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Angaben zur Veröffentlichung / Publication details:

Schoch, Manfred. 2023. "The interplay of challenge-hindrance-appraisal and self-efficacy: technostress and remote working performance." *Australasian Journal of Information Systems* 27. https://doi.org/10.3127/ajis.v27i0.3653.

The Interplay of Challenge-Hindrance-Appraisal and Self-Efficacy: Technostress and Remote Working Performance

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Abstract

Measures to contain the COVID-19 pandemic have caused many employees to work from home; A novel situation in which individuals used information systems (IS) more intensively to stay in touch with co-workers. This novel IS use situation affected individuals differently and resulted in both positive and negative outcomes. Recent calls for research advocate for clarification regarding the conceptualisation of appraisal, which explains different individual responses to objectively equal environments. In particular, challenge-hindrance-research does not differentiate between primary and secondary appraisal. Therefore, it remains unclear how individual capability beliefs, such as self-efficacy, affect challenge and hindrance IS use appraisal. We conduct an empirical study with 1,553 German employees to investigate these relationships and the positive and negative outcomes during the COVID-19 pandemic. We find that challenge and hindrance IS use appraisal, and remote working self-efficacy are interconnected, yet different constructs. We find that self-efficacy is related to challenge IS use appraisal, rather than hindrance IS use appraisal. Further, challenge IS use appraisal is a driver for performance in a remote working environment. We conclude that there are stressful aspects of IS use that are not influenced by an individual's belief in their abilities. Our study emphasises the importance of remote working self-efficacy and IS use appraisal to mitigate techno-distress and increase performance during remote work.

Keywords: IS use, cognitive appraisal, self-efficacy, remote work, challenge-hindrance.

1 Introduction

To contain the COVID-19 pandemic, many organisations have advised their employees to work from home. Studies surveying the German workforce indicate that more than 25% worked from home during the height of the first wave of the pandemic in March 2020 (Möhring et al., 2020). This number was likely higher for knowledge-intense industries. To maintain communication and collaboration between employees in this physically distanced work environment, many organisations and employees reverted to digital communication and collaboration tools, such as Microsoft Teams or Zoom. As a result, sales and usage time of such tools grew exponentially (Spataro, 2020).

The physical distancing measures came with many potential psychological stress and strain sources, such as reduced social contacts and increased family demands from a lack of childcare options. The use of digital technologies was both a blessing and a curse for many in this time. While it enabled individuals to stay in touch with co-workers, family, and friends, it also confronted many with new IT issues. Such issues include erecting and maintaining remote working infrastructure, using new technologies, or using existing technologies for new purposes. Such novel circumstances are a potential source of stress for some (Ellsworth & Scherer, 2003). Early scientific contributions have investigated the effect of the physical distancing measures, and the increased IS use on psychological health (e.g. Vaziri, Casper,

Wayne, & Matthews, 2020). Yet, individual differences in the perception of such stressful situations and ways to mitigate the adverse consequences are important avenues for further research.

COVID-19 came at a time when researchers have begun to recognise that technostress research has been primarily concerned with the negative side of stress (Tarafdar, Cooper, & Stich, 2019). Few contributions have already investigated the positive side of technostress. These studies have advanced our knowledge of technostress through models that differentiate between challenge and hindrance stressors (Benlian, 2020; Califf, Sarker, & Sarker, 2020). This is congruent with stress research from the realm of occupational psychology. Many studies have similarly differentiated between challenge and hindrance stressors (Cavanaugh, Boswell, Roehling, & Boudreau, 2000). Yet, organisational psychologists have recently suggested that analyses that recognise individual differences in appraisal of such situations may be fruitful. This emphasises diversity and the study of different individual reactions to stress. Underlying is an individual assessment that explains different individual responses in objectively equal environments (Krohne, 2001). In the context of IS use, appraisal may include the evaluation of IS as a challenging or motivating factor on the one hand or a threat and disturbing factor on the other (Tarafdar et al., 2019).

A recent call for research has proposed that low technology self-efficacy could be a driver of threat appraisals in the context of IS use (Tarafdar et al., 2019). Congruently, seminal work from psychology has found that self-efficacy and appraisal are different phenomena that affect each other (Jerusalem & Schwarzer, 2010). While self-efficacy is a characteristic of the individual that builds on prior personal accomplishments and experiences, appraisal may vary between situations and within situations over time. This is because appraisal is a cognition that may change continuously as an individual interacts with the environment (Jerusalem & Schwarzer, 2010).

Congruently, IS research has identified perceived control over IT as an important factor in stress (Tams, Ahuja, Thatcher, & Grover, 2020). IT control is considered an element of secondary appraisal (Beaudry & Pinsonneault, 2005). Yet, much empirical research on the bright and dark side of IS use has built on challenge-hindrance-research (e.g., Califf et al., 2020; Maier et al., 2021). The associated conceptualisation "does not differentiate the primary and secondary appraisal process" (LePine, Zhang, Crawford, & Rich, 2016, p. 1052).

In this study, we investigate the relationship between remote working self-efficacy and challenge/hindrance IS use appraisal, the impact that individual IS use appraisal has on remote working during the COVID-19 pandemic, which came with increased use of digital communication technology. We further conclude how further research on IS can profit from these findings. Thus, the paper at hand investigates the following research question:

What relationship do individual challenge/hindrance appraisal and self-efficacy have with techno-distress and performance in times of remote work?

The theoretical implications of this work are threefold: First, we advance the current knowledge regarding the relationship between self-efficacy and IS use appraisal. We show that self-efficacy affects challenge IS use appraisal rather than hindrance IS use appraisal. This suggests that hindrance IS use appraisal is not related to the individuals' resources and, thus, has a different root that warrants further research. Second, we show a positive relationship between the two antecedents of low remote working self-efficacy and hindrance IS use

appraisal with technostress experienced during remote work brought about by the COVID-19 pandemic. Third, we portray remote working self-efficacy and challenge IS use appraisal as important antecedents of performance during remote work.

2 Theoretical Background

Stress due to digital technologies has a long history. It was first described as a failure of employees to adapt to modern office technology. A more recent definition of technostress is: "stress that users experience as a result of their use of IS in the organisational context" (Tarafdar, Pullins, & Ragu-Nathan, 2015, p. 103). Further, technostress is "a process that involves a transaction between the individual and the environment" (Tarafdar et al., 2019, p. 8). As such, technostress is primarily a dark side phenomenon focused on technology characteristics its users consider a threat (Tarafdar et al., 2019).

Recently, research on technostress has shifted its focus to a view on technostress that accounts for its positive and negative sides. In doing so, it has (explicitly and implicitly) recognised the role of appraisal, which accounts for different individual responses in objectively equal environments (Krohne, 2001). For example, studies that have considered appraisal found that technology-driven challenge stressors lead to challenge appraisal of certain IS events and thus may result in positive outcomes (e.g., Benlian, 2020). In a study concerning healthcare IT, Califf et al. (2020) have categorised positive characteristics of IS use (usefulness) and aspects that facilitate IS use (technology support and facilitating conditions) as challenge stressors – thus, these situations were predominantly appraised as challenging between subjects. Congruent with their operationalisation, the established technostress-creators have been categorised as hindrance stressors by the study.

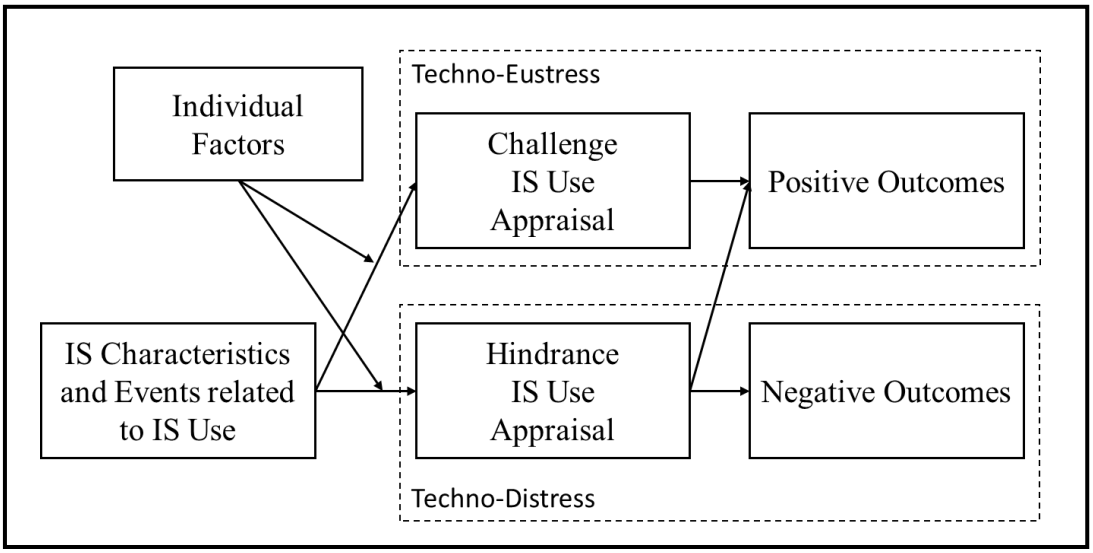


Figure 1. Conceptual Model, based on Tarafdar et al. (2019), Maier et al. (2021)

Recent conceptual work on technostress has differentiated between techno-distress and techno-eustress. Techno-distress "embodies the negative stress that individuals face in their use of IS" (Tarafdar et al., 2019, p. 20). It thus involves the individual appraisal of IS use as negative – hindering, threatening, or damaging – and is associated with negative outcomes (Tarafdar et al., 2019). As pointed out, the operationalisation of technostress-creators already involves parts of this techno-distress process, as they have an inherent threat appraisal.

Techno-eustress refers to the positive side of stress and involves challenge IS use appraisals and positive outcomes (Tarafdar et al., 2019). The authors further suggest that there may be a relationship between hindrance appraisal with positive outcomes under some circumstances (Tarafdar et al., 2019). On this basis, we depict a conceptual model of this process in Figure 1 (see above). There are other conceptualisations, for example, focusing on addiction (Hu, Park, Day, & Barber, 2021), but this work on remote work during COVID-19 focuses on organisational IS use.

2.1 Sources of Technostress

According to theory, the root of technostress is IS use (Ayyagari, Grover, & Purvis, 2011). Thus, previous work on technostress has included IS use variables directly into their models. For example, Ayyagari et al. (2011) include IS use as a control variable, Stich, Tarafdar, Stacey, and Cooper (2019) investigate email use as a driver of stress, and Maier, Laumer, Eckhardt, and Weitzel (2015) find an effect of social network usage on stress. Similarly, events that happen during IS use, such as technology-induced interruptions, have been assessed as potential sources of stress (Galluch, Grover, & Thatcher, 2015).

Research has identified conditions that create stress and summarised them as, for example, invasion, overload, complexity, uncertainty and insecurity (Ragu-Nathan, Tarafdar, Ragu-Nathan, & Tu, 2008). Their conceptualisation has an inherent threat or hindrance appraisal and thus measures the negative side of stress (Tarafdar et al., 2019). The corresponding items measure a misfit between individual resources and situational conditions (Ayyagari et al., 2011). For example, techno-overload occurs when IS forces individuals to work faster and longer than they want. A given number of emails is considered too many when it exceeds the level an individual feels confident dealing with (Stich et al., 2019). The exact number of emails necessary to create the perception of techno-overload is highly individual and related to individual factors, such as skills, preferences, or self-efficacy. Traditional technostress-creators (as conceptualised by Ragu-Nathan et al. (2008)) thus represent a condition after the individual appraisal (c.f., Tarafdar et al., 2019).

2.2 Individual Factors

Individual factors that moderate the relationship between IS use and different appraisals have been investigated regarding technostress. Tarafdar et al. (2019) summarise existent research and find that such individual factors include technology self-efficacy, technology competence, or personality traits (e.g., neuroticism, agreeableness, and extraversion). The influence of personality traits on the relationship between technostress and other job-related outcomes has been studied by Srivastava, Chandra, and Shirish (2015). Other studies found age-related user characteristics, such as computer experience and self-efficacy, to be influencing factors for stress and task performance due to technology-mediated interruptions (Tams, Thatcher, & Grover, 2018). These factors may help users experience higher degrees of control over interruptions, which helps mitigate adverse effects on well-being. Congruent with seminal work on stress (Lazarus & Folkman, 1984), a study on cybersecurity-related threats finds that user self-efficacy is an antecedent for perceived avoidability – a perception that a threatening situation can be dealt with (Liang & Xue, 2009).

2.3 Appraisal and Cognitive Mediating Processes

This touches upon the vital question in technostress research of how different individuals experience IS use differently and what individual factors drive the relationship (Tarafdar et

al., 2019). It has been recognised that not all users are similarly affected by the use of IS. What stresses one individual might easily be handled by another. This view emphasises the role of the individual and allows for differences in how situations are perceived. The cognitive process that explains different individual responses in objectively equal situations is called appraisal (Krohne, 2001). Such appraisals can differ between individuals regarding the same stimulus (Smith & Kirby, 2011). Relevant appraisal conditions in a work context are considered to be challenge appraisal and hindrance appraisal and have been used in the context of IS use (LePine et al., 2016; Maier et al., 2021). Lazarus and Launier (1978) describe challenges as situations that provide opportunities to overcome hardship and for growth. This is congruent with LePine et al. (2016), who consider challenging work conditions to promote personal growth and enable the fulfilment of work tasks, while hindering work conditions thwart them.

Other IS studies have introduced a more nuanced appraisal model that incorporates the concept of primary and secondary appraisal (Beaudry & Pinsonneault, 2005, 2010). This differentiation is congruent with seminal work on stress (e.g., Lazarus & Folkman, 1984). In primary appraisal, a user determines whether a situation provides an opportunity or is considered a threat. This depends on the expected consequences of the situation (Beaudry & Pinsonneault, 2005). Secondary appraisal involves the user's perception of control over an IT-related situation. It is worth noting that general individual beliefs about capabilities may affect appraisal but are conceptually different and robust across situations (Lazarus & Folkman, 1984).

Control can, for example, be perceived through being able to schedule work independently, autonomy in the methods chosen to complete work assignments, or the ability to determine what is to be done (Tams et al., 2020). A distinction can be drawn between internal control and external control (Bhattacherjee, Davis, Connolly, & Hikmet, 2018). Internal control is the user's ability to control their own behavior. Individual factors and capability beliefs may influence the perception of internal control. External control is the user's perception of control over the environment, including access to organisational resources (Bhattacherjee et al., 2018).

It could be argued that the constructs and items developed by LePine et al. (2016) to measure challenge and hindrance appraisal capture mainly primary appraisal. The authors build on challenge-hindrance-stressor research, which "does not differentiate the primary and secondary appraisal process" (LePine et al., 2016, p. 1052). Yet, they also state that individual characteristics, such as cognitive ability, may influence their operationalisation of appraisal and that future work should investigate such individual differences. A link between such individual differences and secondary appraisal seems intuitive.

2.4 Coping and Adaptation

The research stream that considers primary and secondary appraisal operationalisation has also drawn connections to user adaptation (Bhattacherjee et al., 2018; Stein, Newell, Wagner, & Galliers, 2015). It has developed notably separately from the technostress stream yet shares many underlying theories and concepts. Adaptation is congruent with the notion of coping, which is a mediating process of stress (Lazarus & Folkman, 1984).

IS research has made several contributions regarding appraisal, individual factors and how they affect the stress process. Studies on coping with technostress have found that control over IT and positive reappraisal are important factors for successfully dealing with techno-distress (Pirkkalainen, Salo, Tarafdar, & Makkonen, 2019). The perception of control has also been

associated with problem-focused coping strategies that may help overcome issues with IS (e.g., Salo, Makkonen, & Hekkala, 2020). Fine granular views of the coping process have further suggested that this is associated with the availability of resources (Ortiz de Guinea, 2016).

2.5 Outcomes of the Technostress Process

Occupational psychologists adapted the appraisal concept to the work context through the Challenge-Hindrance-Framework (Cavanaugh et al., 2000). The appraisal process is implicit in this conceptualisation (Benlian, 2020). This means that most individuals generally appraise challenge and hindrance stressors (stimuli) accordingly (LePine et al., 2016). Yet, individual-level differences in appraisal cannot be accounted for by the challenge-hindrance-stressor framework. Several meta-studies on the Challenge-Hindrance-Framework have been published since and have underscored its relevance to research and practice (Mazzola & Disselhorst, 2019; Podsakoff, Lepine, & LePine, 2007). According to the studies, challenging situations are generally associated with positive outcomes, such as performance, and hindering situations with negative outcomes, such as psychological strain.

We summarise the current findings and the existing research gap as follows. Many studies have theoretically established and empirically investigated the relationship between IS use and technostress. Research on technostress has investigated several individual factors that influence the relationship between IS use and the negative side of technostress. This primarily involves the relationship with various aspects of control. Yet, research has acknowledged that there are conceptual issues and overlaps in technostress research that require clarification. Particularly the individual factors that influence IS use appraisals and their relationship with known technostress-creators that have an inherently negative connotation have seen little attention. In particular, this regards the operationalisation of appraisal following challenge-hindrance-research, which is widely used to investigate the bright and dark side of technostress. Investigating the influence of individual differences on such IS use appraisal provides an avenue to advance theoretical knowledge on technostress. In this work, we aim to address these issues. The COVID-19 pandemic has brought many individuals into a novel IS use situation they may not have chosen themselves and did not envision before the pandemic. This has led to a novel use situation that provides excellent opportunities for research regarding the perception of technostress and its outcomes.

3 Hypothesis Development

We propose a research model based on hypotheses derived from the literature. Following the conceptual model from left to right, the research model of this paper comprises IS use for remote work during COVID-19, individual remote working self-efficacy, the role of IS use appraisal, and their influence on techno-distress[1] and performance. A graphical representation of the research model is shown in Figure 2. In the following, we derive the corresponding hypotheses in detail.

[1] As Hu et al. (2021) point out, it may be problematic to use the word technostress or techno-distress to refer to an outcome and that technostrain may be a better term. Yet, we stay within known terminology in IS research (e.g., Shu et al., 2011) and use techno-distress to refer to the underlying state that users experience as a result of the techno-distress process.

3.1 The Influence of Remote Working Self-efficacy

Techno-distress has been characterised as a misfit between situations related to IS use and an individual's resources (Ayyagari et al., 2011). It is important to note that this is a construct that captures IS use appraised by the individual user as threatening or damaging (Tarafdar et al., 2019). The conceptualisation emphasises the individuals' ability to deal with the demands imposed by IS use. Thus, and congruent with Tarafdar et al. (2019), individual factors play an important role in technostress. Previous literature has primarily included personal resources, such as general IS problem-solving competencies described as digital literacy (Tarafdar et al., 2019) or technology competence (Tarafdar et al., 2015) in work on the perception of techno-distress. Yet, the resources required for remote work have been separately studied in previous works (e.g. Wang & Haggerty, 2011). Such resources are broader and include providing adequate information by the employer and ways to receive help regarding remote work. To our knowledge, no studies regarding techno-distress have yet included such context-specific measures.

We suggest that remote working self-efficacy affects techno-distress in times of remote work situations such as the ones experienced during the COVID-19 pandemic. Further, the employer can contribute to this sense of self-efficacy by providing adequate support and information. This is because individuals who are self-efficacious with IT will know how to operate IS in a healthy manner and can prevent or circumvent techno-distress by themselves or with their organisation's help. For example, users can deactivate notifications of their work communication tools to reduce techno-invasion. Such support is particularly important when close in-person contact with co-workers, and thus social support, is unavailable. Thus, we bring forward the following hypothesis:

H1: *Remote working self-efficacy has a negative effect on techno-distress.*

Self-efficacy is a central construct in behavioural research and has been identified as a major driver of performance in occupational psychology and management science. This is because individuals with high self-efficacy, compared to those with low self-efficacy, may be more persistent in problem-solving even if they initially experience hindrances and setbacks (Tims, B. Bakker, & Derks, 2014). Analyses in the workplace related to computer hardware and software have empirically confirmed this proposition (Harrison, Rainer, Hochwarter, & Thompson, 1997). Thus, we transfer this concept to the context of remote work. For example, suppose individuals with high remote working self-efficacy encounter a technical issue during videoconferences. In that case, they may work persistently to find a workaround or fix the problem, which increases their effectiveness and efficiency in completing the meeting. In turn, this may increase performance. Thus, we hypothesise:

H2: *Remote working self-efficacy has a positive effect on performance.*

In this paper, we extend this existing view on the role of self-efficacy to the context of individual appraisal of IS use. Smith and Kirby (2011) refer to Lazarus and Folkman (1984) and point out that challenge appraisals are more likely when the individual has control over a situation. In other words, the person perceives that it "has the potential to change the circumstances to bring them more in line with his or her desires" (Smith & Kirby, 2011, p. 8). This suggests that individual resources, such as remote working self-efficacy, are important antecedents of IS use appraisal. Apart from this theoretical plane, empirical research has shown that there is a connection between self-efficacy and challenge appraisal. Yet, the

constructs are not identical. For example, Jerusalem and Schwarzer (2010) show that individuals with low self-efficacy show different appraisal patterns over time than individuals with high self-efficacy. They find that individuals with high self-efficacy maintain higher levels of challenge appraisal throughout a task. This exemplifies that while self-efficacy is a characteristic of the individual, appraisal can vary from situation to situation and within situations. Similar indications have been found in technostress literature, where Salo, Pirkkalainen, Makkonen, and Hekkala (2018) suggest that confidence to overcome smartphone failures is essential to positive views on stress. It thus seems intuitive that high self-efficacy influences challenging IS use appraisal. Jerusalem and Schwarzer (2010) find that the opposite is also true: low self-efficacy is associated with increased threat and hindrance appraisals over time. This is congruent with the conceptual work of Tarafdar et al. (2019), who specifically propose that low self-efficacy may be associated with increased threat appraisal (which resembles hindrance appraisal in the work context, as pointed out). We thus conclude that there are several indications for the role of remote working self-efficacy in determining a challenge or hindrance IS use appraisal in times of remote work and hypothesise:

H3a: *Remote working self-efficacy has a positive effect on challenge IS use appraisal.*

H3b: *Remote working self-efficacy has a negative effect on hindrance IS use appraisal.*

3.2 The Influence of Challenge and Hindrance Appraisal

Several technostress studies have already incorporated challenge and hindrance situations into their models. Califf et al. (2020) categorised technostress-creators and technostress-inhibitors as either challenging or hindering in a mixed methods study in the health care sector. In their research, technostress-creators, such as unreliability, complexity, uncertainty, insecurity, and overload were categorised as hindering. Similarly, Benlian (2020) developed technology-driven challenge and hindrance stressors and found them to confer with challenge and hindrance appraisal. Congruent with these previous results of IS literature, we thus propose that hindrance IS use appraisal will be positively associated with techno-distress (Califf et al., 2020). This is also in line with Tarafdar et al. (2019), who state that known technostress creators have an inherently negative connotation. It thus captures the "technology environment as threatening and the outcomes [as] adverse consequences" (Tarafdar et al., 2019, p. 12). We thus hypothesise:

H4: *Hindrance IS use appraisal has a positive effect on techno-distress.*

Contrarily, hindrance stressors and hindrance appraisal may hamper performance. This is because such situations provide no opportunity for personal growth or gains but rather thwart them (Cavanaugh et al., 2000). Thus, occupational psychology research has found negative relationships between hindrance appraisal and task performance (LePine et al., 2016). Recent meta-studies have confirmed this relationship in the realm of occupational psychology (Mazzola & Disselhorst, 2019). Previous work on technostress has suggested a connection between techno-distress and performance (Tarafdar et al., 2015). It is important to note that techno-distress implies a threat or hindrance appraisal (Tarafdar et al., 2019). Other studies have pointed out that the relationship between hindrance appraisal and performance has not been fully understood yet and that different empirical results exist (LePine et al., 2016). We conclude from theoretical conceptualisation and empirical results that hindrance appraisal is causal for effects on performance. Thus, we hypothesise:

H5: *Hindrance IS use appraisal has a negative effect on performance.*

In contrast, challenge stress provides opportunities for growth and personal gains (LePine et al., 2016). This is because challenge stress may generally be associated with higher motivation and the ability to overcome hurdles (Mazzola & Disselhorst, 2019). Recent work on the positive side of technostress has found that characteristics of IS which make them more useful can be appraised as challenging (Califf et al., 2020). Similarly, Benlian (2020) emphasises the role of IS for learning and mastering skills in his characterisation of technology-driven challenge stressors. In addition, recent work suggests that challenge IS use appraisal leads to innovative use behaviour (Maier et al., 2021). In turn, advanced and innovative use behaviour has been associated with increased performance (Burton-Jones & Straub, 2006). Thus, theory and empirical findings imply that challenge IS use appraisal may be associated with an increase in performance. Hence, we hypothesise:

H6: *Challenge IS use appraisal has a positive effect on performance.*

3.3 Control Variables

This model's dependent variables may be influenced by other factors, too. Thus, we include IS-related variables and variables related to job stress in the model that have been shown to influence the outcomes. First, higher IS use has been shown to influence technostress. Technostress has been theorised as a consequence of IS use (Ayyagari et al., 2011). Thus, various variables relating to IS use have been included both as explanatory variables (e.g., Maier, Laumer, Weinert, & Weitzel, 2015; Stich et al., 2019) and control variables (e.g., Ayyagari et al., 2011) in previous studies. Second, a higher workload may increase both technostress (Ayyagari et al., 2011; Stich et al., 2019) and performance (e.g., Lepine, Podsakoff, & LePine, 2005).

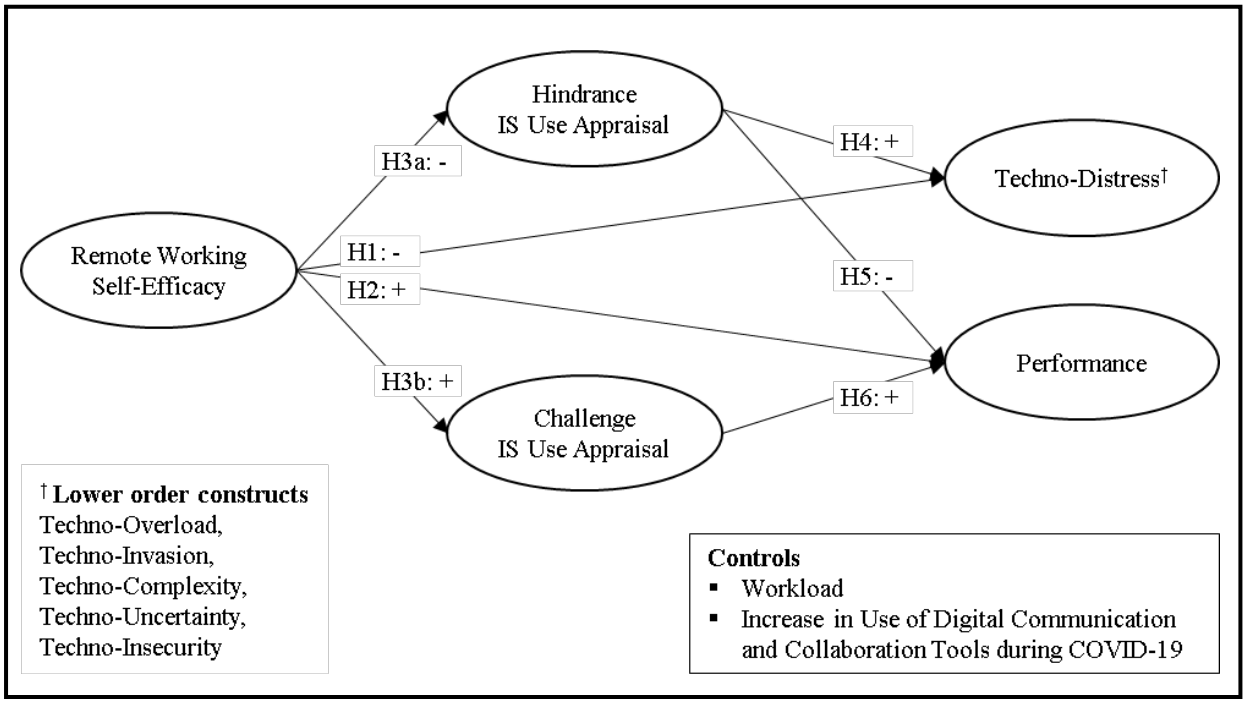


Figure 2. Research Model

4 Quantitative Empirical Analysis

4.1 Survey Design and Procedures

To test the model empirically, we design an online survey. The survey collects data concerning IS use and its consequences during COVID-19. It is part of a larger study and contains questions not reported in this work. We acquired participants via an external research panel focusing on the German workforce (Dynata, formerly Research Now SSI). The external panel provider was primarily chosen because they allow efficient access to a representative sample of German full-time and part-time employees. Further, using the panel provider allowed us quick access to employees working from home, which would have been difficult during the first wave of COVID-19. After internal testing of the data collection instrument, we conducted a small pretest using the panel provider. The responses were assessed, the feedback was implemented, and the data was collected anonymously. Respondents were asked to answer the questionnaire honestly and to give consent to their participation. For their participation, respondents were paid a small incentive. The survey was administered in May 2020 during the initial COVID-19 lockdown in Germany. Data quality was ensured by evaluating open questions and excluding questionnaires that were completed unrealistically fast. For example, we excluded participants who gave nonsensical answers regarding their profession in a text box. Further, extreme outliers were identified and deleted after a manual assessment of the response time distribution. As a result, we collected 1,553 valid responses. We consider this sample largely representative of the German workforce.

We used existing evaluated item scales for our questionnaire, which focused on individual resources regarding the digital workplace, IS use, appraisal, technostress, and performance. We use the Wang and Haggerty (2011) scale for measuring remote working self-efficacy. Recent literature acknowledges that there are few adequate measures for techno-distress[2] (Hu et al., 2021). We thus use the items from Ragu-Nathan et al. (2008) that measure "stressors appraised by the individual as damaging" (Tarafdar et al., 2019, p. 9) which "create technostress in the organisation "(Ragu-Nathan et al., 2008, p. 421) as lower order constructs (LOC). These items measure several aspects of the stress process, such as outcomes ("I spend less time with my family due to this technology") and coping actions ("I do not share my knowledge with my co-workers for fear of being replaced"). Operationalization of stress concepts, such as stimuli, coping, and outcome, have often been confounded in stress research (Edwards & Cooper, 1988). Thus, by combining them into a reflective higher-order construct (HOC) we aim to capture the underlying construct of techno-distress. Such a HOC should be viewed as an outcome of the appraisal process rather than an antecedent variable. For reflective measurement models, the underlying construct is assumed to cause changes in the indicators (e.g., Jarvis, MacKenzie, & Podsakoff, 2003). Thus, in the paper at hand, the reflective HOC is assumed to cause changes in the LOCs, which is consistent with Ragu-Nathan et al. (2008). This approach further helps ensure a parsimonious model (Polites, Roberts, & Thatcher, 2012). For appraisal, we ask participants to report their appraisal of IS use in general as either challenging or hindering. Congruent with Benlian (2020), we use the scales of LePine et al. (2016) adapted to the context of IS. When answering these questions, individuals were asked to think about their overall digital technology use at work. The same

[2] This important early contribution to technostress uses the term to refer to the negative side of technostress – techno-distress.

panel had participated in a previous questionnaire before COVID-19, revealing that the digital technologies used are rather heterogeneous. For example, digital technologies consist of various devices and peripherals, communication technology, and specialised software. Many individuals likely experienced changes in their work IT during COVID-19. Changes may include newly introduced communication and collaboration systems, increased use (see controls), and increasingly digitised processes, such as digital signatures.

Regarding performance, we use the scale of Frone, Yardley, and Markel (1997). For the control variable of workload, we used a COPSOQ III subscale (Burr et al., 2019). All of these measurements are reflective and measured on five-point Likert scales. Regarding the control variable of IS use, we adapted a scale by Venkatesh, Thong, and Xu (2012) to reflect a relative change in use during COVID-19 for email, instant messaging, audio and video communication. This construct is formative and measured on a three-point Likert scale. The appendix provides an overview of the items.

1,553 participants completed our survey, of which 41.9% are female and 58.1% male. Regarding age, 1.5% were below 25, 15.1% were 25-34, 27.4% were 35-44, 31.2% were 45-54, 24.4% were 55-64, and below 0,5% were 65 and older. All respondents work and live in Germany with 9.4% reporting a migration background. Industries and professions are widely distributed (see Table 1). Most respondents work full-time (74%). While it is highly likely that all individuals were confronted with increased digital communication during the time of the data collection, roughly 51.9% report to spend substantial work time outside the office.

Industries	
Public administration, safety, and defense	11.5%
Manufacturing/production of goods	11.2%
Health and social work	9.3%
Wholesale and retail trade	8.2%
Information and communication	7.9%
Banks/financial and insurance providers	7.7%
Other business and personal economic services	5.9%
Professional, scientific, and technical services	5.0%
Others (under 5%)	33.3%
Professions	
Computer, information and communication technology occupations	13.0%
Professions in law and administration	10.4%
Professions in financial services, accounting, and tax consulting	9.1%
Professions in business management and organisation	7.5%
Purchasing, sales and trade occupations	6.9%
Medical health professions	5.5%
Others (under 5%)	35.0%
Working hours	
Full-time (<30h/week)	74.0%
Part-time (>30h/week)	26.0%
Primary place of work	
Office	48.9%
Home office	33.1%
Mixed	14.4%
Other location	3.6%

Table 1. Demographics of the Sample

4.2 Results

We assess the model through structural equation modeling (PLS-SEM) using SmartPLS 3.2. We start with the evaluation of the measurement model before assessing the structural model and testing our hypotheses.

4.2.1 Evaluation of the Measurement Model

Regarding the reflective measurement model, we tested the internal consistency reliability using composite reliability (CR) and Cronbach's Alpha (Alpha). All scales are above 0.7 and below 0.95, which can be regarded as satisfactory. For convergent validity, we examine outer loadings and average variance extracted (AVE). Outer loadings are satisfactory because they all exceed the common threshold of 0.708 (Hair, Hult, Ringle, & & Sarstedt, 2017). AVE is above 0.5 in all cases. This indicates convergent validity.

For discriminant validity, we examine each indicator's cross-loadings with all other constructs and find that they are indeed lower than the indicator's outer loadings. Further, we evaluate the heterotrait-monotrait (HTMT) ratios. These are consistently below the threshold of 0.90 (Henseler, Ringle, & Sarstedt, 2015) for all first-order constructs with a maximum of 0.73 (Techno-Invasion and Techno-Insecurity). Thus, discriminant validity is supported. Table 2 shows the respective values as well as the means and standard deviations (SD) of the reflective constructs.

Further, we check for common method variance (CMV). We use a post hoc correlational marker test to do so (Lindell & Whitney, 2001; Richardson, Simmering, & Sturman, 2009). We determine the two smallest shared variances in bivariate correlations among substantive exogenous latent variables. We then correct for it by partialling out the shared variance. Our results show that no bivariate correlation became insignificant as a result. Thus, we conclude that CMV is no major concern in this study.

	Number of Indicators	Mean	SD	Outer Loadings	Alpha	CR	AVE
Hindrance IS Use Appraisal	3	2.602	1.182	0.909-0.934	0.910	0.944	0.848
Challenge IS Use Appraisal	3	3.270	1.015	0.864-0.901	0.864	0.917	0.786
Remote Working Self-Efficacy	4	3.582	0.996	0.853-0.918	0.919	0.943	0.805
Performance	4	3.485	1.036	0.854-0.884	0.893	0.925	0.756
Techno-Overload (LOC)	4	2.464	1.221	0.823-0.905	0.899	0.930	0.769
Techno-Invasion (LOC)	3	2.161	1.217	0.809-0.900	0.833	0.900	0.751
Techno-Complexity (LOC)	5	2.177	1.159	0.826-0.901	0.918	0.938	0.753
Techno-Uncertainty (LOC)	4	2.510	1.173	0.860-0.890	0.894	0.926	0.758
Techno-Insecurity (LOC)	5	2.058	1.151	0.812-0.881	0.900	0.926	0.714
Techno-Distress (HOC)	21	2.264	1.180	0.740-0.876	0.907	0.907	0.661

Table 2. Descriptive Statistics Reflective Constructs, Outer Loadings, Internal Consistency, and Average Variance Extracted

4.2.2 Evaluation of the Structural Model and Hypotheses Testing

Collinearity is also not a major issue in the structural model since all inner variance inflation factors are lower than 5 (maximum of 1.146). Figure 3 presents the path estimates for the model, including their significance level. R^2 values are depicted in the constructs.

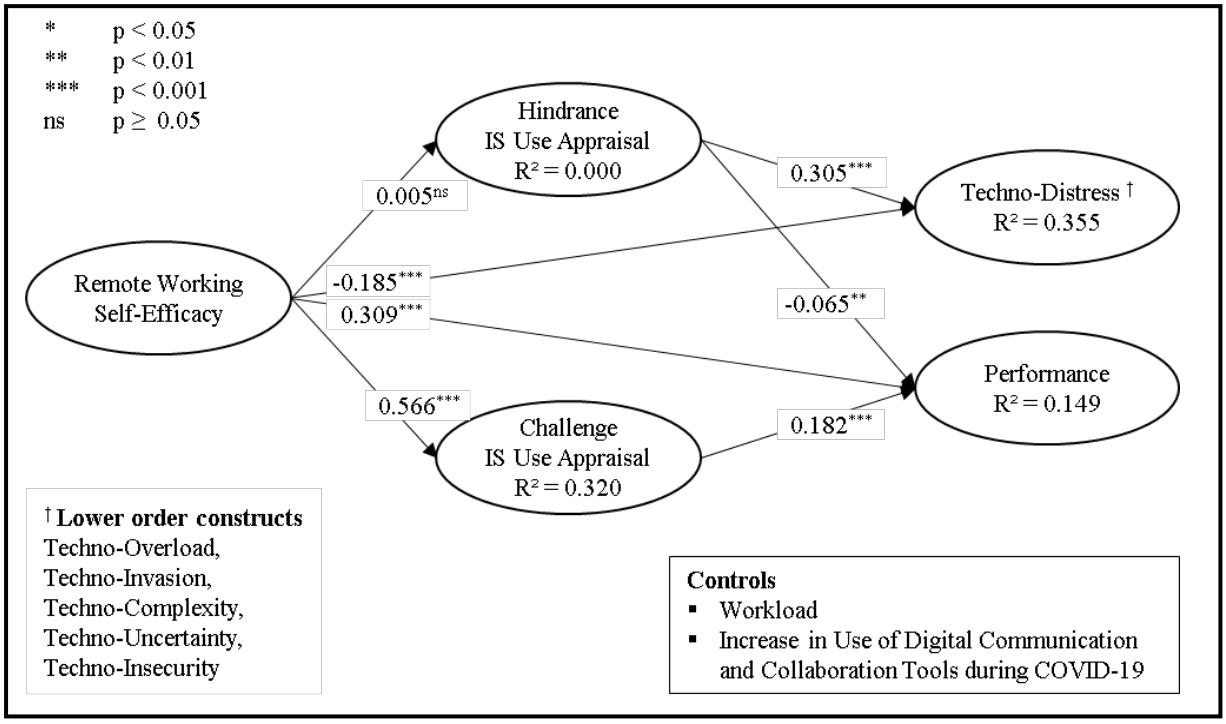


Figure 3. Model Results

Regarding H1, we find that remote working self-efficacy is associated with technostress with a small effect size (f^2=0.050). Further, the data shows that remote working self-efficacy is a driver of performance in times of work from home with a small effect size (f^2=0.079) supporting H2. Contrary to H3a, we find that it is not significantly related to hindrance IS use appraisal, indicating that there may be different reasons for hindrance appraisal. Yet, we find a significantly positive relationship between remote working self-efficacy and challenge IS use appraisal and a large effect size (f^2=0.470). This supports H3b. Regarding the relationship between hindrance IS use appraisal and techno-distress, we find that it is positively associated and that the effect size is small to medium (f^2=0.133). This supports H4.

Further, we find the relationship between hindrance IS use appraisal and performance to be statistically significant. Yet, the effect size is marginal (f^2=0.005). Therefore, and considering the large sample size of this study, we consider H5 not supported. Regarding challenge IS use appraisal, we find that it is indeed associated with higher performance with a small effect size (f^2=0.026). This is in support of H6. Regarding controls, workload (β=0.095; p<0.001; f^2=0.011) and increased IS use during COVID-19 (β=0.071; p=0.023; f^2=0.005) are related to performance. Also, both workload (β=0.295; p<0.001; f^2=0.123) and increased IS use during COVID-19 (β=0.226; p<0.001; f^2=0.70) are positively related to techno-distress. Table 3 summarises the empirical findings.

Theoretical Hypotheses			**Empirical Results**	
H1	neg.	Remote Working Self-Efficacy → Techno-Distress	-	supported
H2	pos.	Remote Working Self-Efficacy → Performance	+	supported
H3a	neg.	Remote Working Self-Efficacy → Hindrance IS Use Appraisal	n.s.	not supported
H3b	pos.	Remote Working Self-Efficacy → Challenge IS Use Appraisal	+++	supported
H4	pos.	Hindrance IS Use Appraisal → Techno-Distress	+	supported
H5	neg.	Hindrance IS Use Appraisal → Performance	o	not supported
H6	pos.	Challenge IS Use Appraisal → Performance	+	supported

Table 1. Overview of Hypotheses and Empirical Results
Note: n.s. indicates a non-significant effect. For significant effects: o indicates a marginal effect (f^2 <0.02), +/- a small (f^2 ≥0.02), ++/-- a medium (f^2 ≥0.15), and +++/--- a large (f^2 >0.35) effect size.

5 Discussion

5.1 Theoretical Implications

The theoretical implications of this work are threefold. They comprise insights on the relationship between self-efficacy and IS use appraisal, insights regarding the individual factors influencing technostress in times of remote work, and insights into how these factors influence performance. Our theoretical contributions are summarised in Table 4.

First, we follow a call for research by Tarafdar et al. (2019) to investigate the relationship between individual factors and IS use appraisal. The challenge-hindrance conceptualisation of IS use appraisal is often used in the technostress literature (e.g., Califf et al., 2020; Maier et al., 2021). As such, it does not differentiate between primary and secondary appraisal (LePine et al., 2016) and thus deviates from other operationalisations of IS use appraisal, which often includes IT control (secondary appraisal). Internal control is affected by individual beliefs about capabilities (e.g., Tams et al., 2018). How this conceptualisation of IS use appraisal is affected by individual factors, such as self-efficacy, is important to better understand empirical results of studies using it.

We address our research question in the context of remote work during COVID-19 and with a focus on remote working self-efficacy. We find that hindrance IS use appraisal is not related to the individuals' remote working self-efficacy. Tarafdar et al. (2019) propose low self-efficacy as a factor that may affect appraisal, which indicates that IS is a threatening and disturbing factor. The authors further point out that both hindrance and threat situations are associated with distress. Therefore, it is an interesting finding of our study that hindrance appraisal is not related to self-efficacy. This contradicts our hypothesis and previous conceptual work on technostress (Tarafdar et al., 2019). We conclude that hindrance IS use appraisal has a different root that warrants further research.

The implications of this finding may be that hindering IS use might be associated with factors that the individual cannot control, regardless of individual self-efficacy. Thus, the origins of such stressors could lie in either the technology or the work itself. This may be congruent with the conceptualisation of the technostress trifecta of Tarafdar et al. (2019) who also consider factors related to the design of IS. Organisations may be able to address such issues without the involvement of their employees. If researchers and practitioners identify such sources of techno-distress, they may be able to reduce technostress through organisational measures.

Second, and regarding performance, we find that remote working self-efficacy in general increases performance for remote work during COVID-19, which is congruent with previous work on IS use (e.g., Compeau et al., 1999). The influence of hindrance IS use appraisal, however, is only marginal, which puts the real-world impact and thus its practical relevance of the relationship in doubt (Mohajeri, Mesgari, & Lee, 2020). Yet, we show that a challenge IS use appraisal further contributes to increased performance. This indicates that the two subprocesses of technostress that can be assessed using the appraisal items from challenge-hindrance-research may be more separate than previously thought.

The fact that both remote working self-efficacy and challenge IS use appraisal have positive effects on performance has theoretical implications. As we pointed out, appraisal and self-efficacy are related yet different. Self-efficacy is an individual characteristic that serves as a resource factor for appraisal (Jerusalem & Schwarzer, 2010). Thus, while self-efficacy is rather stable and tends to translate to other situations (Bandura, 1977), appraisal may vary between situations and within situations over time depending on outcome expectations. This is because appraisal is a cognition that may change continuously as an individual interacts with the environment (Jerusalem & Schwarzer, 2010). Of course, a cross-sectional survey cannot capture this time effect. Yet, it shows that the two constructs are different and may be affected differently.

Third, we shed light on the relationship between IS use during remote work brought about by COVID-19 and techno-distress. In this work, we propose that the novel situation of communication and collaboration technology use during COVID-19 is a source of techno-distress and we control for this increased use in our study. We further show that remote working self-efficacy is a way to mitigate techno-distress in times of remote work. This is congruent with previous work on technostress (e.g., Shu, Tu, & Wang, 2011) and previous work on the overlap between social cognitive theory and IS use (Compeau, Higgins, & Huff, 1999).

We advance the current knowledge on technostress research regarding challenge IS use appraisal by identifying remote working self-efficacy as a major antecedent in the particular context of remote work. Previous work has given little recognition to its possible role as an antecedent for challenge IS use appraisals. Yet, previous research has stated that controllability of the situation (Gibbons, 2010) and a high chance of coping may be associated with a positive side of stress and thus challenge IS use appraisal (Salo et al., 2018). Self-efficacy is, in turn, an assessment of the own abilities built on past performances and experiences. In that regard, it also captures confidence in controlling a situation to some degree. A more detailed view of how self-efficacy works is provided by Jerusalem and Schwarzer (2010). In their research they assess the relationship between temporal patterns of appraisal and self-efficacy. Their results suggest that individuals with low self-efficacy may well have challenge appraisals of a situation at first. Yet, over time the negative experiences of failure results in frustration and a decreasing perception of challenge. Thus, self-efficacy heavily affects challenge appraisal.

In summation, self-efficacy is a construct that has been used in many studies on technostress and it may seem trivial to revisit the construct. Yet, our empirical findings show that the relationships may be more complex and not as clear as might be assumed. We conclude that the relationship between self-efficacy and appraisal is worth revisiting. Our empirical results show that researchers may overstate the effect of self-efficacy or challenge appraisal when not measuring the respective other construct. Future studies may provide additional detail on the

relationship by following the stress process over time to analyse the temporal interplay (Jerusalem & Schwarzer, 2010). Also, previous work has shown that self-efficacy may be shaped more by previous outcomes, such as performance, than it shapes future outcomes (Harrison et al., 1997). Thus, the construct and associated empirical results may provide misleading insights. This further emphasises the necessity to revisit self-efficacy and appraisal with future research.

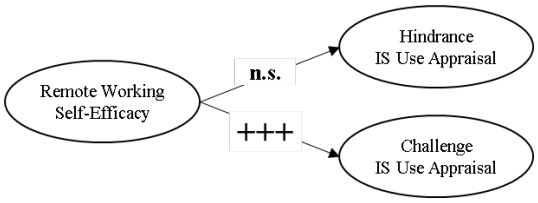
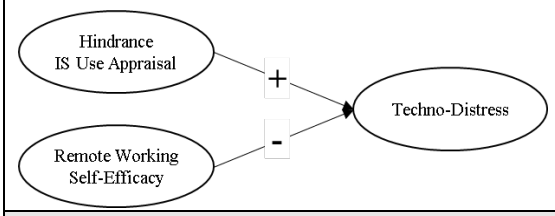
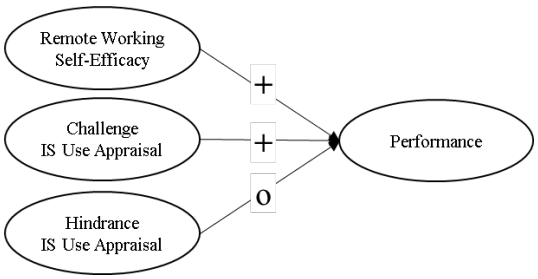
Relationship Between Self-Efficacy and Appraisal	
	• Remote working self-efficacy does not affect hindrance IS use appraisal, indicating that hindrance may be unrelated to the individual's believe in his or her abilities • Remote working self-efficacy has a strong effect on challenge IS use appraisal and is an important antecedent
Individual Factors and Appraisal Influencing Techno-Distress	
	• Confirming recent studies, hindrance IS use appraisal increases techno-distress • Further, remote working self-efficacy reduces techno-distress in times of remote work
Individual Factors and Appraisal Influencing Performance	
	• Both Remote working self-efficacy and challenge IS use appraisal increase the perception of individual performance • Yet, the significant negative relationship of hindrance IS use appraisal and performance has no substantial effect size

Table 4. Overview of Theoretical Contributions

Note: n.s. indicates a non-significant effect. For significant effects: o indicates a marginal effect (f^2 <0.02), +/- a small (f^2 ≥0.02), ++/-- a medium (f^2 ≥0.15), and +++/--- a large (f^2 >0.35) effect size.

In summation, self-efficacy is a construct that has been used in many studies on technostress and it may seem trivial to revisit the construct. Yet, our empirical findings show that the relationships may be more complex and not as clear as might be assumed. We conclude that the relationship between self-efficacy and appraisal is worth revisiting. Our empirical results show that researchers may overstate the effect of self-efficacy or challenge appraisal when not measuring the respective other construct. Future studies may provide additional detail on the relationship by following the stress process over time to analyse the temporal interplay (Jerusalem & Schwarzer, 2010). Also, previous work has shown that self-efficacy may be shaped more by previous outcomes, such as performance, than it shapes future outcomes (Harrison et al., 1997). Thus, the construct and associated empirical results may provide misleading insights. This further emphasises the necessity to revisit self-efficacy and appraisal with future research.

5.2 Managerial Implications

Our findings have several managerial implications. We find that increased use of IS for communication during COVID-19 has adverse consequences on employees in the form of technostress. This may be driven by the novel situation that employees are facing. Yet, our research suggests several measures that can be taken to mitigate such technostress.

We find that hindrance IS use appraisal increases technostress and that hindrance IS use appraisal is not associated with the individuals' self-efficacy. This may indicate that there are sources of technostress in the IS use of employees that cannot be mitigated through individual knowledge but are inherent in either the work or the technology. This indicates that organisations can indeed take actions on these levels to reduce technostress of their employees. This could involve, for example, providing adequate technology to fulfil the communication needs of the individuals. To the best of our knowledge, such demands have been scarcely investigated. Yet, a recent study has pointed to technology incompatibility as a potential source of demands for employees (Vaziri et al., 2020). Thus, organisations and their IT departments should consider providing adequate and useful tools to mitigate technostress – particularly in the times of physical distancing.

Further, we find that the remote working self-efficacy of individuals strongly influences the perception of technostress during remote work. We find that it not only influences the relationship between IS use and technostress, but also strongly influences challenge IS use appraisal, which is associated with increased usefulness and performance. We thus conclude that it is paramount for organisations to provide an environment where employees can increase their digital literacy in general and remote working self-efficacy in particular. In a way, this is also good news, as it is easier to improve systematically than cognitive appraisal, which is said to be highly individual (Lazarus & Folkman, 1984). Yet, there are other avenues to affect appraisal, such as cognitive reappraisal or mindfulness (Garland, Gaylord, & Park, 2009)

6 Limitations and Future Research

This work has several limitations that leave avenues for future research. For example, our operationalisation of appraisal focuses on the general use of IS. While this is congruent with previous research on technostress (e.g. Benlian, 2020), research in psychology has suggested that appraisal can change from situation to situation within individuals and has thus suggested different ways of measurement (Searle & Auton, 2015). Other studies have included frequent appraisal measurements within a single stressful situation over time (Jerusalem & Schwarzer, 2010). Yet, the detailed measurement appraisal in individual situations requires complex data collection. It has been pointed out that it has been omitted for obvious reasons of practicality in many studies (Jerusalem & Schwarzer, 2010). Nonetheless, we acknowledge this as a shortcoming of our study and encourage future work to look into more detailed analyses.

Further, the conceptual model derived from the literature offers many avenues for investigation. In our research model, we operationalise it using different constructs. This includes the appraisal concept by LePine et al. (2016), which is discussed extensively in this paper. It also involves the chosen outcome variables, which are conceptually relatively far apart. For example, a narrower operationalisation of performance, such as IT-enabled

performance, could have been used. Other outcome variables related to the bright and dark side of IS use, such as affect or well-being, could also be included in subsequent studies.

In addition, the relationship between self-efficacy, appraisal, and outcomes may be affected by previous outcomes more than it is a determinant of future outcomes (Sitzmann & Yeo, 2013). This is an intriguing proposition that has not been investigated in relation to technostress to the best of our knowledge. Such analyses require data beyond cross-sectional surveys and may consider both appraisal and self-efficacy and their relationship. Further, other factors may affect the measurement of the relationship between these variables. For example, previous work has shown problems with overconfidence and overestimation of self-assessed performance. This may be associated with the Dunning-Kruger-Effect (Kruger & Dunning, 1999). Such issues could be considered in future work.

Regarding the COVID-19 pandemic, we acknowledge that more stressors exist that may lie outside of the realm of IS use and technostress, such as childcare, job insecurity, and a lack of social contact. IS use may have had positive effects during COVID-19, for example, staying in touch with co-workers and continuing working from home.

7 Conclusion

Due to the physical distancing measures to counteract COVID-19, digital communication tools and their use have changed how we work, and remote work has increased dramatically. This work investigates the positive and negative consequences of IS use in times of COVID-19 and how they differ between individuals. We follow a call for research inquiries into the factors that influence individual appraisal of IS use situations and thus its positive and negative sides (Tarafdar et al., 2019). This is particularly true for the operationalisation of appraisal in challenge-hindrance-research that does not differentiate between primary and secondary appraisal. We find that hindrance IS use appraisal is associated with higher technostress. Yet, hindrance IS use appraisal is not associated with remote working self-efficacy, which suggests that some sources of technostress cannot easily be changed by individuals. Rather, they might be rooted in the provided technologies or the circumstances of digital work. Such factors may be captured in a hindrance IS use appraisal. Nonetheless, we find that high levels of remote working self-efficacy are associated with lower levels of technostress, emphasising the role of specific competencies in mitigating stress during remote work. Further, we find that remote working self-efficacy is also positively related to challenge IS use appraisal, which enables growth and gains and thus leads to higher performance. As a theoretical contribution, we shed light on the relationship between IS use and technostress and show that remote working self-efficacy is an important antecedent of IS use appraisal. For practitioners, we emphasise the role of both the provision of adequate technology for remote work and the role of remote working self-efficacy of their employees to reduce technostress and increase performance in remote work situations. Further research may go into more detail on the appraisal process and differentiate between different stressors and situations.

Acknowledgements

The author extends his gratitude to Christian Regal, Julia Lanzl, and Henner Gimpel for the fruitful conversations on the paper's subject and their collaboration regarding data collection.

Funding

This paper presents and discusses results of the Bavarian Research Association on Healthy Use of Digital Technologies and Media (ForDigitHealth), funded by the Bavarian Ministry of Science and Arts.

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Appendix – Measurement Items

Increased Use of Digital Communication Tools during COVID-19 (based on: Venkatesh et al., 2012)	
Three-point Likert Scale: substantially less than before, remained the same, substantially more than before	
IUC01	How frequently are you using email for business purposes compared to before the corona pandemic?
IUC02	How frequently are you using instant messaging (e.g., via MS Teams, Slack, WhatsApp) for business purposes compared to before the corona pandemic?
IUC03	How frequently are you using audio calls (e.g., via telephone, MS Teams, Skype) for business purposes compared before the corona pandemic?
IUC04	How frequently are you using video calls (e.g., via MS Teams, Skype, Zoom) for business purposes compared to before the corona pandemic?
Remote Working Self-Efficacy (source: Wang and Haggerty 2011)	
RSE01	I have confidence that I can complete my virtual work because I can access appropriate support staff readily.
RSE02	I have confidence that I can complete my virtual work because I can access information needed to perform my job.
RSE03	I have confidence that I can complete my virtual work because I can set objectives that align with the organisation's goals.
RSE04	I have confidence that I can complete my virtual work because I can prioritise tasks to use my time effectively.
Challenge IS Use Appraisal (source: LePine et al., 2016)	
CA01	Using digital technologies to fulfill the demands of my job helps me improve my personal growth and well-being.
CA02	I feel the demands of my job relating to the use of digital technology as a challenge to achieve personal goals and accomplishment.
CA03	In general, I feel that the use of digital technology promotes my personal accomplishment.
Hindrance IS Use Appraisal (source: LePine et al., 2016)	
HA01	Using digital technologies to fulfill the demands of my job thwarts my personal growth and well-being.
HA02	I feel the demands of my job relating to the use of digital technology constrain my achievement of personal goals and development.
HA03	In general, I feel that the use of digital technology hinders my personal accomplishment.
Performance (source: Frone et al., 1997)	
PF01	I am viewed by my supervisor as an exceptional performer.
PF02	I am viewed as an exceptional performer in this organisation.
PF03	I have a reputation in this organisation for doing my work very well.
PF04	My colleagues think my work is outstanding.
Workload (source: COPSOQ III / Burr et al., 2019)	
WL01	Do you have to work very fast?
WL02	Do you work at a high pace throughout the day?
WL03	Is it necessary to keep working at a high pace?
Techno-Distress: Techno-Overload (source: Ragu-Nathan et al., 2008)	
TO01	I am forced by this technology to do more work than I can handle.
TO02	I am forced by this technology to work with very tight time schedules.

TO03	I am forced to change my work habits to adapt to new technologies.
TO04	I have a higher workload because of increased technology complexity.
Techno-Distress: Techno-Invasion (source: Ragu-Nathan et al., 2008)	
TI01	I have to be in touch with my work even during my vacation due to this technology.
TI02	I have to sacrifice my vacation and weekend time to keep current on new technologies.
TI03	I feel my personal life is being invaded by this technology.
Techno-Distress: Techno-Complexity (source: Ragu-Nathan et al., 2008)	
TC01	I do not know enough about this technology to handle my job satisfactorily.
TC02	I need a long time to understand and use new technologies.
TC03	I do not find enough time to study and upgrade my technology skills.
TC04	I find new recruits to this organisation know more about computer technology than I do.
TC05	I often find it too complex for me to understand and use new technologies.
Techno-Distress: Techno-Insecurity (source: Ragu-Nathan et al., 2008)	
TS01	I feel constant threat to my job security due to new technologies.
TS02	I have to constantly update my skills to avoid being replaced.
TS03	I am threatened by coworkers with newer technology skills.
TS04	I feel there is less sharing of knowledge among coworkers for fear of being replaced.
Techno-Distress: Techno-Uncertainty (source: Ragu-Nathan et al., 2008)	
TU1	There are always new developments in the technologies we use in our organisation
TU2	There are constant changes in computer software in our organisation.
TU3	There are constant changes in computer hardware in our organisation.
TU4	There are frequent upgrades in computer networks in our organisation.

Note: Items measured on a five-point Likert scale unless stated otherwise

doi: https://doi.org/10.3127/ajis.v27i0.3653