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TECHNOSTRESS IN THE NEW NORMAL: EXPANDED ASPECT OF INCOHESION AND INSTABILITY

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ABSTRACT

As the shift to technology-driven work becomes normal practice, technostress has emerged as a critical issue for employees, simultaneously hindering human interactions in the work community. However, the study of cohesion aspects as part of technostress has not been extensively explored. This study aims to investigate the new pattern of technostress components using a mixed-method research design. The various aspects of technostress in the new normal were explored through in-depth interviews with 31 participants. The findings indicated agreement on 2 aspects (techno-overload and techno-invasion) and disagreement on 3 aspects (techno-complexity, techno-insecurity, and techno-uncertainty) compared to previous concepts of technostress, while also reporting 3 new perceptions of technostress (techno-induced incohesion, aspect of hindrance in technology usage, and aspect of feeling inadequacy in technology usage). The qualitative analysis was transcribed into a pool of technostress items. Subsequently, 309 participants completed survey forms for conducting factor analysis using Exploratory Structural Equation Modeling. The results revealed 4 factors: techno-overload, techno-insecurity, techno-induced incohesion, and techno-instability, with updated definitions provided. Additionally, the highlights of the new 'Technostress Scale', trends of technostress in the new normal, and implications are discussed.

KEYWORDS: Technostress, Overload, Insecurity, Incohesion, Instability, Scale development.

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1. INTRODUCTION

1.1 Background

Due to the Covid-19 pandemic, many organizations had to change their working styles to align with the prevention guidelines. Most organizations adopted technology for remote work during the lockdown, leading to its widespread use for work. Even after the pandemic subsided, technology continues to play a significant role in both office-based and remote work. This has become the 'new normal' for work, with employees now typically using technology as standard practice. As a result of this shift, many research studies point out that a significant number of employees are facing technostress (Dragano & Lunau, 2020; Farmania et al., 2022; Ingusci et al., 2021; Irawanto et al., 2021; Molino et al., 2020; Mushtaque et al., 2022; Oksanen et al., 2021; Sandoval-Reyes et al., 2021; Urbano et al., 2021). Moreover, the use of technology is a barrier to teamwork and group cohesion, impacting work performance across various sectors (Breideband et al., 2022; Hardwig & Boos, 2023; Malik et al., 2020; Silkens et al., 2023; Wildman et al., 2021).

The study of technostress has been widespread since computers were introduced in the workplace (Brod, 1984). The development of measuring technostress has shifted from overall measurements (Kasuga, 1994) to component-based measurements (Ragu-Nathan et al., 2008) and is ongoing. Some studies choose some components from the original scale (Alam, 2016; Fieseler et al., 2014; Okolo et al., 2020), while some studies add or change some components from the original scale to align with specific context, such as studying in professional lawyers (Cadieux et al., 2021), or different perceptions of stress as challenge or threat (Lei & Ngai, 2014).

Considering the negative relationship between stress and cohesion, a high level of cohesion is correlated with a low level of stress in various sectors (Morris et al., 1976; Mushtaq et al., 2019). There is a discussion on promoting cohesion as a strategy to reduce technostress (Loup et al., 2016). Additionally, technology poses a barrier to teamwork and group cohesion in the new normal, evident in decreasingly direct conversations and working separately (Hardwig & Boos, 2023; Malik et al., 2020; Shaikh et al., 2022). Therefore, it is possible that in the new normal, which coworkers mostly communicate through technology, technostress may arise due to a lack of cohesion.

Previous studies on technostress have adapted its components to suit various contexts. However, the new normal appears to differ from the aspects of previous technostress dimensions. The adoption of social distancing policies introduced new requirements that organizations had to adjust to, leading to a shift in technostress patterns. Remote technology increased the prevalence of working separately rather than engaging in face-to-face meetings. This shift underscored a key change in how technostress manifests, as the lack of direct interpersonal interaction became a central aspect of the remote working environment. As a result, employees demonstrate decreased cohesion. Even after the pandemic, the continued reliance on technology for work has contributed to ongoing emotional distance. Employees report experiencing stress related to interpersonal relationship challenges arising from technology-mediated work. This suggests that the strain associated with a lack of cohesion in digital work environments may be a component of technostress. However, study explicitly examined interpersonal relationships as a distinct dimension of technostress has not yet been found.

Therefore, this study aims to investigate whether 'Techno-induced Incohesion' is one of the technostress components. The mixed-method research design was employed in this study. A semi-structure interview was conducted to comprehensively explore various aspects of technostress in the new normal. Subsequently, after transcription and qualitative analysis, factor analysis was performed to confirm the new technostress components.

1.2 Adjustment of technostress components

The initial measurement of technostress assessed general nervousness from technology use (Kasuga, 1994) before evolving into a component-based scale. Ragu-Nathan et al. (2008) used the Transaction-Based Model of stress to categorize technostress into 2 constructs: 5 technostress creators and 3 technostress inhibitors. The first component of technostress creators is *Techno-overload*, where employees are forced to work harder, faster, and longer. The second is *Techno-invasion*, which blurs work and personal life due to constant connectivity through technology. The third is *Techno -complexity*, where difficulty of technology leads to feelings of inadequacy and requires extra effort to learn. The fourth is *Techno-insecurity*, which involves job insecurity fears due to technological advancements or skilled replacements. The last is *Techno-uncertainty*, where

constant technological changes create unease as employees must continuously adapt.

Technostress inhibitors refer to organizational support aimed at reducing technostress, consist of 3 components (Ragu-Nathan et al., 2008). First, *Literacy facilitation* involves policies that enhance employees' technology-related knowledge. Second, *Technical support provision* includes facilities to minimize technology-related issues. Lastly, *Involvement facilitation* promotes a positive attitude and encourages responsible technology use. However, technostress inhibitors are not as extensively discussed, while technostress creators are more commonly used in research.

Nevertheless, some researchers choose specific components of technostress creators to measure overall technostress, as demonstrated in the following example. Fieseler et al. (2014) utilized 4 out of 5 components: Techno-overload, Techno-invasion, Techno-complexity, and Techno-uncertainty, to measure technostress in salespersons. The results indicated that technostress leads to exhaustion and decreases job satisfaction, while effective leadership can mitigate these outcomes. Alam (2016) measured technostress in aviation industry using 3 out of 5 components: Techno-overload, Techno-complexity, and Techno-uncertainty, and identified a negative relationship between technostress and productivity. Okolo et al. (2020) measured technostress using 3 out of 5 components: Techno-overload, Techno-invasion, and Techno-complexity, and discovered a positive relationship between Techno-overload and counterproductive work behavior in bankers. Similarly, Di Dalmazi et al. (2022) employed 3 out of 5 components: Techno-overload, Techno-invasion, and Techno-complexity, and found that technostress positively influences affective and cognitive strain, which in turn affects work engagement and job performance. These examples illustrate the adaptability of technostress measurement.

Moreover, some researchers modify details or add components of technostress to align with specific context, as demonstrated in the following example. Lei and Ngai (2014) adapted the transactional theory of stress into technostress measurement consist of 5 dimensions, i.e., work overload, work-home conflict, invasion of privacy, role ambiguity, and job insecurity. From these dimensions, some can be classified as challenge appraisal, some as threat appraisal, or both. Cadieux et al. (2021) expanded technostress components to align with professional lawyers, and the results indicate that technostress can be divided into 8 factors, i.e., Feeling of work-overload, Feeling of informational overload, Feeling of communication overload, Feeling of work-home conflict induced by information and communications technologies (ICTs), Feeling of pressure induced by ICTs, Feeling of utility (reversed), Feeling of misinformation, and Feeling of insecurity induced by Artificial Intelligence (AI).

However, a study that adjusts technostress components to explain interpersonal relationship aspects, such as cohesion, has not been found yet. Considering the new normal work routine, technology has empirically posed a barrier to teamwork and group cohesion even after the Covid-19 pandemic subsided, as demonstrated in the following example. Malik et al. (2020) examined changes in the work environment influenced by the pandemic and its impact on the social bonds among employees. The study indicates that a low level of trust and social cohesion constitutes an organizational management crisis, influenced by technology-mediated communication and social distancing. In line with Shaikh et al. (2022), investigating the impact of working in the new normal on leaders' perceptions, the results point out that the adaptation of technology for work facilitates the hiring of diverse talents from elsewhere, offers flexible work hours, increases autonomy, and provides freedom from relocation. However, this transition has a negative impact on interpersonal relationships, manifested in decreased direct conversations, workplace isolation, and reduced team cohesion. Similarly, Hardwig and Boos (2023) summarized the challenges in organizational management triggered by the pandemic into 3 categories, i.e., the impact on team effectiveness, the impact on team cohesion and organizational commitment, and obstacles related to spatial and technical infrastructures.

Therefore, these examples illustrate that a lack of cohesion can contribute to technology-related stress. We hypothesize that one of the new components of technostress will be *'Techno-induced Incohesion'*, which refers to a low level of cohesion among employees resulting from the increasing use of technology for work and communication in the workplace. Factor analysis was employed to investigate this presumption.

H1: 'Techno-induced incohesion' will be one of the components of technostress.

2. METHODOLOGY

This study employed a mixed-method research design to explore new aspects of technostress. Part 1 involved semi-structured interviews to examine technostress in the new normal, and the findings were used to develop a question pool for a new technostress scale. Part 2 applied statistical analysis to confirm the components using Exploratory Structural Equation Modeling (ESEM), which integrates exploratory factor analysis with structural equation modeling to explore and confirm factors simultaneously. The details of the study are as follows.

2.1 Participants

Employees in various careers and positions across 29 universities in Thailand were invited to participate in this study, encompassing diverse roles , making them a valuable setting for studying shifting work trends. Eligible participants were over 18 years old and engaged in online work at least twice a week in the past month, including video conferences, chats, emails, and online platforms like Google Docs. Following Belmont Report ethics (1979), informed consent was obtained, participation was voluntary, and personal data remained confidential to ensure anonymity in published findings. The sample size followed the rule of thumb, with 20–30 interviewees for data saturation (Baker & Edwards, 2012) and at least 300 participants for the online survey (1992), recruited via convenient sampling.

2.2 Instruments

2.2.1) Sample Characteristics Screening Form. This form determined participant eligibility based on two criteria: age (18+ years) and frequency of online work (at least twice a week in the past month). Those who answered "yes" to both proceeded to the next step.

2.2.2) Self-identifying Code. Participants generated a six-digit code following our guidelines to link demographic data and interview content while maintaining anonymity.

2.2.3) Demographic Data. Collected details include gender, education, position, work style (individual–group), work duration, daily work hours, online work hours, remote and office workdays per week.

2.2.4) Study Part 1: Semi-structured Interview. The interview explored technostress in the new normal through 3 sections:

Section 1: Free Association.This section begins by explaining the meaning of technostress and then asks participants to share their experiences with it. In-depth explanations or examples of related events are also inquired.

Section 2: Cohesion Aspect.This section is provided if participants did not address this aspect in Section 1. The question explores whether cohesion in the workplace is associated with technostress. If an association exists, participants are asked to provide in-depth explanations. If not, their opinions are explored to confirm the disassociation.

Section 3: Original Components of Technostress.This section begins with participants rating the 'Technostress Creators Scale' (Ragu-Nathan et al., 2008) and then explores how well the original scale represents participants' technostress in the new normal context. In-depth opinions are also discussed.

2.2.5) Study Part 2: Quantitative Analysis. This part involved rating-scale measurements to explore the construct validity of the new technostress scale.

Technostress Questionnaire.The 54 items transcribed from the interview (α = .97, CITC = .38 – .79) were rated on a 5-point scale for validating the new scale.

2.3 Procedure

To collect data, the research study was publicized through online social network services, and invitation letters were sent to universities. In Study Part 1, participants booked online interview appointments via Google Form. Each interview involved only 1 participant and the researcher to conduct the process along the interview flow. The interviews were conducted as one-time sessions, lasting 20–30 minutes each. After qualitative analysis, the results were transcribed into a pool of questions for use in Study Part 2.

Study Part 2 involved conducting an online survey using Google Form. Participants accessed the survey through online social network services or by scanning a QR code included in the invitation letters sent to universities. The one-time survey took 15-20 minutes for each participant. The data collected from this part were utilized for statistical analysis to establish the new technostress scale.

3. RESULTS

3.1 Interview analysis

After excluding volunteers who did not meet the criteria, 31 participants (see Table 1) completed the interview. Participants were aged 24–63 years (M = 35.7, SD = 9.4), mostly female (45.2%), held a master's degree (45.2%), and in full-time staff positions (64.5%). The most common work style was interdependent (45.2%).

Table 1: Demographic Data of Interview Participants (N = 31).

Variables		Frequency	%	Cumulative %
Gender	Male	13	41.9	41.9
	Female	14	45.2	87.1
	LGBTQ+	4	12.9	100.0
Education	Bachelor's Degree	11	35.5	35.5
	Master's Degree	14	45.2	80.6
	Doctoral Degree	6	19.4	100.0
Position	Staff (Short-term Contract)	4	12.9	12.9
	Staff (Full-time)	20	64.5	77.4
	Head officer	3	9.7	87.1
	Executives	4	12.9	100.0
Work Style	Fully Independent	5	16.1	16.1
	Mostly Independent	7	22.6	38.7
	Interdependent	14	45.2	83.9
	Mostly Collaborative	3	9.7	93.5
	Fully Collaborative	2	6.5	100.0

Participants reported working 1-12 hours per day (M = 7.6, SD = 2.5). Online work followed a similar pattern, ranging from 1–12 hours (M = 4.2, SD = 2.7), including time spent actively online, such as video conferences and systemic check-ins, ranging from 0-8 hours per day (M = 2.8, SD = 2.2). Remote work occurred 0-7 days per week (M = 1.9, SD = 2.0), while office-based working spanned 1-6 days per week (M = 4.0, SD = 1.4).

Interview data were analyzed using qualitative methods (Belotto, 2018; Creswell, 2009), starting with word-by-word transcription. The transcribed data were coded into meaning units (Belotto, 2018), with representative phrases used as codes. Similar data were grouped into categories, themes were identified based on meaning units, and code frequencies were recorded (see Table 2). Full content demonstrated in Appendix A.

Table 2: Interview Data Coding.

Theme	Code	Frequency of Statements
Techno-induced Incohesion	– Emotional Distancing	34
	– Communication Barriers	42
	– Misunderstandings	26
	– Negative Emotions	27
Hindrances in Technology Usage	– Technology Instability	57
	– Misinterpretation	23
	– Ineffective Work	16
Incompetence with Technology	– Insufficient Adaptation	58
	– Comparison to Others	17
Overloading of Technology	– Increased Workload	74
	– Longer Time Spent	15
	– Invaded Privacy	39
	– Feeling Overwhelmed	24

The analysis was interpreted in detail, summarized into 2 sub-parts covering 8 issues.

Part 1.1: Free Association Analysis

Issue 1: Techno-induced Incohesion

The results align with presumption, as participants reported experiences of techno-induced incohesion. Increased technological use in the workplace has become a source of decreased cohesion, as tasks are completed individually, even group-based work can separately done. Direct conversations receive less attention, and online responses are delayed. Some online interactions cause nervousness due to unclear emotions and difficulty understanding unfamiliar colleagues. Insulting remarks occur more often, as technology weakens accountability for others' feelings. However, technology also facilitates remote coordination, enabling collaboration and maintaining connections despite physical separation.

Issue 2: Hindrances in Technology Usage

The results indicate stress caused by technological disruptions. Various hindrances affect work effectiveness, including unstable devices, programs, and network connections. Technology-based work also presents challenges like missed information, Misinterpretation, and unresponsive coworkers, which are less common in traditional work. Additionally, maintaining focus is difficult due to environmental distractions, and entertainment features on work devices.

Issue 3: Incompetence with Technology

The results indicate stress manifesting as negative emotions due to adaptation inefficiency. While technology is seen as a work facilitator, initial adoption often reduces confidence in its use. Participants reported feeling unskilled in using technology smoothly, citing a lack of knowledge and adaptation skills. This stress sometimes appears as nervousness at work and fear of unacceptance from colleagues.

Additionally, participants highlighted issues of overloading and invasion, aligning with the original aspect, as analyzed below.

Part 1.2: Original Technostress Component Analysis

Issue 1: Techno-overload

The results show that technostress in the new normal involves overload, similar to the original concept. Participants reported stress from adopting technology, which increased work quantity, added responsibilities, more unnecessary urgent tasks, and requirement for multitasking. Some also faced additional workloads due to fast-paced requirements. However, head officers and executives reported a positive view of overload, seeing technology as an opportunity to accomplish more work.

Issue 2: Techno-invasion

The results reveal that techno-invasion remains a key stress factor, as technology intrudes on privacy and blurs work-life boundaries. Constant alerts and the extension of work beyond office hours were particularly stressful. This intrusion contributes to technostress and work-life imbalance. However, the invasion is often mentioned as being linked to the overloading of technology.

Issue 3: Techno-complexity

The findings disagree with the original concept of techno-complexity, which focused on technology being hard to understand. Most participants (27 of 31) found technology easy to adapt to, even those who considered themselves 'low-tech.' Technology is now perceived as a facilitator for work. However, the complexity has shifted to limitations and inefficiency, as technology often requires multiple programs to complete complex tasks. Participants also expressed the need to use various programs to collaborate across sectors and the need to master platforms with similar functions, such as Zoom, Teams, and Google Meet.

Issue 4: Techno-insecurity

There is disagreement with the original notion of techno-insecurity, which highlighted job insecurity due to technology. Most participants (24 of 31) believed technology could not replace humans. Technology is viewed as a tool, and human expertise remains essential for development, control, and decision-making. The replacement of unimproved individuals is not solely due to technology. However, some participants experienced insecurity not from job loss, but being bullied by colleagues with superior technology skills and unnecessary competition, leading to stress both as eustress (promoting self-improvement) and distress (causing discouragement).

Issue 5: Techno-uncertainty

The results show that participants disagree with the original concept of techno-uncertainty, which focused on stress caused by frequent technological changes. Most participants (24 of 31) accepted technology updates as necessary and beneficial. The evolution of technology proceeded gradually; some changes were unnoticeable. Therefore, continuous updating in technology is not perceived as part of stress. However, stress emerged when updates led to inefficient changes, such as unstable platforms or the removal of useful features, causing obstacles in work performance. Moreover, being forced to adopt new technology that does not align with workflows is also a source of stress related to technological changes.

Interviews from the original scale are summarized in Appendix B.

Upon reviewing the overall interview data, it becomes apparent that some original definitions do not align with the new normal. Additionally, some aspects could be consolidated. For example, **techno-overload** and **techno-invasion** can be merged, as increased workload is linked to the intrusion of technology into personal lives. Similarly, **techno-insecurity**, **techno-uncertainty**, and **incompetence with technology** could be combined, as technological inefficiencies contribute to feelings of inadequacy and insecurity, extending beyond job insecurity. Therefore, merging and updating these definitions will be considered based on factor analysis.

3.2 Factor Analysis

After excluding ineligible participants, unfinished surveys, and acquiescence bias, 309 participants remained (see Table 3). Their CITC critical value for reliability testing was $r(309) = .112$. Participants aged 19–68 ($M = 34.3$, $SD = 8.5$), were mostly female (67.0%), held a bachelor's degree (50.8%), and occupied full-time staff positions (66.7%), with Interdependent work as the most common style (44.3%).

Table 3: Demographic Data of Factor Analysis (N = 309).

Variables		Frequency	%	Cumulative %
Gender	Male	78	25.2	25.2
	Female	207	67.0	92.2
	LGBTQ+	24	7.8	100.0
Education	Diploma	6	1.9	1.9
	Bachelor's Degree	157	50.8	52.8
	Master's Degree	101	32.7	85.4
	Doctoral Degree	45	14.6	100.0
Position	Staff (Short-term Contract)	72	23.3	23.3
	Staff (Full-time)	206	66.7	90.0
	Head officer	17	5.5	95.5
	Executives	14	4.5	100.0
Work Style	Fully Independent	45	14.6	14.6
	Mostly Independent	84	27.2	41.7
	Interdependent	137	44.3	86.1
	Mostly Collaborative	19	6.1	92.2
	Fully Collaborative	24	7.8	100.0

Participants' work durations ranged from 1 month to 45 years (M = 7.13, SD = 7.7). Daily working hours varied between 1–18 hours (M = 8.3, SD = 2.0). The online work spanning 0.5–20 hours (M = 4.4, SD = 2.9), including active online tasks 0-15 hours (M = 2.7, SD = 2.7). Remote work occurred 0–7 days per week (M = 1.6, SD = 2.0), while office-based work ranged from 0–7 days (M = 4.4, SD = 1.4).

Factor analysis was conducted using Exploratory Structural Equation Modeling (ESEM) in Mplus 8.3, utilizing predefined categories from qualitative analysis (Alamer & Marsh, 2022; Asparouhov & Muthén, 2009; van Zyl & ten Klooster, 2022). ESEM was conducted using maximum likelihood estimation with oblique rotation, assuming factor coherence. Based on qualitative analysis, 5 factors were specified for 54 technostress items, allowing free estimation and loading. Items with factor loadings ≥ 0.50 were included in that factor (Hair et al., 2010).

The ESEM results of 5-factors analysis indicated a poor model fit (χ^2 = 2575.288, df = 1171, χ^2/df = 2.199, p < .01; RMSEA = .071 [.068, .075]; SRMR = .037; CFI = .854; TLI = .821). Additionally, none of the items in Factor 5 met the selection criteria, and most exhibited cross-loadings with lower factor loadings in Factor 5. The content in Factor 5 lacked thematic coherence and aligned better with other factors. Consequently, Factor 5 was removed, along with other cross-loading items that were too ambiguous to be assigned to any factor. However, some cross-loading items with clear content alignment and higher loadings in a specific factor were retained. After this refinement, the Technostress Scale consisted of 4 factors, 44 items (see Table 4), with improved fit indices (χ^2 = 1302.048, df = 749, χ^2/df = 1.738, p < .01; RMSEA = .056 [.051, .061]; SRMR = .035; CFI = .926; TLI = .907).

Table 4: Factor Loadings of the Technostress Items (N = 309).

Item	Factor loadings				Item	Factor loadings				Item	Factor loadings			
	1	2	3	4		1	2	3	4		1	2	3	4
Q01	.641	.231	-.104	-.071	**Q19**	.025	.765	.116	-.033	**Q37**	.044	-.014	-.050	.860
Q02	.641	.204	.010	-.056	**Q20**	.032	.734	.107	.075	**Q38**	.011	-.052	.159	.716
Q03	.636	.189	-.005	.016	**Q21**	.108	.846	.028	.040	**Q39**	-.033	.222	-.054	.782
Q04	.687	-.018	.140	.015	**Q22**	-.026	.712	.153	-.048	**Q40**	.059	.176	.084	.529
Q05	.445	.213	.117	.039	**Q23**	.039	.911	-.020	.038	**Q41**	-.039	.102	.080	.645
Q06	.575	.371	.030	-.072	**Q24**	.066	.846	-.027	.056	**Q42**	.067	.052	.383	.169
Q07	.628	.240	.017	-.034	**Q25**	-.011	.789	.028	.052	**Q43**	-.011	.186	.429	.031
Q08	.763	-.011	.064	.069	**Q26**	.015	-.082	.809	-.070	**Q44**	.038	.013	.613	.089
Q09	.404	.120	.160	.051	**Q27**	-.012	.026	.731	-.192	**Q45**	.114	.021	.498	.057
Q10	.595	.268	-.040	.021	**Q28**	.059	.118	.784	-.161	**Q46**	.061	-.044	.726	.038
Q11	.685	-.022	.032	.159	**Q29**	.016	-.128	.849	.029	**Q47**	.106	.064	.508	.041
Q12	.723	-.080	.115	.031	**Q30**	-.026	.029	.805	-.059	**Q48**	.164	-.056	.377	.184
Q13	.805	-.055	.047	.085	**Q31**	-.092	.109	.712	-.016	**Q49**	.102	.165	.271	.088
Q14	.385	.543	-.154	-.032	**Q32**	-.043	.335	.480	.017	**Q50**	-.076	.667	.119	-.057
Q15	.131	.638	-.080	.023	**Q33**	.104	.092	.554	.040	**Q51**	-.065	.728	.121	.062
Q16	.141	.788	-.113	-.072	**Q34**	-.026	.155	.704	-.066	**Q52**	-.096	.765	.018	.035
Q17	.393	.368	.026	-.009	**Q35**	-.003	-.016	.659	.129	**Q53**	-.154	.698	.161	.078
Q18	.273	.658	-.050	-.064	**Q36**	.002	.058	.012	.772	**Q54**	-.076	.650	.136	.051

After rearranging items by factor loadings, the full Technostress Scale (Appendix C) was created (44

items; *M* = 3.2, *SD* = 0.8, 95% CI [3.09, 3.26]). The short form (Appendix D) was created by selecting the key items from each component (20 items; *M* = 3.2, *SD* = 0.8, 95% CI [3.13, 3.30]). Both forms include 4 components: techno-overload, techno-insecurity, techno-induced incohesion, and techno-instability, with updated definitions reflecting the new normal context.

Factor 1: Techno–overload

This factor merges the original components of techno-overload and techno-invasion, emphasizing the overwhelming feelings from excessive work duties and extended time using technology for work. Therefore, the term 'Techno-overload' captures this concept.

Techno-overload refers to the overwhelming stress of working harder and faster due to technological adoption. This includes increased workload, additional responsibilities, more unnecessary urgent tasks, and multitasking requirements. Growing work demands lead to greater technology use, contributing to time overload as technology intrudes privacy and blurs work-life boundaries.

The full-form scale includes 11 items (*M* = 3.4, *SD* = 1.0, 95% CI [3.31, 3.52]), with factor loadings of .595–.805 and high reliability (α = .931, CITC = .669–.756). The short-form scale consists of 5 items (*M* = 3.4, *SD* = 1.0, 95% CI [3.30, 3.51]), with factor loadings of .595–.763 and high reliability as well (α = .843, CITC = .558–.706).

Factor 2: Techno–insecurity

This factor merges 3 original concepts, techno-complexity, techno-insecurity, and techno-uncertainty, expanding to include technology incompetency. It focuses on insecure feelings arising from obstacles in technology use, such as complexity, functional limitations, and job insecurity. The term 'Techno-insecurity' captures this concept.

Techno-insecurity refers to feelings of insecurity caused by obstacles in adapting to technology, leading to a lack of confidence in its effective use. These obstacles include technological challenges, such as complexity and functional limitations. Additionally, it encompasses insecurities related to feelings of threat, such as unfamiliarity with new technology, being overshadowed by colleagues with higher tech skills, and job insecurity.

The full-form scale includes 16 items (*M* = 2.5, *SD* = 0.9, 95% CI [2.36, 2.57]), with factor loadings from .543–.911 and high reliability (α = .951, CITC = .597–.803). The short-form includes 5 items (*M* = 2.5, *SD* = 1.0, 95% CI [2.34, 2.57]), with factor loadings from .712–.846 with high reliability as well (α = .864, CITC = .614–.757).

Factor 3: Techno–induced incohesion

This factor aligns with the literature review's presumption, focusing on workplace cohesion issues due to increased technology adoption. Thus, the term 'Techno-induced incohesion' captures this concept.

Techno-induced incohesion refers to feelings of isolation from technology use, which disrupts human interactions and creates incohesion. This includes social incohesion, such as reduced intimacy and delayed interaction, and task incohesion, such as working separately and encountering inaccuracies in work objectives. As a result, emotional distance grows in cooperation, diminishing the sense of belonging in the workplace.

The full-form scale includes 11 items (*M* = 3.1, *SD* = 1.0, 95% CI [2.97, 3.18]), with factor loadings from .554 to .849 and high reliability (α = .930, CITC = .650–.764). The short-form scale consists of 5 items (*M* = 3.2, *SD* = 1.0, 95% CI [3.07, 3.30]), with factor loadings of from .613 to .849 and high reliability as well (α = .866, CITC = .626–.742).

The identification of 'Techno-induced incohesion' *supports the acceptance of the study's hypothesis.*

Factor 4: Techno–instability

This factor introduces a new dimension to technostress, emphasizing inefficiencies in technology improvement, contrasting with the earlier perspective of technology being too advanced. It focuses on technical problems, particularly instability during technology adoption for work. Thus, the term 'Techno–instability' describes this component.

Techno–instability refers to frustration caused by inefficiently developed technology, leading to instability or disruption. This instability can manifest in hardware (e.g., unsteady computers or peripherals), software (e.g., unstable operating systems or applications), or networks (e.g., inconsistent internet or local area network (LAN) connectivity). These issues result in stress due to hindered technology use and impaired work performance.

The full-form scale includes 6 items (*M* = 3.7, *SD* = 1.0, 95% CI [3.61, 3.84]), with factor loadings of .529–.860 and high reliability (α = .910, CITC = .701–.811). The short-form scale consists of 5 items (*M* = 3.8, *SD* = 1.0, 95% CI [3.68, 3.91]), with factor loadings of .529–.782 and high reliability as well (α = .901, CITC = .675–.812).

4. DISCUSSIONS AND IMPLICATIONS

4.1 Highlights of the new 'Technostress Scale'

The mixed-method study identifies three key distinctions from traditional technostress. The new 'Technostress Scale' includes expanded, adjusted, and removed aspects from the original 'Technostress Creators' measurement, as discussed follows.

First, the expanded aspect of technostress involves stress from technology itself and its impact on individuals. Techno-instability is one such aspect, where malfunctioning devices, software, and networks lead to frustration and dissatisfaction. This perspective differs from previous views where individuals perceived technology as too complex. Nowadays, technology is seen as a facility, becoming a normal part of daily life. However, the drawbacks of technology still pose obstacles, especially in the work context. Therefore, stress from technology has shifted from its perceived difficulty to its limitations.

Techno-induced incohesion is another expanded aspect. Despite technology serving as a tool to connect people anywhere, anytime, enabling communication without the need for direct meetings, the downside of this shifted communication style manifests as a reduced sense of emotion. Contacting through technology hinders human interactions, leading to a lower perception of humanity and a lack of concern for each other's feelings. Consequently, people think less and use more emotionally harmful words. Specifically, working separately through technology diminishes direct interactions, resulting in decreased cohesion in the workplace. These findings align with previous studies that have highlighted a decline in interpersonal relationships due to increased technology adoption for work during the Covid-19 pandemic (Breideband et al., 2022; Malik et al., 2020; Wildman et al., 2021).

The second distinction involves adjustments to techno-overload and techno-insecurity to fit the new normal. The findings indicate that techno-overload has a broader perception. Employees perceive an overload of tasks and an overload of time as interconnected issues. While the adoption of technology brings about an easier approach to work, the downsides of this convenience are manifested in increased work demands and more complex requirements. These heightened workloads are typically beyond what can be completed within regular work hours. Coupled with technology's ability to facilitate connectivity anywhere and anytime, this leads to an overload of time spent on work through technology. Consequently, technology invades personal life, blurring the line between work and the personal context. As a result, the overload of tasks and overload of time cannot be completely separated, distinguishing it from the original aspect where people could perceive the overload of tasks and the invasion from technology separately.

Similarly, techno-insecurity is a linkage of various traditional aspects—techno-complexity, techno-insecurity, and techno-uncertainty—combined with a focus on the feeling of inadequacy. Unlike the original definition of technostress, which defined techno-insecurity as job insecurity due to replacement by technology, the new techno-insecurity encompasses a wide range of insecure feelings related to technology usage. As familiarity with technology usage in daily life induces a perception of technology as a facilitator instead of a replacement, the job insecurity stemming from technology is buffered. However, stress from adapting to technology is still ongoing but has shifted to insecure feelings related to inadequate skills in technology usage. This aligns with stress theory, which suggests that dealing with harmful environments leads to stress (Lazarus & Launier, 1978), and the changes can be regarded as one such harmful environment (Wisse & Sleebos, 2016). Experiencing unfamiliar or complex technology can result in a lack of confidence in using technology. Besides, there may be feelings of competition or being bullied by others with higher technology skills, including job insecurity. Therefore, techno-insecurity in the new aspect encompasses insecure feelings arising from challenges related to technology itself and other threatened feelings induced by technology usage.

The last distinction is the removal of the aspect from the original technostress. The original techno-uncertainty, which refers to feelings of displeasure and unsettledness stemming from continuous changes and upgrades in technology, is not applicable in the new normal context. The constant development of technology is now appreciated. People have changed their perspective from not liking to frequently adapting to new technology to believing that technology should be updated regularly. Updating brings about more convenient devices, more stable software, and additional useful functions. Therefore, stress from the development of technology has shifted from its mere changing nature to its ineffective improvement, which falls under the techno-instability dimension, or just a slight nervousness at the initial stage of adaptation, which falls under the techno-insecurity dimension.

4.2 Trend of technostress in the new normal

Due to the Covid-19 pandemic, technology was adopted for remote work to comply with social distancing guidelines, leading to decreased interpersonal relationships in organizational contexts (Breideband et al., 2022; Malik et al., 2020; Wildman et al., 2021). This shift in working style continues even as the pandemic subsides, with technology becoming mainstream for work, and socialization within organizations still maintaining distance despite the relaxation of prevention guidelines. Results from this study confirm the changed pattern of interpersonal relationships in the workplace. Employees are experiencing stress related to technology hindering human interaction, resulting in a lack of emotional connection. Considering the moderate to slightly high levels of mean range in the techno-induced incohesion component, employees are struggling with social and task incohesion, which can diminish their sense of belonging within the work community.

The mean score range of the techno-instability and techno-insecurity components also show the shifted pattern of technostress. Previous perceptions of technostress usually focused on its complexity and difficulty, especially among older individuals and non-ICT specialists (Le Roux & Botha, 2021; Marchiori et al., 2018). This differs from the qualitative findings in this study, which indicate a low perception of complexity and difficulty on technology. Technology is perceived as a facility, and it is not considered too difficult to use, although slight nervousness can occur when adopting new technology. This is confirmed by the slightly low level of mean range in the techno-insecurity component, demonstrating that employees are quite confident in adopting technology for work. On the other hand, the perception of technology has shifted from its difficulty to its inefficacy. The instability and disruption of technology lead to employees' frustration and dissatisfaction, as confirmed by the slightly high to high level of mean range in the techno-instability component. Considering these two components implies that employees are struggling with stress related to ineffective and malfunctioning technology, even though they have sufficient technology efficacy.

Moreover, the results indicate that stress related to the overloading of technology is still ongoing, with a wider aspect covering the overload of work and overload of time. Techno-overload stands out as a prominent aspect of technostress from previous times to nowadays. The increasing use of technology has led employees to devote more of their lives to work, a trend that was further amplified by the widespread adoption of technology during the Covid-19 pandemic (Farmania et al., 2022; Ingusci et al., 2021; Irawanto et al., 2021; Okubo et al., 2021). This is confirmed by the slightly high levels of mean range in the techno-overload component in this study. Therefore, attention should still be given to stress related to the overwhelming feeling due to high amounts of technology usage.

4.3 Implications for practice

This study sheds light on new aspects of technostress, namely techno-induced incohesion and techno-instability, which have not been previously stated. These findings offer valuable implications to reduce stress related to technology, especially in organizational contexts. Organizations can apply these findings to their policies to mitigate employees' stress on these four main points as follows.

Firstly, based on techno-overload, which has played a significant role in technostress from previous times to the present, organizations should consider task assignments. Work demands should be balanced with available resources, especially the time provided. Assigning an appropriate amount of workload that can be completed within regular work hours, or carried over to the next workday, is much more appreciated by employees. Furthermore, considering other empirical studies that indicate leisure time outside of work hours can decrease stress, burnout, and increase wellbeing (Mataloni, 2023; Wolff et al., 2021), unnecessary urgent tasks and additional work requirements beyond regular work hours should be reduced.

Secondly, as technology becomes a barrier to teamwork and group cohesion in the new normal, resulting in stress related to feelings of isolation, the interpersonal relationship aspect should be given more attention. Cohesion in teams or groups has been empirically indicated to decrease stress, increase organizational commitment, and improve employees' wellbeing (Morris et al., 1976; Mushtaq et al., 2019). Therefore, organizations should consider providing a work environment that fosters positive direct interactions among employees or offering relationship-building activities based on employees' preferences to reduce stress.

Thirdly, the findings in this study suggest that ineffective technology exacerbates technostress in the new normal context, particularly regarding work-related technology. Malfunctions and inconstant technology contribute to stress related to defective work performance and frustration while working. Therefore, organizations should consider providing high-quality technology for work, including hardware such as convenient devices, software such as full-license programs, and network infrastructure

such as stable internet connections, to prevent stress arising from techno-instability.

Lastly, the issue of insecure feelings stemming from technology usage, which encompasses insecurity from technology itself and other threatened feelings, should not be neglected. Although this study showed a slightly low level of stress from techno-insecurity, this aspect should still be given attention. Secure feelings are empirically related to self-efficacy in using technology, as confirmed in previous studies where technology self-efficacy had a negative relationship with technostress (Lee, 2021; Shu et al., 2011; Tams et al., 2018). Therefore, providing facilities that ensure sufficient technology self-efficacy, such as manual guidelines and training for new technology adoption as desired, can help maintain secure feelings, thereby buffering technostress for employees.

5. LIMITATIONS AND FUTURE DIRECTIONS

According to the main objective to investigate the shifted pattern of technostress in the new normal context, the data was collected from employees in universities, which is a sector that has observably transitioned to a technology-driven work style. Although participants were recruited from a diverse range of work styles (individual or group-based work), careers, and positions, there are a few limitations in this study.

First, these participants represent just a small part of the various sectors in the overall organizational context, which may limit the generalizability of the findings. Thus, our 'Technostress Scale' should be reexamined in more diverse cultural and organizational contexts.

The next limitation pertains to the education level of the participants. As all participants have graduated from higher education levels, this may influence their perception of technology as a basic device and their confidence in their ability to use it effectively. This is reflected in the slightly low level of techno-insecurity observed. Therefore, future studies could benefit from replication with employees from other levels of education, which would be interesting and beneficial.

Moreover, these expanded aspects of the new technostress scale were gathered through a data-driven approach after the interviews, with techno-instability emerging unexpectedly. Therefore, further theory-driven studies assessing convergent and discriminant validity using other scales are needed.

The last limitation regards cultural attribution, as this study was conducted in Thailand, which is a collectivist culture that prioritizes the importance of community and interconnectedness among individuals, as evidenced by the concerns for techno-induced incohesion. Therefore, it would be valuable to further investigate the patterns of this dimension in individualist cultures.

Author Contributions Statement

R.B. wrote the main manuscript text, including the conceptualization, methodology, formal analysis, and discussion, under the supervision of P.J. All authors contributed to the funding acquisition.

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Declarations

Ethical Approval

In accordance with the ethical principles outlined in the Belmont Report, all participants provided online informed consent and participated voluntarily. Data collection was conducted anonymously, and all personal information was kept confidential. This study received ethical approval from the Research Ethics Review Committee for Research Involving Human Research Participants, Group I, Chulalongkorn University (Approval no. 051/67) on February 27, 2024.

Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

AI Usage

The authors declare they have used AI services, specifically integrated grammar-checking tools in MS Word and ChatGPT for grammar correction and minor style refinements. They carefully reviewed all suggestions from these services to ensure the original meaning and factual accuracy were preserved.

Consent to Participate

All participants provided online informed consent prior to participation and confirmed their agreement before starting the survey.

Consent to Publish: Not applicable.

Clinical Trial Number: Not applicable.

Data Availability: The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request.

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Appendix A.
Full Interview Data Coding (*N* = 31)

Theme	Code	Content	Frequency	%
Techno-induced Incohesion	***Emotional Distancing***	– Connecting with coworkers through tech does not build closeness since there is no face-to-face interaction.	25	80.6
		– Working separately through technology makes coworkers less close.	6	19.4
		– Relationships in the team are shaky because there is no instant feedback.	3	9.7
	Communication Barriers	– There is less communication when working through technology.	20	64.5
		– Communication with coworkers through technology is delayed.	12	38.7
		– There is hesitation to reach out to new coworkers through technology because of uncertainty about their friendliness.	6	19.4
		– Difficulty in working through technology because coworkers' reactions are not visible.	4	12.9
	Misunderstandings	– Misunderstandings happen when talking through technology.	18	58.1
		– Accusations of being unfriendly arise because people often misinterpret messages during online chats.	6	19.4
		– Getting to know new coworkers through tech makes it hard to really understand each other.	2	6.5
	Negative Emotions	– Nervousness occurs when communicating through technology due to uncertainty about emotions.	16	51.6
		– Annoyance with those using technology as an excuse to take advantage at work.	8	25.8
		– Coworkers seem to care less about each other's feelings and are likely to use more hurtful words through technology.	3	9.7
Hindrances in Technology Usage	***Technology Instability***	– Technology used for work has too many limitations.	17	54.8
		– Unstable internet connection.	15	48.4
		– The programs are still underdeveloped.	9	29.0
		– Systems are not updated to match the work.	7	22.6
		– Frequent equipment malfunctions with no apparent cause.	5	16.1
		– Troubleshooting technology issues happens too often because of malfunctions.	4	12.9
	Misinterpretation	– Meetings through technology often lead to misinterpreted contexts.	13	41.9
		– Uncertainty about whether coworkers understand things the same way when working through technology.	10	32.3
	Ineffective Work	– Technology use reduces work efficiency due to lack of focus.	9	29.0
		– Worry about errors in work due to incomplete information from technology.	4	12.9
		– Network congestion from too many users on the same system slows down work.	3	9.7
Incompetence with Technology	***Insufficient Adaptation***	– Learning to use technology for work felt difficult at first.	13	41.9
		– Adjusting to use new technology is tiring.	12	38.7
		– Constant learning to keep up with technology is exhausting.	11	35.5
		– Technology changes too fast, making it hard to keep up.	7	22.6
		– Do not like learning new programs because not into technology.	5	16.1
		– Unconfident when using new programs.	5	16.1
		– Achieving work goals through technology is harder than using traditional methods.	5	16.1
	Comparison to Others	– Concern about not doing well at work due to insufficient technology skills.	5	16.1
		– Lack of technology proficiency creates fear of not being accepted by coworkers.	4	12.9
		– Feeling overshadowed by coworkers who are more tech-savvy.	2	6.5
		– Using technology leads to excessive competition with	2	6.5

		coworkers.		
		– Stress from trying to keep up with coworkers' technology skills.	2	6.5
		– Fear of job loss due to technology replacing roles.	1	3.2
		– Feeling bad despite making many adjustments to technology, yet coworkers are still dissatisfied.	1	3.2
Overloading of Technology	***Increased Workload***	– Workload increases when new tasks are added to existing duties through technology.	18	58.1
		– Using technology leads to redundant tasks.	13	41.9
		– Working through technology increases expectations to produce more work.	13	41.9
		– Working through technology requires more unnecessary urgent tasks.	12	38.7
		– Work requirements through technology are too complex, leading to confusion.	11	35.5
		– Using technology means multitasking more.	7	22.6
	Longer Time Spent	– Tasks take longer due to the drawn-out nature of working through technology.	9	29.0
		– Feeling harassed by out-of-hours work requests in group chats.	6	19.4
	Invaded Privacy	– Rest time is invaded due to needing to be ready to work through technology almost constantly	27	87.1
		– Working through technology blurs the line between work and personal life.	9	29.0
		– Lack of freedom in work when controlled by technology.	3	9.7
	Feeling Overwhelmed	– Tired of helping others with tech problems outside of job scope.	12	38.7
		– Too many programs are required.	8	25.8
		– Attending online meetings while handling on-site duties makes me feel ineffective in both areas.	3	9.7
		– Frustration from fixing errors caused by rushing to meet tech-driven deadlines.	1	3.2
Other Findings	***Stressors from Other Sources***	– Working with those who refuse to adapt to technology makes the job harder.	21	67.7
		– Lack of organizational support for tools that aid in working with technology.	14	45.2
		– Inadequate organizational policy to ensure work aligns with technology.	13	41.9
		– No personal devices available that are ready for online work.	9	29.0
		– Increased expenses due to working through technology.	8	25.8
		– Work environment is unsuitable for working with technology.	7	22.6
		– Worry about online accounts being taken over by criminals.	1	3.2
	Other Outcomes	– Health issues arise from using technology, i.e., eye strain, back pain, and weight gain.	7	22.6
		– Working through technology causes more physical fatigue than working without it.	6	19.4
		– Technology leads to mental exhaustion due to information overload.	4	12.9
		– Using technology for work affects the organization's image negatively.	1	3.2

Appendix B.

Details of Interviewing from the Original Technostress Creators Scale (N = 31)

Theme	Content		Frequency	%	C%
Part 1: Exploring based on the original scale					
Techno-overload	1) I am forced by this technology to do more work than I can handle.	Agree	16	51.6	51.6
		Disagree	4	12.9	64.5
		Not Applicable	11	35.5	100.0
	2) I am forced by this technology to work with very tight time schedules.	Agree	16	51.6	51.6
		Disagree	6	19.4	71.0
		Not Applicable	9	29.0	100.0
	3) I am forced to change my work habits to adapt to new technologies.	Agree	12	38.7	38.7
		Disagree	3	9.7	48.4
		Not Applicable	16	51.6	100.0
	Inquiry: – Adjusting habits to match technology makes work easier.				
	4) I have a higher workload because of increased technology complexity.	Agree	15	48.3	48.3
		Disagree	4	12.9	61.2
		Not Applicable	12	38.7	100.0
Techno-invasion	5) I have to be in touch with my work even during my vacation due to this technology.	Agree	24	77.4	77.4
		Disagree	2	6.5	83.9
		Not Applicable	5	16.1	100.0
	6) I have to sacrifice my vacation and weekend time to keep current on new technologies.	Agree	13	41.9	41.9
		Disagree	6	19.4	61.3
		Not Applicable	12	38.7	100.0
	Inquiry: – Updating new technology in daily life does not feel like giving up weekend time				
	7) I feel my personal life is being invaded by this technology.	Agree	16	51.6	51.6
		Disagree	4	12.9	64.5
		Not Applicable	11	35.5	100.0
Techno-complexity	8) I do not know enough about this technology to handle my job satisfactorily.	Agree	10	32.3	32.3
		Disagree	8	25.8	58.1
		Not Applicable	13	41.9	100.0
	Inquiry: – It is not hard to learn more. – If something is unclear, just use technology to find more info.				
	9) I need a long time to understand and use new technologies.	Agree	6	19.4	19.4
		Disagree	7	22.6	42.0
		Not Applicable	18	58.1	100.0
	Inquiry: – A bit worried at first, but it is easy to use after a while. – Technology is no need to take too long time to understand.				
	10) I do not find enough time to study and upgrade my technology skills.	Agree	6	19.4	19.4
		Disagree	12	38.7	58.1
		Not Applicable	13	41.9	100.0
	Inquiry: – The company already provides training. – After using it for a bit, you will get the hang of it – no need to find extra time to learn.				
	11) I find new recruits to this organization know more about computer technology than I do.	Agree	8	25.8	25.8
		Disagree	9	29.0	54.8
		Not Applicable	14	45.2	100.0
	Inquiry: – It is good to have skilled people around, so they can help out.				
	12) I often find it too complex for me to understand and use new technologies.	Agree	4	12.9	12.9
		Disagree	12	38.7	51.6
		Not Applicable	15	48.3	100.0
	Inquiry: – Technology is not too hard to understand.				
Techno-insecurity	13) I feel constant threat to my job security due to new technologies.	Agree	7	22.6	22.6
		Disagree	12	38.7	61.3
		Not Applicable	12	38.7	100.0
	Inquiry: – Technology tech is more of a help than a threat. – Tech probably cannot replace people; humans are needed to make decisions. – Worry about manual labor jobs that might get replaced by tech.				
	14) I have to constantly update my skills to avoid being replaced.	Agree	11	35.5	35.5
		Disagree	6	19.4	54.9
		Not Applicable	14	45.2	100.0
	Inquiry: – Willingly updating, not driven by fear of being replaced.				
	15) I am threatened by coworkers with newer technology skills.	Agree	6	19.4	19.4
		Disagree	13	41.9	61.3
		Not Applicable	12	38.7	100.0

	Inquiry: – Sometimes there is a bit of showing off or pressure, but it is not serious. *– Technology skills are not the main thing I feel threatened by from coworkers.*				
	16) I feel there is less sharing of knowledge among coworkers for fear of being replaced.	Agree	4	12.9	12.9
		Disagree	15	48.3	61.2
		Not Applicable	12	38.7	100.0
	Inquiry: – Sharing knowledge helps lighten the workload and reduce work stress.				
Techno-uncertainty	17) There are always new developments in the technologies we use in our organization.	Agree	8	25.8	25.8
		Disagree	7	22.6	48.4
		Not Applicable	16	51.6	100.0
	Inquiry: – Technology needs to keep improving.				
	18) There are constant changes in computer software in our organization.	Agree	7	22.6	22.6
		Disagree	14	45.2	67.8
		Not Applicable	10	32.3	100.0
	Inquiry: – Improved software make work easier. *– Stress only happens when software gets worse after an update.*				
	19) There are constant changes in computer hardware in our organization.	Agree	5	16.1	16.1
		Disagree	13	41.9	58.1
		Not Applicable	13	41.9	100.0
	Inquiry: – Changes happen gradually, so it is not stressful. *– I like when there are changes and improvements.* *– I enjoy when new features are added to devices.*				
	20) There are frequent upgrades in computer networks in our organization.	Agree	6	19.4	19.4
		Disagree	12	38.7	58.1
		Not Applicable	13	41.9	100.0
	Inquiry: – Normal updates do not feel too frequent. *– I only dislike when the system is unstable during development.*				

Appendix C

Details of the Full-form Technostress Scale: 49 Items (N = 309)

Item		Factor loadings	Entirety Analysis (α_E =963)		Components Analysis	
			CITC	α–Del	CITC	α–Del
Techno–overload (α_C = .931)						
TS01	My personal life is invaded by technology.	.805	.534	.962	.728	.924
TS02	My leisure time is disrupted because I am expected to be constantly available for work through technology.	.763	.588	.962	.756	.923
TS03	Technology forces me to communicate about work even on weekends.	.723	.509	.962	.680	.926
TS04	Technology forces me to handle multiple tasks simultaneously.	.687	.564	.962	.718	.924
TS05	I feel harassed, as work demands follow me beyond regular work hours through technology.	.685	.557	.962	.681	.926
TS06	I have increasing duties when working through technology.	.641	.503	.962	.669	.927
TS07	Working through technology compels me to do unnecessary urgent tasks.	.641	.588	.962	.732	.924
TS08	Working through technology leads to expectations on me to handle more workloads.	.636	.577	.962	.710	.925
TS09	Technology pressures me to work much faster than usual.	.628	.638	.962	.742	.923
TS10	Working through technology blurs the line between work and personal life.	.595	.618	.962	.690	.926
TS11	Technology forces me to work beyond my capacity.	.575	.686	.961	.749	.923
Techno–insecurity (α_C = .951)						
TS12	It is tiring to constantly adapt to new technology instead of the methods I was accustomed to.	.911	.687	.961	.803	.947
TS13	I am stressed about keeping up with developing technology skills to match my colleagues.	.846	.707	.961	.801	.947
TS14	I am tired of learning continuously to keep up with technology.	.846	.679	.961	.770	.947
TS15	Technology changes too quickly for me to adapt.	.789	.640	.962	.738	.948
TS16	I am confused by working through complex technology functions.	.788	.645	.962	.751	.948
TS17	I am worried about not performing well due to my insufficient technology skills.	.765	.615	.962	.709	.948
TS18	I feel pressured by colleagues who are more proficient in technology.	.765	.607	.962	.731	.948
TS19	Working through technology leads to unnecessary competition with colleagues.	.734	.637	.962	.707	.948
TS20	I lack confidence when using new software for work.	.728	.692	.961	.767	.947
TS21	I am afraid of being replaced at work due to the integration of technology.	.712	.563	.962	.658	.949
TS22	I am afraid of not being accepted by colleagues if my technology skills are insufficient.	.698	.659	.961	.739	.948
TS23	I am not good at using technology, making me dislike learning new programs.	.667	.606	.962	.696	.949
TS24	Working through technology to achieve original objectives is more challenging than using traditional methods.	.658	.673	.961	.707	.949
Abbreviations: **α–Del** = Cronbach's Alpha if Item Deleted; **α_E** = Cronbach's Alpha of entire scale; **α_C** = Cronbach's Alpha of the component; **TS** = Technostress Scale						
TS25	I feel bad that even though I have made a lot of adjustments to working through technology, my colleagues are still dissatisfied.	.650	.655	.962	.715	.948
TS26	Initially, learning to use technology for work is difficult.	.638	.600	.962	.671	.949
TS27	The technology used for work has too many limitations, making it difficult for me to perform my job.	.543	.604	.962	.597	.951
Techno–induced incohesion (α_C = .930)						
TS28	Communicating with colleagues through technology makes me anxious because I am unsure of their feelings.	.849	.564	.962	.759	.921
TS29	Contacting colleagues through technology leads to less closeness, as face-to-face interactions are not frequent.	.809	.516	.962	.691	.924
TS30	Working separately through technology leads to lower cohesion in the work community.	.805	.582	.962	.764	.921
TS31	My relationship with colleagues is not as good as before because communicating through technology leads to frequent misunderstandings.	.784	.642	.962	.753	.922
TS32	Team communication is reduced when working through technology.	.731	.501	.962	.650	.926
TS33	Not seeing responses from colleagues makes working through	.726	.694	.961	.762	.921

	technology harder for me.					
TS34	I worry when contacting new colleagues through technology, as I am unsure whether they are friendly or not.	.712	.612	.962	.730	.923
TS35	Relationships in the workplace are shaky due to delayed interactions via technology.	.704	.615	.962	.702	.924
TS36	Building relationships with new colleagues through technology makes it difficult to truly know each other.	.659	.559	.962	.659	.926
TS37	Working through technology makes me unsure whether coworkers consistently understand.	.613	.664	.961	.685	.925
TS38	Communicating through technology leads to the use of more emotionally harmful words.	.554	.622	.962	.669	.925
	Techno–instability (α_C = .910)					
TS39	I am irritated by having to use unstable programs.	.860	.448	.962	.791	.889
TS40	I am frustrated by the frequent malfunctions of technology devices with unknown causes.	.782	.529	.962	.811	.885
TS41	I get annoyed when my work is disrupted due to an unstable internet network.	.772	.461	.962	.759	.893
TS42	I am dissatisfied working through technology that is not developed to align with my job.	.716	.492	.962	.742	.895
TS43	I am bored when my work is delayed due to too many users on the same network system.	.645	.495	.962	.701	.901
TS44	I dislike solving immediate problems arising from disrupted technology.	.529	.583	.962	.706	.901
	Abbreviations: **α–Del** = Cronbach's Alpha if Item Deleted; α_E = Cronbach's Alpha of entire scale; α_C = Cronbach's Alpha of the component; **TS** = Technostress Scale					

Appendix D.

Details of the Short-form Technostress Scale: 20 Items (N = 309)

Item		Factor loadings	Entirety Analysis (α_E = .915)		Components Analysis	
			CITC	α–Del	CITC	α–Del
Techno–overload (α_C = .843)						
TS_S01	My leisure time is disrupted because I am expected to be constantly available for work through technology.	.763	.555	.911	.669	.805
TS_S02	I have an increased workload when working through technology.	.641	.463	.913	.615	.820
TS_S03	Working through technology compels me to do unnecessary urgent tasks.	.641	.555	.911	.706	.795
TS_S04	Technology forces me to handle multiple tasks simultaneously.	.687	.562	.911	.703	.798
TS_S05	Working through technology blurs the line between work and personal life.	.595	.553	.911	.558	.836
Techno–insecurity (α_C = .864)						
TS_S06	I am stressed about keeping up with developing technology skills to match my colleagues.	.846	.627	.909	.757	.816
TS_S07	I am tired of learning continuously to keep up with technology.	.846	.619	.909	.748	.818
TS_S08	I am worried about not performing well due to my insufficient technology skills.	.765	.544	.911	.653	.843
TS_S09	I am confused by working through complex technology functions.	.788	.556	.911	.647	.844
TS_S10	I am afraid of being replaced at work due to the integration of technology.	.712	.492	.912	.614	.852
Techno–induced incohesion (α_C = .866)						
TS_S11	Communicating with colleagues through technology makes me anxious because I am unsure of their feelings.	.849	.554	.911	.702	.834
TS_S12	Working separately through technology leads to lower cohesion in the work community.	.805	.560	.911	.710	.832
TS_S13	Team communication is reduced when working through technology.	.731	.489	.912	.626	.854
TS_S14	Not seeing responses from colleagues makes working through technology harder for me.	.726	.687	.908	.742	.824
TS_S15	Working through technology makes me unsure whether coworkers consistently understand.	.613	.669	.908	.661	.844
Techno–instability (α_C = .901)						
TS_S16	I am frustrated by the frequent malfunctions of technology devices with unknown causes.	.782	.571	.910	.804	.869
TS_S17	I am irritated by having to use unstable programs.	.860	.516	.912	.812	.869
TS_S18	I get annoyed when my work is disrupted due to an unstable internet network.	.772	.531	.911	.762	.878
TS_S19	I am dissatisfied working through technology that is not developed to align with my job.	.716	.559	.911	.731	.885
TS_S20	I dislike solving immediate problems arising from disrupted technology.	.529	.625	.909	.675	.898
Abbreviations: **α–Del** = Cronbach's Alpha if Item Deleted; α_E = Cronbach's Alpha of entire scale; α_C = Cronbach's Alpha of the component; **TS_S** = Technostress Scale Short from						