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Technology-induced Strain from Team Communication Platforms: Empirical Evidence for Working from Home**

Abstract

Working from home (WFH) has recently become a widespread form of workplace transformation. Here, digital team communication platforms (TCP), like Microsoft Teams or Slack, have essential value for enabling WFH at a large scale. However, TCPs facilitate permanent availability and distractions, indicating stress potential for employees, particularly when WFH. Therefore, this study examines the occurrence of TCP-generated technostress and its drivers in the WFH environment. Based on the Transaction-Based Stress Theory and technostress literature, we developed a research model with perceived strain as the outcome variable, shaped by TCP technology characteristics and established stressors. To validate the proposed model, we conducted a survey with 503 participants who have worked with TCP from home. Structural equation modelling revealed a variance explained of R^2=.573 for perceived strain from TCP. We confirmed the TCP technology characteristics of mobility, interruption, and usefulness to correlate with the stressors of work-home conflict, work overload, and role ambiguity. These stressors, in turn, significantly shaped the outcome variable perceived strain. Furthermore, we found the ability to mentally detach from work to have a buffering moderator effect on the impact of stressor role ambiguity. Correspondingly, we provide implications for theory and practice on how TCP could be implemented with the goal of reducing harm to employee well-being.

Keywords: technostress, working from home, team communication platforms, Transaction-Based Stress Model, mental detachment from work
(JEL: J28, O15, O33)

Introduction

Recently, working life has undergone a profound transformation, catalysed by the COVID-19 pandemic, that has forced organisations to reconsider how, when, and

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where to work. This transformation has highlighted the growing relevance of working from home (WFH) as a significant shift in team organisation, employee communication, and human resource management (De' et al., 2020; Waizenegger et al., 2020). Current surveys show that, for example, in Germany, 38% of employees work from home at least sometimes, compared to 18% before the pandemic (Pauly & Markert, 2020; Statista, 2023b). In the future, 86% of employees wish to work in a hybrid form between WFH and in-office or to work completely from home (Statista, 2023a). Home-based employees, also referred to as teleworkers, benefit from the flexibility and the facilitated combination of work and private obligations. Accordingly, WFH enhances work-life balance, reduces stress, and improves job satisfaction (Irawanto et al., 2021). However, WFH introduces contextual differences that can modify the impact of stressors. For example, the physical separation of work and home life becomes blurred in WFH, leading to challenges in managing boundaries. Stressors such as work-home conflict may take on new dimensions when individuals are working in the same space where they also engage in personal activities.

Technological innovations can be considered a key driver of flexible work approaches, as they transform stationary workplaces into virtual rooms independent of time and place (Suh & Lee, 2017). For WFH, in particular, team communication platforms (TCP), e.g., Microsoft Teams, Slack, and Cisco Webex, are considered an essential component as they extend or even replace previous communication forms, such as e-mail or in-person conversations. TCP serve as a digital meeting place and facilitates chat, calls, video conferences, and collaborative work through various features like messengers and cloud services. As a result, TCP empowers organisations to maintain inter- and intra-organisational communication, regardless of physical location. In this way, TCPs have become linchpins in the establishment of remote work as a sustainable organisational model (Waizenegger et al., 2020). Nevertheless, disrupted work environments, in this case switching to WFH with TCP, can impair employee health and performance outcomes (Carillo et al., 2021; Fritz et al., 2010). These tools introduce a new layer of complexity and potential stressors related to constant accessibility, interruptions, and the need to manage digital communication effectively.

This study investigates the relevant technology characteristics of TCP and their effects on stressors involved in WFH. Accounting for the WFH context, the additional question arises whether employees who are (not) able to mentally detach from their work in their free time are affected differently (Sonnentag & Kruel, 2006). In merging two pivotal trends in contemporary work and organisational research – the influence of digital organisational communication on employee well-being within a WFH context – this study addresses the following research questions:

(1) How do the technology characteristics of team communication platforms influence work-related stressors and thus increase the perceived strain on teleworkers?

(2) Does the ability to mentally detach from work during non-working hours reduce the impact of stressors on perceived strain?

To address this research gap, we propose a research model that is based on the transaction-based stress model by Lazarus and Folkman (1984) and Ayyagari et al.'s (2011) work on technostress. This allowed us to include relevant TCP technology characteristics, established stressors of professional life, and perceived strain as the outcome variable. To validate the model, we conducted an online survey among n=503 employees from diversified sectors. With a variance explained of R^2=.573, the proposed model identified all considered technology characteristics (mobility, interruption, and usefulness) to correlate with the stressors of work-home conflict, work overload, and role ambiguity, all of which in turn shaped perceived strain significantly. Furthermore, we found the ability to detach from work mitigated the impact of role ambiguity on strain. Therefore, our study indicates salient points for organisations employing TCP, especially with the aim to enhance job quality and protect employees from negative outcomes.

Theoretical Background

Employee Well-Being and Team Communication Platforms – Literature Overview

Employee well-being is a relevant factor for organisations not only from a humanitarian but also from an economic perspective as it is connected, for example, to work performance (LeBlanc, 2009). The research strand regularly links employee well-being to the construct of work-induced strain (Tarafdar et al., 2019). Strain is defined as an "individual's psychological, physical, and behavioural response to stressors" (Cooper et al., 2001, p. 14), while stressors are stimuli that generate stress in work environments (Cooper et al., 2001).

Previous research revealed that digital organisational communication can impact performance (Garro-Abarca et al., 2021), while our study focuses on its effect on employee well-being. Here, the relevance of communication for mental health was highlighted by Qin and Men (2022), as employees with a supportive and informal team culture discuss things more authentically and feel safe with their colleagues. This process has been greatly interrupted by communication via TCP. In particular, the advent of digital employee communication tools has been linked to challenges in fostering team culture (Latapie & Tran, 2007) and building trustful relationships with managers (Mackenzie, 2010). Consequently, the widespread adoption of TCP is likely to have profound effects on interpersonal relationships in the workplace (McGloin et al., 2022) and, subsequently, the perceived stress

(Nappo, 2020). Consistent with those findings, Bordi et al. (2018) analysed that purely digital communication was predominantly perceived as demanding. In the same vein, Oksanen et al. (2021) compared employee stress levels before and after the COVID-19 outbreak and showed that communication via digital media leads to perceived stress.

Most recently, researchers introduced video conference fatigue to the literature on work-related strain. Riedl (2022) outlined stress-inducing differences between natural communication and video conferences, such as reaction delays, visual self-awareness, as well as lack of body language and eye contact. In addition, Bailenson (2021) outlined that employees are stressed by video conferences since they feel trapped in their small video frame and perceive themselves as permanently watched by many faces. Fauville et al. (2021a) confirmed these works empirically and validated a "Zoom fatigue scale". They found that daily usage fosters video conference fatigue, while introverts and younger people are more receptive to the fatigue. A subsequent study demonstrated that video conference fatigue is negatively associated with the attitude towards video conferences (Fauville et al., 2021b). Apart from video conferences, communicating via TCP chats has challenges due to the disparities between written and spoken language, leading to problems such as misinterpretation, escalating conflicts, or cyberbullying (Stich et al., 2018).

Transaction-Based Stress Model

The Transaction-Based Stress Model (Lazarus & Folkman, 1984) focuses on people's psychological stress perception before physical responses become observable. Accordingly, stress is the ongoing process of weighing threatening environmental demands against one's own resources and coping abilities. In a two-step cognitive appraisal approach, individuals evaluate, first, a situation's possible influence on one's own well-being and, second, the perceived control to manage the corresponding demands. If the result of this process is a situation perceived as harmful without proper coping resources, the strain will arise and be expressed by negative thoughts, emotions, or behaviours.

The model consists of four key variables: (1) stressors, (2) situational factors, (3) strain, and (4) other organisational consequences (Cooper et al., 2001). Stressors (1) are stress creators at work and can be role- or task-related (Cooper et al., 2001). The frequency, duration, and severity of stressful conditions are decisive for the resulting stress (Galluch et al., 2015). Situational factors (2) are mechanisms that can amplify or reduce stressor effects. These factors include, for example, the degree of perceived control, information transparency, or social support (Ragu-Nathan et al., 2008). Perceived strain (3) comprises the behavioural, psychological, and physiological outcomes of stressors, including emotional exhaustion, poor job performance, frustration, or burnout (LeBlanc, 2009; Podsakoff et al., 2007). Other organisational outcomes (4) concern the organisation beyond the individuals since

dissatisfaction can result in collective consequences like absenteeism or fluctuation (Galluch et al., 2015; Ragu-Nathan et al., 2008).

In order to explore the composition of technostress from TCP, we chose the nomological structure of the Transaction-Based Stress Model as foundation of our research model. Correspondingly, we integrated perceived strain as the outcome variable of our research model. While we cover the selection of appropriate stressors in the next chapter, we refrain from integrating "other organisational outcomes" in support of a concise research model.

Regarding the situational factors influencing stressor impact, our study particularly investigates perceived strain in the WFH context. The worldwide pandemic-triggered shift to WFH intensively spotlights the corresponding stressors of changing work environments, including longer working hours and conflicts with private life (Gimpel et al., 2020; Waizenegger et al., 2020). Regarding WFH and employee strain, Mann and Holdsworth (2003) pointed out that WFH can lead to increased perceived stress, for example, due to loneliness and worry. Moreover, Şentürk et al. (2021) observed that an increased workload, irregular working hours, and simultaneous childcare lead to decreased physical health indicators for WFH. Other researchers previously linked the merging of work and private life in the same location to the capability of mental detachment, defined as an "individual's sense of being away from work situation" (Etzion et al., 1998, p. 579). Mental detachment occurs when individuals do not engage in work-related thoughts or feelings during off-work time (Fritz et al., 2010). In terms of actions, it is expressed in eliminating work-related activities, such as checking emails, during non-work time. A lack of distance from work means limited relief and recovery from job demands and can increase stress levels (Sonnentag et al., 2010). Recent studies linked mental detachment and technostress, demonstrating that detachment lowers perceived stress from technology (Pfaffinger et al., 2022; Zinke et al., 2023). We, however, integrate the ability to mentally detach from work during non-work time as a situational factor. Accordingly, we investigate a moderating effect to uncover the interplay between individual characteristics and technology-related stressors, shedding light on how this personal trait can influence the strength and direction of these relationships (Ghosh et al., 2020). In a similar vein, Büchler et al. (2020) demonstrated that detachment can mitigate the adverse impact of perpetual connectivity on well-being. Additionally, Cho et al. (2020) revealed that individuals who feel in control over the boundaries between work and private life experience a diminished influence of technology availability after work hours on work-family conflict.

Technostress Antecedents

It is not only the WFH environment that brings specific requirements for employees but also its infrastructure technologies. Regular technology usage can cause negative psychological and cognitive reactions toward the technologies, including

technology anxiety (Compeau et al., 1999) and technophobia (Weil & Rosen, 1995). Technology-induced stress, technostress, was first coined by psychologist Craig Brod (1984) and defined as "a modern disease of adaptation caused by an inability to cope with new computer technologies in a healthy manner" (Brod, 1984, p. 16). In the work environment, technostress can be described as "stress experienced by end users in organisations as a result of their use of information and communication technology" (Ragu-Nathan et al., 2008, pp. 417–418). It arises from monitoring possibilities, multitasking expectations, social isolation, and confusing and frustrating operations (Brod, 1984). Previous studies found that employees suffering from technostress exhibit lower commitment (Ragu-Nathan et al., 2008), productivity, and job satisfaction (Tarafdar et al., 2015). In the course of rapid workplace transformations due to the pandemic lockdowns, technostress for teleworkers has already been confirmed in various facets (Bahamondes-Rosado et al., 2023). However, none of these studies have focused on TCP as WFH-enabling technology and how its characteristics contribute to the experience of technostress. To shed light on this relevant gap in the literature, we refer to Ayyagari et al.'s (2011) research on technostress, which supplemented the Transaction-Based Stress Model with diverse characteristics of workplace technologies as stressor antecedents. Following this framework, a user's perception of technology features and properties can lead to stressors which finally generate strain (Ayyagari et al., 2011). Here, they distinguish between three types of technology characteristics: (1) usability, (2) dynamic, and (3) intrusive features. Usability (1) comprises performance-related features like usefulness, complexity, and reliability. Dynamic features (2) concern rapid changes in work environments due to technologies, and intrusive features (3) refer to disturbances due to permanent reachability and anonymity. For our research model, we focus on technology characteristics that specifically represent TCP as our study object while including each of the three characteristic types (usable, dynamic, intrusive).

(1) The usefulness of technology has historically been shown to be a dominant driver of technology adoption and can be defined as the "degree to which characteristics of technology enhance job performance" (Ayyagari et al., 2011, p. 837). Ollo-López et al. (2021) explored the components of technology usefulness for teleworkers and found, i.e., the ability to fulfil family responsibilities while simultaneously attending to job tasks and reduced travelling times contributing to perceived usefulness. High levels of usefulness have been found to reduce computer phobia and technostress (Sami & Pangannaiah, 2006). Therefore, we integrate usefulness to represent usability features.

(2) TCP are location-independent technologies as they work across devices from every geographical position (Suh & Lee, 2017). For related technologies, researchers implied feature mobility, which is defined as the "degree to which the use of a digital technology is usable in dependence of the location and enables to work from almost anywhere" (Becker et al., 2020, p. 6). Büchler et

al.'s (2020) study found that mobile devices, such as laptops and smartphones, contributed to lower employee well-being through permanent connectivity. TCP can be (but does not necessarily have to be) used on mobile devices. For example, some employees might attend video conferences on their smartphones while others use TCP only on their stationary computers in a separate room. Accordingly, whether TCP is perceived as appropriate for mobile usage depends on the user. Thus, we transfer mobility to our research model representing dynamic technology features.

(3) Due to permanent availability and responsiveness, technologies are seen as a source of interruption from work (Galluch et al., 2015). An interruption refers to any distraction that takes attention away from the current task and requires a conscious effort to return to the original task (Keller et al., 2020). These interruptions impair task processing, reduce accuracy, and thus extend the time required for task completion (Tarafdar et al., 2010). Fonner and Roloff (2012) also showed that interruptions from instant messages have a higher impact on stress for teleworkers compared to in-office employees. Thomée et al. (2011) found that individuals who communicate with short messages, as is the case with TCP, experience increased levels of stress. In his work on demands from video conferences, Riedl (2022) found virtual meetings to encourage responsiveness towards incoming distractions, such as e-mails or chats. Reflexive multitasking has been found to negatively impact performance (Madore et al., 2020) and well-being (Reinecke et al., 2017). While some researchers classified interruption as a stressor (Galluch et al., 2015), we follow Ayyagari et al.'s (2011) distinction between external technology-side stimuli and stressors as rather internal processes triggered by technology. Accordingly, since interruptions are technology-dependent, we include interruption as an intrusive technology feature in our research model.

After the technology characteristics, Ayyagari et al. (2011) extracted five stressors that can theoretically be triggered, namely (1) work-home conflict, (2) invasion of privacy, (3) work overload, (4) role ambiguity, and (5) job insecurity. Work-home conflict (1), defined as a perceived conflict between the demands of work and family, arises from competing temporal demands and spillover effects from one area of life to another. Invasion of privacy (2) accounts for the concern that organisations or third parties might access private information through technologies. Work overload (3) can be described as the perception that an assigned job exceeds a person's abilities or skills. Computer-based tasks, such as TCP usage, have particularly high mental demands due to uncertainty and the required pace of work (Tams et al., 2018). Role ambiguity (4) is considered to be the unpredictability of consequences of one's role performance and a lack of information needed to perform the work role. In addition, role ambiguity refers to uncertainty about expected work behaviour and the prioritisation of tasks (Sonnentag & Kruel, 2006). Modern approaches, such as job enlargement, lead to employees performing

several tasks (roles) in organisations. In interdisciplinary projects, these roles can relate to completely different areas, e.g., IT and sales. Job insecurity (5) emerges since technologies might replace certain workforces or imply new requirements for employees.

As suitable stressors for our research model, we firstly adopt work-home conflict, since TCP enable permanent availability, challenging private relationships with distractions and confused obligations. Secondly, we integrate work overload since computer-based tasks, such as TCP usage, involve additional demands from technological uncertainty and a perception of a higher work pace (Tams et al., 2018). As a third stressor, we chose role ambiguity as TCP could cause a lack of clarity about whether and to what extent employees have to deal with TCP issues, like chats and calls, compared to core work activities (Maier et al., 2015). For the sake of a parsimonious research model, we refrain from integrating privacy invasion and job insecurity, as these stressors cannot directly be linked to our research frame of TCP and WFH.

Hypotheses Development

In the distinctive context of WFH with TCP, we propose that perceived TCP mobility, characterised by location-independent availability and responsiveness, will positively influence perceived work-home conflict. This effect is particularly relevant in the WFH setting, where employees may check messages and notifications outside of traditional working hours and locations since they are afraid of missing information (Tarafdar et al., 2019). This intrusion into personal time can potentially lead to conflicts with family members, friends, and personal tasks, ultimately contributing to an increased perception of work-home conflict (Boswell & Olson-Buchanan, 2007). Our study seeks to explore how this relationship, observed in other digital work settings (e.g., Yun et al., 2012), may manifest in the context of telework with TCP. From this, we formulate H1:

H1:   Perceived TCP mobility is positively related to perceived work-home conflict.

When employees receive messages on their mobile devices, they feel pressured to respond and work accordingly, regardless of time and place (Tarafdar et al., 2015). Empirical evidence shows that this constant accessibility forces employees to speed up work and extend working hours (Hung et al., 2015). Likewise, permanent connectivity was found to impair well-being through the inability to disengage from work (Büchler et al., 2020). Awareness of mobile accessibility allows colleagues or clients to expect the employee to be available even outside of working hours (Porter & Kakabadse, 2006). In the WFH environment, where boundaries between work and personal life are already less clear, TCP notifications might amplify the pressure to respond immediately and to work beyond regular hours. Thus, TCP

mobility features could cause more work than traditional communication methods with more predictable patterns. We therefore hypothesise:

H2:   Perceived TCP mobility is positively related to perceived work overload.

The literature shows that teleworkers' domestic activities are demonstrably interrupted by work, which thus influences perceived work-home conflict (Delanoeije et al., 2019). In particular, interruptions such as push messages, (video) calls, or reminders are typical for TCP and entice employees to check and process them even outside working hours. Using TCP, employees have less control over when they engage in work-related communication, even if it is only to check the team chat during family dinner. This impact might manifest in the WFH setting since employees per se are closer to their private lives (e.g., partner and children), substantiating H3:

H3:   Perceived TCP interruption is positively related to users' perceived work-home conflict.

Interruptions from work furthermore interfere with task processing, for example, by reducing accuracy and prolonging task completion (Tarafdar et al., 2010). Resuming the original task then results in increased cognitive effort (Keller et al., 2020), which can result in fatigue and exhaustion (Pachler et al., 2018). Interruptions that are outside the original work task can thus lead to a decrease in user productivity and increase stress (Galluch et al., 2015). As a consequence, the multitude of interruptions can lead to user overload (Galluch et al., 2015). Earlier studies have shown that interruptions increase perceived time pressure (Sonnentag et al., 2018) as well as perceived workload (Tams et al., 2018). We suggest that TCP, by their nature, foster interruptions and multitasking as they encourage calls, chatting, and fact-checking parallel to the original work (Riedl, 2022). The connection between perceived TCP interruptions and perceived work overload is especially conceivable in the WFH setting since teleworkers are permanently close to work, so TCP interruption might impede finishing a workday (Tarafdar et al., 2015). We accordingly formulate:

H4:   Perceived TCP interruption is positively related to perceived work overload.

The constant requirement to respond to digital notifications has the effect of reducing time for actual work tasks (Ayyagari et al., 2011). Hence, demands imposed by interruptions from one role create ambiguity about which task to perform next. Here, interruptions impair the ability to establish a deeper connection to single tasks, leading to lower expectations and goal setting (Galluch et al., 2015). In the office, different business areas may be physically separated from each other. For example, departments usually hold their meetings at their own facilities so that participants physically move to the thematic area. When WFH, the setting stays the same, no matter what role an employee plays in a meeting. Through

TCP, teleworkers can constantly receive requests for varying roles. The following hypothesis is derived:

H5:   Perceived TCP interruption is positively related to perceived role ambiguity.

If used correctly, communication technologies can help employees work more efficiently, increase performance, and facilitate communication (Yun et al., 2012). When employees effectively utilise TCP features like chat functions to access organisational experts, they can streamline problem-solving and work processes, potentially reducing workload. However, applications that are not useful to work processes are considered an additional source of stress, as these can result in overload (Tarafdar et al., 2015). When relying on TCP to enable WFH, usability is even more crucial, as otherwise, additional work is required to control the system while no potential help is at hand, such as office neighbours. Furthermore, written digital communication, a common aspect of TCP, also carries a risk of miscommunication, which can result in additional work and coordination efforts (Ramirez et al., 2002). We postulate:

H6:   Perceived TCP usefulness is negatively related to perceived work overload.

Blurred boundaries between work and private life are considered an established stressor for employees (Ayyagari et al., 2011). The domestic activities of teleworkers have been shown to be interrupted by work, generating work-home conflict (Delanoeije et al., 2019). TCP are a source of permanent availability and therefore amplify this impact. In this regard, Leung and Zhang (2017) confirmed that the use of communication technologies causes the border between family and work to become more permeable. Since the positive influence of work-home conflict on strain has been empirically demonstrated before (Maier et al., 2015), we assume our research context to amplify this connection. Thus, we assume:

H7:   Perceived work-home conflict is positively related to perceived strain.

Demands from higher workloads can exceed employees' capabilities, resulting in longer working hours and causing work overload (Ahuja et al., 2007). Moore (2000) proves the positive influence of work overload on job burnout. Further studies show that perceived work overload is positively related to individuals' perceived strain from technology usage (Ayyagari et al., 2011; Galluch et al., 2015; Maier et al., 2015). Suh and Lee (2017) provide evidence of this in the WFH context. Hence, we hypothesise:

H8:   Perceived work overload is positively related to perceived strain.

The influence of role ambiguity as a work stressor is well-known and contributes to increasing user exhaustion (Moore, 2000). Individuals who experience role ambiguity report negative affective reactions to their work, emerging tensions, or anxieties

due to unclear tasks or prioritisation (Gillet et al., 2016; Sonnentag & Kruel, 2006). Especially when technologies are involved, the original work task is extended so that employees also have to deal with functionalities, updates, or technical problems. Therefore, Christ-Brendemühl and Schaarschmidt (2020) could prove that role ambiguity results in higher technostress, confirming its relevance towards perceived strain (Ayyagari et al., 2011; Maier et al., 2015). Again, Suh and Lee (2017) clarify role ambiguity as a stressor for WFH, leading to:
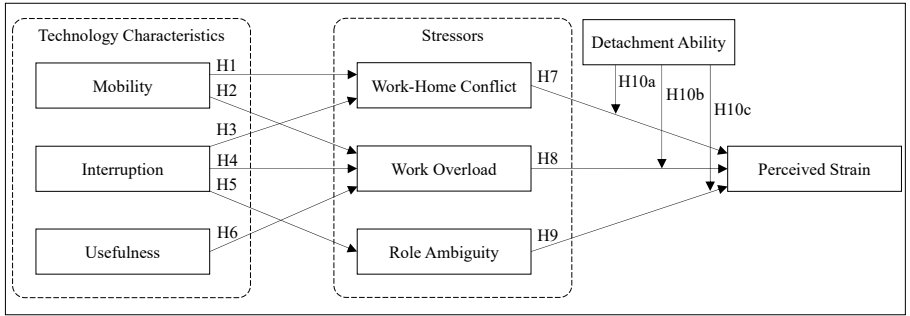
H9:   *Role ambiguity is positively related to perceived strain.*

Studies have shown that the ability to mentally detach from the job during non-work time is associated with an improvement in psychological well-being and a reduction of emotional exhaustion (Fritz et al., 2010; Sonnentag et al., 2010). In other words, if the detachment capability is low, stressors will also be present during non-work time, causing permanent strain. Teleworking with TCP introduces the challenge of constant accessibility, where work-related notifications can intrude into personal time, making the ability to mentally detach more crucial for preserving well-being. In summary, detachment ability serves as a protective mechanism, helping teleworkers maintain well-being despite the challenges posed by stressors created by the WFH and TCP context. Inserting detachment ability as a situational factor from the Transaction-Based Stress Theory, we predict:

H 10a-c: The ability to mentally detach from work during non-work time impairs the positive effect of (a) work-home conflict, (b) work overload, and (c) role ambiguity on perceived strain as a moderator.

In Figure 1, the hypotheses are transferred into the proposed research model.

Figure 1. Research Model

Methodology

Data Collection

For data collection, we conducted an online survey that took place in March 2021. We sent the survey to the managing directors and department heads of German companies from diverse sectors, including industry, retail, insurance, banks, and consultancies, and asked them to distribute the survey to their team, department, and company. We were able to generate 503 participants for our survey. To ensure valid opinions on the surveyed topic, we asked whether participants had already worked from home with TCP as a selection criterion.

Table 1. Description of the Sample

Variable	Value	n	%	Variable	Value	n	%
Age	20 and younger	3	0.6	Employment	Employee	492	97.8
	21 to 30	217	43.1		Self-Employed	11	2.2
	31 to 40	119	23.7				
	41 to 50	74	14.7				
	51 to 60	80	15.9				
	61 and older	10	2.0				
Gender	Female	297	59.1	Business Sector	Finance & Insur.	195	38.7
	Male	2051	40.7		Technology	57	11.3
					Consulting	45	8.9
					Automotive	20	4.0
	Non-binary		0.2		Health	19	3.8
					Food	13	2.6
					Other	154	30.6
TCP usage frequency	Rarely	14	2.8	TCP software (Multiple possible)	Microsoft Teams	467	92.8
	Sometimes	58	11.5		Slack	123	24.5
	Often	286	56.9		Cisco Webex	50	10.0
	Alle the time	145	28.8		Skype 4 Business	19	3.8

The sample can be described as follows. The average age is M(years)=36.2 (min.=20; max.=65). Regarding gender, 297 participants were women (59.1%), 205 men (40.8%), and one non-binary (0.2%). Our sample shows a high level of education, with 72.4% (364) having a university degree. Of the participants, 492 have worked with TCP as employees (97.8%) and 11 were self-employed (2.2%). Regarding the sector, most participants worked in financial services (38.8%), followed by technology (11.3%) and consulting (8.9%). When asked which TCP software participants used on a regular basis, the most named providers were Microsoft Teams (467 mentions / 92.8%), Slack (123 / 24.5%), and Cisco (50 / 10.0%). Concerning TCP usage frequency, 14 participants (2.8%) stated they used TCP rarely, 58 (11.5%) sometimes, 186 (56.9%) often, and 145 (28.8%) all the time. Overall, the sample represents the population of people possibly working from

home with TCP to a sufficient degree; associated limitations of generalizability will be addressed in the last chapter.

Operationalisation

For construct measurement, we used high-quality scales that are well-established in the literature and have already been validated (see Appendix for the question-naire). We adjusted the scales' wording to the context of using TCP and WFH. Scales from different researchers were used to query technology characteristics. As explained before, we focus on the individual perception of the relevant technology characteristics. For mobility, the scale of Becker et al. (2020) was adopted. To measure interruption perception, we applied the scale of Galluch et al. (2015), who examined interruptions at work. We used the scales of Ayyagari et al. (2011) to measure usefulness, the stressors of work-home conflict, work overload, role ambiguity, and the outcome variable perceived strain. For the moderator mental detachment ability, we applied the items of Sonnentag and Fritz (2007), who validated this scale to assess recovery from work. For all items, we used seven-point Likert scales, as this reaches the upper limits of reliability (Nunnally, 1978).

Results

Measurement Model

To validate the proposed research model, we used structural equation modelling with the partial least square approach (PLS-SEM). This technique has especially proven suitable for testing complex path models with latent variables (Benitez et al., 2020). We set the algorithm of the statistical software SmartPLS 3 to a path weighing with a maximum of 1000 iterations and a stop criterion of 10-7. To examine the validity and reliability of the measurement model, we consulted the recommended indices, comprising Cronbach's alpha (α), composite reliability (CR), convergent validity, and discriminant validity.

To confirm convergent validity, outer factor loadings (FL) should be greater than.708 (Hair et al., 2019), composite reliabilities should exceed.8 (Nunnally, 1978), and the average variance extracted (AVE) is recommended to be.5 at least (Barclay et al., 1995). Table 2 illustrates that all criteria for reliability and conver-gent validity were met.

Table 2. Descriptive Statistics, Reliability, and Convergent Validity of the Measurements

Construct	Item	FL	M	SD	A	CR	AVE
Mobility	MB1	.742	5.414	1.805	.758	.845	.577
	MB2	.768	6.157	1.308			
	MB3	.763	5.893	1.434			
	MB4	.765	5.877	1.434			
Interruption	IP1	.912	3.871	1.760	.918	.948	.859
	IP2	.935	3.706	1.811			
	IP3	.933	3.602	1.796			
Usefulness	US1	.836	5.147	1.323	.903	.930	.768
	US2	.852	4.710	1.385			
	US3	.915	5.316	1.302			
	US4	.901	4.799	1.521			
Work Home Conflict	WH1	.880	3.793	2.050	.905	.940	.840
	WH2	.948	2.901	1.835			
	WH3	.920	2.686	1.813			
Work Overload	WO1	.857	3.078	1.785	.892	.934	.824
	WO2	.943	3.304	1.852			
	WO3	.921	3.197	1.894			
Role Ambiguity	RA1	.878	3.022	1.674	.909	.936	.784
	RA2	.898	2.801	1.642			
	RA3	.895	2.807	1.733			
	RA4	.872	3.133	1.872			
Detachment Ability	DT1	.903	4.302	1.816	.899	.929	.766
	DT2	.876	3.535	1.820			
	DT3	.867	4.262	1.846			
	DT4	.854	5.165	1.655			
Perceived Strain	ST1	.939	3.133	1.865	.949	.963	.867
	ST2	.954	3.211	1.908			
	ST3	.903	3.388	2.012			
	ST4	.928	2.827	1.828			

Note. M=Mean, SD=Standard Derivation, α=Cronbach's Alpha, FL=Factor Loadings, CR=Composite Reliability, AVE=Average Variance Extracted

We tested discriminant validity to examine whether construct indicators differed from each other. According to the Fornell-Larcker criterion, it can be evinced by comparing the square roots of the AVEs with the corresponding off-diagonal inter-construct correlations (Fornell & Larcker, 1981; Henseler et al., 2015). As shown in Table 3, the AVE square roots exceed the corresponding inter-construct correlations, ascertaining discriminant validity for all constructs. Additionally, we consulted the heterotrait-monotrait ratio (HTMT, Table 4) to verify discriminant validity and observed that all values ranged within the recommended threshold of under .85 (Henseler et al., 2015).

Table 3. Inter-construct correlations and square roots of AVE

	MB	IP	US	WH	WO	RA	DT	ST
MB	.760							
IP	.079	.927						
US	.276	-.046	.877					
WH	.159	.507	.041	.917				
WO	.099	.630	-.090	.636	.908			
RA	.099	.570	.029	.633	.716	.886		
DT	-.048	-.333	.002	-.523	-.453	-.394	.875	
ST	-.014	.529	-.160	.579	.705	.674	-.377	.931

Note. MB=Mobility, IP=Interruption, US=Usefulness, WH=Work-Home-Conflict, WO=Work Overload, RA= Role Ambiguity, DT=Detachment Ability, ST=Perceived Strain

Table 4. HTMT values

	MB	IP	US	WH	WO	RA	DT
IP	.094						
US	.329	.064					
WH	.190	.554	.056				
WO	.121	.696	.092	.705			
RA	.117	.620	.072	.694	.792		
DT	.065	.363	.044	.564	.497	.422	
ST	.032	.565	.165	.621	.766	.721	.398

Note. MB=Mobility, IP=Interruption, US=Usefulness, WH=Work-Home-Conflict, WO=Work Overload, RA= Role Ambiguity, DT=Detachment Ability, ST=Perceived Strain

Structural Model

To refute concerns of collinearity and common method bias, we computed variance inflation factors (VIF). Since none of the VIF values in Table 5 exceeds the threshold of 3.3, our structural model can be assumed as free of collinearity and common method issues (Hair et al., 2019; Kock, 2015).

According to Benitez et al. (2020), we can proceed with the path analysis of the structural model. Here, we applied determination coefficients and cross-validated redundancy and undertook bootstrapping to test the coefficient's significance on a p<.05 level. The analysis showed a variance explained of R^2=.573 for strain as the outcome variable, indicating a variance explanation that aligns with the values from related studies (Ayyagari et al., 2011).

Table 5. VIF Values

	WO	WH	RA	St
MB	1.092	1.006		
IP	1.011	1.006	1.000	
US	1.088			
WH				2.106
WO				2.375
RA				2.306
DT				1.424

Note. MB=Mobility, IP=Interruption, US=Usefulness, WH=Work-Home-Conflict, WO=Work Overload, RA= Role Ambiguity, DT=Detachment Ability, ST=Perceived Strain

Regarding technology characteristics, TCP mobility demonstrated a positive correlation with work-home conflict (H1, path coefficient =.119***) and work overload (H2, path coefficient=.073*). TCP interruption was significantly linked with work-home conflict (H3, path coefficient=.497***), work overload (H4, path coefficient=.620***), and role ambiguity (H5, path coefficient=.570***). As the third TCP feature, usefulness displayed a negative association with work overload (H6, path coefficient=-.081*). Among stressors, work overload correlated most strongly with perceived strain (H8, path coefficient=.417***), followed by role ambiguity (H9, path coefficient=.285***) and work-home conflict (H7, path coefficient=.116*). These results lead to confirming Hypotheses 1-9. Testing control variables, our analysis revealed that age (path coefficient=.032, p=.304), gender (path coefficient=.000, p =.995), and education (path coefficient=-.046, p =.167) did not demonstrate significant associations with perceived strain.

An additional mediation analysis revealed the indirect effects of all three technology characteristics on the strain. The mediated effect of mobility via work-home conflict and work overload was significant (p<.05*) and partial, as well as the indirect negative effect of usefulness via work overload (p<.05*). The indirect effect of interruption via work-home conflict, work overload, and role ambiguity was highly significant (p<.001***) and indicated a full mediation.

To test the hypothesised moderation effect of detachment ability (H10 a-c), we applied the product indicator approach, as it is recommended for models with latent variables (Fassott & Henseler, 2015). It computes the products of each indicator of the latent independent variable with each indicator of the moderator variable. All potential pairwise products then become the indicators of the latent interaction variable (Henseler & Chin, 2010). Of the resulting interaction variables, only the moderation on the effect of role ambiguity was significant (H10c, path coefficient=-.131**). As hypothesised, the analysis shows that an increased detachment ability mitigates the connection between role ambiguity and strain, confirming H10c (see Figure 2). In contrast, the moderation on work-home conflict (H10a,

path coefficient=.072, n. s.) and work overload (H10b, path coefficient=.026, n. s.) were not significant, resulting in rejecting H10a and H10b. Figure 3 summarises the results of all described tests.

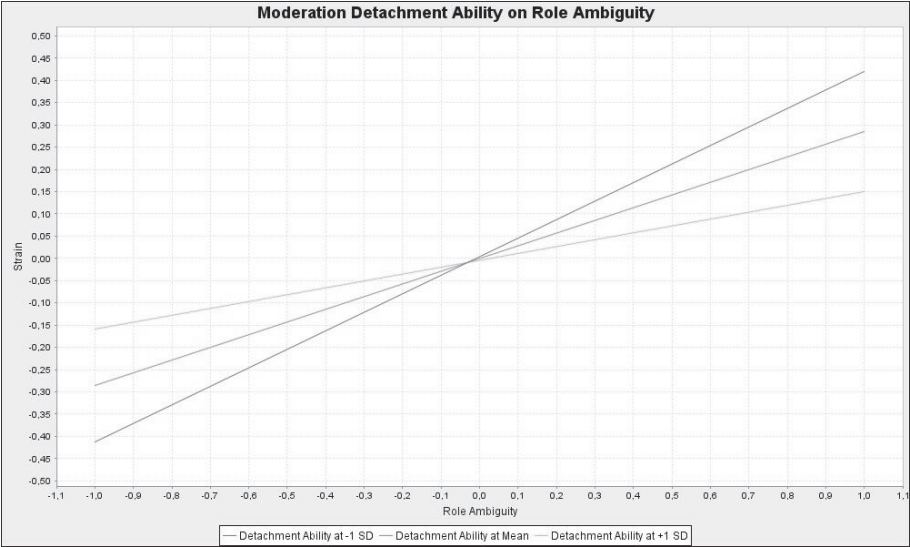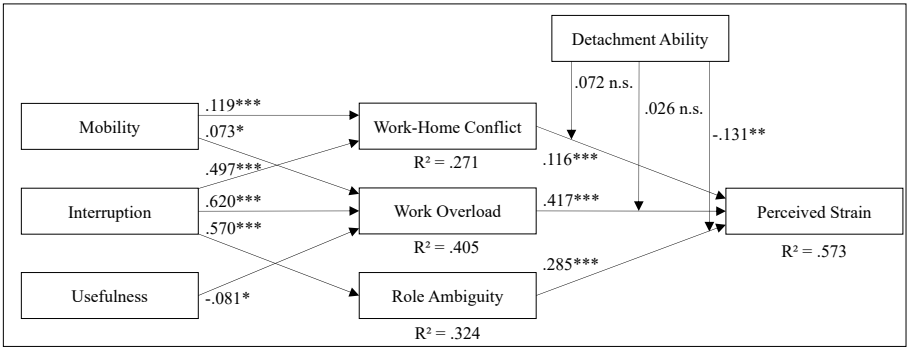**Figure 2. Moderating Effect of Psychological Detachment from Work on Role Ambiguity**

Figure 3. Structural Model Results

Discussion

Summary of Investigation

This paper aims to identify factors that predict perceived strain from TCP among teleworkers. The model of this paper is based on the widely used Transaction-Based Stress Theory and its extension towards technostress (Ayyagari et al., 2011). We found the technology characteristics of mobility, interruption, and usefulness to

foster the proposed work-related stressors of work-home conflict, work overload, and role ambiguity. These stressors, in turn, lead to increased perceptions of strain among employees. However, the effect of role ambiguity on strain was found to be weakened if the person can psychologically detach from work (moderation of detachment ability). In summary, it can be concluded that TCP usage does impact employee well-being, which must be considered by organisations.

Theoretical Implications

By examining the interplay between TCP technology characteristics (mobility, interruption, and usefulness), stressors (work-home conflict, work overload, and role ambiguity), and perceived strain, we enrich the Transaction-Based Stress Theory by Lazarus and Folkman (1984) with empirical data specific to digital telework. In doing so, we also contribute to the validation of the technostress framework proposed by Ayyagari et al. (2011). This extension helps to tailor the framework to the evolving work landscape characterised by increased remote work and reliance on digital communication. The theoretical implication of this paper consists of the unique combination of its three major components. First, to the best of our knowledge, it is the first study to investigate technostress from TCP characteristics, a main driver of digital workplaces. Second, we confirm that technology characteristics and stressors operate in the WFH environment, representing a pandemic-accelerated organisational trend. Third, the moderation of psychological detachment from work was successfully implemented as a buffer of stressor impact.

As noted, various technology characteristics had previously been linked to work-related strain. These studies produced divergent results depending on the investigated technologies and settings. Our findings, especially the identification of mobility as stress-inducing, align with the notion of the connectivity paradox, according to which technologies increase and decrease the perceived distance to work (Fonner & Roloff, 2012). Furthermore, the impact of interruption is especially relevant as technologies create a work culture in which barriers to contacting colleagues about minor issues are minimised. On the other hand, consistent with previous studies on technostress, the results revealed that TCP can reduce work overload when it is perceived as useful. The effect of usefulness indicates that TCP if used correctly, can also have positive effects on employee mental well-being, which could be examined in more detail in subsequent research. For example, the Job Demands and Resources Model (Bakker & Demerouti, 2007), which also looks at the motivating effect of new work environments, could be used for this purpose. Finally, our study contributes to establishing the characteristics of the presented technology in future research on TCP.

People's individual experiences of stressors can vary widely. Some individuals may thrive in a WFH environment, while others struggle with the unique stressors it presents. Our study acknowledges and explores these individual differences,

shedding light on how detachment ability can moderate the impact of stressors on perceived strain. Investigating the influence of detachment from work during non-work time as a moderator represents a further extension of the model towards the WFH environment. The moderation effect could buffer the effect of stressor role ambiguity. This means that strain from unclear task prioritisation, especially between TCP handling and actual work, is lower in people with high detachment ability. For the other stressors, work-home conflict and work overload, the moderating effect of detachment ability could not be confirmed, which contrasts with previous studies (e.g., Moreno-Jiménez et al. (2009)).

With the validation of ten hypotheses and a notable degree of explained variance, this modified model elucidates the strain arising from the use of non-office technologies. Our model brings together technostress, telework, and research on detachment as established research domains in the field of employee psychology. Therefore, our study underscores that technostress transcends physical office settings and manifests when utilising TCP in a remote work environment, thus contributing new insights to the growing body of literature on this topic.

Practical Implications

For organizations, it is important to derive recommended actions on how the well-being of teleworkers using TCP can be increased. To this end, awareness of technostress, its causes, and consequences must be cultivated (Tarafdar et al., 2015). For implementing TCP and related technologies in an as human- centered way as possible, we present the following suggestions.

As employees can no longer leave their work at the office, both work-home conflict and work overload intensify with the increasing mobility of technologies. However, mobility aspects are essential for WFH and provide beneficial arguments, particularly more freedom for employees. It is, therefore, inappropriate to recommend restricting mobility components. Instead, our results should once more raise awareness that WFH and its accompanying technologies might not be suitable for every individual or might influence employees' mental health. In our analysis, interruption had a major impact on all stressors, which proves the harmful relevance of distracting notifications and off-topic requests. Organisations could promote TCP-free timeslots (Tarafdar et al., 2015) or "do not disturb" functions, which are available in the investigated TCP. However, it was also shown that mental health is strengthened through informal communication with colleagues (Qin & Men, 2022). To avoid this informal exchange being perceived as too much of an interruption, companies could also fix time slots for, e.g., digital coffee breaks.

The negative impact of usefulness on perceived work overload holds the potential for organisations to reduce work-related strain. In this regard, Oksanen et al. (2021) refer to the fostering of technological abilities to reduce technostress. To utilise the positive effect of usefulness, we refer to the conceptualisation of Ragu-Nathan et

al. (2008). According to this, (1) technical support for TCP should be offered, (2) TCP literacy should be increased (e.g., through training), and (3) general involvement in new technologies should be strengthened (e.g., through incentives). Thus, training sessions can be used to show employees how to use TCP in a beneficial way, as this promotes intrinsic motivation (Sami & Pangannaiah, 2006).

The stressors of work-home conflict, work overload, and role ambiguity could be confirmed to increase perceived strain among TCP users when WFH. Work-home conflict was found to be a fostering stressor in this study. Organisations could block access to TCP outside of core working hours to protect personal lives from TCP intrusion. For a healthy work-life balance, it is necessary to clearly communicate expectations for accessibility and communication guidelines (Richter & Richter, 2020). TCP policies can help users to better manage the increasing demands from private and professional spheres and their overlaps. For example, managers should not send e-mails to employees outside of working hours, as this creates stronger expectations of availability (Derks et al., 2015). The objective should furthermore be to reduce the perceived workload from technology usage. This means that organisations should ensure that employees' TCP usage is appropriate to their skills or qualifications. Having contact persons available or mandatory training on how to use TCP, rather than one-time and generalised technical training, could be supportive (Tarafdar et al., 2015). Perceived role ambiguity can be tackled, for example, through clear requirements for working hours and tasks. Training for efficient time management or policies that require workers to devote a certain amount of time to their original work can also help reduce role ambiguity (Gillet et al., 2016).

Moreover, it has been shown that the ability of users to mentally detach from work during their non-work time buffers the impact of stressors, in our case, role ambiguity. As a result of a lower stressor impact, increased work engagement and performance can be expected (LeBlanc, 2009; Sonnentag et al., 2010). The goal is, therefore, to strengthen the ability of teleworkers to mentally detach and thus reduce perceived strain. To this end, organisations could offer special training programs on detachment or recreational activities, such as sports programs or cultural and social activities outside of work (Sanz-Vergel et al., 2011).

Limitations and Future Research

Although our study provides essential insights, it is not free of limitations. Our results are predominantly relevant to jobs or sectors where WFH is a conceivable format. Regarding the sampling, the overrepresentation of highly educated participants (72.4% with a university degree) could imply a perspective on technostress that may not align with employees with lower educational attainments. Likewise, the sample age skews young. For example, communication styles, digital literacy, or the family situation at home might differ compared to underrepresented demographic groups, impacting TCP technostress perception. Nevertheless, it is important to

note that our sample remains representative of the population of individuals who have experience with teleworking using TCP, which has become increasingly prevalent, especially in knowledge-based industries. Therefore, the insights derived from this sample offer valuable contributions to our understanding of the phenomenon despite a limited generalizability.

Successfully establishing innovative approaches for workplaces requires adjustments to existing organisational cultures and the leadership paradigm. Even though technology can facilitate virtual teamwork, it poses new problems due to constant connectivity and technostress (Richter & Richter, 2020). Despite the identified challenges, the literature points out that technology-induced strain can have not only negative but also positive effects (Tarafdar et al., 2019). For future research, it might be insightful to investigate how these positive effects can be achieved with TCP usage.

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Appendix – Questionnaire

Variables		Items	Source
Mobility (MB)	MB1	The use of TCP is not limited to my workplace.	Becker et al. (2020)
	MB2	The use of TCP is not limited to a specific location.	
	MB3	TCP can be accessed from anywhere.	
	MB4	TCP allow me to work from anywhere.	
Interruption (IP)		When working from home, …	Galluch et al. (2012)
	IP1	I was interrupted too often by TCP.	
	IP2	I experienced many distractions from TCP.	
	IP3	The interruptions from TCP were frequent.	
Usefulness (US)		When working from home, …	Ayyagari et al. (2011)
	US1	TCP allow me to complete tasks faster.	
	US2	TCP improve the quality of my work.	
	US3	TCP make my work easier.	
	US4	TCP increase my effectiveness.	
Work Home Conflict (WH)	WH1	TCP blur the lines between my professional and private life.	
	WH2	TCP lead to conflicts with private tasks.	
	WH3	I don't get everything done at home (privately) because of TCP.	
Work Overload (WO)		When working from home, …	
	WO1	TCP cause more inquiries, problems, or complaints in my job than I would otherwise experience.	
	WO2	I feel busy or rushed by TCP.	
	WO3	I feel pressured by TCP.	
Role Ambiguity (RA)		When working from home, …	
	RA1	I am unsure if I need to deal with issues of TCP or with my actual work activities.	
	RA2	I am unsure what to prioritize: Dealing with problems of TCP or my actual work activities.	
	RA3	I cannot allocate time properly for my work activities because my time spent on TCP varies.	
	RA4	The time I spend with TCP reduces the time I have to complete my work tasks.	
Detachment Ability (DT)	DT1	In my free time, I forget about work.	Sonnentag & Fritz (2007)
	DT2	In my free time, I don't think about work at all.	
	DT3	In my free time, I distance myself from my work.	
	DT4	In my free time, I give myself a break from the demands of work.	
Perceived Strain (ST)		When working from home, …	Ayyagari et al. (2011)
	ST1	I feel drained from TCP activities.	
	ST2	I feel tired from my TCP activities.	
	ST3	Working with TCP all day is a burden for me.	
	ST4	I feel burned out from my TCP activities.	