping* behaviors occur in response to stressors [12, 50, 2, 52]. For example, IT users might vent their negative emotions regarding IT and distance themselves from the situation when they experience IT use-related stressors. The concept of reactive coping holds that individuals react instinctively when experiencing stressors in order to deal with them [12, 20]. Proactive coping behaviors also reinforce the effects of reactive coping behaviors so that the effects of an individual's reactive coping depend on his or her proactive coping behaviors as well [26, 60]. Thus, the combination of proactive and reactive coping behaviors is deemed to be important in coping with technostress. The research objective of our study is *to examine how proactive and reactive coping behaviors, individually and together, enable organizational IT users to cope with technostress*. Drawing on the above concepts, we theorize and validate a model of proactive and reactive coping for technostress in the workplace.

Our model was tested in a cross-sectional survey study of 846 organizational IT users. Structural equation modeling (SEM) was used in the analysis. The paper makes three theoretical contributions on coping with technostress. First, by theorizing and validating a model of proactive and reactive coping, we develop a theory-based understanding of coping behaviors in response to technostress. Second, by analyzing the interaction effects, we explain how coping with technostress depends on the shared effects of proactive and reactive coping behaviors. Third, our findings demonstrate that reactive coping behaviors are inadequate for coping effectively when deployed separately from proactive coping behaviors. This study

contributes to practice by explaining how IT users can tackle the technostress they face at work and, further, how organizations can support them in coping with it.

We proceed in this paper as follows. First, we summarize the literature on technostress and coping and present the gaps that serve as motivation for investigation of proactive and reactive coping. We then theorize the proactive and reactive coping behaviors for technostress and develop our research hypotheses. Subsequently, we present our results and, finally, we discuss the study's contributions to theory and implications for practice.

THEORETICAL BACKGROUND

In this section, we provide a background on technostress and coping in the Information Systems (IS) literature. We then describe proactive and reactive coping and their intertwined relationship in stressful situations (e.g., [50, 20, 2]).

Technostress

Technostress, recognized in the literature as the stress that individuals experience due to their IT use, has emerged as an important negative impact of IT use. Workplace-related outcomes of technostress include reduced performance and job satisfaction [45, 58] and increased burnout [54]. The transactional view of stress has been the predominant theoretical framework for understanding technostress. This view emphasizes the negative effects of IT use through a relationship between stress creators and outcomes [32, 14]. In this view, technostress creators are IT-use related stressors or stress creators[1] that arise out of the individual's primary appraisal of factors in the external environment. Such factors can include, for example, characteristics of IT such as constant connectivity. The factors in the external environment are appraised as threatening and demanding by the individual who thus experiences technostress

[1] 'Stressors' or 'stress creators' are conditions wherein the factors in the external environment are appraised as posing demands that exceed an individual's resources in meeting them. These two terms are used inter-changeably in the literature (e.g. [14]) and we do likewise in this paper. When the factors in the external environment are related to use of IT, the stressors or stress creators are known as technostress creators [58].

creators, or conditions wherein the factors are appraised as posing demands of IT use that exceed an individual's resources in meeting them [4, 45, 56].

Technostress creators are associated with negative psychological and behavioral outcomes [4, 59]. Psychological outcomes include feelings of being drained due to the use of IT for work [4]. From the point of view of an individual's performance at work, behavioral outcomes emanating from technostress creators include a lack of effectiveness in being able to use IT for work. Such outcomes are evaluated by examining the relationship between the technostress creators and the negative outcome, such as an individual's productivity through the use of IT [58, 59].

Coping in the context of Information Systems use

Coping is a theoretically cognate concept to stress [32, 33]. Coping behaviors are those that an individual undertakes to tackle stressful situations [33]. Coping has thus been defined as an individual's "cognitive and behavioral efforts exerted to manage specific external and internal demands that are appraised as taxing or exceeding the resources of the person" [33, p. 141]. Coping behaviors follow the secondary appraisal of an individual's evaluation of his/her situation and resources to deal with stress creators. In the case of this study, our interest is in technostress creators [56, 18].

Studies on coping in the context of IT use have examined two kinds of situations. One, they have examined how individuals cope with changes relating to introduction of new IT or modifications to existing IT. For example, Beaudry and Pinsonneault [6] discussed how IT users' coping strategies such as disturbance handling and benefits maximizing can help them respond to such IT related change. Findings also show that particular emotions, such as anger, can be associated with specific coping strategies, such as seeking support for IT use [7], whereas mixed emotions, i.e., concurrent sense of achievement and loss when using IT, can trigger combinations of coping strategies, such as engaging simultaneously in self-preservation

and disturbance handling [55]. IT users tend to rely on their emotions for coping if they believe they cannot avoid IT threats [36] or have few options to deal with them [6]. Two, they have examined how individuals cope by reacting to IT security requirements and threats. For instance, D'arcy et al. [16] studied moral disengagement as a coping response to stress experienced from the particular requirements of IS security such as complexity of IS security policies. Liang et al. [37] examined coping responses to IT security threats, such as IT security breaches, and showed that individuals engage in multiple coping strategies that rely on emotion focused actions such as wishful thinking and problem focused actions such as updating and installing security-related software applications. These studies do inform how users adapt to and cope with *IT related change* and complicated *IT security related requirements and threats* in the organization. However, none of them focus on how individuals engage in coping behaviors in response to *IT-related stressors from ongoing use of work IT*, i.e., technostress creators [56] or explain the *effectiveness of coping behaviors in mitigating the negative outcomes* of technostress creators.

Extending these views with research on coping with technostress is of substantial importance from both theoretical and practical perspectives. From the theoretical perspective, coping with technostress integrates the cognate concepts of stress and coping in the context of workplace technostress, taking the literature conceptually forward. This view also accounts for coping behaviors as a way to mitigate the negative effect of IT use-related stressors on outcomes such as IT users' work performance. From the practical perspective, coping with technostress is of value to organizations because all IT users are potentially exposed to technostress [36]; the same IT characteristics that both organizations and IT users find beneficial (i.e., reliability, presenteeism, and accuracy) can also create technostress [4]. Thus, IT users need to be able to cope with technostress situations so that they can alleviate or avert the negative outcomes associated with them.

Proactive and reactive coping

Research on psychological stress has examined a number of coping behaviors. A widely recognized distinction is made between problem- and emotion-focused coping behaviors [18]. They denote two broad and distinct facets of coping. Problem-focused coping encompasses behaviors aimed at handling the source of stress. Individuals use problem-solving to do something about the stressor, such as finding out what caused the problem and following a plan of action to solve it [12]. Emotion-focused coping includes behaviors aimed at handling and regulating one's emotions associated with a stressful situation and feeling better about it [12]. For example, individuals might apply denial behavior, pretending that a problem did not happen [12]. Thus, problem-focused coping can help address the issues that create stress, whereas emotion-focused coping can help in stress situations that need to be endured [12, 18].

Although the approach of problem-focused and emotion-focused coping provide a useful overall view on coping behaviors, it does not take a stand on how individuals can prepare for stressful situations that are likely to be ongoing. Therefore, another approach to examining coping is to distinguish between *proactive* and *reactive* coping. Such an approach is particularly useful for understanding ongoing stressful situations that cannot be fully avoided but for which individuals can prepare proactively. Studies on coping show that individuals prepare themselves for stressful situations [e.g., 2, 51] when they know that they will face them (e.g., because of dealing with increased workload [51]). In addition to such proactive behaviors, individuals also cope with ongoing stressful situations by reacting to stress creators when they emerge, though instinctive emotional responses [e.g., 2, 52]. This study is aimed at understanding these two kinds of coping behaviors. Next, we present each of the coping behaviors. We also note their possible links to problem-focused and emotion-focused coping.

The concept of proactive coping[2] holds that individuals can proactively prepare for stressful events [2, 20, 50]. *Proactive coping* is defined as the efforts taken by individuals to build up resilience against ongoing stressful events [50, 2]. It emphasizes the utilization of coping behaviors to deliberately prepare for apparent and potentially ongoing stressful situations [15, 20]. The literature commonly describes two types of proactive coping behaviors that help individuals in ongoing stressful situations—meaning-making and mastery [51, 15, 2]. *Meaning-making* is about finding the positive meaning in stressful situations. *Mastery* denotes the perception of control over such situations [51, 49]. Proactive coping behaviors can thus provide shelter for stressful events because they help the individual in preparing to prevail over them [2].

We wish to clarify that coping behaviors are complex because they can be applied for different purposes, depending on the situation [12, 20]. For example, meaning-making can be both a way to prepare for unavoidable stressful situations that threaten one's well-being and a way to recover quickly from a stressful situation [2, 12, 20]. Thus, depending on the purpose for which it is applied, meaning-making can serve both as a proactive coping (in the former case) and emotion-focused coping (in the latter case) behavior. Similarly, mastery can manifest both in an individual's cognitive mindset of being able to successfully handle future stressful situations, and in the individual's actual actions to tackle the issues that create the stressful situation [2, 51]. Therefore, mastery can be examined from the perspectives of both proactive coping (in the former case) and problem-focused coping (in the latter case). We thus note that while proactive coping is conceptually distinct from problem-focused and emotion-focused

[2] We note here that proactive coping encompasses two theoretically distinct aspects that deal with stressful events [2, 20, 60]. The first is about continual preparation for ongoing stressful situations by strengthening one's ability to cope. The second is related to anticipating stressful situations and aims at their prevention before they take place [20]. We focus on the first view in this paper because workplace technostress situations are ongoing and somewhat inevitable; thus, they cannot be prevented as espoused by the second view.

coping, specific coping behaviors can be classified as being both proactive and, problem-focused or emotion-focused, depending on the individual's intention and the stress situation.

In addition to deliberately preparing with proactive coping behaviors, individuals commonly react to ongoing stressful situations with emotional responses in order to minimize the strain triggered by the stress creators [20, 52, 60]. These emotional responses are referred to as *reactive coping* behaviors. They are an individual's instinctive responses to stress creators [12, 52]. Typical reactive coping behaviors include *expressing emotions* during a stressful event [12, 52] and *separating oneself* from such situations [20]. These behaviors are spontaneous ways of responding to stress creators in order to restore emotional stability [19, 52]. This is why IT users are highly likely to engage in reactive coping behaviors when feeling stressed.

We note that reactive coping behaviors have similarities to emotion-focused coping. Emotion-focused coping behaviors are of, at least, two kinds [12, 20]—the more instinctive responses and the less-instinctive responses (i.e., planned actions). The former are almost instantaneous responses to stress creators, which are similar to reactive coping behaviors. The latter, less-instinctive behaviors in many cases involve planned actions, such as seeking social support from friends or colleagues to address the problem that creates stress [12, 26, 20].

Prior research on psychological stress has observed that the effects of reactive coping behaviors are influenced and modulated by those of proactive coping behaviors. For example, proactive coping behaviors, such as mastery beliefs over ongoing stressful situations, influence the effects of reactive coping behaviors such as expressing emotions [60]. The effectiveness of coping is dependent on both the individual and shared effects of proactive and reactive coping [2, 60, 62]. It is thus expected that IT users can combine proactive and reactive coping behaviors to cope with ongoing technostress situations. Such a combination is important because reactive coping behaviors, on their own, are often inadequate for dealing with stressful

situations and can even be associated with poor outcomes if not combined with other coping behaviors [12, 20, 60]. Studying proactive and reactive coping both independently and together can extend the current limited understanding of coping with ongoing technostress. This is the focus of our study.

Next, we hypothesize the relationships pertaining to these behaviors and situate them in the technostress literature.

HYPOTHESES DEVELOPMENT

Based on the literature outlined above, we next develop our research hypotheses. Specifically, we develop the new relationships between proactive and reactive coping behaviors as well as the previously validated relationship between the technostress creators and IT-enabled productivity. Our research model is shown in Figure 1.

The relationship between the technostress creators and IT-enabled productivity

Several studies have evidenced that IT-related stressors lead to negative outcomes in organizations. Tarafdar et al. [58] and Ragu-Nathan et al. [45] distinguished the stressors specific to IT use (i.e., techno-overload, techno-invasion, techno-complexity, techno-insecurity, and techno-uncertainty). These stressors that are referred to as `technostress creators´ have been shown to reduce IT-enabled productivity [58]. This is so because the demands of IT use exceed individual's resources so that the user cannot use IT for work as effectively as before the technostress creators emerged. The decrease in individual IT-enabled productivity has been emphasized as a technostress-specific behavioral strain [58, 59]. Thus, we anchor onto the *technostress creators and IT-enabled productivity* relation because it enables us to situate the coping behaviors we study in a validated (e.g., [58, 29]) and well accepted view on workplace technostress. Drawing from that relationship as a foundation for this study, we hypothesize the following:

H1: Technostress creators have a negative relationship with IT-enabled productivity, so that the higher the levels of technostress creators, the lower the level of IT-enabled productivity.

The effects of proactive and reactive coping on the relationship between the technostress creators and IT-enabled productivity

In this section, we hypothesize on the proactive and reactive coping behaviors, individually and in relation to each other, and situate them within the technostress phenomenon.

We posit three effects that are further discussed below: 1) the effect of reactive coping behaviors on the relationship between the technostress creators and IT-enabled productivity; 2) the effect of proactive coping behaviors on IT-enabled productivity; and 3) the effect of proactive coping behaviors as moderators of the effect of reactive coping behaviors.

Effect 1: The effect of reactive coping behaviors on the relationship between the technostress creators and IT-enabled productivity

The first effect is that of reactive coping behaviors on the relationship between the technostress creators and IT-enabled productivity. Reactive coping denotes the responses to stress creators that can diminish the impact caused by them [33, 12, 11]. They are, thus, the moderators of the relationship between the stress creators and stress outcomes in the transactional view [14, 4].

We study distress venting and distancing from IT as two distinct reactive coping behaviors [33, 12]. First, *distress venting* is based on the concept of expressing emotions during stressful situations [12]. It is defined as a tendency to focus on aspects that are perceived as upsetting and to express those feelings verbally [12]. Venting, or airing out emotions, is a coping reaction to stressful situations [10], wherein individuals speak out their mind as they encounter a stressful situation [10]. Distress venting has been shown to alleviate tension and stress because letting off steam can restore emotional stability and improve the functioning of

conscious thought after the occurrence of stress creators [20, 12]. Although venting is aroused by negative feelings, it can help to reduce the effect of stress creators on the negative outcomes, as negative emotions are released rather than kept in, through this coping behavior [12]. In the case of technostress, organizational IT users could vent their negative feelings in ongoing technostress situations. This is shown by findings that indicate that IT users vent their feelings after negative experiences with IT to ease their frustration with IT [47]. For example, they can be threatened by the idea that they are falling behind in adopting new IT to handle their work satisfactorily. They consider what they can do about it and start by letting out their emotions. Expressing their frustration can help them free their thoughts from the stressor, focus on the task at hand, and thus, enable them retain their ability to use their current IT to handle their job in a sufficient manner. Therefore, it is likely that IT users can reduce the negative impact of the technostress creators on their IT-enabled productivity by letting out their feelings in stressful IT use situations. Thus, we hypothesize the following:

> *H2a: Distress venting moderates the relationship between the technostress creators and IT-enabled productivity, so that the higher the level of distress venting, the less negative the relationship between the technostress creators and IT-enabled productivity.*

Second, *distancing from IT* is based on the concept of separating oneself from stressful situations [20]. Distancing is a way for individuals to minimize the impact caused by stress creators [20]. Specifically, distancing can help individuals withdraw their attention from the stress creators and regroup their thoughts on the tasks at hand [12, 20]. Research shows that individuals distance themselves from the use of IT when they feel anxious about it [7]. In the case of technostress, when organizational IT users try to put the demands caused by IT use out of their mind, that helps them to get their thoughts away from the IT and free their mind of the demands posed by it, so that they can adjust and direct their thoughts toward their work and

carry on using IT for it. This suggests that, when faced with technostress situations, IT users can reduce the impact of the technostress creators on their IT-enabled productivity by separating themselves from such situations. Thus, both of these reactive coping behaviors could reduce the effect of the technostress creators on IT-enabled productivity by moderating this relationship. We propose the following:

> *H2b: Distancing from IT moderates the relationship between the technostress creators and IT-enabled productivity, so that the higher the level of distancing from IT, the less negative the relationship between the technostress creators and IT-enabled productivity.*

Effect 2: The effect of proactive coping behaviors on IT-enabled productivity

The second effect that we examine suggests a favorable relationship between the proactive coping behaviors and IT-enabled productivity. Essentially, proactive coping includes self-developmental efforts that enable favorable outcomes [60, 51, 2]. Such favorable outcomes have been witnessed in various stressful life situations [60, 52, 8].

Proactive coping includes two types of behaviors described above—meaning-making and mastery. In this study, we focus on positive reinterpretation as a form of meaning-making and IT control as a form of mastery. *Positive reinterpretation* is described as infusing stressful situations with positive meaning [33]; it is a form of coping that focuses on imparting positive meaning to stressful situations [2, 51]. Literature commonly presents it as a meaning-making mechanism that strengthens the ability to cope in stressful situations [63, 4]. Positive reinterpretation has been shown to contribute to better outcomes in stressful situations, such as superior adjustment during life transitions [9], personal growth in response to distressing events [22, 44], and positive affect during caregiving in a serious health crisis [41]. In general, a positive reinterpretation of stressful events is associated with positive outcomes [60]. Indeed, Moskowitz [40] argued that positive reinterpretation is one of the few coping behaviors that is

consistently shown to lead to positive outcomes associated with stress. In related findings, we know that employees' positive attitudes lead to good work performance [3]. Positive reinterpretation can be applied to IT use situations in that, while individuals deal with a variety of ongoing stressful situations with IT use, they can prepare for such situations by trying to see them in a more positive light. Positive reinterpretation is helpful when coping with ongoing technostress situations, such as when IT users think that they have to constantly adjust their working style because of new IT. This is because an IT user evaluates what to do about it and looks for positive aspects of their IT use even when IT use has created the demands. This helps them to make sense of how IT can be used in new or pressurized situations, advancing the ways in which they can use IT to perform their work. Drawing from these insights, we suggest that positive reinterpretation of stressful IT use situations may lead to the use of IT for improving the quality of work and thus to higher IT-enabled productivity.

H3a: Positive reinterpretation has a positive relationship with IT-enabled productivity, so that the higher the level of positive reinterpretation, the higher the level of IT-enabled productivity.

IT control is described as individuals' perceptions of the degree to which they are capable of, or have control over, performing a given IT use behavior [17]. IT control is thus a mastery perception [17] concerning IT use. The perception of control is subjective [8] and is generally perceived in relation to both the self [12, 33] and the situation [17]—in this case, to that of IT use. Research on coping has found that increased control related to stressful situations is associated with favorable outcomes in such situations [18, 52]. Lefcourt [34] showed that an individual's belief in prevailing over stressful situations is essentially linked to a greater resilience when stress creators emerge. Individuals with high control were shown to experience improved well-being because of reduced tensions and fatigue. Bandura [5] explained how such control is a powerful way of dealing with stressful situations in general.

Early insights in the case of technostress indicate that the beliefs relating to the efficacy of IT use are related to positive outcomes from technostress, such as IT-enabled productivity, because they give the individual a sense of control in tackling technostress situations [57]. Users exposed to simulated IT interruptions in an experimental setting showed a lower incidence of the stress hormone salivary amylase when they had control over the timing of the interruption [23]. Research also shows that IT control helps the IT users deal with problematic IT use situations [61]. Based on these findings, it is possible to suggest that IT users' perceptions of being able to use work-related IT the way they want is essential when technostress creators emerge. For instance, organizational IT users can feel overloaded because the use of IT forces them to work more than they can possibly handle [45]. They could evaluate coping options in that stressful situation and, instead of feeling helpless, they can feel in control of their IT use. If they feel that they can use IT the way they want to, such an assessment can elevate their confidence even in demanding situations of, for example, techno-overload. This could enable them to make the best possible use of IT for work purposes. Thus, we hypothesize that IT control has a positive relationship with IT-enabled productivity:

H3b: IT control has a positive relationship with IT-enabled productivity, so that the higher the level of IT control, the higher the level of IT-enabled productivity.

Effect 3: Proactive coping behaviors as moderators of the effect of reactive coping behaviors

The third effect that we investigate suggests that proactive coping behaviors moderate the effects of reactive coping behaviors. An important tenet of the proactive coping literature is that proactive coping behaviors influence the extent to which reactive coping behaviors are effective [2, 52]. For example, positive attitudes can influence the effect of distancing from stressful situations in a favorable manner [33, 20]. Thus, with proactive behaviors, the effects of reactive coping behaviors are moderated [60, 62, 52, 26].

We theorize that, in addition to the direct effect on IT-enabled productivity, proactive coping behaviors also regulate the extent to which reactive coping behaviors are effective moderators of the relationship between the technostress creators and IT-enabled productivity. First, we hypothesize on the effects for positive reinterpretation and, second, for IT control.

As positive reinterpretation aims at re-envisaging the stressful situation as a positive one [33, 2], this coping behavior might contradict that of distress venting, which is essentially aroused by negative feelings [12]. Coping behaviors that stem from positive and negative feelings have been argued to operate independently and are sustained by different coping processes [18]. Although it is clear that positive feelings are more beneficial than negative feelings in stressful situations [60], there is uncertainty as to the extent to which the effects of venting behavior (i.e., aroused by negative feelings) are influenced by the tendency of positive reinterpretation (i.e., aroused by positive feelings). Because of the somewhat opposing forces of these two kinds of coping behaviors, we suggest that IT users prone to positive reinterpretation will be less effective at reducing the effects of technostress creators through high levels of venting behavior. The outburst would not, in their case, be the optimal way to cope. For example, organizational IT users can face constant technical problems while using IT, such as system crashes, and do not necessarily know why those happen. When such IT problem occurs, they evaluate their options to cope and, almost instantly, air their emotions to those around them. We hypothesize that those who see related situations in a positive light (i.e., coping by positive reinterpretation) will not benefit from venting, while those deficient in positive reinterpretation are more likely to retain their IT-enabled productivity.

> *H4a: Positive reinterpretation moderates the effect of distress venting on the relationship between the technostress creators and IT-enabled productivity, so that the higher the level of positive reinterpretation, the weaker the effect of distress venting on the relationship between the technostress creators and IT-enabled productivity.*

Positive reinterpretation has been shown to increase the awareness of individuals in situations in which stress occurs [26, 60]. In this regard, such behavior is favorable because a positive attitude in a stressful situation can enhance the coping effects of other coping behaviors [44]. For example, positive attitudes, combined with time-outs from stressful situations, have been shown to enable more favorable outcomes than time-outs only [33]. The IT users who are experiencing stress could, therefore, use the combination of positive reinterpretation and distancing from IT to their advantage. For instance, they could fear that they might be replaced because they prefer old IT devices that may not be compatible with all relevant organizational software available at work (e.g., enterprise social networking or resource planning tools). Individuals prone to positive reinterpretation could shift their attention away from such stressful situations and retain the quality of their IT-enabled productivity. This is because positive reinterpretation is about seeing the positives of IT use for work. As the users consider what they can do about a stressful situation, they step away from it and emphasize the positives, such as their own IT use strengths. This can reduce the negative effect of the technostress creators on their IT-enabled productivity. Consequently, we hypothesize the following:

H4b: Positive reinterpretation moderates the effect of distancing from IT on the relationship between the technostress creators and IT-enabled productivity, so that the higher the level of positive reinterpretation, the stronger the effect of distancing from IT on the relationship between the technostress creators and IT-enabled productivity.

Perception of control can enforce persistence and resilience during stress situations [33]. Stress research shows that the combination of low control and venting of frustration can be an unfavorable one and could lead to poor outcomes [11, 12]. We suggest that the effectiveness of distress venting about the use of IT is subject to the feeling of being in control over IT use. For example, organizational IT users can, at times, feel that the use of IT for work is invading their personal life. Letting feelings out and complaining about this stressful

situation to their closest friends or family is not likely to help these IT users in retaining their IT-enabled productivity when they have a shortage of options on how to handle IT; that is, when they have low IT control. However, when venting is combined with a strong belief in one's own IT use capabilities (i.e., high IT control), individuals could potentially reduce the effect of the technostress creators on their IT-enabled productivity since complaints and outbursts are less likely to be only due to the individual's helplessness with IT. Thus, as they assess their coping options, airing out emotions in combination with high control could retain the users' ability to use IT satisfactorily to handle work and enhance their effectiveness of coping with technostress. Hence, we hypothesize the following:

H4c: IT control moderates the effect of distress venting on the relationship between the technostress creators and IT-enabled productivity, so that the higher the level of IT control, the stronger the effect of distress venting on the relationship between the technostress creators and IT-enabled productivity.

Although there is not much literature on the joint effect of control and distancing as coping measures, we draw on insights about these two coping behaviors individually to hypothesize their potential joint effects. Distancing can be helpful and effective when there is not much that can be done about a stressful situation [18, 20]. Control, on the other hand, can help as the individual retains a mastery perception in the situation [17]. It is possible that the effectiveness of coping by distancing is reduced with increased mastery. In terms of coping with ongoing technostress, we argue that individuals with high IT control do not benefit through coping by distancing from IT as much as those with low IT control do, for example, when they feel overloaded by IT around them. This is because an individual's beliefs in his or her own IT use abilities (high IT control) would likely add to their "toolbox" for handling IT-enabled tasks in alternative ways; distancing from IT, which all IT users might sometimes do, could just be a momentary break before carrying on with IT use for work. Individuals with low

belief in their abilities (low IT control) could, on the other hand, use distancing from IT more effectively since they may not have as many alternatives. Thus, we hypothesize the following:

H4d: IT control moderates the effect of distancing from IT on the relationship between the technostress creators and IT-enabled productivity, so that the higher the level of IT control, the weaker the effect of distancing from IT on the relationship between the technostress creators and IT-enabled productivity.

METHODS

We next describe the approach to test our hypotheses. First, we explain how the data collection was carried out. Then, we describe the key measures of the model. Finally, we describe the step-by-step procedures taken to test our model of proactive and reactive coping for technostress.

Data collection

The data to validate our model was collected via survey. We chose to study IT users in different occupations to reveal the impact of coping behaviors at large. As our model looks into the IT users' individual ways of dealing with ongoing stressful situations, it was of high importance that we retain the anonymity of the respondents. Use of online respondent panels has been suggested as a valid and relevant approach to ensure these two criteria [38]. The assistance provided by the panel enabled us to gather data from multiple industries in the US, which would not have been possible by other means.

The empirical context of our study focused on the use of work-related IT devices such as laptops, smartphones and tablets. This sets an appropriate basis for the study because such devices are the means through which employees access different workplace IT-applications (such as enterprise resource planning and communication tools), and thus execute their work. In this way, they are multi-functional and can thus expose the individual to IT-related stressors and the potential of associated negative effects on work performance.

We focused on the IT users who worked full-time and frequently used IT to accomplish their work tasks. We ensured that the questions were well framed for the respondents. Specifically, at the beginning of the survey, we primed them in two ways. First, to a particular IT device by asking them to name their primary, or most frequently used, IT device (e.g., laptop, smartphone, or tablet) and to relate their answers throughout the survey to that device. The primary, or most frequently used, device was expected to be associated with technostress because the individual used it for the maximum time and consequently had the greatest interaction with it on an ongoing basis, thereby generating the possibility of technostress. Second, we primed them to type of situations. We informed the respondent that we would like to know how they perceive and act in situations in which IT problems occur. IT problems were referred to as "problematic events and frustrating situations when using IT."

We included three screening questions (i.e., "I use this IT to support my work activities," "I use this IT in my work," and "I use this IT to accomplish my work tasks) to ensure that the respondents used the IT device for their work activities. If any of the three responses were below "occasionally" (3 on a scale of 1–5), we kindly informed the respondent that he or she could not proceed with the survey. We also ensured that the attentiveness limitation of using online panels [38] was overcome through the use of reverse-coded items, affirming questions, randomization of the order of constructs and items, and attention-trap questions (i.e., fashion consciousness, which is theoretically unrelated to our study).

A total of 1,049 responses were collected. After careful data screening (e.g., removing non-conscientious responses with little variance between the responses (SD < 0.5) and those with more than 2% of data missing data or missing data for the three control variables (gender, age, and IT experience), 846 responses were selected for the final sample. Detailed demographics of this final sample are reported in the Table 1.

Measures

All constructs in our study have been established and validated to a certain extent. We have drawn on the transactional view of technostress. According to this view, technostress creators are stressors that organizational IT users experience due to use of IT. Due to that, the extent to which they can use IT effectively to accomplish work is reduced. We focused on this relation of technostress creators and IT-enabled productivity [58]. Thus, the use of IT is accounted for in both the technostress creators and IT-enabled productivity. In the former, the use of IT is incorporated as a stressor, that is, the individual perceives that IT use presents a demand that he or she finds unable to fulfil. In the latter, it is embodied in the extent to which IT can be used to effectively carry out work tasks [58]. Correspondingly, we adapted the technostress creators (TS) and IT-enabled productivity (PRO) scales from Tarafdar et al. [58], which capture the transactional view of technostress and account for the use of IT in the aforementioned way. Technostress creators constitute the IT use-related stressors that create stress for organizational IT users (e.g., [45, 54, 57]). They were operationalized as a reflective second-order construct measured by multiple first-order constructs—techno-overload (TO), techno-complexity (TC), techno-insecurity (TIS), techno-invasion (TI), and techno-uncertainty (TU) [58, 45]. In the case of technostress creators, the use of IT is viewed from the perspective of a demand beyond the individuals' ability to tackle [56], for example, through items such as "I spend less time with my family due to work IT" (techno-invasion). IT-enabled productivity accounts for a different view on organizational IT in that it evaluates to what extent IT is used to effectively accomplish work [58]. It is measured through items such as "Work IT helps me to accomplish more work than would otherwise be possible." Only minor adjustments were made to the items of these scales. For example, a term that reappears throughout the scales, "this technology," was changed to "work IT" to align with the other constructs.

The scale for positive reinterpretation (POS) was adapted from the positive reinterpretation and growth-scale by Carver et al. [12]. As the scale has not been previously

applied to the technostress context, we slightly adjusted its items toward IT use. For example, the wording, "I look for something good in what is happening," was adjusted to "I look for something good in what is happening with IT use at work, even when things might go wrong." The scale for IT control (CON) was adapted from Fishbein and Ajzen [17]. In accordance with Fishbein and Ajzen [17], we operationalized IT control as a reflective second-order construct measured by two first-order constructs—perceived autonomy (AUT) and perceived capability (CAP). All of the aforementioned scales were measured on a scale of 1 (Strongly disagree) to 5 (Strongly agree).

The scale for distress venting (VEN) was adapted from the venting anger scale by Beaudry and Pinsonneault [7]. As the items of this scale were close to the items in the venting of emotions scale by Carver et al. [12], we added a fourth item: "When IT problems occur, I let my feelings out." Similarly to positive reinterpretation, distancing from IT (DIS) has not been applied to the technostress context. We wanted to address the adaptive rather than the maladaptive way of distancing from IT [12], and we slightly adjusted the scale by Leiter et al. [35]. Problematic situations were adjusted to the IT use context (e.g., "When IT problems occur, I do my best to get out of the situation"). The fourth item ("When IT problems occur, I turn to other activities to take my mind off IT problems") was adapted from the mental disengagement scale by Carver et al. [12], as it fit the adaptive way of distancing from IT. Both of the reactive coping scales (distress venting and distancing from IT) measure how frequently the respondent applies the coping behavior (on a scale of 1= Never to 5=Every time).

The scales were first tested in a separate pilot study consisting of 1,091 responses collected from IT users working for a US-based organization. This pilot study identified a few issues. Techno-uncertainty (TU) did not load well on the second-order technostress creators construct. There could be an empirical reason for this, in that it is possible that the respondents in our sample did not find the constant changes in IT in their organizations, as embodied in the

techno-uncertainty first-order construct, to be as stressful as the other first-order constructs. Based on this, we decided to proceed with the remaining four first-order constructs of technostress creators for our main study. Minor modifications were also made to the coping responses-related constructs due to low loading. For example, the items for distancing from IT (DIS) mainly concerned mental distancing, and items such as "I do my best to get out of the situation" did not load well on the construct. Based on Leiter [35], this item was replaced with one concentrating on mental disengagement: "I try not to be concerned about the IT that created the problems." The final scales of the study are reported in Table 2.

Data analysis

We analyzed the collected data following an incremental approach similar to Srivastava et al. [54], which is based on the estimation of multiple nested models with increasing complexity. In Model 1, the three control variables (gender, age, and IT experience) were considered. In Model 2, technostress creators, distress venting, distancing from IT, positive reinterpretation, and IT control were added as additional antecedents of IT-enabled productivity. In Model 3, distress venting, distancing from IT, positive reinterpretation, and IT control were additionally hypothesized to act as first-order moderators for the effect of the technostress creators on IT-enabled productivity (four two-way interactions). Finally, in Model 4, positive reinterpretation and IT control were additionally hypothesized to act as second-order moderators for the aforementioned first-order moderations (two three-way interactions). In addition, positive reinterpretation and IT control were also modeled to act as first-order moderators for the effects of distress venting and distancing from IT on IT-enabled productivity (two two-way interactions) in order to cover all the main effects and the first-order moderations underlying the hypothesized two-order moderations, as suggested by Aiken et al. [1].

We used the IBM SPSS Statistics 24 and the Mplus version 7.11 software for data analysis. The SPSS software was used for data preparation and preliminary analysis, whereas

the Mplus software was used for structural equation modelling (SEM). Because of the potential deviations from normality in the indicator variables, we used the MLR option of Mplus as the model estimator, which stands for the maximum likelihood estimator robust to non-normal data. The potential missing values were handled using the FIML option of Mplus, which stands for full information maximum likelihood and uses all available data for the model estimation. We estimated the interaction effects in Models 3 and 4 using the latent moderated structural equation (LMS) method by Klein and Moosbrugger [30] and a Monte Carlo integration with a total of 10,000 integration points. This method enables the simultaneous estimation of all the model parameters, in contrast to the more commonly applied two-step approaches in which the parameters of the measurement and structural models are estimated separately, often resulting in the omittance of measurement error.

RESULTS

Construct reliability and validity

Reliability and validity were evaluated at both indicator and construct levels. Indicator reliabilities and validities were evaluated using standardized confirmatory factor analysis (CFA) loadings of the indicators in Mplus, which are reported in Table 2 along with the means and standard deviations. As a criterion for acceptable reliability and validity, we used the factor loading threshold of 0.4 as suggested by Gefen et al. [24]. As can be seen in the Table, the reliability and validity of the indicators could be considered to be at an acceptable level.

Construct reliability was assessed using composite reliability (CR) suggested by Fornell and Larcker [21], with which it is commonly expected that each construct should have a CR greater than or equal to 0.7 for it to exhibit acceptable reliability [43]. The CR of each construct is reported in the first column of Table 3. As can be seen, all the constructs met this criterion.

Construct validity was assessed by examining the convergent and discriminant validities of the constructs as suggested by Fornell and Larcker [21]. To exhibit acceptable

convergent validity, the first criterion requires that each construct has an average variance extracted (AVE) greater than or equal to 0.5, meaning that, on average, each construct should explain at least half of the variance of its indicators. As can be seen in Table 3, all the constructs met this criterion. To exhibit satisfactory discriminant validity, the second criterion requires that each construct should have a square root of AVE greater than or equal to its absolute correlation with the other constructs. As can be seen in Table 3, all the constructs also met this criterion, with the exception of the TO, TI, TC, and TIS constructs, as well as the CAP and AUT constructs, which correlated highly with each other. However, these high correlations are acceptable and can be expected, because these first-order constructs act as reflective indicators of the corresponding second-order TS and CON constructs [13]. Thus, they do not pose a threat to discriminant validity.

As our data was collected with self-reported measures, we also tested for potential common method variance (CMV) and common method bias (CMB). After a thorough examination of two different tests (cf. Appendix 1), we observed some CMV in the model indicators but did not find this to result in CMB in the model estimates. Thus, CMV and CMB are not significant concerns in our study.

Model estimation and hypotheses testing

The model estimation results regarding the size and statistical significance of each examined effect are reported in Table 4, and the key results are illustrated in Figure 2. Also, Table 4 reports the proportion of explained variance (R^2) and the potential change in the proportion of explained variance (ΔR^2) in IT-enabled productivity when compared to the previous model. In accordance with the recommendation by Aiken et al. [1], all the effect sizes are reported as unstandardized to avoid ambiguities in interpreting the two-way and three-way interactions in Models 3 and 4. The proportions of explained variance in Models 3 and 4 were calculated manually from the model estimates following the formulas by Maslowsky et al. [39]

and Muthén and Asparouhov [42], as the Mplus software does not report them automatically due to the use of the LMS method in model estimation.

The goodness-of-fit for Models 1 and 2 was assessed using the chi-square (χ^2) / degrees of freedom (df) ratio and four fit indices [28, 27]: the comparative fit index (CFI), the Tucker-Lewis index (TLI), the root mean square error of approximation (RMSEA), and the standardized root mean square residual (SRMR). Together, they assess the model fit comprehensively from both relative (CFI and TLI) and absolute (RMSEA and SRMR) perspectives [27]. These goodness-of-fit statistics are reported in Table 5. In the case of both Model 1 and Model 2, the χ^2 / df ratio met the cut-off criterion for acceptable fit (χ^2 / df < 3.0) that is suggested by Kline [31]. Furthermore, acceptable fit was also suggested by the four fit indices, whose values met the respective cut-off criteria (CFI ≥ 0.90, TLI ≥ 0.90, RMSEA ≤ 0.06, and SRMR ≤ 0.08,), suggested by Hu and Bentler [28] as well as Gefen et al. [25].

For Model 3 and Model 4, which were estimated using the LMS method, the χ^2 / df ratio is not available nor the aforementioned four fit indices [39]. Therefore, their goodness-of-fit was assessed using the log-likelihood ratio test as suggested by Maslowsky et al. [39]. The log-likelihood value, the number of free parameters, and the result of the log-likelihood ratio test for both the models are reported in Table 6. In addition, Table 6 reports the Satorra-Bentler scaling correction factor (SCF), which was used to correct the value of the test statistic (D) due to the usage of the MLR estimator in estimating the models [48]. In the case of both models (3 and 4), the test rejected the null hypothesis of there being no statistically significant loss in the fit of Model 2 in comparison to Model 3 and the fit of Model 3 in comparison to Model 4. Thus, inversely, we can infer that the goodness-of-fit of both Models 3 and 4 remains better than the goodness-of-fit of Model 2, which was assessed as acceptable above.

Regarding the results reported in Table 4, each of the nested models (Models 1–4) that added complexity to the analysis enabled a larger proportion of the variance explained in IT-

enabled productivity. It is important to note the considerable change in the interpretation of the effect of the technostress creators on IT-enabled productivity between Model 2 as well as Models 3 and 4. In Model 2, the effect size can be expressed with only one value, which is independent of the scores of distress venting, distancing from IT, positive reinterpretation, and IT control. In contrast, in Models 3 and 4, the effect becomes conditional, and its size depends on the scores of these four constructs. If the score of all four constructs is equal to the mean score of the construct (i.e., zero, because the constructs are mean-centered), the effect size is equal to the value listed in Row 4 of Table 4 (which also lists the size of the unconditional effect in the case of Model 2). However, if the scores of the four constructs change, the effect size changes in proportion to the coefficients reported in rows 9–12 in the case of Model 3, and additionally in rows 17–20 in the case of Model 4. In other words, in Models 3 and 4, the effect size of the technostress creators on IT-enabled productivity cannot be expressed with only one value like in Model 2.

With respect to hypotheses support, the effect of the technostress creators on IT-enabled productivity (H1) was tested in Model 2 and the remainder of the nested models. The effect was found to be statistically significant in each of the models, indicating a negative relationship between the technostress creators and IT-enabled productivity. H1 was therefore supported. First-order moderations (Models 3–4) were used to test H2a and H2b, which concerned reactive coping behaviors as moderators of the relationship between the technostress creators and IT-enabled productivity. The moderation by distress venting was found to be statistically not significant. Thus, H2a was not supported. In contrast, the moderation by distancing from IT was found to be statistically significant and positive. Thus, H2b was supported. Furthermore, the effects of positive reinterpretation and IT control on IT-enabled productivity were tested and found to be statistically significant and positive. Thus, both H3a and H3b were supported.

Second-order moderations (Model 4) were used to test H4a–d. Of the added second-order moderations, all were found to be statistically significant. Positive reinterpretation was found to have a negative effect on moderation by distress venting and a positive effect on the moderation by distancing from IT. In contrast, IT control was found to have a positive effect on the moderation by distress venting and a strong negative effect on the moderation by distancing from IT. In order to interpret these results and to examine H4a–d more thoroughly, Tables 7–10 illustrate the size and statistical significance of the effect of the technostress creators on IT-enabled productivity changes, depending on the pairwise scores of distress venting and distancing from IT as well as of positive reinterpretation and IT control constructs. These changes are also plotted graphically in Appendix 2. In accordance with Aiken et al. [1], the low and high scores refer to the scores that are one standard deviation below or above the mean score of the construct, whereas the medium score refers to no deviation from the mean score of the construct (i.e., zero, because the constructs are mean-centered).

In terms of distress venting and positive reinterpretation (Table 7), the results suggest that the interaction between the lower levels of distress venting and the high and medium levels of positive reinterpretation are favorable, as the negative relationship between the technostress creators and IT-enabled productivity is practically nullified (0.066 with high positive reinterpretation) or at least made less negative (-0.141* with medium positive interpretation). However, this is not the case with low levels of positive reinterpretation, where the lower levels of distress venting tend to make the effect of the technostress creators on IT-enabled productivity more negative. Thus, H4a is supported.

With respect to distancing from IT and positive reinterpretation (Table 8), the results suggest that the higher levels of distancing from IT, together with all levels of positive reinterpretation, have favorable effects on the relationship between the technostress creators and IT-enabled productivity. However, this is especially the case with medium and high levels

of positive reinterpretation, where the higher levels of distancing from IT can practically nullify the negative relationship between the technostress creators and IT-enabled productivity (0.034) or even turn it into a positive one (0.255*). Thus, H4b is supported.

Regarding distress venting and IT control (Table 9), the results suggest that the interaction of the higher levels of distress venting and IT control practically nullifies the negative relationship between the technostress creators and IT-enabled productivity (-0.005). However, this is not the case with medium and low levels of IT control, where the higher levels of distress venting tend to make the relationship between the technostress creators and IT-enabled productivity more negative. Thus, H4c is supported.

Finally, in terms of distancing from IT and IT control (Table 10), the results suggest that the interactions of the higher levels of distancing from IT and low and medium levels of IT control can even turn the potentially highly negative relationship between the technostress creators and IT-enabled productivity into a positive one (0.249*) or, at least, practically nullify it (0.034). In contrast, together with high levels of IT control, the higher levels of distancing from IT tend to make the relationship between the technostress creators and IT-enabled productivity more negative. Thus, H4d is supported.

In general, our hypotheses were well supported (Summary of the results can be found in Appendix 3). However, a detailed investigation of the conditions in which coping responses become effective in association with proactive coping revealed conditions that may not always be favorable.

Our study results provide additional insights that help to delineate the effects that certain reactive coping behaviors have in the technostress context. Model 4 indicates that distress venting has a negative relationship with IT-enabled productivity. This additional insight is important because it provides evidence that reactive coping behaviors are inadequate in the technostress context. Another additional insight is in regard to the control variables. None

of the three control variables (gender, age, and IT experience) were found to have a statistically significant effect on IT-enabled productivity in Model 1 and, by themselves, were able to explain practically none (0.0%) of the variance in IT-enabled productivity. However, it should also be noted that, together with the constructs in the following three models (2, 3, and 4), the effect of gender on IT-enabled productivity was found to be statistically significant, suggesting that women (coded 1) were slightly more productive with IT in comparison to men (coded 0). Next, we discuss the implications of these results in more detail.

DISCUSSION

Our study focused on organizational IT users' ways of coping with stressful IT use. Drawing from concepts of coping [2, 20, 51], we conceptualize and validate important relationships that demonstrate proactive and reactive coping behaviors for dealing with technostress. Next, we discuss the contributions of the study.

Contributions to research

This study makes three important contributions to IS research on stress and coping, namely: (1) theorizing and validating proactive and reactive coping in the context of workplace technostress; (2) investigating the interactions between the proactive and reactive coping behaviors; and (3) demonstrating the inadequacy of reactive coping behaviors when deployed in isolation from proactive coping behaviors. We reflect on these contributions below.

Studies have examined (e.g., [58]) the negative relationship between the technostress creators and the behavioral strain of IT-enabled productivity in organizations. Our study extends this finding in a conceptually new direction by revealing how individuals engage in proactive and reactive coping behaviors to weaken this negative relationship. Drawing from concepts on coping [51, 2, 40, 60], we show that both proactive coping (positive reinterpretation and IT control) and reactive coping (distress venting and distancing from IT) play specific roles in alleviating the negative relationship between the technostress creators and

IT-enabled productivity. Reactive coping behaviors help IT users moderate downwards the strength of the negative relationship between the technostress creators and IT-enabled productivity. The proactive behaviors, on their part, strengthen the IT users' ability to cope with stressful situations in a two-fold manner. One, they decrease the behavioral strain – in this case they have a positive relationship with increased IT-enabled productivity. Two, they influence the effects of reactive coping behaviors that occur in response to stressful situations. To our knowledge, this is one of the first studies to explain how individuals can deploy these two coping behaviors together in dealing with technostress. Given the under-representation of coping in the technostress literature, as recently noted [56], this contribution is a timely cumulative attempt at taking the technostress literature conceptually and empirically forward.

Our second contribution is an understanding of the conditions in which the interactions between the proactive and reactive coping behaviors affect the relationship between the technostress creators and IT-enabled productivity. The findings illustrate that the effects of reactive coping behaviors are moderated by proactive coping behaviors. This means that distress venting and distancing from IT have differing effects depending on the individuals' positive reinterpretation and IT control. Positive reinterpretation, combined with distancing from IT or low distress venting, can diminish the negative relationship between the technostress creators and IT-enabled productivity. High IT control combined with distress venting can similarly moderate downwards the strength of this negative relationship. Individuals with high IT control do not, however, benefit from distancing from IT. These users are likely to retain their IT-enabled productivity in the face of technostress creators even without distancing.

Our third contribution is to explain that reactive coping alone is not adequate for coping with technostress. Distress venting and distancing from IT are common reactions to coping and the literature (e.g., [12]) suggests that such reactions to stress are perhaps unavoidable because they occur instinctively. However, our study shows that these coping behaviors on their own

are not enough. Indeed, in our sample of respondents, distress venting does not even weaken the negative relationship between the technostress creators and IT-enabled productivity. Distancing from IT is marginally better because it does weaken this negative relationship. However, as emphasized above, both of these behaviors, when augmented by the interaction effect of the two proactive coping behaviors of positive reinterpretation and IT control, create a further reduction of the negative relationship between the technostress creators and IT-enabled productivity.

Overall, this study advances our understanding of the coping behaviors for technostress and their theoretical interrelations. As emphasized by Bandura [5], the self-beliefs and cognitive structures of individuals have a significant effect on their coping behaviors in stressful situations. Our findings suggest that proactive coping behaviors can steer the effects of reactive coping behaviors when individuals are threatened by technostress creators [51, 20, 60, 52]. The explanatory power of the four models shows that the proportion of the variance extracted increases as moderation effects are taken into account. This shows that the four coping behaviors are interrelated [51, 2, 20].

Contributions to practice

Our study contributes to practice by explaining 1) how IT users in organizations can tackle technostress and 2) how organizations can support their employees in coping with technostress. First, IS research has lacked empirical studies that could inform IT users about whether certain responses to technostress creators (i.e., distress venting and distancing from IT) could help in clearing out some emotions during stressful occurrences in IT use. Our study suggests that such coping behaviors may be helpful. However, it indicates that, along with and in addition to these responses, a positive personal interpretation of stressful IT use situations and control over one's IT use can help IT users to retain their IT-enabled productivity in the face of technostress. While it is perhaps not incorrect to say that IT users are likely to face

technostress situations on an ongoing basis, this study suggests that IT users have the power to deal with these situations on their own with both proactive and reactive coping behaviors.

Second, organizations can use our findings to educate and support their employees to cope with technostress. This can be done in a two-pronged way. Firstly, organizations can develop programs for employees to identify specific technostress creators they face on an ongoing basis in their work situations. Secondly, it is important to note that coping with technostress is a matter of nuance and personalization, because there are different ways of doing it. To this end, organizations can develop a dossier of possible coping behaviors (including the four that we study) that employees can reflect on, in order to gauge the effectiveness of different behaviors for their own personal IT use situations. They can then facilitate employees' efforts in implementing the different behaviors. For example, they can run wellness programs that create awareness of the benefits of taking breaks from IT use and airing emotions about technostress situations in a constructive way, and competency development programs that can instill in employees a greater of positivity and control with respect to IT use to prepare them for facing technostress situations. Through these sorts of programs, organizations can steer their employees' IT use behaviors toward increased IT-enabled productivity even in the face of technostress.

Limitations and further research

Our study has limitations. First, it was based on self-reported data from IT users in a workplace context, measured at a single point in time. That said, for ongoing and chronic stress situations [20], such as technostress, it is suggested that assessing coping subjectively is useful because individuals can better reflect on their own coping behavior. We do acknowledge that other types of research designs, such as interventionist approaches that allow pre- and post-tests, could contribute to the empirical validation of coping. We also express caution for the possibility of generalization because, even though the data were collected from organizational

IT users in multiple industries, all the organizations to which the respondents of this study belonged are based in the US.

Second, our study focused on specific coping behaviors. The inclusion of additional coping behaviors in future studies could provide a more comprehensive impression of coping with technostress. For example, other proactive coping approaches, such as self-monitoring [11], and reactive approaches, such as denial [12], can be studied.

Third, our study concentrated on the effects of coping behaviors on the relationship between the technostress creators and IT-enabled productivity. Future research could look at other outcomes, such as IT-enabled innovation and job satisfaction. Another potential topic is to examine how the technostress creators and their outcomes can shape one another over time and what the role of coping behaviors is in these relationships.

CONCLUSION

Research has emphasized the importance of technostress in organizations, and coping as an under-studied aspect of it. This study shows how organizational IT users can cope with technostress by engaging in particular coping behaviors. In this regard, we took a first step toward validating specific proactive and reactive coping behaviors in the context of workplace technostress. We hope that our study will provide a foundation for the investigation of further coping behaviors for technostress.

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MANUSCRIPT FIGURES

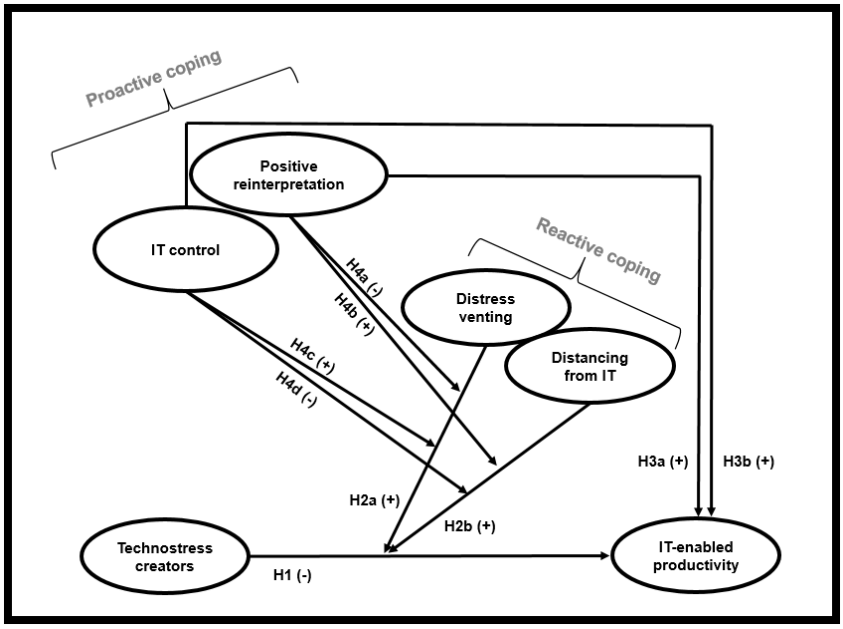

Figure 1. Hypothesized model of proactive and reactive coping for technostress.

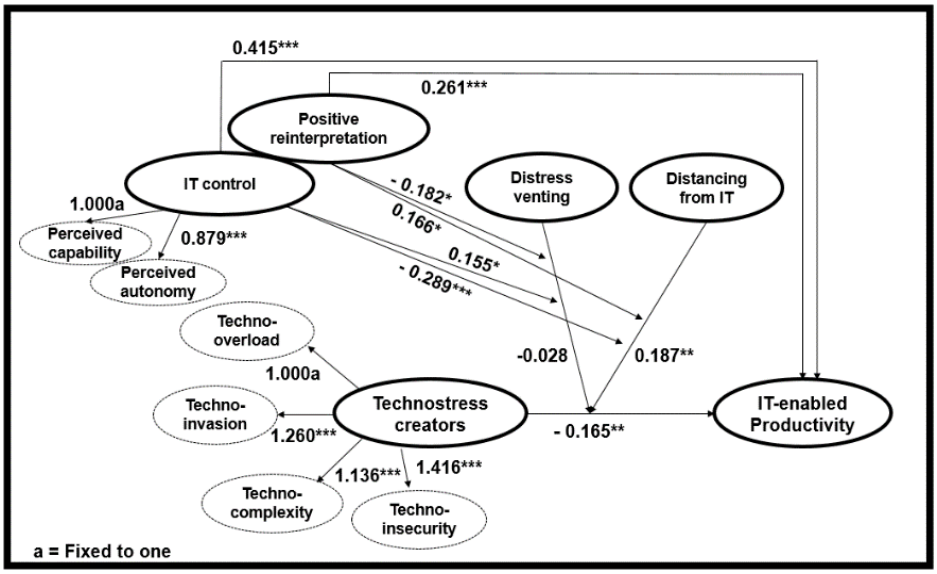

Figure 2. Key results (from Model 4, *** = p < 0.001, ** = p < 0.01, * = p < 0.1)

MANUSCRIPT TABLES

Table 1: Sample characteristics (N = 846)

Variable	Category	Frequency
Gender	Female	444 (52%)
	Male	402 (48%)
Age	20–35 years	335 (40%)
	36–50 years	224 (26%)
	51–65 years	287 (34%)
Nationality	U.S.	846 (100%)
Employment	Hardware and software / ICT	268 (31%)
	Service business	170 (20%)
	Healthcare / Medical	89 (11%)
	Construction / Architecture / Real estate	62 (7%)
	Manufacturing	60 (7%)
	Other (<50) (biotech, agriculture, education, military, pharmaceutical)	197 (23%)
IT device	Laptop / PC / Mac	710 (84%)
	Smartphone / Tablet	136 (16%)

Table 2: Item wordings, standardized loadings, means, and standard deviations

Item wording	Loading	Mean	SD
Technostress creators: Techno-overload (TO)			
TO1 I am forced to work much faster because of work IT	0.767***	3.005	1.217
TO2 I am forced to do more work than I can handle because of work IT	0.852***	2.743	1.264
TO3 I am forced to work with very tight time schedules because of work IT	0.845***	2.879	1.254
TO4 I am forced to change my work habits to adapt to new IT	0.746***	3.098	1.263
TO5 I have a higher workload because of increased IT complexity	0.804***	2.977	1.260
Technostress creators: Techno-invasion (TI)			
TI1 I spend less time with my family due to work IT	0.824***	2.459	1.306
TI2 I have to be in touch with my work even during my vacation due to work IT	0.767***	2.655	1.416
TI3 I feel my personal life is being invaded by work IT	0.884***	2.496	1.408
Technostress creators: Techno-complexity (TC)			
TC1 I do not know enough about my work IT to handle my job satisfactorily	0.738***	2.199	1.278
TC2 I need a long time to understand and use new IT	0.808***	2.474	1.271
TC3 I do not find enough time to study and upgrade my IT skills	0.760***	2.682	1.271
TC4 I find new recruits to this organization know more about IT than I do	0.707***	2.809	1.224
TC5 I often find it too complex for me to understand and use new IT	0.838***	2.371	1.216
Technostress creators: Techno-insecurity (TIS)			
TIS1 I feel a constant threat to my job security due to new IT	0.846***	2.196	1.312
TIS2 I have to constantly update my skills to avoid being replaced	0.728***	2.789	1.320
TIS3 I am threatened by coworkers with newer IT skills	0.869***	2.223	1.285
TIS4 I do not share my knowledge with my coworkers for the fear of being replaced	0.811***	2.096	1.277
TIS5 I feel there is less sharing of knowledge among coworkers for the fear of being replaced	0.774***	2.379	1.325
IT-enabled productivity (PRO)			
PRO1 Work IT helps to improve the quality of my work	0.790***	4.004	0.920
PRO2 Work IT helps to improve my productivity	0.869***	4.099	0.885
PRO3 Work IT helps me to accomplish more work than would otherwise be possible	0.819***	4.057	0.945
PRO4 Work IT helps me to perform my job better	0.799***	4.086	0.912
Distress venting (VEN)			
When IT problems occur at work…			
VEN1...I get mad and tell everyone about my IT problems	0.757***	2.334	1.150
VEN2...I lose my temper and curse, for example	0.876***	1.922	1.118
VEN3...I take my IT problems out on my family, my friends, and other people	0.761***	1.675	1.092
VEN4...I let my feelings out	0.658***	2.323	1.064

Distancing from IT (DIS)			
When IT problems occur at work…			
DIS1...I try to keep away from the IT that created the problems	0.889***	2.713	1.199
DIS2...I separate myself as much as possible from the IT that created the problems	0.907***	2.622	1.186
DIS3...I try not to be concerned about the IT that created the problems	0.455***	2.783	1.207
DIS4...I turn to other activities to take my mind off the IT problems	0.547***	3.102	1.248
Positive reinterpretation (POS)			
POS1 I look for something good in what is happening with IT use at work even when things might go wrong	0.697***	3.803	1.000
POS2 I try to see challenging situations with IT use at work in a different light to make them seem more positive	0.795***	3.733	1.002
POS3 I learn something from the problems I have with using IT at work	0.707***	4.100	0.919
IT control: Perceived autonomy (AUT)			
AUT1 I feel in complete control over how I use IT at work	0.821***	3.580	1.147
AUT2 How I use IT at work is completely up to me	0.882***	3.309	1.260
AUT3 There is nothing that prevents me from using IT at work the way I want	0.849***	3.227	1.264
IT control: Perceived capability (CAP)			
CAP1 If I wanted to, I would be able to use IT at work the way I want	0.823***	3.594	1.100
CAP2 I believe I have the ability to use IT at work the way I want	0.903***	3.645	1.125
CAP3 I see myself as capable of using IT at work the way I want	0.757***	3.843	1.027

Table 3: Construct reliability and validity

	CR	AVE	PRO	TO	TI	TC	TIS	VEN	DIS	POS	CAP	AUT
IT-enabled productivity (PRO)	0.891	0.672	0.820									
Techno-overload (TO)	0.901	0.646	-0.065*	0.804								
Techno-invasion (TI)	0.866	0.683	-0.071*	0.663***	0.826							
Techno-complexity (TC)	0.880	0.595	-0.072*	0.675***	0.736***	0.772						
Techno-insecurity (TIS)	0.903	0.652	-0.077*	0.717***	0.782***	0.796***	0.807					
Distress venting (VEN)	0.850	0.588	-0.131**	0.467***	0.510***	0.519***	0.551***	0.767				
Distancing from IT (DIS)	0.806	0.530	-0.088*	0.271***	0.295***	0.301***	0.319***	0.452***	0.728			
Positive reinterpretation (POS)	0.822	0.537	0.426***	0.057*	0.062*	0.063*	0.067*	-0.101*	0.043	0.733		
Perceived capability (CAP)	0.868	0.689	0.581***	0.100**	0.109**	0.111**	0.118**	0.036	0.009	0.447***	0.830	
Perceived autonomy (AUT)	0.887	0.724	0.489***	0.085**	0.092**	0.094**	0.100**	0.030	0.007	0.377***	0.843***	0.851

(CR = composite reliability, AVE = average variance extracted, diagonal axis reports the square roots of AVE)

Table 4: Model estimation results (unstandardized, *** = p < 0.001, ** = p < 0.01, * = p < 0.1)

	Model 1	Model 2	Model 3	Model 4
Gender	0.013	0.118*	0.117*	0.117**
Age	0.000	0.002	0.002	0.002
IT experience	0.002	0.003	0.003	0.002
Technostress creators (TS)	–	-0.105*	-0.166**	-0.165**
Distress venting (VEN)	–	-0.021	-0.063	-0.088*
Distancing from IT (DIS)	–	-0.026	-0.029	0.005
Positive reinterpretation (POS)	–	0.211***	0.206***	0.261***
IT control (CON)	–	0.425***	0.426***	0.415***
TS x VEN	–	–	0.011	-0.028
TS x DIS	–	–	0.082*	0.187**
TS x POS	–	–	-0.012	0.145
TS x CON	–	–	0.178**	0.071
VEN x POS	–	–	–	-0.156*
VEN x CON	–	–	–	0.161*
DIS x POS	–	–	–	0.095*
DIS x CON	–	–	–	-0.093*
TS x VEN x POS	–	–	–	-0.182*
TS x DIS x POS	–	–	–	0.166*
TS x VEN x CON	–	–	–	0.155*
TS x DIS x CON	–	–	–	-0.289***

R^2	0.0 %	42.3 %	47.0 %	61.4 %
ΔR^2	–	42.3 %	4.7 %	14.4 %

Table 5: Goodness-of-fit statistics

	Model 1	Model 2	Model 3	Model 4
X^2	31.923	2,497.739	–	–
df	11	837	–	–
X^2 / df	2.902	2.981	–	–
CFI	0.985	0.911	–	–
TLI	0.976	0.905	–	–
RMSEA	0.047	0.048	–	–
SRMR	0.014	0.068	–	–

Table 6: Results of log-likelihood ratio tests

	Model 1	Model 2	Model 3	Model 4
Log-likelihood	-3,542.314	-42,885.100	-42,870.679	-42,851.222
Scaling correction factor (SCF)	1.4843	1.2401	1.2425	1.2442
Free parameters	15	143	147	155
D	–	–	21.713	30.510
df	–	–	4	8
P	–	–	< 0.001	< 0.001

Table 7: The effects of the technostress creators on IT-enabled productivity with different scores for positive reinterpretation and distress venting (unstandardized, ** = p < 0.01, * = p < 0.1)

	Low positive reinterpretation (POS)	Medium positive reinterpretation (POS)	High positive reinterpretation (POS)
Low distress venting (VEN)	-0.348*	-0.141*	0.066
Medium distress venting (VEN)	-0.264**	-0.165**	-0.066
High distress venting (VEN)	-0.181*	-0.189*	-0.197*

Table 8: The effects of the technostress creators on IT-enabled productivity with different scores for positive reinterpretation and distancing from IT (unstandardized, *** = p < 0.001, ** = p < 0.01, * = p < 0.1)

	Low positive reinterpretation (POS)	Medium positive reinterpretation (POS)	High positive reinterpretation (POS)
Low distancing from IT (DIS)	-0.342***	-0.364***	-0.386***
Medium distancing from IT (DIS)	-0.264**	-0.165**	-0.066
High distancing from IT (DIS)	-0.187	0.034	0.255*

Table 9: The effects of the technostress creators on IT-enabled productivity with different scores for IT control and distress venting (unstandardized, ** = p < 0.01, * = p < 0.1)

	Low IT control (CON)	Medium IT control (CON)	High IT control (CON)
Low distress venting (VEN)	-0.085	-0.141*	-0.197*
Medium distress venting (VEN)	-0.229*	-0.165**	-0.101
High distress venting (VEN)	-0.373*	-0.189*	-0.005

Table 10: The effects of the technostress creators on IT-enabled productivity with different scores for IT control and distancing from IT (unstandardized, *** = p < 0.001, ** = p < 0.01, * = p < 0.1)

	Low IT control (CON)	Medium IT control (CON)	High IT control (CON)
Low distancing from IT (DIS)	-0.707***	-0.364***	-0.022
Medium distancing from IT (DIS)	-0.229*	-0.165**	-0.101
High distancing from IT (DIS)	0.249*	0.034	-0.180*