Considering Characteristic Profiles of Technologies at the Digital Workplace: The Influence on Technostress

Completed Research Paper

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Abstract

Workplaces develop more and more to digital workplaces. However, this may lead to technostress. An understanding of the profiles of technologies used at the digital workplace, their interplay, and how they influence technostress is valuable as it can assist developers of technologies and designers of workplaces to prevent technostress. Therefore, we analyze literature and conduct expert interviews to identify ten characteristics of digital technologies that relate to technostress. By analyzing data from 4,560 employees, we evaluate the characteristics. Furthermore, we develop characteristic profiles of multiple technologies used at the respondent's digital workplace. Lastly, we investigate their influence on technostress creators using structural equation modeling. We find that the different portfolios of technology profiles influence technostress creators in different manners. Our contributions are identifying additional characteristics of digital technologies, showing the importance of investigating workplaces as a whole, and highlighting design opportunities for health-oriented workplaces that alleviate technostress.

Keywords: Digital technologies, characteristics of digital technologies, digital workplace, technostress, digital stress, mixed methods research, structural equation modeling

Introduction

Digitalization, driven by a wide variety of digital technologies, has led to multifaceted changes for individuals, economies, and society (Fitzgerald et al. 2013; Gimpel et al. 2018a). Digital technologies are ubiquitous in private but also in business lives. They have changed the workplace from a narrowly defined and time-bound place to a partly virtual and temporally and locally independent existence (Zuppo 2012). At the beginning of the year 2020, the COVID-19 pandemic led to the imposition of confinement or contact restrictions in many countries. Work was transferred to home offices where possible. For many, this meant a new level of virtual work. This may have a long-term impact on the equipment of many workplaces with digital technologies and their use even after the end of the pandemic.

Digital technologies include devices like smartphones or tablets but also applications that can facilitate business processes by providing tools for inter- and intra-organizational communication and collaboration (Zuppo 2012). Today's workplace does not only consist of a single digital technology but many, which enable effective ways of working, defined as a digital workplace (Gartner 2020). The design of the digital workplace has become an important factor in increasing the productivity of knowledge workers (Köffer 2015). However, the increased usage of digital technologies in the changing world of work may cause stress, leading to potentially negative reactions in individuals. Research has noted this specific form of stress as technostress (Ayyagari et al. 2011; Tarafdar et al. 2007; Tarafdar et al. 2011; Tarafdar et al. 2019), which has first been introduced by clinical psychologist Craig Brod as "a modern disease [caused by one's] inability to cope with new computer technologies in a healthy manner" (Brod 1984, p. 16).

In the last years, researchers focused on different aspects of technostress including technostress creators (e.g. Tarafdar et al. (2007) , strains (e.g. Gimpel et al. (2018b)), technostress inhibitors (e.g. Ragu-Nathan et al. (2008) and coping behaviors (e.g. Pirkkalainen et al. (2019)). Ayyagari et al. (2011) emphasized the question of which role the different characteristics of digital technologies play in terms of technostress. The characteristics of digital technologies refer to the functional and non-functional features perceived by the user, which can be pursued directly or indirectly. Many other researchers followed the call of Ayyagari et al. (2011) that their list of proposed characteristics might not be exhaustive and that the introduction of new technologies in the future might also result in new characteristics. Therefore, Maier et al. (2015) analyzed characteristics of enterprise resource planning (ERP) systems, Salo et al. (2019) focused on characteristics of social network services, and Hung et al. (2015) regarded mobile phone characteristics influencing technostress. In summary, there exist additional characteristics resulting from further research focusing on specific technologies or contexts that extend the list of Ayyagari et al. (2011). However, to eliminate the black box phenomenon between technologies and technostress, further research is needed. Currently, there is no research that uses the extended list of characteristics to analyze their influence on technostress and no review of whether there are also other characteristics beyond that.

Furthermore, Ayyagari et al. (2011) analyzed the influence of technology characteristics on technostress by incorporating all digital technologies that are used at the workplace of their respondents without referring to a specific technology. Therefore, it is not ensured that respondents only think about one digital technology they use at work when answering the questionnaire. Instead, it is conceivable that the respondents mix their perception of using many different digital technologies, maybe even with those they use at home. This is also one of the significant drawbacks that Ayyagari et al. (2011) mentioned by themselves in their limitations section. However, analyzing the relation between the characteristics of one specific technology and technostress might seem to be by far more precise and concrete, as it does not mix-up and allow for bias when participants have different technologies in mind. On the other side, it does not properly reflect reality. Typically, people use a combination, and hence, the assessment of technostress incorporates the experiences with multiple digital technologies and not only with a specific technology. However, there are no considerations to assess the characteristics of specific digital technologies building digital technology profiles in order to summarize these across all technologies used at the user's workplace to explain the connection with technostress. Research on the design of digital workplaces examined people-focused and process-focused design approaches, in which information exchange and sharing documents or project support was regarded, without the impact on technostress (Williams and Schubert 2018). Therefore, an understanding of characteristics of digital technologies, their interplay at the workplace, and how they influence technostress will be valuable as it can assist developers of digital technologies and designers of workplaces in a way that can prevent technostress.

Therefore, we aim to add to technostress literature by addressing the following three research questions (RQ):

> *RQ1) Which characteristics of digital technologies with relation to technostress exist?*
>
> *RQ2) How does the characteristic profile of specific digital technologies look like?*
>
> *RQ3) What is the influence of characteristic profiles of digital technologies used at the workplace on technostress?*

In order to answer our research questions, we apply mixed methods. First, we conceptualize the relevant characteristics of digital technologies based on extant literature and qualitative research. Next, to be able to evaluate the characteristics quantitatively, we collect existing items scales, develop new multi-item scales where necessary, and perform an initial reliability and validity test of our scales via card-sorting and a quantitative pre-test. Then, we further validate the scales in a large-scale survey with both exploratory (EFA) and confirmatory factor analyses (CFA). Based on survey data, we develop characteristic profiles of multiple specific technologies used at the respondent's workplace and determine their influence on technostress using structural equation modeling (SEM).

Our paper is structured as follows: Section 2 introduces the theoretical background, including the characteristics of digital technologies that have already been found to influence technostress. Section 3 presents the methodology, while section 4 describes the development of the digital technology profiles based on interviews with experts and focus groups as well as a survey with 4,560 users of digital technologies in different organizations. Section 5 analyzes the relationship between the developed digital technology profiles of specific technologies with technostress. Finally, section 6 discusses these results and concludes the paper.

Theoretical Background and Related Work

Digital workplaces are characterized by the set of digital technologies provided to execute one's work effectively, irrespective of the location, and whether the task is performed alone or with others (Williams and Schubert 2018). Bharadwaj et al. (2013, p. 471) defines digital technologies as "combinations of information, computing, communication, and connectivity technologies" and refer to the importance of the interplay of digital technologies. Digital technologies include social, mobile, analytics, and cloud technologies, as well as the internet of things, and are known by the SMACIT acronym (Sebastian et al. 2017). Vial (2019) also includes platforms, the internet, software, and blockchain to the term of digital technologies, whereas only platforms are mentioned frequently in research articles (Tan et al. 2015; Tiwana et al. 2010). Elements of a digital workplace include digital technologies accessible by every stakeholder and interaction is possible without any physical limitations (Dahlan et al. 2018). The objective of digital workplaces is to improve collaboration and communication in the organization and has gained relevance in the past years (Yalina 2019). The design of a digital workplace is crucial for the worker's productivity, especially for knowledge workers (Köffer 2015; Yalina 2019). People-focused and process-focused design principles exist, dealing with information exchange and project support issues (Williams and Schubert 2018). Dery et al. (2017) illustrated how one can successfully design digital workplaces to drive organizational success. They mention that positive employee experiences of collaborating with others and dealing with the complexity of digital workplaces enable innovation and name possible improvements for the digital workplace, including fast log-in and mobility, but do not consider the possible effects on the individuals' well-being.

Besides the positive effects of the use of digital technologies including an increase in productivity, effectiveness, and efficiency (Bharadwaj 2000; Melville et al. 2004), research has shown the potential of digital technologies to cause technostress, as a specific form of stress that is perceived by end-users of digital technologies (Brod 1984; Ragu-Nathan et al. 2008). Technostress is not created by the technology itself but emerges from the interaction of human users with digital technologies. Whether technostress emerges depends on the user's resources, capabilities, assessments, and the type of technology (Gimpel et al. 2019). Ayyagari et al. (2011) developed a technostress framework consisting of the main concepts of stress (technostress creators and strains) and the IT artifact consisting of technology characteristics (see Figure 1). Following this framework, a user's perception of features and attributes of a digital technology (technology characteristics) can lead to stress-creating stimuli which again create responses and outcomes for the user (strains) (Ayyagari et al. 2011; Salo et al. 2019).

Figure 1. Technostress Framework by Ayyagari et al. (2011)

Digital technologies can be characterized in different ways depending on the point of view, e.g., along with their physical components, approaches, and concepts (Berger et al. 2018). Concerning the link of digital technologies with technostress, prior research analyzed characteristics of single digital technologies (Hung et al. 2015; Salo et al. 2019; Westermann et al. 2015) or digital technologies in general (Ayyagari et al. 2011; Tarafdar et al. 2007). Analyzing social networking services as one digital technology, Salo et al. (2019) found two main characteristics: (1) self-disclose features regarding information about oneself and (2) information cue paucity referring to the limited, one-sided information delivery. Hung et al. (2015) characterized mobile technologies by high accessibility, mobility, ubiquity, and connectivity. Additionally, Westermann et al. (2015) found that push notifications are often assessed to be disturbing, which can also be seen as a characteristic. Ayyagari et al. (2011) defined characteristics of digital technologies in general based on how individuals perceive them in use. Ayyagari et al. (2011) found six characteristics categorized in usability, dynamic, and intrusive features. Usability features are usefulness, complexity, and reliability. The single dynamic feature is the pace of change. Intrusive features are presenteeism and anonymity. Adding to these six characteristics, Tarafdar et al. (2019) mention mobility.

Regarding technostress creators, Tarafdar et al. (2007) and Ragu-Nathan et al. (2008) developed and empirically validated scales for five factors, which create technostress among individuals. The first dimension is techno-overload, describing situations where greater workload and higher speed are caused by digital technologies. Secondly, techno-invasion describes the effect of being constantly reachable and connected, leading to a blurring boundary between work and private life. The third creator is called techno-complexity, which describes the feeling of not having the needed skills and experiences to deal with the complexity of digital technologies and being forced to spend time and effort in learning it. Techno-insecurity describes the fear of losing one's jobs due to automation or missing skills to deal with digital technologies. Lastly, techno-uncertainty refers to the feeling of having to constantly develop one's abilities and knowledge due to continuing technology changes and upgrades.

Prior research has also pointed out the outcomes of technostress. The most recorded strain is the negative effect on end-user satisfaction, followed by job satisfaction, performance, productivity, and organizational commitment (Sarabadani et al. 2018). Tarafdar et al. (2007) stated that higher technostress results in lower productivity. Ragu-Nathan et al. (2008) showed that technostress creators decrease job satisfaction as well as organizational and continuance commitment. Both are emphasized by Tu et al. (2005), who found that next to lower productivity, also higher employee turnover can result out of technostress. Concerning individuals' health, Mahapatra and Pati (2018) found that, in an Indian context, techno-invasion and techno-insecurity can lead to burnout which, in turn, is associated with several negative outcomes on the organizational and individual level including lower productivity, job satisfaction, and higher absenteeism as well as depression and anxiety (Maslach et al. 2001). For German employees, Gimpel et al. (2018b) found that higher levels of technostress go along with a higher number of people reporting to suffer from headaches, fatigue, sleeping problems, and exhaustion, for example.

Research Process

As we strive to answer three interconnected questions, our research process is divided into three parts, each of them applying a combination of various methods. We conduct a mixed-methods approach, as described by Venkatesh et al. (2013). It includes and integrates qualitative as well as quantitative investigations, which, according to Venkatesh et al.'s (2013) scheme, serve developmental purposes.

First of all, we aim to identify the characteristics of digital technologies that relate to technostress. For identifying and conceptualizing the characteristics of digital technologies, we follow steps one to six of the process of MacKenzie et al. (2011). We conduct a literature research and interviews with experts and focus groups. Based on this, we develop multi-item survey scales for the characteristics of specific digital technologies. The scales and individual items are refined based on results from card-sorting regarding their content and face validity. Next, we perform a pre-test and an exploratory factor analysis (EFA) and, again, refine the scales and individual items.

Second, the resulting scales are then used in a large-scale quantitative survey. For the validation, the data is split into two random subsets. On the first subset, an additional EFA is carried out to examine the revised items. Finally, a confirmatory factor analysis (CFA) is performed on the second subset to validate the scales. Furthermore, we used the data to calculate a normed characteristics profile for specific technologies by aggregating the answers across many respondents.

Third, as we argue that technostress does not solely depend on the usage of a single technology but on the combination of all technologies used at the workplace, we, hence, use in the further course the digital technology profiles of the used technologies at the respondents' workplace. Therefore, we use covariance-based structural equation modeling (SEM) to estimate the effect on technostress.

The Development of Digital Technology Profiles

Theoretical Conceptualization

In order to build the foundation for our research, in a first step, we conducted a literature search. The focus was to identify technologies and their characteristics in relation to technostress (creators). To cover the full picture, the search additionally comprised literature of linked outcomes like stress and strain (including health and well-being). The list covered a broad picture of literature in different areas. Databases, namely EBSCO Business Source Premier, EBSCO Academic Search Premier, EBSCO Psych, Web of Science, and PubMed, were searched in the languages English and German. Because the seminal paper by Tarafdar et al. (2007) was published in 2007, only publications from this year onwards were included. The list of search strings is available in Supplemental Material A[1]. Types of publications that were considered are (academic) journals, reviews, proceedings, books, book chapters, and dissertations. Overall, 273 articles relevant for our research were identified.

To enrich the insights from the literature research, we interviewed practitioners and experts. The semi-structured interview guideline included questions about technostress creators, technologies for which usage may cause stress, and technology characteristics, which the subjects believed to cause stress and stressful usage behaviors. The complete interview guideline can be found in Supplemental Material B. In total, 15 people participated in face-to-face interviews, including employee and employer representatives, experts from occupational health management, ethics, ergonomics, informatics, and human resource management. Each interview lasted between 30 and 90 minutes. The number of interviews was determined by content saturation, meaning interviews were conducted until no new aspects were identified and named by our experts. Interviews were audio-recorded, transcribed, and continuously analyzed through MAXQDA with a formalized coding strategy. Categories were built deductively because the interviews were structured in sections with questions concerning technologies, their characteristics, and how these exactly relate to technostress. These particular aspects guided the analysis to gain a better understanding of the relationship.

Following on from this, six focus groups were conducted (between 5 and 8 participants each) consisting of employees and managers from four different organizations (n=33). The groups covered different occupational groups and hierarchies. Participants were contacted by a responsible from the respective company and were asked to take part voluntarily. The groups almost got identical task descriptions to the experts. First, they named the technologies they use at the workplace and their characteristics. They rated which of these caused the most stress. Besides, they were asked for (short-term and long-term) consequences and successful strategies to cope with the stress. The guideline for the focus group workshop is available in Supplemental Material C. The aim was to get insights from the practical perspective and collect examples for aspects that were named by our experts. All group discussions were recorded by an observer and the results documented in a picture protocol. Again, the results were written down, coded, and aggregated. For the technologies, for example, categories were identified when they named one specific software product (e.g., Edge as an example for an Internet browser).

The result of these steps is a conceptual understanding of nine characteristics of digital technologies relating to technostress. See Table 1 for their definition. Please note that in a later quantitative pre-test, one characteristic (information provision) was split into two (push and pull). For brevity of presentation, Table 1 already shows this split. Simplicity of use refers to the characteristic complexity by Ayyagari et al. (2011). It

[1] https://bit.ly/3aVPAdn

was renamed to avoid confusion with the technostress creator techno-complexity (Ragu-Nathan et al. 2008). Reachability refers to the characteristic presenteeism by Ayyagari et al. (2011) and was renamed to avoid confusion with a common psychological phenomenon describing the feeling of obligation by employees to go to work even though they are ill.

Characteristic	Definition
Anonymity	Degree to which the use of a digital technology stays anonymous and cannot be identified by others (in accordance with Ayyagari et al. (2011)).
Intangibility of Results	Degree to which results of the work with a digital technology are immaterial in nature and therefore intangible (self-developed).
Mobility	Degree to which a digital technology is usable independent of the location and enables to work from almost anywhere (self-developed).
Pace of Change	Degree to which a digital technology changes dynamically and rapidly (in accordance with Ayyagari et al. (2011)).
Pull[2]	Degree to which information of a digital technology is provided only on request (self-developed).
Push[2]	Degree to which a digital technology automatically provides new information while using it (in accordance with Westermann et al. (2015)).
Reachability	Degree to which a digital technology enables the individual to be contacted by third parties (in accordance with presenteeism in Ayyagari et al. (2011)).
Reliability	Degree to which a digital technology works reliably and is free of errors and crashes (in accordance with Ayyagari et al. (2011)).
Simplicity of Use	Degree to which a digital technology can be used without major effort or training (in accordance with complexity in Ayyagari et al. (2011)).
Usefulness	Degree to which a digital technology supports the accomplishment of tasks and enhances job performance (in accordance with Ayyagari et al. (2011)).

Table 1. Characteristics of Digital Technologies, their Source, and Definition.

To sum up, we identified characteristics of digital technologies that — according to literature and qualitative empirical research — relate to technostress. This answers RQ1.

Operationalization and Evaluation of Characteristics

For the development of scales for the characteristics of digital technologies, we followed the guidelines of MacKenzie et al. (2011). Based on this, we collected items for already existing characteristics and further created items for newly identified characteristics resulting in the first draft of our scales. We created our items to be short and simple and use appropriate language for employees. During the development, we carefully made sure that the items only address one single aspect (i.e., no connection of different statements in one item) in order to prevent a confusion of the respondent. Thereby, we also considered recommendations proposed by Podsakoff et al. (2003) to avoid common method bias by "improving scale items" (Podsakoff et al. 2003, p. 888). We used the anchor points of the existing rating scales to retain the interpretability and comparability of the results with the existing studies.

To evaluate content validity, we conducted a card-sorting via an online matching task with fellow researchers (n=39) in which they were asked to map items to characteristics (definition of the constructs) (Moore and Benbasat 1991). 85% correct matches were defined as the minimum boundary for the retainment of an item. Out of the 26 items, 22 were mapped correctly to the related construct by more than 85% of the persons, so we did not change them. The remaining four items were matched correctly by less than 85% of the participants. Thus, we changed the wording of these items to fit the corresponding construct better, provide more clarity, and reduce ambiguity. This step of item generation finished with the revised scales.

To evaluate the structure of our scales and validate our reworked items, we conducted a pre-test. 445 respondents who were acquired via an online panel took part in the study. The data was collected

[2] Please note that pull and push were first conceptualized as one characteristic with pull and push at opposite ends of the continuum. It was revised in later steps. Notifications may, only in some cases for some features, be configured by the user for certain technologies. Hence, individual settings of the users were not considered, and items were phrased with a general wording.

anonymously as far as possible (some socio-demographic questions were included to evaluate the quality of the intended sample). Participants were instructed to respond honestly and gave informed consent to participation. This was done to further minimize common-method bias by "protecting respondent anonymity and reducing evaluation apprehension" (Podsakoff et al. 2003, p. 888). This principle was applied to all data collection processes. To get a better understanding of the participant's digital workplace, each respondent of our survey stated his or her usage of 40 technologies (Nüske et al. 2019), evaluated by 0 = "no usage", 1 = "monthly usage", 2 = "weekly usage", 3 = "daily usage", and 4 = "several times a day". The list of technologies included common hardware used at the workplace like a printer, laptop or stationary phone, software like text, table, and presentation programs, simulation programs, statistical and analysis tools, networks like cloud systems, intranet, wifi, and technologies like virtual augmented reality and mixed reality. Participants evaluated their perception regarding the characteristics of one randomly selected technology that they used at least weekly. We decided to give each participant only one technology to reduce dropouts due to the length of the survey.

We performed an EFA (parallel analysis revealed nine factors that were extracted using principal axis factoring with an oblimin rotation) to carefully assess the quality of our questionnaire and did a preliminary analysis of all scales. The result of this EFA properly reflected our assumption of the factor structure of the scales with nine underlying technology characteristics. However, we faced some problems. First of all, we observed a few severe cross-loadings between the constructs simplicity of use and reliability. Also, we originally derived a bipolar construct "information provision" that contained aspects about how digital technologies provide users with information distinguishing whether the information has to be requested explicitly by the user (pull) or whether they are provided automatically when available (push). Regarding the issues with the properties of the items of this characteristic, we decided to redefine it and created two separate scales for push and pull as they seem to be more than two ends of one construct. The two scales refer to the original settings of the technologies. Items were phrased with a general wording, that did not consider the individual settings of the user. In some cases, of course, it is possible to adjust the individual settings (e.g., turn off notifications on the lock screen of the smartphone) but this does not apply to all devices and features. In addition, organizational policies possibly interact with personal preferences (e.g., a user may be able to set his stationary telephone on mute, but he does not use this option because the supervisor expects him/her to be reachable on the phone for customers). Finally, we revised the items accordingly.

To go on in our evaluation and validation process, we conducted a large-scale study distributing a questionnaire that, among other things, contained our scales on characteristics of digital technologies. These were assessed with the same procedure as in the pre-test: each participant rated the characteristics of one randomly drawn technology from the list of 40, which (s)he uses. To evaluate the respondent's technostress level, the items belonging to the five technostress creators introduced by Tarafdar et al. (2007) and Ragu-Nathan et al. (2008), namely techno-overload, techno-invasion, techno-complexity, techno-insecurity, and techno-uncertainty were included in the survey. This served the last step of our research to test for the influence of technology profiles on technostress. We acquired respondents for the surveys via an external research panel focusing on German employees. Respondents were paid for participation in the study. We included control variables to review the representability of our sample. These comprised gender, employment status, occupational title and sector, number of hours worked per week, and education. The sample for the evaluation consisted of 4,560 respondents. The distribution of participants was representative of the German working population with respect to the control variables age, gender, and occupational sector.

We used a five-point Likert-type rating scale from 0 = "I do not agree at all" to 4 = "I totally agree" to measure the technostress creators as well as the characteristics of digital technologies. All questions were presented in German. If necessary, the items were translated. Therefore, multiple German native speakers translated the questions in parallel. They met afterward to resolve discrepancies and agree on the most suiting translation. For more detailed information about the final scales used in this study and their sources, see Table 6 in the Appendix. For a list of the technologies, see Supplemental Material D.

As the EFA in the pre-test showed few severe cross-loadings between some constructs, we reinvestigated the factor structure with an EFA in the data set of the main study. Therefore, we split our study population into two evenly large subsets. On the first subset (n=2,280), we performed the EFA (parallel analysis revealed ten factors that were extracted using principal axis factoring with an oblimin rotation). This time no problematic cross-loadings of the items on a competing construct were observed. For more detailed information on the results of this EFA see Supplemental Material E. Following the EFA, we performed a CFA on the second subset (n=2,280) with maximum likelihood estimation of fifteen latent factors (ten characteristics of digital technologies, five technostress creators) that were allowed to intercorrelate in the model to analyze our measurement model further. The descriptive statistics, item reliabilities, and internal consistency are presented in Table 2.

Construct	No. of Items	Mean	Standard Deviation	Loadings	Cronbach's α	AVE
Anonymity	4	1.78	1.10	0.76-0.92	0.89	0.82
Intangibility of Results	6	1.58	1.10	0.60-0.90	0.92	0.80
Mobility	5	2.55	1.27	0.76-0.93	0.93	0.85
Pace of Change	4	1.78	1.15	0.92-0.94	0.96	0.93
Pull	3	2.47	1.00	0.74-0.89	0.83	0.80
Push	3	2.07	1.17	0.75-0.85	0.85	0.81
Reachability	4	2.71	1.24	0.92-0.95	0.97	0.94
Reliability	3	2.92	0.89	0.86-0.93	0.93	0.90
Simplicity of Use	3	3.13	0.89	0.81-0.92	0.90	0.87
Usefulness	4	2.81	1.05	0.82-0.90	0.92	0.86
Techno-Complexity	5	1.23	1.23	0.81-0.88	0.90	0.71
Techno-Insecurity	4	1.24	1.29	0.78-0.86	0.83	0.66
Techno-Invasion	3	1.28	1.35	0.75-0.90	0.80	0.72
Techno-Overload	4	1.63	1.30	0.79-0.90	0.88	0.74
Techno-Uncertainty	4	1.81	1.23	0.81-0.88	0.87	0.72

Table 2. Statistical Quality of the Measures used in the Study: Descriptive Statistics, Item Reliabilities, Internal Consistency, and AVE

All loadings of the items on their respective latent factors in the CFA were above the value of 0.71, which indicates that more than 50 % of the variance of this item is explained by the underlying construct. Only for the intangibility of results, lower loadings were observed. However, since the average variance extracted (AVE) of intangibility of results (and for all other constructs) was above 0.50, we did not consider it critical and retained the indicators. Cronbach's Alpha showed values of at least 0.80 for all scales indicating internal consistency.

In the next step, we assessed discriminant validity based on the Fornell-Larcker criterion (Fornell and Larcker 1981) as Cronbach's Alpha relies on correlations of the items and, thus, does not account for dimensionality of constructs. The Fornell-Larcker criterion compares the size of the correlations of the latent constructs to the AVE. The square root of each construct‘s AVE was higher than the correlations with the other constructs (see Table 6 in Supplemental Material F). Another, newer criterion to asses discriminant validity is the heterotrait-monotrait ratio introduced by Henseler et al. (2015). It sets the average correlation of items measuring different constructs (heterotrait-heteromethod) in relation to the average correlations of items measuring the same construct (monotrait-heteromethod). If the indicators of one construct correlate higher with each other than with the indicators of different constructs, the ratios should be small. Ratios close to 1 indicate a lack of discriminant validity. The ratios were obtained for the characteristics of digital technologies and the technostress creators as they are used in the model to analyze for our second research question. All ratios were below 0.85, indicating that discriminant validity is good. For more detailed information on the results, see Table 7 in Supplemental Material F. Overall, we consider discriminant validity as given.

In the last step of validating our measurement instrument, we evaluated the fit of our model to gain further information about our assumptions on the data structure. The fit was judged according to the following guidelines: The root mean square error of approximation (RMSEA) indicates good model fit at values smaller than 0.6. The square root mean residual (SRMR) should show values smaller than 0.05. Comparative fit index (CFI) and Tucker-Lewis index (TLI) indicate a satisfactory model fit if they are higher than 0.90 and good fit at values above 0.95. We did not consider chi-square for the evaluation of the model fit, because the indicator has shown to be sensible to sample size in simulation studies (Boomsma 1982).

For our model, CFI (0.956) and TLI (0.951) were above 0.95, indicating good fit of the initial model with ten latent, correlating characteristics. Both SRMR (0.036) and RMSEA (0.044) showed only small deviations of the estimated from the expected covariance matrix with values below 0.05 and/or 0.06, respectively. Therefore, we argue that we finally validated our measurement model. To sum up, we now have validated measurement scales for the identified characteristics of digital technologies that — according to literature and qualitative empirical research — relate to technostress.

To confirm this ten-factor structure, a nested model comparison was conducted. The simpler model comprised nine latent factors (interim result from the first EFA in pre-test, reapplied to data from the main study) where all items of the two factors simplicity of use and reliability loaded on the same, common construct. A chi-square difference test revealed significant better fit ($\chi^2_{Model1} = 5277.18$, $\chi^2_{Model2} = 3327.98$, $df_{Model1} = 651$, $df_{Model2} = 657$, $\Delta\chi^2 = -1949.20$) of the model with ten latent factors. The fit indices are displayed in Table 3.

Model	CFI	TLI	RMSEA	SRMR
Nine Factors – Model 1	0.924	0.914	0.059	0.041
Ten Factors – Model 2	0.956	0.951	0.044	0.036

Table 3. Nested-Model Comparison of the Measurement Model for the Technology Characteristics

Profiles of Digital Technologies based on their Characteristics

To get a better understanding of the differences between technologies with respect to their characteristics, we created a profile for each of the 40 digital technologies from our list. Each profile line consists of the means of all ten characteristics that were evaluated for this one specific technology. We argue that the characteristic of a digital technology that is used more frequently has a higher impact on the overall perceived characteristics of digital technologies. Therefore, we only regarded the responses of persons that used this specific technology at least once a day. We then calculated a mean score for the ten characteristics. See Table 4 for examples.

From the overall list of 40 technologies, some had to be excluded for the profiles. Due to the randomized choice which technology the respondent was asked to evaluate, group sizes were in some cases below 30. These were considered too small to provide unbiased information. For example, 86 used augmented, virtual and mixed reality daily, but only ten respondents were asked to evaluate its characteristics due to the randomized sampling. All profiles with means and standard deviations are provided in Table 4. The table shows how different technologies are perceived by users. It is important to note that these perceptions are from users, that is, they are conditional on the respondent working in a job where the employer assumes a task-technology fit and, thus, provides the technology. Cash systems have a higher perceived usefulness than statistics software to pick just one example. Likely, only few people use both types of systems. The perceptions originate from different people in different jobs. Five profiles are visually displayed in Figure 2 to highlight similarities and differences. For example, smartphones enable mobile working represented by high values of mobility. The same applies to e-mails because usually, these can be checked on the run with the smartphone. However, in contrast to smartphones, e-mails have a rather low pace of change. A new smartphone is released almost every other week by different companies, whereas the functionality of the e-mail program remains the same as ten years ago (Figure 2).

To sum up, we now have profiles of the 26 most important (i.e., common and frequently used) workplace technologies along with the characteristics that — according to literature and qualitative empirical research — relate to technostress. This answers RQ2.

Technology	n	Useful-ness		Simplicity of Use		Reliabi-lity		Anony-mity		Mobility		Reach-ability		Pace of Change		Pull		Push		Intangi-bility	
		M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Administrative Software	69	3.02	0.98	2.79	1.00	2.82	0.89	1.50	1.15	2.18	1.39	2.19	1.34	1.90	1.01	2.47	1.20	1.71	1.15	1.38	1.13
Cash System	41	3.08	1.10	3.49	0.73	3.19	0.73	1.80	1.39	2.14	1.68	1.37	1.57	1.53	1.38	2.46	1.37	1.69	1.53	1.64	1.50
Cloud Computing	54	2.60	1.04	2.73	1.01	2.44	1.03	1.64	1.13	2.88	1.16	2.53	1.25	2.16	0.96	2.49	1.16	1.97	1.22	1.66	1.17
Database	134	2.86	1.05	2.60	1.04	2.71	0.96	1.61	1.16	2.15	1.37	1.92	1.32	1.88	1.09	2.44	1.18	1.92	1.29	1.46	1.22
E-Mail	311	3.10	1.07	3.68	0.68	3.41	0.72	1.50	1.27	3.31	1.21	3.70	0.62	1.15	1.14	2.45	1.31	2.38	1.38	1.57	1.32
Headset	69	2.89	1.17	3.35	0.98	3.16	1.00	1.78	1.45	2.32	1.48	2.97	1.18	1.18	1.28	1.75	1.41	1.69	1.39	1.83	1.35
Internet	220	3.10	0.97	3.42	0.76	2.88	0.84	1.86	1.22	3.25	1.06	3.22	0.95	2.10	1.07	2.61	1.10	2.10	1.20	1.65	1.12
Knowledge Management	91	2.86	1.07	2.92	1.05	2.70	1.00	1.91	1.28	2.55	1.33	2.36	1.25	2.21	1.08	2.54	1.12	1.86	1.22	1.68	1.19
Laptop	125	3.07	1.15	3.55	0.74	3.29	0.78	1.79	1.28	3.23	1.15	3.03	1.07	1.73	1.18	2.65	1.10	2.06	1.30	1.23	1.23
Logistics System	33	3.05	0.91	2.94	0.95	2.65	1.00	1.92	1.23	1.96	1.45	1.86	1.42	2.04	1.28	2.60	1.09	1.99	1.31	1.45	1.33
Management Information Software	42	2.66	0.99	2.60	0.88	2.62	0.89	1.69	1.36	2.53	1.25	2.53	1.29	2.40	1.06	2.64	1.12	1.91	1.38	1.65	1.40
Mobile Phone	62	2.35	1.37	3.46	0.97	2.98	1.18	1.75	1.35	2.79	1.46	3.54	0.80	1.15	1.20	2.23	1.24	1.88	1.39	2.10	1.13
Network Hardware	82	2.78	1.07	2.69	0.95	2.56	0.94	1.58	1.16	2.55	1.29	3.01	1.03	2.07	1.07	2.35	1.12	1.93	1.26	1.58	1.13
Office Software	188	3.33	0.85	3.09	0.91	3.12	0.86	1.95	1.21	2.98	1.22	1.83	1.37	1.64	1.15	2.13	1.23	1.45	1.30	1.21	1.27
PC	301	3.17	1.04	3.27	0.85	3.01	0.85	1.51	1.23	1.48	1.52	2.92	1.13	1.80	1.20	2.64	1.10	1.98	1.32	1.33	1.20
Printer	303	3.25	0.96	3.57	0.70	3.24	0.82	1.74	1.35	1.87	1.57	2.39	1.47	1.27	1.19	2.20	1.34	1.72	1.44	1.07	1.21
Production Planning	30	2.77	1.14	2.46	0.98	2.46	1.09	1.75	1.26	1.91	1.43	1.73	1.30	1.70	1.28	2.34	1.30	1.71	1.37	1.81	1.24
Realtime Communication	50	2.89	1.11	3.19	1.00	2.84	1.08	1.81	1.38	2.68	1.44	3.22	0.89	2.05	1.15	2.46	1.16	2.41	1.30	1.94	1.18
Security Background	94	2.18	1.28	2.55	1.02	2.79	0.94	2.00	1.11	2.93	1.18	2.13	1.27	1.94	1.19	2.39	1.16	2.12	1.24	2.08	1.27
Security Interaction	150	1.68	1.30	2.99	1.00	2.87	0.91	1.79	1.23	2.49	1.37	1.96	1.36	1.74	1.29	2.53	1.14	1.81	1.29	1.75	1.25
Smartphone	151	2.56	1.26	3.25	0.92	2.91	0.95	1.74	1.14	3.16	1.13	3.55	0.81	2.37	1.08	2.56	1.15	2.32	1.26	1.78	1.24
Social Collaboration	71	2.46	1.14	2.77	0.92	2.27	1.00	1.63	1.12	2.93	1.09	3.19	0.87	2.19	0.99	2.38	1.05	2.32	1.15	2.03	1.06
Statistics Software	32	2.85	0.96	2.58	0.99	2.77	1.00	2.36	1.23	2.44	1.32	2.29	1.35	2.26	1.08	2.37	0.98	1.99	1.29	1.72	1.42
Tablet	58	2.68	1.29	3.47	0.87	2.81	1.14	1.73	1.25	3.09	1.21	2.76	1.32	1.83	1.27	2.64	1.24	2.15	1.40	1.69	1.40
Telephone	246	2.79	1.14	3.60	0.75	3.42	0.81	1.48	1.40	1.23	1.53	3.50	0.82	0.83	1.16	2.15	1.38	1.64	1.45	1.90	1.37
Wireless Network	164	2.94	1.13	3.21	0.90	2.74	0.92	1.91	1.22	2.85	1.23	3.34	0.85	2.01	1.17	2.49	1.17	2.29	1.23	1.64	1.26

Table 4. Profiles of Digital Technologies: Mean and Standard Deviation for each Characteristic for each Digital Technology

We do not provide a characteristics profile for content management systems, creative- and design-software, medical software, augmented, virtual and mixed reality, digital cash flows systems, sensory systems, artificial intelligence, automatic productions systems, e-commerce systems, product/software development tools, voice interaction technologies, systems for localization and distance determination, and simulation/ modelling software (n < 30).

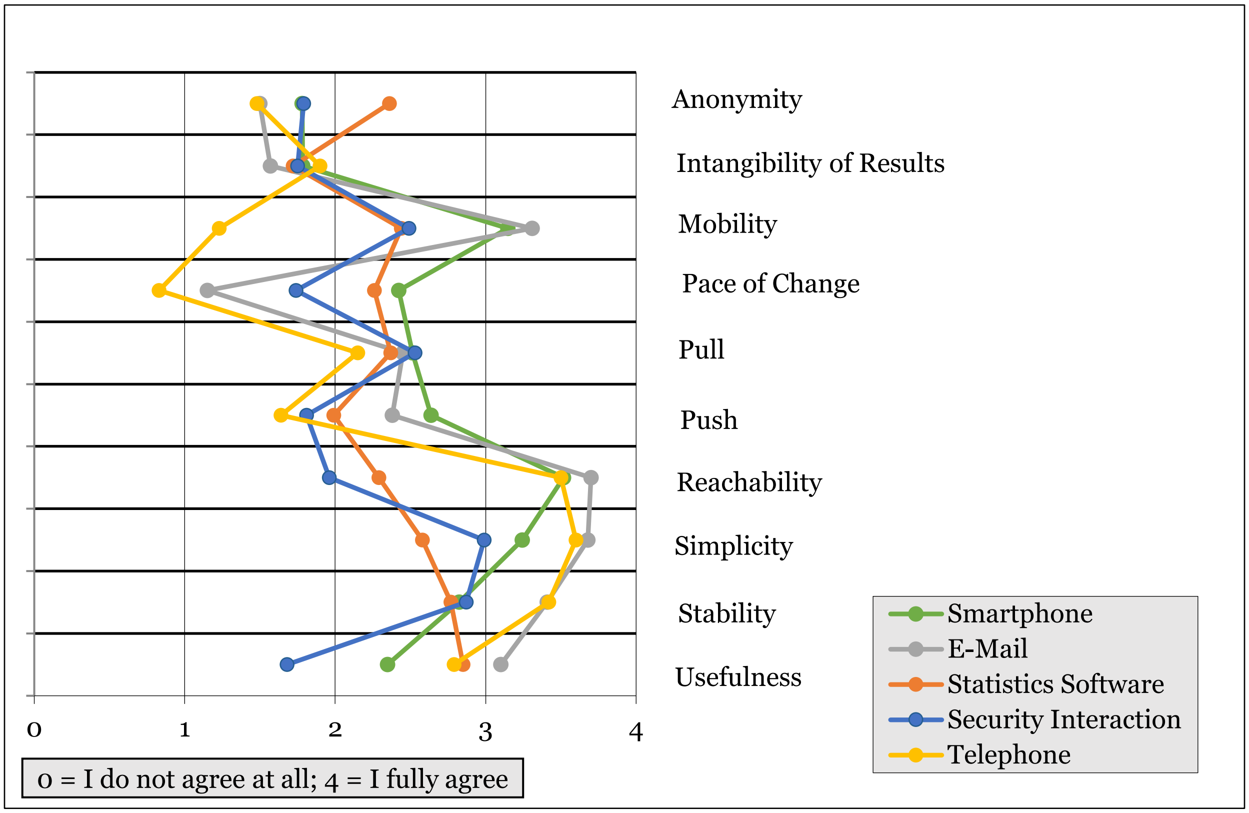

Figure 2. Profiles of Five Different Digital Technologies Based on their Characteristics

The Influence of Technology Profiles on Technostress

Technostress at work arises from a workers' interaction with typically a range of digital technologies. It does not depend on a single digital technology but on the portfolio of digital technologies at the workplace and their characteristics profiles. Thus, in order to investigate the influence of technology profiles on technostress, we aggregated the profiles of the digital technologies to digital workplace portfolios. For example, for a respondent who uses a smartphone, laptop, e-mails, social collaboration software, and wireless networks for work, we took the characteristic profiles of these five digital technologies and averaged them to build one mean "portfolio" score across the five digital technologies for each of the ten characteristics.

We set up a covariance-based structural equation model (SEM) to measure the influence of the ten characteristics of the digital technology portfolio at the workplace on the five technostress creators techno-overload, techno-invasion, techno-complexity, techno-insecurity, and techno-uncertainty (Ragu-Nathan et al. 2008; Tarafdar et al. 2007). We conducted Harman's single factor test, which showed that about 11 % is the highest proportion of variance attributed to one factor, which suggests that common-method bias is not a problem. Next, we statistically controlled for common-method bias by modeling a method factor (Podsakoff et al. 2003). The comparison of the results of the structural model with and without method factor showed no substantial differences (ΔCFI = 0,029). Researchers (Cheung and Rensvold 2002; Little 1997) have suggested that differences in the CFI less than .05 are acceptable and indicate the equivalence of measurement models. Thus, common-method bias seems not to be a major concern for our data. The model showed good fit to the data (CFI = 0.972, TLI = 0.962, SRMR = 0.031, RMSEA = 0.036).

Hypotheses were tested two-tailed because we did not have specific directional hypotheses about the influence of the characteristics of the digital workplace on technostress. Table 5 displays the results. For a detailed list of all paths and their respective *t*-statistics, including the *p*-values see Supplemental Material G.

TS Creator / Characteristic	Techno-Complexity	Techno-Insecurity	Techno-Invasion	Techno-Overload	Techno-Uncertainty
Anonymity	-0.16**	-0.27**	-0.40***	-0.10	-0.17
Intangibility of Results	+0.16**	+0.34***	+0.31***	+0.25***	+0.30***
Mobility	+0.08	+0.18***	+0.28***	+0.12**	+0.14**
Pace of Change	-0.04	+0.04	+0.31***	+0.10	+0.07
Pull	-0.16	-0.18	-0.40**	-0.23	-0.17
Push	+0.11	-0.08	-0.28**	-0.14	+0.03
Reachability	-0.20*	-0.16	-0.18*	-0.13	-0.17*
Reliability	-0.18	-0.25	-0.46**	-0.07	+0.11
Simplicity	+0.08	-0.19	+0.40*	-0.18	-0.50**
Usefulness	+0.00	+0.22**	+ 0.14	+0.11	+0.07
R^2	0.11	0.20	0.22	0.12	0.16

Table 5. Digital Workplace Portfolio: The Influence of the Characteristic Profiles of Digital Technologies on the Five Technostress Creators; * p < 0.05, ** p < 0.01, *** p < 0.001; '+' indicates that a higher value of the characteristic within the digital workplace portfolio is associated with a higher level of the technostress creator and '-' is vice versa

In this final step of the analysis, we answer RQ3, which asked how the profiles of digital technologies used at the workplace influence technostress. Results of the structural model reveal that not all portfolios of characteristics at the digital workplace influence technostress in the same manner, but each of the characteristics is significantly linked to at least one technostress creator.

Discussion and Conclusion

We investigated the characteristics of digital technologies that are related to technostress. Therefore, we did a literature search and qualitative interviews in order to expand the understanding of characteristics that have previously been presented in the literature. To validate the characteristics as well as their relationship with technostress, we conducted a quantitative survey study. We used structural equation modelling to reveal the characteristics' relationship with technostress creators. The results answer our three research questions by showing the existence of ten characteristics of digital technologies related to technostress, profiling 26 common workplace technologies along the ten characteristics, and relating the digital workplace portfolio with technostress creators.

In terms of revealing characteristics of digital technologies with relation to technostress creators, we found evidence for ten different characteristics. Each technology characteristic relates to at least one technostress creator and each technostress creator to at least two characteristics.

In this dense web of relationships, we found that anonymity is negatively related to complexity, insecurity, and invasion. For insecurity, for example, this means that if the users may use their technologies anonymously without leaving traces of their usage behavior, employees fear to lose their jobs less as they less feel their work activities to be monitored. Intangibility of results is positively associated with all five technostress creators. Again, for insecurity, this relationship is understandable as employees experience more fear of losing their jobs if they do not see the results of their work and thereby feel no progress in accomplishing their tasks. Regarding these two results concerning insecurity in combination this could be interpreted in the following way: With high intangibility of results, employees might experience a lack of productivity and they fear losing their job because this seemingly poor performance could be controlled or traced, for example by the supervisor, if a system does not allow anonymous usage. For mobility, we found positive relations with insecurity, invasion, overload, and uncertainty. With regard to invasion, this may be because mobile workplaces allow individuals for more flexibility in doing their tasks. Therefore, they may experience a stronger feeling of blurring boundaries between job and private life, resulting in higher levels of perceived invasion. Pace of change is only related to invasion and the relationship is positive, meaning that a high pace of change increases the feeling of one's life being invaded with digital technologies. This may be because employees have to use their non-work times (e.g. weekends) in order to deal with the newly changed digital technologies and learn how to use them and, thus, feel their private lives as being invaded by digital technologies. In contrast to pace of change, pull as well as push is negatively linked with invasion. For pull, this relationship may be because individuals actively have to access information via their digital workplace portfolio and, thus, are more in control of when they want to do so. For push, however, in the first sense, one would expect a positive link to invasion. But we argue that, if individuals know that their digital technologies will notify the individuals about important work issues, they do not have to constantly check their smartphone or other digital technologies for important updates and, thus, can mentally disconnect from their job when being with their family. Reachability is negatively associated with complexity, invasion, and uncertainty. One possible interpretation of the decreasing uncertainty could be that people who are well reachable (i.e. due to their position) will inevitably interact and deal with the technology permanently, which means that they have little uncertainty in using it. For reliability, we only found a negative relation to invasion. Simplicity is linked with invasion and uncertainty. For invasion, the relation is positive, whereas, for uncertainty, it is negative. Interestingly, simplicity does not affect complexity. Lastly and unexpectedly, usefulness is positively related to insecurity. At this point, further research is needed to better understand and interpret the relationship.

Our paper contributes to theory in several ways. Our first contribution is the identification and definition of further characteristics of digital technologies that affect technostress at an individual's workplace, including measurement scales for the newly added characteristics. Placing these newly identified characteristics side by side with the ones from extant literature (esp. from Ayyagari et al. 2011), our paper presents the most holistic set of technology characteristics related to technostress. Further, to the best of our knowledge, we are the first to combine the characteristics of Ayyagari et al. (2011) with the technostress creators of Ragu-Nathan et al. (2008) and thereby can show their relationships. With this broader understanding of characteristics, future research can investigate the influence of digitalization on technostress in more detail.

Second, we show that it is important to investigate the workplace as a whole based on the portfolio of technologies at the workplace. Prior research either investigates individual technologies (e.g. Hung et al. 2015; Maier et al. 2015; Salo et al. 2019) or the entire digital workplace without considering the individual technologies at work (e.g. Ragu-Nathan et al. 2008; Tarafdar et al. 2007). We take an intermediate way considering all major individual digital technologies at the workplace. We build technology profiles on the individuals' perception of characteristics and not by asking technology experts. Stress is a construct that builds on the perception of a situation and the individual's own ability to cope with a certain situation. Therefore, from the individual's point of view, the perceived characteristics of digital technologies at the workplace are key because stress is neither solely anchored in the environment and its demands nor solely in the person characteristics (Folkman and Lazarus 1984). Asking users rather than design experts seems appropriate according to adaptive structuration theory (DeSanctis and Poole 1994). Outcomes of the use of advanced information technology do not only depend on the structure of the technology but also the social interaction of the user with the technology (which can be different than intended by the designer also depending on the organizational practices and norms). These profiles were put together to an individual portfolio consisting the mean characteristics of the different technologies each employee uses at his/her own workplace. This provides a more holistic picture than looking at only a single technology; further, it allows to trace the effects on technostress back to characteristics and from there to individual technologies rather than considering technologies at the workplace as monolithic.

Third and last, we give evidence on the relationship of the characteristics with different technostress creators instead of technostress in general. This more detailed understanding can help future research to develop specific preventive measures and coping strategies for concrete technostress creators at concrete workplaces. In sum, the identification and measurement of characteristics of digital technologies along with knowledge on their effect on technostress enable future research to cluster technologies and evaluate different technologies and workplaces based on their impact on technostress. Future research could consider whether the technology profiles prove to be consistent among demographic and cultural differences. Also, the size of the technology profile combined with the intensity of usage or additional moderating characteristics influencing technostress can be analyzed.

The results of this study also provide implications for practice. Since prior research has shown the negative effects of technostress, including lower productivity and lower job satisfaction, organizations should aim to prevent and lower the level of technostress of their employees. Based on our developed items for characteristics of digital technologies, digital workplaces can be evaluated on their possible susceptibility to technostress, by for example identifying technologies that outshine the positive characteristics of other digital technologies in terms of technostress. This is important as we were able to show that the combination of technologies and their aggregated mean characteristics are associated with technostress creators. The combination of technologies matters as one technology with its' characteristics can distort the overall sensation and lead to technostress.

Workplace designers should focus on usability features, including usefulness, simplicity of use, and reliability, but also on technologies that enable mobility and pull configurations. When individual technostress creators are of specific concern for a given workplace or company, the guidance becomes more nuanced on which characteristics to look out for and which technologies have a favorable profile regarding these characteristics. Besides, individuals can affect their levels of technostress by adjusting their workplace technologies. Therefore, employers also should give their employees the flexibility of configuring their digital technologies in a way that is most beneficial for each individual.

However, there are limitations to our research. Each respondent to the survey assessed only the characteristics of one digital technology and not the characteristics of the digital technologies at her or his entire workplace. However, since our sample is of a high number, we were able to assign the perception of the characteristics between subjects.

Despite these limitations, our results add to a broader understanding of characteristics of digital technologies at an individual's workplace, not only by extending the number of characteristics that were already known but also by revealing the structure among them as well as their effect on technostress creators.

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Appendix

Construct	Item	Mean	SD	Est	Source
Usefulness	Use of {selected technology} enables me to accomplish tasks more quickly.	2.97	1.14	0.82	Ayyagari et al. 2011
	Use of {selected technology} improves the quality of my work.	2.65	1.18	0.83	
	Use of {selected technology} makes it easier to do my job.	2.88	1.13	0.90	
	Use of {selected technology} enhances my effectiveness on the job.	2.75	1.16	0.89	
Simplicity of Use (Complexity)	Learning to use {selected technology} is easy for me.	3.21	0.95	0.87	Ayyagari et al. 2011
	{selected technology} is easy to use.	3.20	0.95	0.92	
	It is easy to get results that I desire from {selected technology}.	3.01	0.99	0.80	
Reliability	The features provided by {selected technology} are dependable.	2.93	0.95	0.91	Ayyagari et al. 2011
	The capabilities provided by {selected technology} are reliable.	2.93	0.94	0.93	
	{selected technology} behaves in a highly consistent way.	2.92	0.96	0.86	
Anonymity	It is easy for me to hide how I use {selected technology}.	1.85	1.22	0.80	Ayyagari et al. 2011
	I can remain anonymous when using {selected technology}.	1.79	1.29	0.80	
	It is easy for me to hide my {selected technology} usage.	1.72	1.23	0.92	
	It is difficult for others to identify my use of {selected technology}.	1.75	1.22	0.76	
Mobility	The use of {selected technology} is not limited to the workplace.	2.68	1.42	0.76	Self-developed with input from Tarafdar et al. 2017
	The use of {selected technology} is not restricted to a certain location.	2.61	1.44	0.86	
	It is possible to use {selected technology} on the go.	2.53	1.50	0.93	
	{selected technology} is accessible from anywhere.	2.51	1.43	0.89	
	{selected technology} enables me to work anywhere.	2.40	1.41	0.80	
Reachability (Presenteeism)	The use of {selected technology} enables others to have access to me.	2.69	1.31	0.92	Ayyagari et al. 2011
	{selected technology} makes me accessible to others.	2.67	1.32	0.95	
	The use of {selected technology} enables me to be in touch with others.	2.74	1.29	0.95	
	{selected technology} enables me to access others.	2.77	1.28	0.95	
Pace of Change	I feel that there are frequent changes in the features of {selected technology}.	1.82	1.24	0.92	Ayyagari et al. 2011
	I feel that characteristics of {selected technology} change frequently.	1.74	1.20	0.94	
	I feel that the capabilities of {selected technology} change often.	1.78	1.22	0.94	
	I feel that the way {selected technology} works changes often.	1.70	1.21	0.92	
Pull	{selected technology} displays information only when I actively interact with it.	2.04	1.29	0.75	Self-developed
	To receive information through {selected technology} I need to actively request it.	2.03	1.35	0.83	
	Information is provided by {selected technology} only on request.	2.11	1.33	0.85	
Push	{selected technology} displays information. whilst I am otherwise engaged.	2.36	1.18	0.75	Self-developed
	I automatically receive news / through information {selected technology} when I use it.	2.48	1.13	0.89	
	{selected technology} uses push notifications to provide information.	2.59	1.15	0.74	
Intangibility of Results	The result of my work with {selected technology} is not tangible.	1.53	1.27	0.89	Self-developed
	The result of my work with {selected technology} is not clearly visible.	1.55	1.25	0.90	
	{selected technology} creates products that are not tangible.	1.56	1.26	0.84	
	The result of working with {selected technology} is not noticeable.	1.46	1.24	0.88	
	Results from the use of {selected technology} are not visible to third parties.	1.69	1.27	0.65	
	Third parties can not immediately see changes caused by using {selected technology}.	1.89	1.26	0.60	

Table 6. Item Means, Standard Deviation and Factor Loadings of the Finale Scales Used in the Main Study (N = 4,560).