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Exploring the Relationship Between Techno-Unreliability at Work and Burnout

Sophie-Charlotte Meyer, PhD and Anita Tisch, PhD

Objective: With the growing dissemination of digital technologies in the workplace, technologies itself and related factors are increasingly discussed as an additional source of work stress, often referred to as technostress. This article explores whether techno-unreliability as a dimension of technostress is associated with burnout. **Methods:** We perform linear regression analyses based on a large representative sample of German employees collected in 2019. We distinguish between information and communication technology users ($n = 4702$) and tool users ($n = 1953$). Interaction models explore whether individual and workplace-related factors might moderate the relationship. **Results:** The results indicate that the more frequently employees experience techno-induced interruptions (as an indicator for techno-unreliability), the stronger their burnout symptoms. Interaction models reveal that social support and job autonomy might buffer this association. **Conclusions:** Ensuring reliable technology and technical support can reduce employee stress.

Keywords: technostress, techno-unreliability, techno-induced interruptions, burnout, mental health, exhaustion, disturbances, ICT use, digital work, affinity for technological interaction

CME Learning Objectives

After completing this enduring educational activity, the learner will be better able to:

- Describe the concept of "technostress".
- Explain how techno-unreliability is associated with burnout.
- Discuss how social support and job autonomy might help to buffer the association techno-induced stress and employee burnout.

A number of large cross-industry representative studies in various European countries show that burnout is widespread and increasingly prevalent in the working population.[1] As included in the newest version of the *International Classification of Diseases*, *11th Revision*, burnout is conceptualized as a "syndrome" that results from "chronic workplace stress that has not been successfully managed."[2] Given the relevance of burnout in the work context, understanding its relationship to modern workplace dynamics is essential. With the growing dissemination of digital technologies in the workplace, technologies themselves and related factors are increasingly discussed as an additional source of work stress potentially impairing employees' mental health,[3–6] sometimes referred to as "the dark side of technology."[7] In this context, the term technostress has become established and Tarafdar et al.[8] most notably proposed a model to conceptualize different sources of technology-related stress, the so-called technostress model. Apart from looking only at the direct effects that working with new technology involves, the technostress model emphasizes indirect effects on mental health related to the technology at the intersection between technology, the organization, and the employee. Specifically, Tarafdar et al.[8] distinguish the following five different dimensions of technostress in the workplace: *techno-overload*, *techno-complexity*, *techno-insecurity*, *techno-uncertainty*, and *techno-invasion*. Building on this model and the recent literature, Dragano and Lunau[9] added the following three additional dimensions: *techno-unreliability*, *technological workplace surveillance*, and *stress in human-machine interaction*.

Even though the technostress model provides important aspects for categorizing the effects of digital technologies on employees' well-being, it is still a young field of research and the theory is not fully developed yet. For instance, the proposed categories partly overlap and confuse different concepts and levels of the technology-stress association. In some of them, technology is merely a precursor to other well-established work-related stressors, while in other categories, technology is the primary stressor.[9] Delimited availability of categories and indistinct underlying mechanisms pose a particular challenge for operationalization in empirical studies.

However, several empirical studies have already been carried out. Some studies consider the mere use of (new) technologies, especially information and communication technologies (ICT), as a stressor at work.[3,10,11] Others, look specifically at job demands changed by technology[4,12,13] and thus also consider different dimensions of the technostress model. The empirical findings are summarized in at least three recently published literature reviews,[4,10,11] which also reflect the hitherto largely unclear relationship between ICT use and burnout.[3,13,14] A meta-analysis by Baumeister et al.[10] focuses on studies that examine the relationship between work-related ICT use and employee well-being, that is, burnout and engagement. Focusing on these two opposing outcomes, the authors emphasize the importance of ICT use as both, a resource and a demand. They find that ICT use is related to burnout while job autonomy, as a resource, and work-life conflict, as a demand, seem to mediate this relationship. Although Baumeister et al.[10] consider different factors also found in the technostress literature, they refrain from discussing their findings regarding the technostress model in greater detail. Taking a more specific focus on studies exploring different dimensions of the technostress model, a literature review by Borle et al.[4] finds that different dimensions of technostress are consistently related to adverse mental health. However, the authors note that most of the studies either focus on specific dimensions of technostress, particularly on techno-overload and

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techno-invasion, or on a summary index or composite score. Focusing on an index might lead to aggregation bias and makes it difficult to assess the role of different dimensions of technostress,[4] which is important for successfully reducing sources of technostress and adapting healthy work designs. For this reason, previous studies emphasize the need to explore other dimensions of technostress that have hardly been researched so far. Moreover, existing studies mostly rely on small and very specific samples, for example, IT workers (for an overview, see the studies by Borle et al.[4] and Dragano and Lunau[9]), making it difficult to generalize the results for a broader working population. As a consequence, many previous studies seem to suffer from a "socioeconomic sampling bias,"[15] as employees with higher socioeconomic positions are overrepresented in smaller studies on technostress.

Given the difficulties associated with the measurement of technostress and possibly due to limited data availability, empirical evidence is still inconclusive, especially with regard to other specific indicators of technostress, such as *techno-unreliability*. Techno-unreliability describes an individual's experience of an unreliable digital technology used, for example, in terms of technical breakdowns or errors.[9,16] Some studies examine interruptions at work in general, for example, by family in the context of telecommuting[15] or interruptions by phone calls or incoming emails.[17] However, interruptions that occur because of the technology or technical errors itself in terms of techno-unreliability have been less studied.

Against this background, the present study examines *techno-unreliability* a recently proposed but underexplored dimension of technostress,[9] to address this gap. Specifically, we empirically explore whether techno-unreliability operationalized by techno-induced interruptions is associated with burnout. In doing so, we contribute to the existing (empirical) literature on how different dimensions of technostress are related to employee burnout (and mental health in general) in two ways:

First, we base our analyses on a large telephone survey "Digitalization and Change in Employment (DiWaBe)" collected in 2019, which is representative for German employees. Previous studies, and the technostress model itself, mainly refer to (high-qualified) ICT users. However, the likelihood of automation has been found to differ considerably across tasks,[18] and the diffusion as well as the usage of digital technologies varies across industries, occupations, and task requirement levels. It can thus be assumed that technostress also differs between different groups of employees. The data cover different occupational and socioeconomic groups allowing us to distinguish between employees predominantly working with ICT ($n = 4702$) and those who mainly work with tools, equipment, or machinery ($n = 1952$). Performing separate analyses for these two groups of employees, we are able to explore the relationship between techno-unreliability and burnout not only for white-collar ICT users but also for employees who perform manual work. Our results are thus supposed to be less selective and valid for a broader group of employees.

Second, we also make some effort to explore which (individual) coping characteristics might buffer or strengthen the relationship. We draw on the JD-R model,[19,20] which assumes that employee well-being is determined by the interaction of job demands and resources. Job demands refer to aspects of work that require sustained effort, such as workload and time pressure. On the other hand, job resources are related to employee engagement and support. Evidence suggests that especially job autonomy and social support relate to employee well-being and might act as buffers against job demands.[21] While greater levels of job autonomy are often considered to be beneficial, it should also be acknowledged that autonomy may sometimes lead to overload and excessive demands, depending on the specific design of working conditions. Recently, these job- or task-related resources have been found to be important for the relationship between (other dimensions of) technostress and mental health.[14,17,22] As indicators for job autonomy and social support are also available in the data at hand, we explore these factors in interaction models. Apart from these job-related resources, we also examine how individual characteristics might help to cope with technostress at work, that is, self-efficacy and affinity for new technologies. Self-efficacy generally plays an important role in enhancing the perception of control, as it decreases the intensity of felt stress and aids individuals in managing their emotional reactions and adapting to increasing pressure.[23,24] Recent studies also highlight the relevance of (technological) self-efficacy in the context of technostress and employee well-being.[13,25] Moreover, the affinity for new technologies is increasingly discussed as a potential (new) resource in the context of digital work environments.[26] The affinity for technologies indicates the goodness of fit between the individual and the work requirement with regard to interaction with digital technology.[26,27] Because both factors, self-efficacy and affinity for technologies, are also available in the data, we explore whether these individual characteristics are important for the correlation between technostress and burnout.

Overall, we add to the existing literature by making a first step to empirically test an underresearched or new dimension of the technostress model based on a large representative sample of employees (ICT users and tool users) and also provide some empirical evidence on characteristics that might help to cope with the technostress experienced.

DATA AND METHODS

Data Source

We draw on the German telephone survey "Digitalization and Change in Employment (DiWaBe)" conducted in 2019[28]. Data from the DiWaBe survey are made available to researchers via on-site use including remote data access. See https://fdz.iab.de/en/our-data-products/individual-and-household-data/diwabe/ for further information. The focus of the survey was on the dissemination of digital technologies in the German working world and its correlations with social, organizational, and health-related factors. The data include approximately 8000 employees from approximately 2000 German manufacturing and service companies, who had already participated in a representative company survey in 2016 (see Table A4 in Supplemental Digital Content 1, http://links.lww.com/JOM/B447, for details on the number of missing values). For the analyses, we restrict the sample to currently employed individuals up to the age of 65 years with valid information on the main variables included. The data allow us to distinguish between employees predominantly working with ICT (ICT users, $n = 4702$) and those who mainly work with tools, equipment, or machinery (tool users, $n = 1952$). This is important, as technology-related stress likely differs across workplaces and between users of different work equipment, and both groups might also differ in their ways of coping with techno-induced interruptions.

Measures

We focus on burnout as outcome variable as this is highly relevant in gauging employees' mental well-being and work-related stress levels. The data include a screening scale for burnout symptoms based on the established Copenhagen Psychosocial Questionnaire capturing the dimension of exhaustion. For the German version of the instrument, see the study by Nübling et al.[29] Researchers previously noted that exhaustion is the core component of burnout, while factors such as accomplishment and depersonalization are related but not integral to the definition of burnout.[13,30] Consistent with this perspective and in line with previous studies (eg, the study by Yener et al.[13]), our study focuses solely on the emotional exhaustion dimension of Maslach et al.'s[31] inventory as a measure of burnout (see Table A1, Supplemental Digital Content 1, http://links.lww.com/JOM/B447, for a translated wording of the questions).

The respondents were asked three questions regarding exhaustion with a response scale distinguishing never (0), rarely, sometimes, frequently, and always (4). Based on these three items (Cronbach $\alpha =$

0.86) we generate a burnout sum score [0;12] with higher values corresponding to stronger burnout symptoms. To check the sensitivity, we also apply alternative operationalization taking the average burnout scale by calculating the arithmetic mean over the three items on exhaustion. Based on this, we also generated an indicator variable that equals 1 if this average burnout scale is ≥3 and 0 otherwise.

Regarding technostress, we consider the frequency of experiencing technology-related interruptions as an indicator of techno-unreliability, a newly proposed yet underexplored dimension of technostress. Again, respondents could answer on a five-point scale with higher values indicating more technostress (0: never, rarely, sometimes, often, and 4: always). Although this variable is ordinal, we treat techno-induced interruptions as quasi-metric in the analyses. To assess the potential bias, we conduct sensitivity analyses including alternative operationalization with different assumptions about the scale's nature (see Section "Robutsness Analyses", p. 4) leading to similar conclusions.

As potential moderating factors that might help employees to cope with technostress, we consider individual factors, such as self-efficacy or the affinity for technological interaction, but also workplace- and job-related factors, such as social support (colleagues, supervisor) as well as job autonomy. These factors have been found to be relevant in buffering the impact of job demands on burnout.[21] For self-efficacy, the data include a scale consisting of three items (see Table A1, Supplemental Digital Content 1, http://links.lww.com/JOM/B447) indicating the individual's confidence to be able to cope with difficult or challenging situations. The implemented Affinity for Technology Interaction Short Scale (ATI-S)[32] consists of four items (see Table A1, Supplemental Digital Content 1, http://links.lww.com/JOM/B447) indicating the individual's affinity for new technologies. The scales are calculated using the mean value over the respective five-level items (0: never, rarely, sometimes, often, and 4: always). For the analyses, we generate two dichotomous variables indicating whether the respondents have a score of 3 or more pointing to an individual's self-efficacy or affinity for technological interaction.

Regarding social support, the respondents were asked in two separate questions how often they receive support from their immediate supervisor and how often they are supported by their colleagues when needed. With respect to job autonomy, we rely on a question asking how often the respondents are able to schedule their own work. Regarding these variables, the respondents could again choose on a scale between never (0), rarely, sometimes, often, and always (4). To keep it simple, we consistently recoded these variables into dichotomous variables (1: always, frequently vs. 0: sometimes, rarely, never).

In all analyses, we also control for several factors that are likely associated with both techno-induced interruptions and burnout. Specifically, we control for gender, age group dummies (<35, 35–49, and ≥50 years), four dummies for completed qualification (no degree, apprenticeship/vocational training, master/technician, university degree), and a dummy whether the respondent is full- or part-time employed. Because techno-related stress likely differs between industries or occupations, we also control for 14 occupational segments based on a clustering of the official German classification of occupations KldB 2010.[33] Table 1 summarizes the mean values of the relevant variables for both samples, ICT users and tool users.

TABLE 1. Sample Statistics

	ICT Users	Tool Users
Burnout		
Burnout score [0;12]	3.637	3.928
Average burnout scale [1;5]	2.215	2.310
Burnout indicator (≥3) [0;1]	0.252	0.313
Techno stressors [0;4]		
Technology-induced interruptions: never	0.072	0.064
Technology-induced interruptions: rarely	0.569	0.536
Technology-induced interruptions: sometimes	0.228	0.265
Technology-induced interruptions: frequently	0.120	0.126
Technology-induced interruptions: always	0.010	0.010
Sociodemographics		
Female	0.433	0.293
Age: <35 yr	0.167	0.207
Age: 35–49 yr	0.403	0.410
Age: ≥50 yr	0.430	0.383
Qualification: no degree	0.052	0.057
Qualification: apprenticeship/vocational	0.464	0.490
Qualification: master/technician	0.146	0.181
Qualification: university degree	0.337	0.273
Full-time employment (≥ 35 hr/wk)	0.796	0.869
Occupation (KldB segments)		
Occupations in agriculture, forestry and horticulture	0.024	*
Manufacturing occupations	0.047	0.123
Occupations concerned with production technology	0.163	0.292
Occupations in building and interior construction	0.047	0.081
Occupations in the food industry, in gastronomy and in tourism	0.017	0.025
(Non)medical health care occupations	0.089	0.125
Service occupations in social sector and cultural work	0.083	0.071
Occupations in commerce and trade	0.060	0.051
Occupations in business management and organization	0.165	0.055
Business related service occupations	0.165	0.020
Service occupations in the IT sector and the natural sciences	0.008	0.087
Safety and security occupations	0.009	*
Occupations in traffic and logistics	0.075	0.055
Occupations in cleaning services	*	*
Moderators		
Affinity for technological interaction (ATI-S, ≥3) [0;1]	0.486	0.410
Self-efficacy (≥ 3) [0;1]	0.721	0.743
Social support from supervisor: always/frequently [0;1]	0.662	0.632
Social support from colleagues: always/frequently [0;1]	0.836	0.828
Job autonomy (schedule own work): always/frequently [0;1]	0.770	0.680
n	4,702	1,953

ICT, information and communication technologies.
*Sample size too small ($n < 30$); Source: DiWaBe 2019, weighted results.

Method

We perform ordinary least squares regression (OLS) treating the outcome on burnout as well as techno-induced interruptions as continuous variables. Given the ordinal nature of the variable ranging between 0 (never) and 4 (always), we included techno-induced interruptions nonlinearly as an indicator variable (Section "Robustness Analyses" and Table A5 Supplemental Digital Content 1, http://links.lww.com/JOM/B447) or as separate dummy variables in an additional robustness check, rendering very similar conclusions (cf Table A3, Supplemental Digital Content 1, http://links.lww.com/JOM/B447). One exception is the regression model taking the dichotomous burnout indicator as dependent variable for which we therefore apply linear probability models. Estimating robust standard errors clustered over 1324 companies allows us to take the nested structure of the data (ie, employees nested in companies) into account. Ignoring the clustering of the data and treating the data as independent observations might lead to biased results, for example, inaccurate estimates or a potential underestimation of standard errors. To examine whether certain workplace-related and individual factors might buffer or amplify the relationship, we include (linear) interaction terms between techno-induced interruptions (continuous variable) and the moderator variables (indicator variables) in additional analyses. We perform all

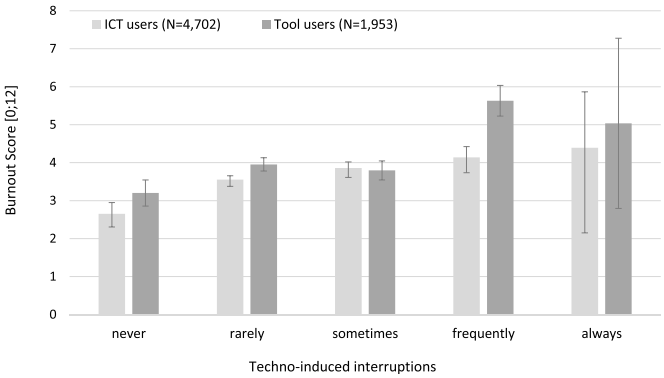

FIGURE 1. Techno-induced interruptions and burnout. Error bars represent the 95% confidence intervals. Source: DiWaBe 2019, weighted results.

analyses separately for ICT users and tool users to take compositional differences, for example, regarding health status and sociodemographic characteristics into account. However, because of differences in sample size, demographic characteristics, and occupational contexts between ICT users and tool users, interpretations of between-group differences should be made with caution.

RESULTS

Descriptive Evidence

Figure 1 displays the raw relationship between techno-induced interruptions at work and burnout separately for ICT users and tools users. In general, the figure suggests a clear relationship: while ICT users who report to never experience techno-induced interruptions have an average burnout score of 2.7, employees who report to be always affected by techno-induced interruptions have a score of 4.4. There also tends to be a gradient, that is, the more often techno-induced interruptions occur, the more burnout symptoms/the higher the burnout score. For tool users, the number of burnout symptoms also differs substantially by the frequency of technology-related interruptions, even though the differences are less pronounced. However, the descriptive findings suggest that tool users generally report more burnout symptoms than ICT users, suggesting that on average they are in poorer (mental) health.

Relationship Between Techno-Induced Interruptions and Burnout, OLS Regressions

In a next step, we estimate OLS regressions controlling for sociodemographic and occupational factors (cf Section "Measures"). See Table A2 in Supplemental Digital Content 1, http://links.lww.com/JOM/B447, for the regressions on the determinants of techno-induced interruptions. The results (Table 2) indicate a significant association between techno-induced interruptions and the number of reported burnout symptoms. Employees experiencing interruptions more frequently have on average higher burnout scores. This holds for both, ICT users as well as tool users (Table 2, columns 1 and 2).

The results of the alternative operationalization (cf Table 2, columns 3–6), using the average burnout scale and a burnout indicator [0;1] are consistently smaller compared with the main specification taking the burnout score as dependent variable, which ranged from 0 to 12. This discrepancy in the size of the estimates can be attributed to the differences in scale and range between the measures. However, the direction of the relationships between techno-induced interruptions and burnout remains consistent across the different operationalization, indicating a robust finding. Performing the analyses by taking the single items on exhaustion for burnout as outcome renders very similar results (results available on request). This suggests that the results are not sensitive to the operationalization of the outcome. To reduce the complexity, we therefore restrict the following analyses to the burnout score as the dependent variable.

Robustness Analyses

In the main specification, we treat techno-induced interruptions as quasi-metric in the analyses, although its scale is ordinal in nature. While this is common in research because of practical considerations, we acknowledge the potential biases as this assumes equal intervals between the categories, which may not hold in reality. Consequently, the magnitude of differences between adjacent categories may not be accurately represented. To assess the potential bias, we conduct a sensitivity analysis including techno-induced interruptions as an indicator variable and recode the five categories into always/frequently (=1) vs. sometimes/rarely/never (=0). Overall, the results render similar conclusions, as the estimates point in the same direction and are also significantly different from 0 (Table 3, panel B). We also checked a specification including techno-induced interruptions with four separate dummy variables rendering very similar conclusions (cf Table A3, Supplemental Digital Content 1, http://links.lww.com/JOM/B447).

Moreover, one might ask if there is a difference between techno-induced interruptions and general interruptions at the workplace. It could be argued that unlike general interruptions (eg, by colleagues), techno-induced interruptions evoke a heightened sense of helplessness and reliance on external support for resolution. To explore the extent of variance in the relationship between techno-induced interruptions and burnout compared with general interruptions in the workplace, we conduct an additional robustness analysis controlling for a dummy variable capturing general interruptions at work (Table 1, panel B). The question is: "*How often are you disturbed or interrupted in your work*?" and the response scale was recoded into always/frequently (=1) vs. sometimes/rarely/never (=0). The findings indicate that general interruptions also exhibit a significant association with burnout. However, the estimates for techno-induced interruptions remain comparable with the main specification. This suggests that

TABLE 2. Ordinary Least Squares Regressions on the Relationship Between Techno-Induced Interruptions and Burnout

Dependent	Burnout Score [0;12]		Average Burnout Scale [0;4]		Burnout indicator [0;1]	
	ICT Users	Tool Users	ICT Users	Tool Users	ICT Users	Tool Users
Techno-induced interruptions [0;4]	0.481***	0.474***	0.160***	0.159***	0.057***	0.048**
	(0.055)	(0.084)	(0.018)	(0.028)	(0.008)	(0.013)
Observations	4,702	1,953	4,696	1,952	4,696	1,952
Adjusted R^2	0.045	0.041	0.045	0.042	0.037	0.023

Robust standard errors in parentheses clustered at the company level. Control variables included the following: gender, age, education, occupation, and full-time employment. Source: DiWaBe 2019, unweighted results.

ICT, information and communication technologies.

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

TABLE 3. Robustness Analyses: Including for Further Covariates and Alternative Specifications

	Dependent: Burnout Score [0;12]	
	ICT Users	Tool Users
Panel A: include technostress as indicator variable		
Techno-induced interruptions: always/frequently [0;1]	1.051*** (0.147)	1.282*** (0.237)
Observations	4,702	1,953
Adjusted R^2	0.040	0.041
Panel B: control for general interruptions at work		
Techno-induced interruptions [0;4]	0.439*** (0.055)	0.457*** (0.083)
General interruptions: always/frequently [0;1]	0.644*** (0.080)	0.645*** (0.083)
Observations	4,700	1,953
Adjusted R^2	0.057	0.052
Panel C: control for baseline health		
Techno-induced interruptions [0;4]	0.517*** (0.091)	0.311* (0.139)
Self-rated health in 2011 [0;10]	−0.389*** (0.046)	−0.492*** (0,067)
Observations	1,954	892
Adjusted R^2	0.147	0.088

Robust standard errors in parentheses clustered at the company level. Control variables included the following: gender, age, education, occupation, and full-time employment. Source: DiWaBe 2019, unweighted results.

ICT, information and communication technologies.

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

there is a distinct correlation between techno-induced interruptions and burnout, independent of general interruptions at the workplace.

Furthermore, one of the major concerns might be that the results are affected by endogeneity, as employees who are in poorer mental health or more prone to burnout are also more likely to perceive working with new technologies as stressful, that is, experience technostress. Unobserved characteristics as well as reverse causality might thus potentially bias the results. Because of the cross-sectional nature of the data at hand, we cannot control for unobserved heterogeneity or account for intra-individual differences in burnout over time. However, the data contain retrospective information on the self-rated health status in 2011, ranging from 0 to 10 (best possible health status). In an additional robustness analysis, we thus try to address the endogeneity issue at least approximately by controlling for the self-rated health status in 2011 (Table 3, panel C). This earlier measurement of the employees' health status may account for some kind of baseline health. To rule out other changes as much as possible, we restrict the analyses to employees who have not changed their employers or job since 2011, substantially reducing the sample. The results indicate a significant relationship between the self-rated health status in 2011 and the burnout score, that is, the better the health status retrospectively assessed for 2011, the lower the burnout score in 2019. However, the estimates for the techno-induced interruptions remain very similar as compared with the main specification, although the estimate is somewhat smaller for tool users (Table 3, panel C).

Interaction Models: The Role of Individual and Workplace-Related Coping Factors

To examine whether certain individual characteristics or workplace-related factors might buffer or amplify the relationship, we include (linear) interaction terms between the (frequency of) techno-induced interruptions and different moderator variables (indicator variables). Table 4 summarizes the results for ICT users (upper panel) and tool users (lower panel). The burnout score [0;12] again serves as dependent variable. The heading of columns indicates the moderator variable. Positive interaction terms suggest that the moderating variable strengthens the association between techno-induced interruptions and burnout, while a negative interaction indicates that the moderator mitigates the association. The estimates for techno-induced

TABLE 4. Relationship Between Technostress, Moderators, and Burnout

	Dependent: Burnout Score [0;12]					
Moderator: ***(Always/Frequently vs Sometimes/Rarely/Never)***	**Main Specification**	**Affinity for Technical Interaction**	**Self-efficacy**	**Social Support: Supervisor**	**Social Support: Colleagues**	**Job Autonomy**
ICT users						
Techno-induced interruptions	0.481** (0.056)	0.507*** (0.072)	0.436*** (0.110)	0.602*** (0.090)	0.637*** (0.155)	0.587*** (0.123)
Moderator		0.232 (0.188)	−0.602** (0.212)	−0.277 (0.171)	−0.333 (0.247)	−0.402 (0.226)
Techno interruptions * moderator		−0.067 (0.124)	0.043 (0.132)	−0.223* (0.106)	−0.189 (0.163)	−0.175 (0.135)
Observations	4702	4,702	4,700	4,628	4,678	4,695
Adjusted R^2	0.045	0.045	0.051	0.054	0.052	0.053
Tool users						
Techno-induced interruptions	0.474*** (0.084)	0.517*** (0.102)	0.493** (0.181)	0.553*** (0.137)	0.280 (0.232)	0.695*** (0.141)
Moderator		0.174 (0.263)	−0.480 (0.317)	−0.447 (0.253)	−1.024* (0.372)	−0.184 (0.286)
Techno interruptions * moderator		−0.133 (0.161)	−0.035 (0.203)	−0.162 (0.164)	0.222 (0.241)	−0.368* (0.167)
Observations	1,953	1,953	1,952	1,932	1,951	1,950
Adjusted R^2	0.041	0.041	0.046	0.052	0.049	0.053

Robust standard errors in parentheses clustered at the company level. Control variables included the following: gender, age, education, occupation, and full-time employment. Source: DiWaBe 2019, unweighted results.

ICT, information and communication technologies.

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

interruptions are generally comparable with the main specification in terms of magnitude and significance. However, the main coefficients tend to be larger in most specifications, suggesting that employees with low affinity for technical interaction, little social support or reduced job autonomy (ie, moderator variable = 0) have on average more burnout symptoms. Regarding the interaction terms, the findings are somewhat different for ICT and tool users. For ICT users, social support from the supervisor (column 4) seems to moderate the association between techno-induced interruptions and burnout. Specifically, when employees experience support from their supervisors, the positive relationship between techno-induced interruptions and burnout becomes less pronounced, indicating a buffering role on burnout symptoms. In general, the results are comparable for social support from colleagues (column 5) and job autonomy (column 6) as the interaction terms are similar in size. However, they do not differ significantly from zero. For tool users, the strongest and only statistically significant interaction appears for job autonomy. For the affinity for technical interaction and self-efficacy (columns 2 and 3), we find no meaningful moderation, neither quantitatively in terms of the size of the coefficients nor qualitatively in terms of statistical significance.

DISCUSSION AND CONCLUSIONS

In recent years, the world of work has undergone rapid digitalization, with the widespread adoption of digital technologies. Whether this trend has led to a reduction in employee workload or to increased stress has not yet been comprehensively investigated. The technostress model posits that the use of modern technologies imposes new demands on employees that might trigger stress reactions.[8,9] While some dimensions of the technostress model are already well studied, such as techno-overload and techno-invasion (for a systematic review, see the study by Borle et al.[4]), empirical evidence is still lacking for others. This article addresses this gap and makes a first step to examine the relationship between one such underresearched dimension, techno-unreliability (operationalized by techno-induced interruptions), and burnout. Using a large and representative employee survey in Germany, we find that techno-induced interruptions are significantly associated with burnout symptoms for both ICT users and tool users: the more often employees experience techno-induced interruptions, the stronger the reported burnout symptoms. Experiencing technical faults and unreliable technology thus seems to be another factor that contributes to work-related stress potentially impairing the (mental) well-being of employees. This finding is consistent with previous studies focusing on other dimensions of technostress (see the study by Borle et al.[4]) and highlight the importance of techno-unreliability as an additional factor of technostress. While previous studies have mainly focused on ICT users, our results suggest that technostress is also related to burnout among other groups of employees working in rather manual work environments. However, there seem to be differences between the two groups of employees considered in the way they cope with techno-induced interruptions. Interaction models further reveal that job autonomy might buffer the association between techno-induced interruptions and burnout, especially for tool users. For ICT users, social support from the immediate supervisor seems to play a mitigating role. The findings thus provide empirical support for the assumption of disparate mechanisms to cope with technostress among the two groups of employees. Based on socio-technical considerations, one could therefore assume that the use of technology primarily challenges interpersonal interactions in some tasks or occupations, while in others, it rather affects the organization of work. Notably, the nature of techno-induced interruptions may also differ according to the undertaken task or employed work equipment. Tool users, who heavily rely on physical tools, machinery, and equipment, are prone to experience interruptions linked to equipment malfunctions or breakdowns during their tasks. For instance, machine malfunctions necessitating troubleshooting and repair could disrupt their workflow, potentially fostering frustration and heightened pressure to meet production targets. In contrast, ICT users may face interruptions tied to digital communication, such as incoming emails and instant messages. The divergence in interruption types encountered by these groups could contribute to the divergence in their coping strategies.

Limitations and Future Research

Overall, the results of this study contribute to the growing body of research on technostress and highlight the importance of addressing this issue in the workplace. However, when interpreting the results, some limitations should be kept in mind. First, given the cross-sectional nature of the data, with all variables being measured at the same point in time and the empirical approach chosen, it is crucial to emphasize that our results do not permit causal interpretation. Endogeneity is an issue for the relationship studied and the results could be biased due to unobserved heterogeneity or reverse causality. For example, employees experiencing burnout symptoms may be more likely to perceive and report technostress. We attempt to address this issue by controlling for retrospective self-rated health status 8 years before the study, indicating some kind of baseline health. The results of this robustness check are very similar to the main specification. However, future research based on longitudinal data or using quasi-experimental methods is still needed to properly address endogeneity. Second, the results are not fully generalizable to other contexts. Although we base our analyses on a large sample including different occupations (ICT users and tool users), we cannot conclude that these correlations hold for all employees per se. Given the sample restrictions made, for example, focusing on dependent employees, the results are not easily transferable to the self-employed. Relatedly, the transferability of our results to countries beyond Germany is subject to limitations due to the varying degrees of digital transformation progress across different nations. Consequently, future research should encompass cross-country comparisons to offer a more comprehensive perspective.

Another limitation is that the data used do not allow to distinguish between different kinds of techno-induced interruptions. For instance, besides unwanted interruptions (eg, technical malfunctions or sudden Wi-Fi outages), there may be more intentional or planned interruptions (eg, software updates) perceived as less stressful. Future research should therefore seek to specify different types of techno-induced interruptions even more precisely. In addition, there is a need to further explore potential factors and coping strategies that may be important in the relationship between technostress and burnout, as well as to evaluate the effectiveness of different interventions in reducing technostress and thus potentially improving employees' mental health.

Conclusions

In summary, our study's findings suggest that techno-unreliability is associated with burnout symptoms among German employees. Depending on the specific group of employees, social support and job autonomy might potentially buffer this association. In light of this, organizations can foster a healthier and more productive work environment by providing reliable technology and technical assistance, along with promoting social support and job autonomy in the workplace. This might reduce stress levels and mitigate the risk of burnout.

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