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Exploring Technostress and Meta-Work: Identifying Subgroups Among Finnish Employees

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ABSTRACT

This study employed a mixed-methods approach to identify subgroups among Finnish employees based on the interplay between meta-work—such as troubleshooting—and technostress, the strain caused by technology use. Using data from an online questionnaire, we identified four technostress subgroups through thematic, correspondence, and cluster analyses: (1) moderate technostress and intense meta-work engagement, (2) high technostress and moderate meta-work engagement, (3) low technostress with effective coping and low meta-work engagement, and (4) low technostress with ineffective coping and very low meta-work engagement. Each subgroup varied by technological skills, age, and organizational factors. Meta-work was found to increase burdens and worsen technostress. To minimize technostress, organizations should address meta-work effects, offer tailored training, implement user-friendly technologies, and create supportive work environments. By automating and simplifying processes, the workload of employees can be reduced. Understanding technostress and meta-work improves well-being and productivity, so studying their long-term effects and coping strategies is important.

1. Introduction

Digital transformation has markedly altered work culture, introducing innovations and efficiency (Imran et al., 2021; Pihlajamaa et al., 2023). However, it also comes with hidden costs, such as technostress and meta-work that employees have to manage. Technostress, the stress experienced due to technology use (La Torre et al., 2019; Tarafdar et al., 2019), and meta-work, which encompasses supporting tasks such as adaptation, configuration, communication and information coordination, maintenance and technical work, and monitoring, measuring, and reporting (Aroles et al., 2023; Beer & Mulder, 2020; Bourlakis et al., 2023; Bruun & Krause-Jensen, 2022; Castillo et al., 2023; Huang, 2021; Jarrahi et al., 2017; Justesen & Plesner, 2024; Palen & Salzman, 2004; Scaramuzzino & Martinell Barfoed, 2023), are central to our study. Technostress has been a concern since the 1980s (Brod, 1984), and recent studies have further examined its dimensions and effects on employee well-being (La Torre et al., 2019; Tarafdar et al., 2019). From an organizational psychology perspective, it arises from the interaction between people and technology (Bourlakis et al., 2023; Pekkala, 2024; Sellberg & Susi, 2014) and is partly due to digital task management demands (Mihelič et al., 2024; Rademaker et al., 2025).

Despite extensive research on technostress and digital transformation, several gaps remain. While digital work is often portrayed as efficient and easy, this masks the underlying meta-work (Aroles et al., 2023). Meta-work, which is a functional necessity in digital environments, can exacerbate stress, especially if tools and processes are inefficient or overly complex, as uncertainty and constant changes increase stress (Aroles et al., 2023). Although meta-work is often understood to facilitate digitally transformed work, it is frequently overlooked in digital transformation

research (Aroles et al., 2023; Justesen & Plesner, 2024). Research on its influence on workload and employee well-being is scarce. Furthermore, previous studies have primarily focused on the general effects of technostress on employee well-being (La Torre et al., 2019; Tarafdar et al., 2019), and while demographic factors such as age and digital competence have been explored (Chou & Chou, 2021; De Giovanni & Catania, 2018), the interaction between these factors and technostress across different professional groups is not well understood. Furthermore, the role of organizational context in shaping technostress profiles has been underexplored (Keshavarz et al., 2025). In addition, not all employees are equally affected, as personality traits, coping strategies, and external support can mitigate these effects (Bakker, 2017; Büchi, 2024; Lazarus & Folkman, 1984; Maier et al., 2019; Marsh et al., 2022; Pasmore et al., 2019; Srivastava et al., 2015), making technostress a complex phenomenon. Understanding these variations is crucial. This study addresses gaps by identifying employee subgroups and examining their experiences with technostress and meta-work. We pose the following research questions to guide this investigation:

- *RQ1: What distinct employee subgroups can be identified based on employees' involvement in meta-work and experiences with technostress?*
- *RQ2: What are the key characteristics of each subgroup?*

This study is grounded in the job demands–resources (JD-R) model and sociotechnical systems (STS) theory, which help explore the effects of digital transformation on employee well-being and organizational productivity. The JD-R model (Bakker et al., 2014) highlights how job demands can lead to stress, while job resources can alleviate it. STS theory focuses on optimizing an organization's social and technical subsystems (Pasmore et al., 2019). In this realm, technostressors and meta-work represent harmful demands that stem from organizational, social, and technological factors (Büchi, 2024; Choroszewicz & Adams, 2019; Fischer et al., 2017; La Torre et al., 2019). While employees use various coping strategies to handle overwhelming demands, ineffective coping can increase stress and lead to negative consequences (Lazarus & Folkman, 1984).

Technostress is a growing issue in Finland (Mubarak & Suomi, 2016), exacerbated by the widespread adoption of technologies (Official Statistics of Finland, 2019). At worst, this technostress can lead to employee overload, lower engagement, higher turnover rates, and burnout risks (Califf & Brooks, 2020; La Torre et al., 2019; Nisafani et al., 2020; Siitonen et al., 2022; Tarafdar et al., 2019; Wang et al., 2021). In response to the increasing digitalization of work, this study adopts an exploratory mixed-methods approach to examine technostress among Finnish employees. By considering both technostress and meta-work, we explore the challenges and opportunities digitalized work presents. We seek to contribute to the development of better digital tools and work environments by clarifying the complex interactions between technology, work conditions, and cognitive processes.

2. Background

2.1. Technostress

In today's rapidly evolving digital landscape, technostress encompasses the emotional, mental, and physical strain arising from managing technological demands and distractions (Pothuganti, 2024; Tarafdar et al., 2019). Digital technologies increase specific demands (e.g., higher workload, complexity, conflicts between work and personal life, and physical strain), leading to psychobiological stress reactions (Dragano & Lunau, 2020; Fischer et al., 2017; Hertzum & Hornbæk, 2023; Persson & Rydenfält, 2021). Employees use various coping strategies to manage technological demands, including seeking information, solving problems, compromising, disengaging, and seeking support. Some strategies are harmful, such as giving up, complaining, and blaming others or technology, while others are more constructive, such as mindfulness and meditation (Siitonen et al., 2025). When individuals struggle to manage and cope with technological demands, they then experience technostress (Wang et al., 2021).

Earlier research has shown that technostress significantly impacts psychological and behavioral outcomes (Nastjuk et al., 2024). Complexities and errors in technology can cause frustration and

heightened physiological responses (Bourlakis et al., 2023; Dragano & Lunau, 2020; Sellberg & Susi, 2014), leading to anger, disappointment, reduced workplace satisfaction, and increased stress levels (Pothuganti, 2024). Technological demands and distractions, called technostressors, and resulting technostress negatively affect employees' physical and psychological well-being (Califf & Brooks, 2020; La Torre et al., 2019; Sellberg & Susi, 2014; Tarafdar et al., 2019). Prolonged stress and ineffective coping can lead to many harmful outcomes; therefore, it is imperative that employees' coping efforts are effectively supported (Siitonen et al., 2025). Consequently, excessive technostress can lead to feelings of inadequacy and overwhelm individuals, impacting self-esteem, sense of role and control, and professional identity (Choroszewicz & Adams, 2019; Eteläpelto et al., 2013; Kaihlanen et al., 2023; Siitonen et al., 2022; Wallin et al., 2022). This discomfort and exhaustion may reduce engagement and willingness to work or learn while increasing turnover intentions (Califf & Brooks, 2020; Wang et al., 2021) and burnout risks (La Torre et al., 2019; Nisafani et al., 2020; Tarafdar et al., 2019).

To better understand the sources of technostress, it is essential to identify the core technostressors that contribute to these negative outcomes. Based on earlier literature (e.g., Dragano & Lunau, 2020; Fischer et al., 2019; Murray et al., 2022; Nastjuk et al., 2024; Salo et al., 2022; Siitonen et al., 2022; Tarafdar et al., 2014), these include the following:

- **Techno-overload:** The pressure to work faster and handle more tasks and information due to technology.
- **Techno-invasion:** The intrusion of technology into personal life that makes it hard to disconnect from work.
- **Techno-complexity:** The feeling of inadequacy due to the complexity of technology.
- **Techno-insecurity:** The fear of job loss or insecurity about one's job due to technological advancements.
- **Techno-uncertainty:** The stress caused by constant changes and updates in technology.

While these are the core technostressors, other potential stressors, such as techno-unreliability, technology-based monitoring, cyberbullying, higher workload, and privacy concerns, have also been highlighted in the literature (e.g. Dragano & Lunau, 2020; Fischer et al., 2019; Murray et al., 2022; Nastjuk et al., 2024; Salo et al., 2022).

Earlier research indicates that individuals experience technostress differently despite mixed results regarding demographic factors, such as gender and age (Chou & Chou, 2021; De Giovanni & Catania, 2018; Marchiori et al., 2019; Ragu-Nathan et al., 2008; Tarafdar et al., 2011; Yener et al., 2021). For instance, Rosa et al. (2025) identified three user profiles based on technostress experiences: (1) techno-functional (largest group, positive relationship with technology, and low technostress), (2) techno-strained (smallest group, older users with moderate ineffectiveness and skepticism), and (3) techno-addicted (highest technostress and pessimistic view of technology). Similarly, Ficapal-Cusí et al. (2025) categorized users into high, moderate, and low technostress profiles. Niu et al. (2022) further linked high digital competence with low technostress, low burnout, and favorable learning outcomes. Similarly, Ylönen et al. (2025) categorized the digital competence profiles of social services and healthcare personnel into three overarching groups: (1) motivated digital experts, (2) burdened digital users, and (3) frustrated survivors. The frustrated survivors, representing burdened and stressed digital users with inadequate digital skills constituted the smallest group, whereas the motivated digital experts—who were nonstressed and highly skilled—comprised nearly half of the respondents. Although individual factors play a role, organizational context also affects technostress profiles (Keshavarz et al., 2025). For example, in the field of nursing, meta-work contributes to increased workloads by requiring additional time for tasks, such as information retrieval (Huang, 2021; Lydahl, 2017; Scaramuzzino & Martinell Barfoed, 2023), which may, in turn, elevate levels of technostress. Given this, it is particularly compelling to examine how meta-work influences different technostress profiles and determine whether certain groups of professionals are more susceptible to its effects.

2.2. Meta-work

Meta-work encompasses diverse digital activities that are often "out of sight," and not part of formal job descriptions yet play a crucial role in smooth functioning (Aroles et al., 2023). Meta-work is usually done on top of other assignments, adding to potential burdens (Scaramuzzino & Martinell Barfoed, 2023). The presence and forms of meta-work tasks vary across professions (Palen & Salzman, 2004). For example, meta-work tasks differ significantly between purely digital roles, such as programming, and positions, such as nursing, where technology supports human-oriented tasks. Understanding meta-work—the work that makes work possible—is essential yet often overlooked (Aroles et al., 2023; Justesen & Plesner, 2024; Palen & Salzman, 2004).

Based on the earlier literature, meta-work includes the following tasks:

- **Adaptation work:** Adapting to new work settings and technologies (Aroles et al., 2023; Beer & Mulder, 2020; Huang, 2021).
- **Configuration work:** Setting up and ensuring systems and tools work together seamlessly (Aroles et al., 2023; Bruun & Krause-Jensen, 2022; Jarrahi et al., 2017; Palen & Salzman, 2004).
- **Communication and information coordination:** Managing information flows, scheduling, and prioritizing tasks (Aroles et al., 2023; Beer & Mulder, 2020; Bourlakis et al., 2023; Huang, 2021; Jarrahi et al., 2017; Justesen & Plesner, 2024; Palen & Salzman, 2004; Scaramuzzino & Martinell Barfoed, 2023).
- **Maintenance and technical work:** Keeping systems functioning, including updates and troubleshooting, and compensating work, such as redoing work (Bruun & Krause-Jensen, 2022; Castillo et al., 2023; Justesen & Plesner, 2024; Scaramuzzino & Martinell Barfoed, 2023).
- **Monitoring, measuring, and reporting work:** Data tracking, collection, and storage, identifying issues, and generating reports (Beer & Mulder, 2020; Huang, 2021; Palen & Salzman, 2004; Scaramuzzino & Martinell Barfoed, 2023).

Managing meta-work tasks can increase cognitive burden and mental fatigue, contributing to technostress. Earlier research indicates that meta-work tasks are potentially stressful and time-consuming, adding to employees' overall workload (Beer & Mulder, 2020; Justesen & Plesner, 2024; Scaramuzzino & Martinell Barfoed, 2023). Meta-work may detract from primary tasks and core responsibilities (Aroles et al., 2023; Huang, 2021; Justesen & Plesner, 2024; Scaramuzzino & Martinell Barfoed, 2023). In the best-case scenario, automating meta-work tasks could help employees focus on their core tasks. However, it should be noted that this automation also creates new forms of meta-work, such as monitoring automated systems (Beer & Mulder, 2020; Huang, 2021). Therefore, understanding the impact of meta-work is crucial to understanding and dealing with technology-related stress in the workplace.

3. Methodology

3.1. Design

This exploratory mixed-methods study (Figure 1) aimed to categorize subgroups based on the relationship between meta-work and technostress, highlighting how digital task management influences workplace stress.

The mixed-methods approach in this study combines survey scale responses with free-text responses (e.g. Guest, 2013) to provide a systematic view of the different experiences while allowing individual experiences to emerge. Given the complexity of technostress, this approach was employed to gain initial insights into the poorly understood phenomenon of meta-work (Harwell, 2011). Qualitative data provided insights into meta-work task types, while quantitative data revealed common sources of technostress. The analysis used abductive thematic analysis (Thompson, 2022) to reveal meta-work forms and their occurrences, followed by multiple correspondence analysis (MCA) (Beh & Lombardo, 2014; Greenacre, 1984) and agglomerative hierarchical clustering (AHC) to group similar respondents. Finally, we used inductive thematic analysis (Bingham, 2023) in each subgroup to understand key points related to technostress and meta-work. Overall, this holistic mixed-methods approach helped to understand the relationship between meta-work and technostress and identify subgroups.
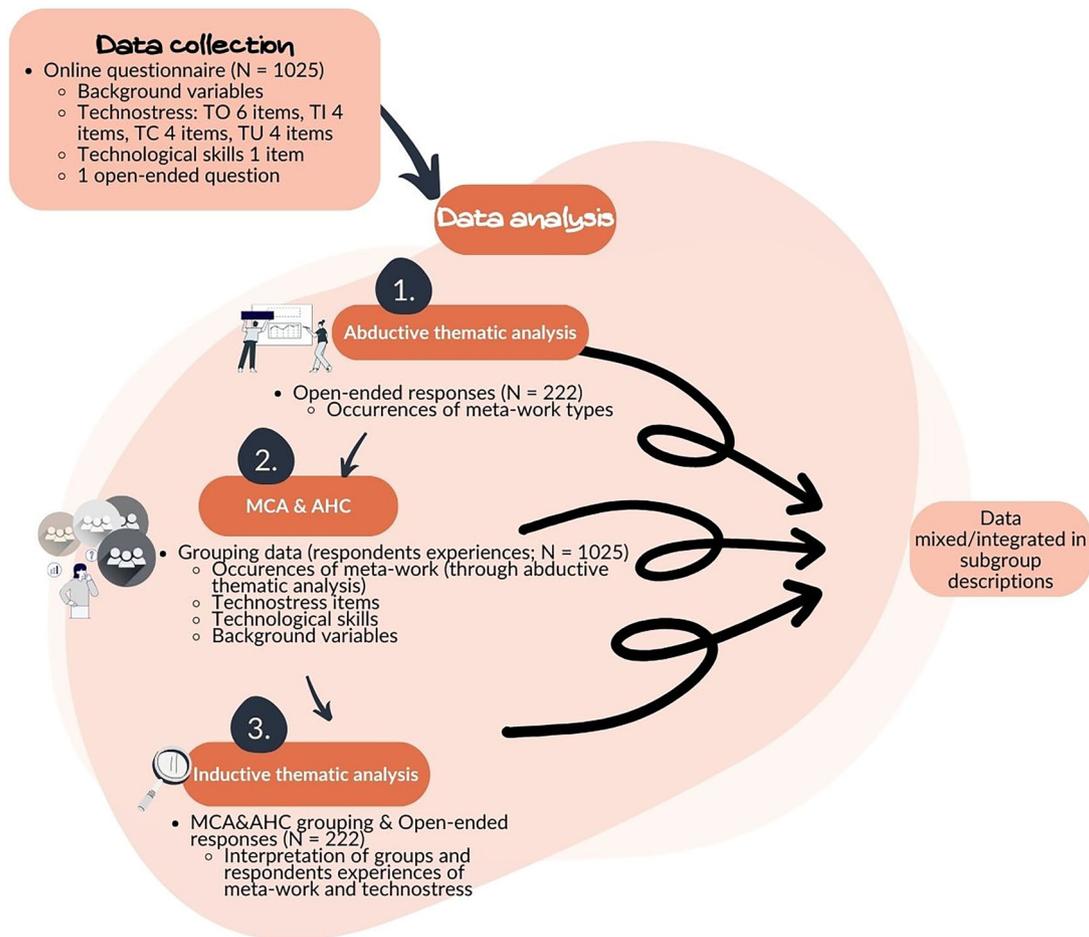
Figure 1. Mixed-methods study design in this study.

Table 1. Characteristics of the respondents.

Gender	N	%	Education	N	%
Female	705	68.8	Secondary school	12	1.2
Male	313	30.5	Vocational training school	114	11.3
I don't want to tell	7	0.7	University or university of applied sciences	882	87.5
			Missing	17	
Age group	N	%	Industry	N	%
Under 30 years old	117	11.4	Technology industry	95	9.3
30–40	295	28.8	Forest industry	47	4.6
41–50	300	29.3	Chemical industry	37	3.6
51–60	244	23.8	Healthcare	514	50.1
Over 60 years old	69	6.7	Stock and retail sale	252	24.6
			Transportation and storage	5	0.5
			Software design and manufacturing	2	0.2
Total work experience (mean years)			Metal industry	51	5.0
		20.6	Other	22	2.1

3.2. Participants

Data for this study were collected in early 2020 through an online questionnaire using a self-selection sampling method (Vehovar et al., 2016). Invitations were sent to five large Finnish companies from different sectors—technology, stock and retail, chemical, forest, and metal industries—and two hospital districts. Invitations were shared on the companies' channels, and all volunteer employees could respond. Participation in the study was voluntary, and participants had the right to refuse or withdraw from the study at any time without any consequences. We followed the ethical guidelines of the Finnish National Board on Research Integrity (TENK, 2023) to ensure the credibility and validity of our research. A summary of the sample demographic data is presented in Table 1 ($N = 1025$).

3.3. Measures

We adapted technostress statements from Ragu-Nathan et al. (2008) questionnaire to ensure coherence with existing research. We also considered linguistic, cultural, and contextual nuances (Castillo et al., 2023) while striving to preserve the original intent of the questions. Techno-overload (TO) included six items, techno-invasion (TI) included four items, techno-complexity (TC) included four items, and techno-uncertainty (TU) included four items:

- TO1: I receive an overwhelming number of messages and excessive information during my workday through digital applications.
- TO2: With the advancement of digital technologies, I am expected to work faster and more efficiently.
- TO3: As these technologies evolve, I often have to change my working methods.
- TO4: My workload has increased due to the use of digital technologies.
- TO5: My schedule has become tighter because of digital technologies.
- TO6: I believe my supervisor should provide clearer support so I can establish boundaries for technology use and avoid overload.
- TI1: My work is frequently disrupted by messages and information received through technology.
- TI2: I find that I must use my personal time to learn the technological applications and tools necessary for my work tasks.
- TI3: I feel pressured to remain reachable through technology even during my free time.
- TI4: The advancement of technology has made my work tasks less clear.
- TC1: Learning new digital technologies and applications is often laborious, difficult, and time-consuming.
- TC2: I do not have enough time to maintain and improve my technological skills.
- TC3: I frequently struggle to understand and use new technologies.
- TC4: The technological environment is becoming increasingly complex, making it more demanding to learn new things.
- TU1: It seems that new employees are more knowledgeable about technology than I am.
- TU2: I often worry about the continuity of my job due to advancements in technology.
- TU3: I feel that I must continually update my technological skills to avoid being replaced by someone else.
- TU4: I avoid sharing my knowledge with colleagues because I fear being replaced by another employee.

Respondents rated statements on a five-point Likert scale (1 = strongly disagree to 5 = strongly agree).

Respondents also assessed their technological skills using five levels, ranging from significant gaps in skills to advanced technology expertise. They gave the following sociodemographic information: age group, gender, educational level, and industry.

Since there is no validated questionnaire for meta-work, we used an open-ended question in our online survey to gather insights. Participants were asked: "*What would you like to say regarding digitally transformed work, well-being, the burden of using technology, or related issues?*" This format allowed for a wide range of responses as respondents could express themselves without the constraints of predefined options (Jenn, 2006). The question highlighted forms of meta-work as well as the relationships between technostress and meta-work.

While our primary interest was in analyzing the individual items of the technostress scale rather than the overall scale, we assessed the internal consistency and reliability of the technostress survey items using Cronbach's alpha. The reliability coefficients were as follows: TO: 0.72, 95% CI [0.69, 0.74], TC: 0.75, 95% CI [0.72, 0.77], TU: 0.43, 95% CI [0.37, 0.48], and TI: 0.40, 95% CI [0.34, 0.46]. While previous studies (e.g. Ragu-Nathan et al., 2008) support the validity of these technostress dimensions, the low alpha values for techno-uncertainty (0.43) and techno-invasion (0.40) indicate potential validity and reliability issues. These low scores may result from a limited number of questions (Tavakol &

Dennick, 2011) or sector-specific technological challenges. Furthermore, the adaptation of survey scales may not have attained the level of success we anticipated, even though it received considerable attention and effort. Although individual items may not correlate strongly, they each capture different aspects of technostress. Thus, we treated all items as individually representing technostress and utilized MCA to analyze the survey scale response data (e.g., Atkinson, 2024).

3.4. Data analysis

3.4.1. Abductive thematic analysis

First, we conducted an abductive thematic analysis (see Figure 2) of the open-ended questions following Thompson's (2022) key steps to identify meta-work forms. These meta-work forms were then used in the next phase of the analysis, specifically in MCA and AHC, along with measures related to technostress.

The first author primarily handled abductive thematic analysis, but the coding and themes were refined in collaboration with the other authors. The analysis was conducted using the ATLAS.ti software, which facilitated the systematic identification of codes and the formation of themes. The analysis began with a review of the material, which included several readings, to find meaningful themes and concepts based on the existing literature. We received 222 open-ended responses, which varied in length from a few words to several hundred, with an average of about one sentence. Many of these responses showed no signs of meta-work ($n = 76$) and included approving or neutral comments, such as "It is great that these issues are being addressed!" and feedback about the questionnaire. Several hundred responses did not include open-ended answers at all. Empty responses ($n = 806$) and those showing no meta-work were coded as N/A ($n = 882$).

We labelled and coded the remaining 146 responses focused on meta-work. Throughout this analysis, we applied abductive reasoning. We then developed themes by grouping similar codes and refining them into coherent themes. We refined the themes by comparing them with the data and existing literature to ensure they were clear and comprehensive. We combined themes from both sources and identified five main meta-work themes by comparing and aggregating the literature and codes (see Figure 2): (1) configuration work, which encompasses tasks such as
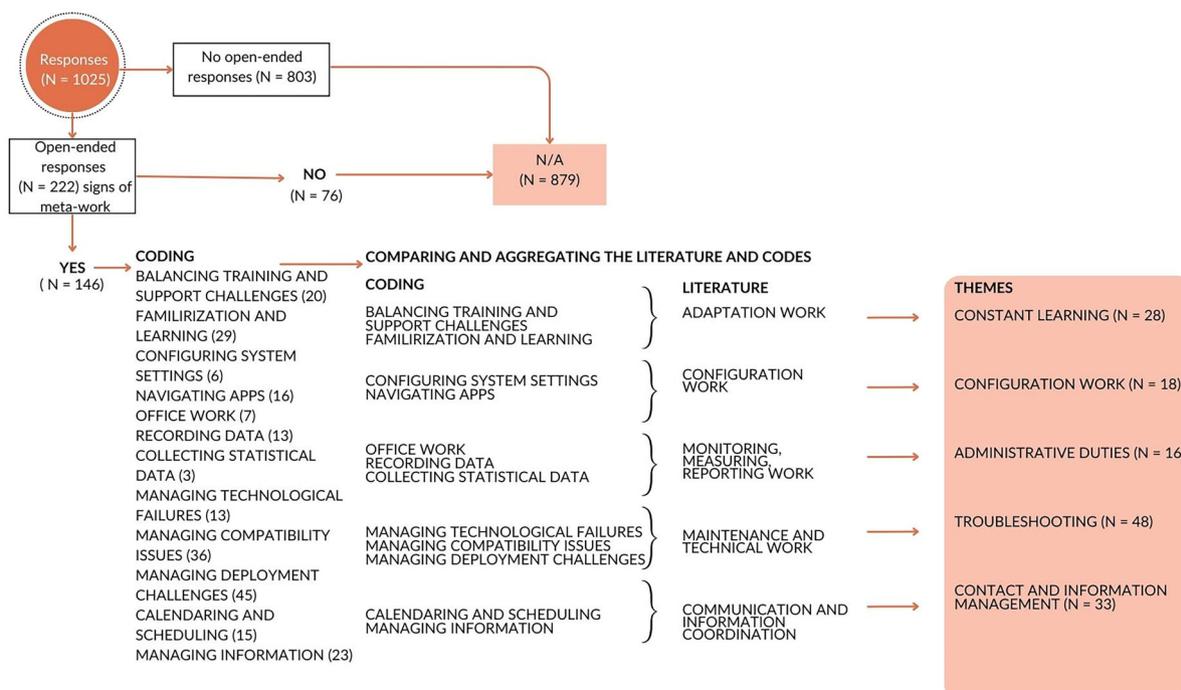

Figure 2. Abductive thematic analysis process.

managing settings, files, and applications; (2) contact and information management, which involves tasks such as organizing calendars, setting up meetings, coordinating communication channels, managing information, and time management/scheduling; (3) troubleshooting, which denotes managing technical failures and difficulties in digitally transformed work processes; (4) administrative duties, which include gathering information, collecting statistical data, entering and maintaining records; and 5) constant learning, which means continuously updating skills and knowledge.

3.4.2. Multiple correspondence analysis and agglomerative hierarchical clustering

We analyzed technostress survey items and occurrences of meta-work (identified through abductive thematic analysis) using MCA to interpret our data (Atkinson, 2024; Beh & Lombardo, 2014; Greenacre, 1984). MCA is a dimensionality reduction technique that is used to reduce a multidimensional contingency table of scale responses to a lower-dimensional representation. We visualized the results with a biplot, displaying active variables (scale items) and their relationships with supplementary variables (background variables and meta-work) (e.g. Kim et al., 2024). In the MCA, meta-work identified through abductive thematic analysis was first categorized into two types: Meta-work+ (mention of meta-work) and Meta-work- (no mention of meta-work). Different meta-work task types were then categorized as MWtypes 1–5: configuration work (MWtype1), contact management (MWtype2), troubleshooting (MWtype3), administrative duties (MWtype4), and constant learning (MWtype5). Finally, we employed AHC with Ward's method to cluster respondents based on their similar characteristics. The optimal number of clusters was determined using the elbow method (Figure 3), where mapping the within-cluster sum of squares (WCSS, i.e., sum of the squared distances of each observation to the cluster centroid) for each number of clusters forms a plateau after an inflection point, suggesting the number of clusters (Chin & Collins, 2024; Ouyang et al., 2025; Patel et al., 2022). The clustering solution at k = 4 accounted for 67% of the explained inertia (i.e., total variance), and adding a subsequent cluster yielded only a gain of less than 5%, suggesting a reasonable number of clusters (e.g. Bergmann et al., 2020; Nystrom et al., 2024). MCA was conducted in *R* using *GDAtools* package (v. 2.1).

We used SPSS to perform cross-tabulations to explore the relationships between clusters, technological skills, background characteristics, and types of meta-work and experience of technostress. Our analysis incorporated the following statistical tests to ensure robustness and accuracy: Pearson's chi-squared test, the likelihood ratio test, and the Fisher–Freeman–Halton exact test. Monte Carlo simulations using IBM SPSS Statistics were used as well. These tests were employed to validate the cross-tabulation results and address issues related to low expected cell counts. In our study, we collected data using a Likert scale. We chose the Fisher–Freeman–Halton exact test for our Likert scale data due to its ability to provide exact *p*-values and reliability with low expected cell counts. This allowed us to effectively evaluate the association between categorical variables
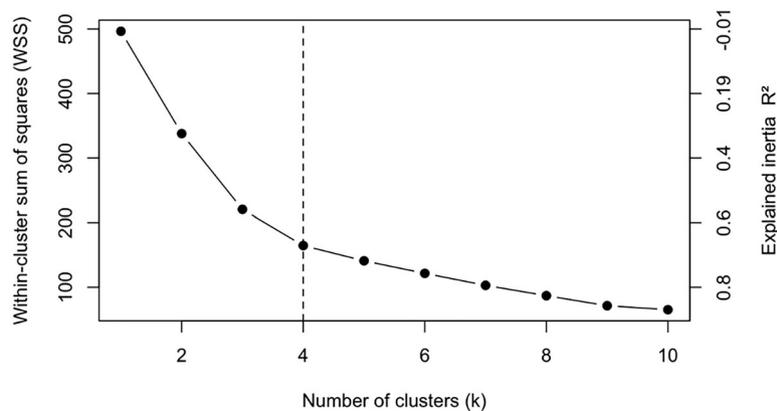

Figure 3. The optimal number of clusters based on the elbow method.
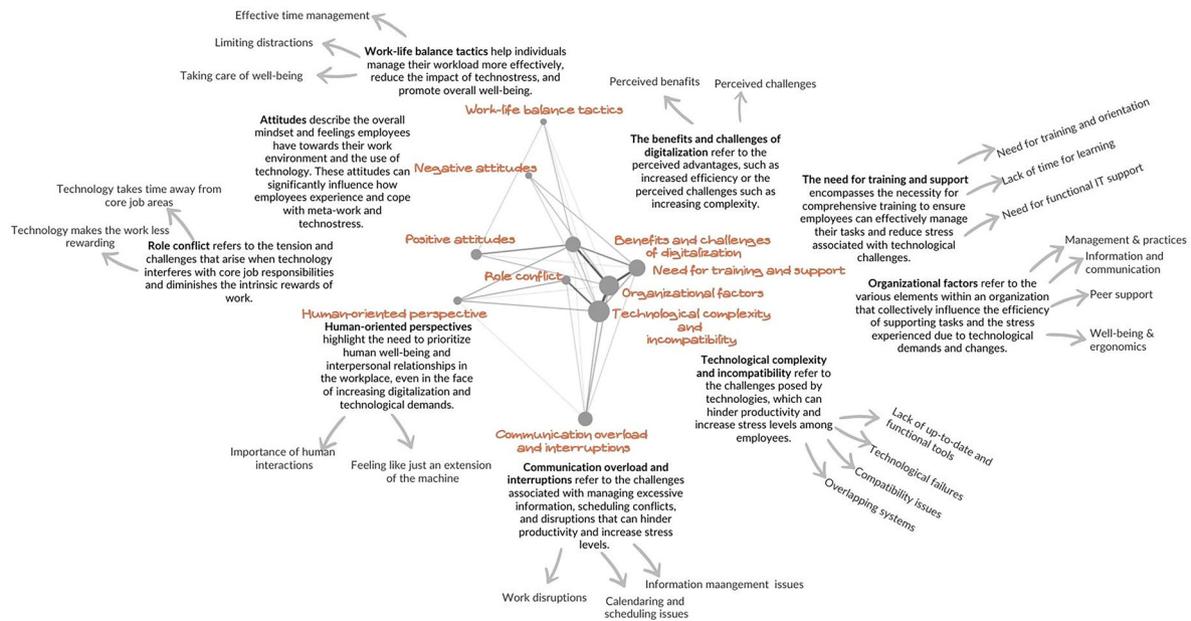
Figure 4. Ten interconnected themes, their describtions, and related codes.

from the responses. We used Monte Carlo simulations to tackle issues concerning low expected counts in our cross-tabulation analysis. Conventional tests, such as Pearson chi-squared test, can be unreliable in these cases, so this method provided a more accurate analysis and enhanced our results. We conducted a simulation with 10,000 iterations at a 99% confidence level using SPSS's Simulation Builder. The results showed that the simulated cell counts matched our observed data, confirming the validity of our cross-tabulation analysis.

3.4.3. Inductive thematic analysis

Following the MCA and AHC, the open-ended responses were analyzed using inductive thematic analysis. The analysis was conducted using the ATLAS.ti software, which enabled the visualization of the relationships between codes. The data were classified into clusters and themes based on groundedness, which represents the frequency of citations coded according to each theme. This approach allowed us to identify key challenges related to technostress and meta-work by cluster. Again, the first writer primarily handled data analysis at this point, but coding and themes were refined in collaboration with the other authors. As a process, this inductive analysis involved reading data and identifying codes, categories, patterns, and emerging themes. Themes were developed by synthesizing the inductive codes into theme statements that described the patterns seen in the data (Bingham, 2023). This method allowed the data to guide the analysis without predefined themes, aiming to identify key points related to technostress and meta-work in each subgroup and develop a narrative for each cluster. Eleven interconnected themes emerged in the data (see Figure 4). The interconnected nature of the themes highlights the complexity of technostress and meta-work, as issues in one area often influence or exacerbate challenges in another.

A Sankey diagram (see Figure 5) show the flow of codes being distributed into different clusters, making it easy to visualize how each code is allocated across the clusters. Technical complexity and organizational factors, such as management and practices, are significant issues, showing high groundedness across all cluster subgroups. Key themes also include the need for training and support, the benefits and challenges of digitalization, and issues such as communication overload and interruptions. Less prominent themes with lower groundedness include work–life balance tactics and negative attitudes. While these themes were less frequently mentioned, they provide valuable insights into specific, albeit less common, insights of technostress and meta-work.
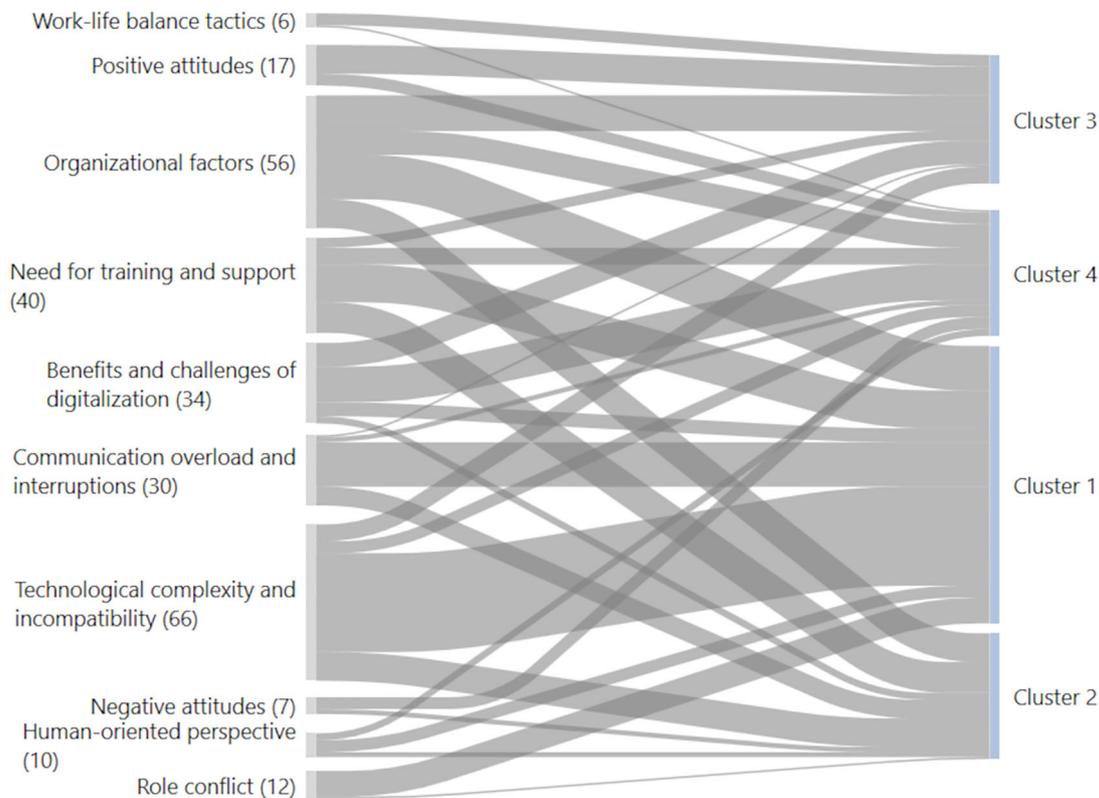
Figure 5. Code distribution across clusters.

4. Results

4.1. Identification of employee subgroups

Four subgroups were identified based on employees' involvement in meta-work and experiences with technostress. Findings revealed key differences among the subgroups in meta-work instances, technostress patterns, and experiences.

4.1.1. Meta-work instances and technostress patterns

Overall, only 14% of responses reported instances of meta-work. Of these 143 identified meta-work instances, 13% were configuration work (MWtype1), 23% were contact management (MWtype2), 34% were troubleshooting (MWtype3), 11% were administrative duties (MWtype4), and 20% were constant learning (MWtype5). Figure 6 illustrates that age, skills, and meta-work are on separate axes, suggesting that they can change independently. The data indicated that the centers of meta-work (+) and non-meta-work (−) were statistically distinct within a 95% confidence interval, with the blue and red balloons in the figure representing individual response (Figure 7). Thus, the results suggest that meta-work activities can vary significantly and are influenced by many factors. In addition, the clear distinction between these two categories also shows that meta-work can face challenges that differ from those related to core tasks. This highlights the need for specific management strategies for dealing with them effectively. The MCA further revealed significant patterns regarding technostress (Figure 6). Younger employees (under 30) exhibited higher technological skills and lower levels of technostress, while older employees (50+) demonstrated the opposite—higher technostress and lower technological skills. Overall, higher technological skills were associated with reduced technostress, whereas lower skills correlated with increased technostress across all dimensions. No noticeable differences related to gender were observed.

4.1.2. Grouping of employees based on technostress and meta-work

AHC was then used to group similar respondents, and the optimal number of clusters was selected by examining the distances between aggregated clusters. This clustering showed that four groups were
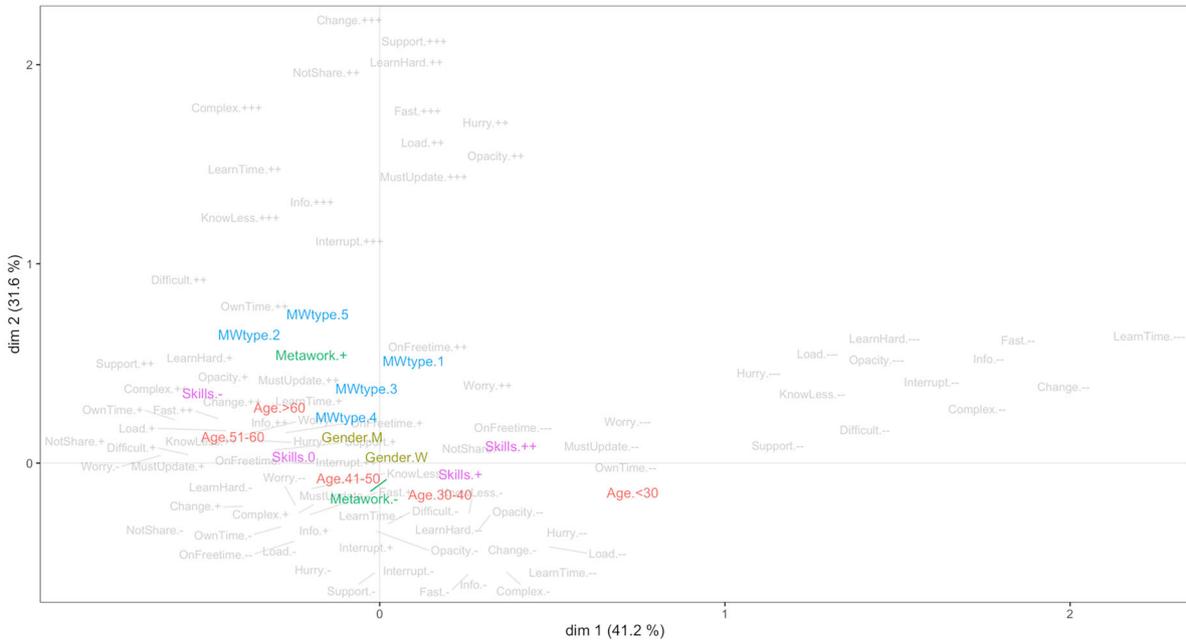
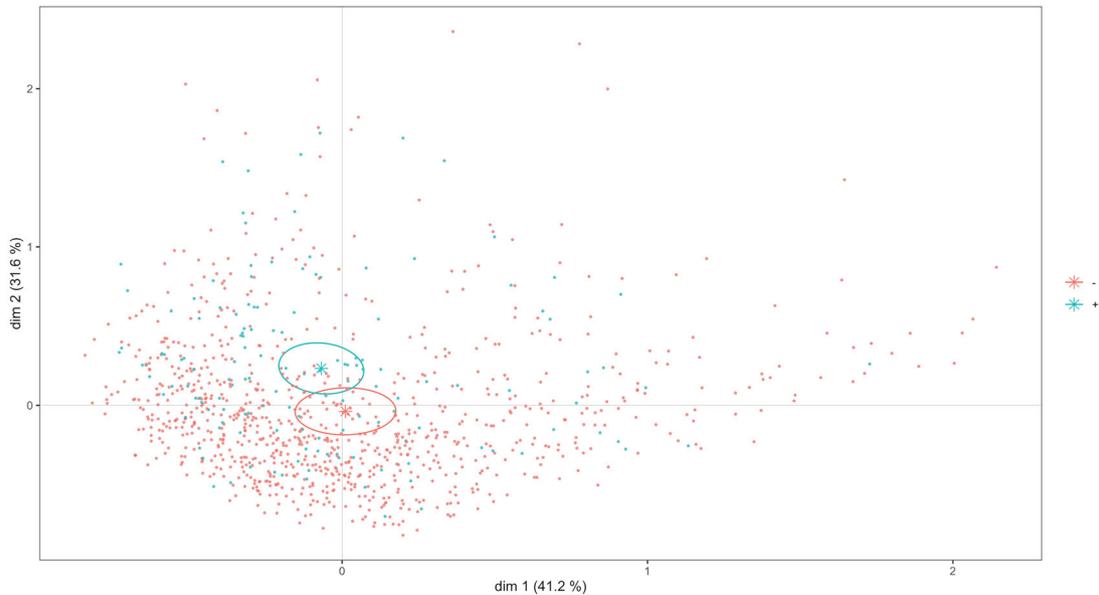**Figure 6.** Biplot of multiple correspondence analysis.

Figure 7. The distinct 95% confidence ellipses (right) show the mean points for meta-work (+) and non-meta-work (−) categories.

optimal (see Figure 8) and that meta-work was centered over the boundary between cluster groups 1 and 2.

Clusters differentiated by age and technological skills (see Figure 9) showed a significant association ($p < 0.001$) confirmed by various tests (Pearson's chi-squared, likelihood ratio, and Fisher–Freeman–Halton exact tests) and Monte Carlo simulations. Work experience also demonstrated significant links in all chi-squared tests ($p < 0.001$). Associations between industry sectors and clusters were significant (Pearson's chi-squared $p = 0.015$, likelihood ratio $p = 0.016$, Fisher–Freeman–Halton exact test $p = 0.017$). However, the linear-by-linear association test revealed no significant trend ($p = 0.756$). Gender and education did not show significant associations.
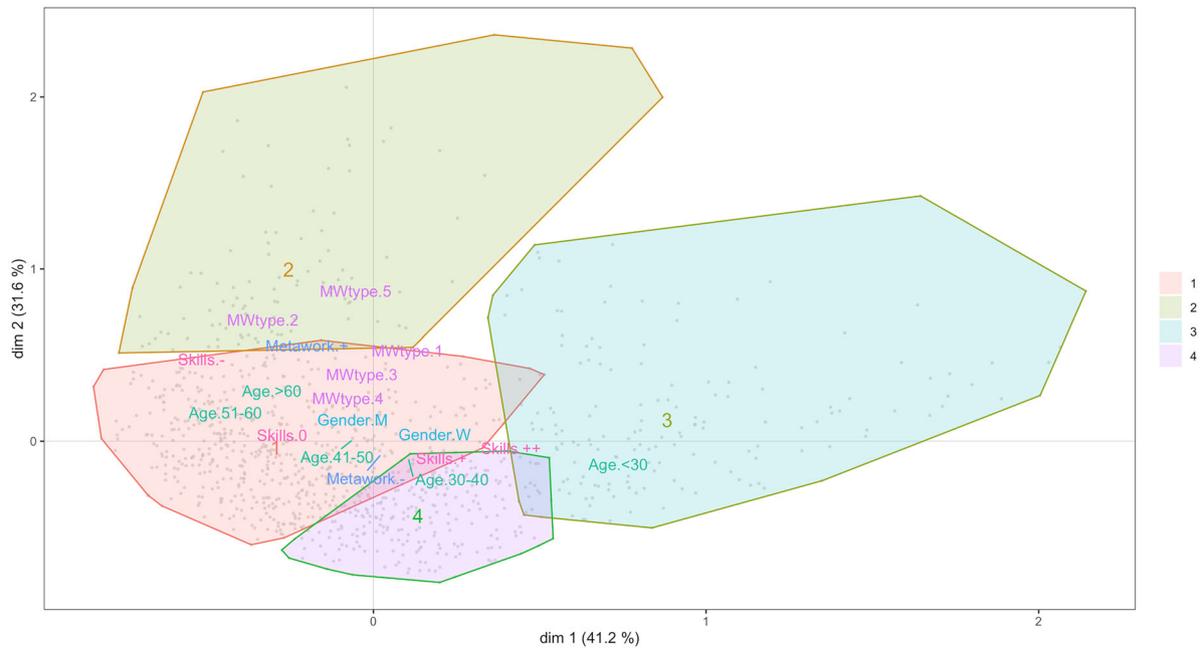
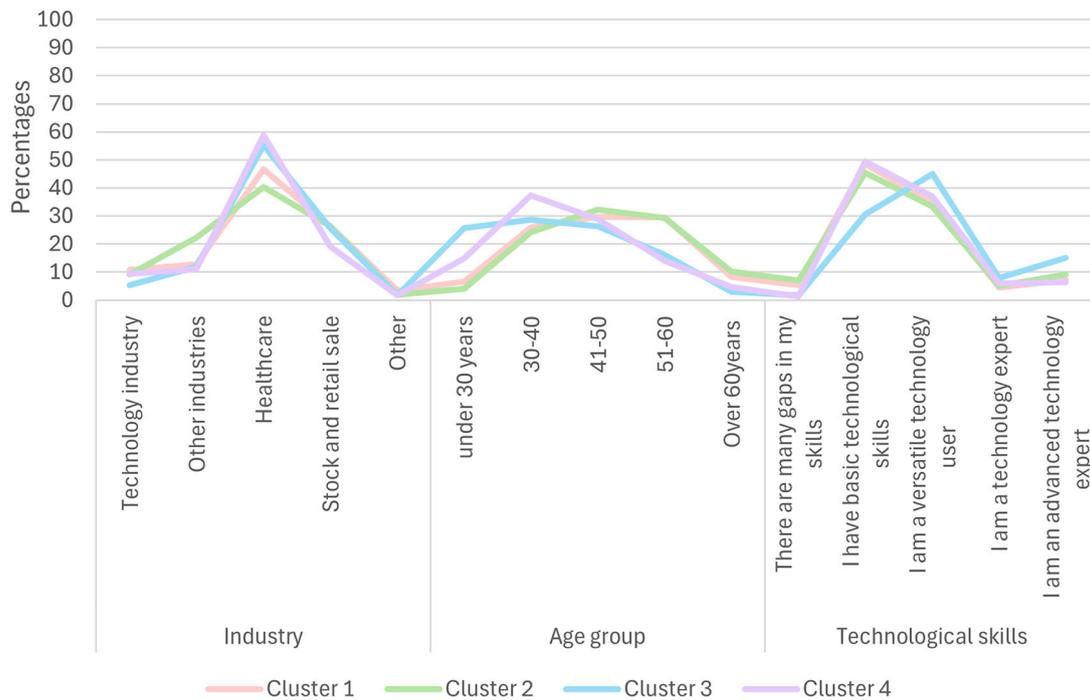**Figure 8.** AHC showing four groups that were optimal.

Figure 9. Clusters differentiated by age and technological skills.

All chi-squared tests also indicated p-values below 0.001 for clusters and meta-work forms (Figure 10) and for clusters and technostressor items as well as sum variables, even though the measurement scales did not perform as intended (Figure 11).

Based on inductive thematic analysis, the complexity of technology, communication overload and interruptions, organizational factors, and the need for training and support are key themes in different clusters (see Figure 12). Experienced role conflicts, attitudes, and work–life balance tactics are key factors that distinguish clusters from each other. The clusters are described in more detail below.
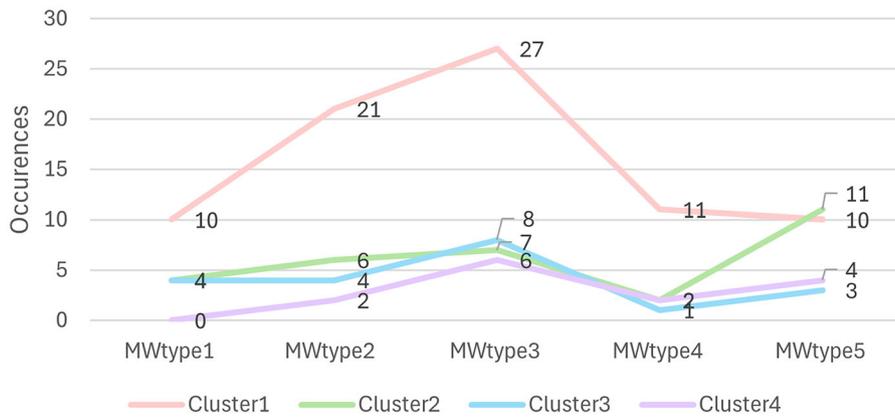
Figure 10. Clusters differentiated by MWtypes.
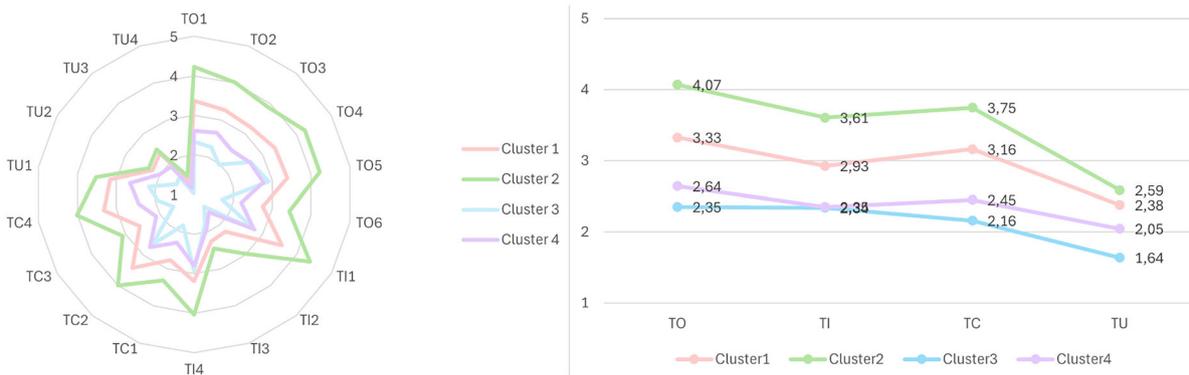
Figure 11. Clusters differentiated by technostress experiences (left technostress items and right sum variables).

Figure 12. Differences across subgroups in themes.

4.2. Characteristics of each subgroup

In this section, we provide a detailed examination of each identified subgroup, focusing on their demographics, technological skills, levels of technostress, meta-work involvement, and key themes derived from their experiences.

4.2.1. Cluster 1: technological complexity, communication overload, and role conflicts driving moderate technostress and intensive meta-work in middle-aged professionals with basic technological skills
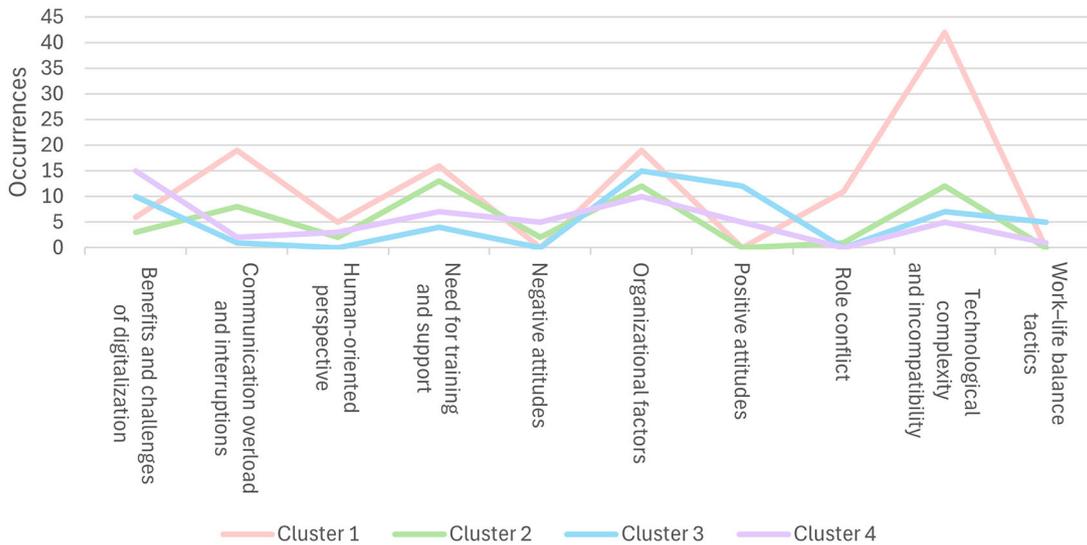
Cluster 1 ($n = 524$) consists of middle-aged employees (41–50 years, mean = 3.07, SD = 1.07) with extensive work experience (mean = 22.6 years) across various sectors. These employees possess basic technological skills (mean = 2.60, SD = 0.93) and experience moderate levels of technostress (Figure 11). They engage more intensively in meta-work forms such as troubleshooting and contact management (Figure 10), which add to their workload. In their open-ended responses, they focused on technology complexity, communication overload, the need for training and support, and organizational factors that hinder their work and increase their workload (Figure 12). Role conflicts are also a significant theme in this cluster.

Cluster 1 employees feel that technological complexity, overwhelming messages, and frequent disruptions have increased their meta-workload, hindering their workflow. One respondent noted,

> As a savant of technological tools, I am often annoyed that total idiots choose the tools and practices used. Many selected solutions fail to serve their intended purpose and sometimes even hinder my work (M, 41–50, digital business development, stock and retail sale).

Constant messages and frequent disruptions tighten their schedules, forcing them to work faster. Communication overload, primarily through email, makes managing and prioritizing tasks difficult. Another respondent mentioned,

> The problem in our unit is the lack of common rules regarding the use of technology. The lack of information has been replaced by information overload, which makes it difficult for users to navigate and filter important messages (F, 30–40, accounting, finance).

Furthermore, they feel that there is not enough time to maintain technological skills, leading to increased stress and frustration. One respondent stated,

> The main issue is that when work demands tight deadlines, there's no time to learn new things. It's impossible to stay updated (F, 51–60, doctor, healthcare).

Learning and adapting to new software increases workload and uncertainty because users are not fully familiar with new tools and their functions. Another respondent noted,

> There are too many new programs being introduced, like replacing Skype with Teams, which many people struggle to use effectively. These changes were meant to simplify workflows but have instead added confusion due to unclear usage and the lack of time to learn them properly (F, 41–50, specialist, stock and retail sales).

In complex technological environments, meta-work forms such as troubleshooting further increase the workload and can lead to job dissatisfaction and professional identity issues. The proliferation of digital tasks and documentation can distract attention from core tasks, such as patient care in healthcare, causing employees to feel detached from their primary professional identity. One respondent shared,

> Technology is helpful in nursing, but it takes time away from direct patient care. My working hours have not increased, and patient numbers haven't decreased. I find myself on the computer more than with patients, which feels upside down (F, 30–40, nurse, healthcare).

As meta-work increases, employees may experience overlaps in tasks. This, in turn, may lead to confusion about their primary responsibilities. This is often due to the organization's focus on digital tasks and new technologies. One respondent commented,

> Digital work is a good thing! But when the company is changing the way of working and the number of tools to use often, it gets complicated and also not trustworthy. And that is a problem (F, 41–50, sales, forest industry).

4.2.2. Cluster 2: technological complexity, communication overload, and organizational factors driving high technostress and moderate meta-work in middle-aged professionals with basic technological skills

Cluster 2 ($n = 99$) consists of middle-aged professionals (41–50, mean = 3.17, SD = 1.04) with an average of 24.1 years of work experience across various sectors. They possess basic technological

skills (mean = 2.64, SD = 1.01), though 7.1% have significant skill gaps. They face high levels of technostress (Figure 11), particularly concerning engaging in constant learning and troubleshooting (Figure 10). Their open-ended responses emphasized the need for training and support, technological complexity, communication overload, and organizational factors hindering their work (Figure 12).

Employees in cluster 2 face increased workloads and stress due to technological complexities. The numerous applications available are perceived as unhelpful, making the situation worse:

> There have been plenty of new digital tools, and I feel that there has been very little guidance on how to use them. They will be introduced in a hurry, and in some cases, perhaps they will be a little unfinished. There are often overlapping systems, and things have to be searched for or done through several programs, which in reality, decreases efficiency (M, 41–50, sales, Forest industry).

A significant amount of time is spent dealing with cumbersome technologies. Meta-work and technostress arise from frequent updates, lack of training, and system complexity. One employee noted,

> Increasingly, my workday is consumed by new, unfamiliar programs. The cloud holds a lot of content, only some of which synchronize with other systems, and I deal with these challenges several times a week. It's overwhelming for me as someone over 50 (F, 51–60, financial officer, stock and retail sale).

Many messages and constant interruptions force people to work faster. This continuous flow of information makes it hard to separate work from personal life, which makes it difficult to disconnect. One participant described the pressure to always be available and the difficulties of managing information:

> Devices like phones and laptops are always with us. It feels like we must be on call constantly. The influx of information is overwhelming, and there's not enough time to digest it (F, 41–50, stock and retail sale, product development).

The complex technological environment makes tasks less clear, necessitating constant learning. However, there is not enough time to update technological skills. One respondent pointed out the challenges of constant changes:

> Many programs are rushed into use, and you're expected to know them right away. In some jobs, technology actually slows down work (M, 30–40, marketing, stock and retail sales).

The workload associated with technology is linked to organizational decisions. One respondent noted,

> My organization has no clear management: what is used, who uses it, and how to use it. As a result, training and support cannot be up to date. The decision on technology and related equipment is made by a party that does not know what is done with these tools daily; this would require knowing the work and even following it in practice to know what kind of equipment/software/technology is being acquired. These decisions are made by a supervisor who is not a technology expert and does not do practical work (F, 30–40, nurse, healthcare).

4.2.3. Cluster 3: effective coping with technostress, positive attitudes, and low meta-work engagement in younger professionals with versatile technological skills

Cluster 3 (*n* = 167) features younger employees (aged 30–40, mean = 3.17, SD = 1.04) across different sectors with versatile technological skills (mean = 3.04, SD = 1.03) and slightly less work experience (mean = 16.5 years). This group experiences low technostress (Figure 11) and engages in fewer meta-work tasks (Figure 10), primarily focusing on troubleshooting caused by complex or outdated systems. In their open-ended responses, they concentrated more on positive attitudes and the benefits and challenges of digitalization, with communication overload being a less significant theme (Figure 12). Cluster 3 appears to have more advanced coping skills, demonstrating more work–life balance tactics. Furthermore, they have primarily positive views, see digitalization as an opportunity to improve their work, and are eager to learn new technologies independently.

They experience slightly increased workload and some frustration from complex and outdated systems that do not communicate with each other. As one respondent noted,

I am burdened by the fact that our software is outdated, rigid, and incompatible with each other and cause more work all the time (F, 30–40, nurse, healthcare).

They also feel that their organization is lagging in digitalization and should invest more. One employee noted,

Modern meeting and team workspace systems are not utilized in the organization, which would make work more efficient (F, 41–50, nurse, healthcare).

However, their attitude toward technology is more optimistic and confident:

Trying out new technologies is valuable and may require some study. Once you learn how to use a new tool, you can see its benefits. A negative attitude toward learning can hinder the adoption of new technology (F, 30–40, project management, stock and retail sales).

They value continuous learning and are ready to try new technologies, emphasizing the need for time to learn and regular training:

It would be good to arrange training regularly; however, I've always received help from IT support (F, 41–50, nurse, healthcare).

They know how to take care of their own well-being, limiting the reading of work emails to working hours and controlling their use of time and attention. Thus, they strive to master the use of technology and find a balance between work and leisure:

Technology is a good slave but a bad master; we must manage our own time. Digital work enables flexibility for our own benefit, which ultimately also benefits the employer (F, 41–50, IT support, stock and retail sale).

4.2.4. Cluster 4: low technostress, ineffective coping and very low meta-work engagement in younger professionals with basic technological skills and mixed attitudes and training needs

Cluster 4 ($n = 235$) includes younger employees (aged 30–40, mean = 2.56, SD = 1.05) across different sectors with basic technological skills (mean = 2.67, SD = 0.87) and slightly less work experience (mean = 17.6 years). This group experiences low technostress (Figure 11) and rarely reports meta-work forms (Figure 10). In their open-ended responses, they focused more on the benefits and challenges of digitalization, while the complexity of technology and communication overload were less significant themes (Figure 12). This makes cluster 4 different from other clusters. However, their tone toward technology is slightly more negative, and they emphasize the importance of the organization's role in updating technology, the importance of human-centeredness, and the need for support and training, which may indicate that they find the current situation somewhat challenging. However, this challenge does not manifest in technostress measurements. Therefore, they might need more support to cope, especially as their technological skills are only basic.

Employees in this cluster felt that technology has helped them a lot in their work and makes it possible to acquire knowledge and solve problems faster. However, they also felt that lack of training was a major problem, especially in the management of new and rarely used systems in foreign languages. One respondent highlighted,

Digital technologies improve access to information and speed up problem-solving for work tasks. However, complex technologies can hinder productivity, especially when they are bureaucratic and not purpose-built. Additionally, insufficient training poses challenges, particularly with new systems that operate in foreign languages. (M, 30–40, research, metal industry).

They highlighted the need for time and support for training:

The technology is manageable if you know how to use it. However, success requires personal interest, attitude, and prioritization, along with company training. You can't rush learning or prioritize it effectively" (F, 41–50, stock and retail sale, marketing communications). Their attitudes are mixed but slightly negative: "Digital work is modern, and you just have to adapt to it (M, 30–40, system/application development, stock and retail sales).

They also stressed the need for newer and better technologies to improve work efficiency:

The service sector is falling behind in digitalization and technology adoption. As technology evolves rapidly, the pace of competence development and implementation remains slow. When new tools and technologies are adopted, they can already feel outdated, leading to frustration and a perception of changes as ineffective and rigid (F, under 30, nurse, healthcare).

Poor equipment (slow, old computers) and system downtimes significantly impact work efficiency:

Digitalization is beneficial! Good programs lead to success, while poor ones result in less effective outcomes (F, 41–50, research and training, healthcare).

The performance targets set by the organization are perceived to create additional workload:

Technology and digitalization make our work easier, but conversely we handle a much more complex and specialized field of work, which means that the amount of work is staggering. Continuous improvement of quality, striving for profitability, collecting information, and introducing new innovations increase the work (F, 51–60, nurse, healthcare).

They see potential for rationalizing and automating specific tasks to prevent overwhelming workloads:

Technology simplifies our work, but humans still handle most tasks. Companies could use technology to streamline and automate processes, making workloads more manageable (F, 30–40, system/application development, stock and retail sales).

However, they also highlighted that humans still perform the primary work:

Digital applications can facilitate nursing in some respects and save time and resources for both patients and nursing staff. Online therapies are a good example of this, but they must not replace humane nursing and patient contact (F, 30–40, nurse, healthcare).

5. Discussion

5.1. Subgroup profiles and their key characteristics

This study examined technostress and meta-work among Finnish employees, identifying four distinct subgroups. Our findings are generally consistent with earlier technostress research (La Torre et al., 2019; Tarafdar et al., 2019); however, underscoring meta-work's impact, echoing Aroles et al. (2023) and Justesen and Plesner (2024). The forms of meta-work highlighted in the literature were also found in our data: adaptation (MWtype5 constant learning), configuration (MWtype 1 configuration), communication and information coordination (MWtype2 contact management), maintenance and technical work (MWtype 3 troubleshooting), and monitoring, measuring, and reporting (MWtype4 administrative duties) (Aroles et al., 2023; Beer & Mulder, 2020; Bourlakis et al., 2023; Bruun & Krause-Jensen, 2022; Castillo et al., 2023; Huang, 2021; Jarrahi et al., 2017; Justesen & Plesner, 2024; Palen & Salzman, 2004; Scaramuzzino & Martinell Barfoed, 2023). While only 14% of responses reported meta-work, with troubleshooting being the most common form, this highlights both the prevalence and the difficulty of recognizing meta-work and its various forms among Finnish employees.

Notably, meta-work especially surrounded the two clusters that experienced high and moderate technostress in their work. The findings particularly highlighted that an overwhelming number of messages, the need to work faster, changing working methods and technologies, an increased workload, a tighter schedule, frequent disruptions, less clear tasks, not enough time to maintain technological skills, and a complex technological environment all intensify technostress and meta-work forms, especially troubleshooting, contact and information management, and constant learning. Our findings thus are consistent with earlier research that has identified key stressors in digital work environments. Previous studies (Dragano & Lunau, 2020; Fischer et al., 2019; Murray et al., 2022; Siitonen et al., 2022) have particularly highlighted technological complexity and communication overload as primary sources of stress. Our study confirms that these stressors significantly contribute to technostress and meta-work. Additionally, our study highlights how meta-work, especially in troubleshooting and ongoing learning, intensifies employee technostress. This finding thus supports Aroles et al. (2023) and Justesen and Plesner (2024) conclusions regarding the hidden costs of digital transformation.

Research shows that technostress is experienced differently among individuals, influenced by factors like gender and age (Chou & Chou, 2021; De Giovanni & Catania, 2018; Marchiori et al., 2019; Ragu-Nathan et al., 2008; Tarafdar et al., 2011; Yener et al., 2021). Our findings reveal that younger employees with higher technological skills experience less technostress, while older employees face more challenges. This finding, thus, highlights that technological proficiency is crucial for reducing technostress. Additionally, organizational factors play a significant role (Keshavarz et al., 2025). Inadequate training and support for new technologies contribute to increased technostress and meta-work. Often, technology decisions are made by those not involved in daily tasks, leading to mismatched tools that do not meet employee needs, causing inefficiencies and more stress. Meta-work increases employee workloads, resulting in role conflicts and job dissatisfaction. The rise of digital tasks can blur job responsibilities, further escalating stress. This finding aligns with previous research, indicating that meta-work adds to workloads (Huang, 2021; Lydahl, 2017; Scaramuzzino & Martinell Barfoed, 2023).

Each subgroup was differentiated by technological skills, age, work experience, and organizational factors. While previous research typically identified three technostress profiles (Ficapal-Cusí et al., 2025; Keshavarz et al., 2025; Rosa et al., 2025; Ylönen et al., 2025), our findings reveal an additional fourth cluster, indicating more nuanced experiences of digital transformation, meta-work, and technostress:

- **Cluster 1 Moderate technostress and intensive meta-work engagement**: Reflects Rosa et al. (2025) techno-strained profile and Ylönen et al. (2025) burdened digital user profile and involves middle-aged, experienced employees with basic technological skills. They face moderate technostress from techno-complexity, techno-overload and related workload, and disruptions, often engaging in troubleshooting and contact management.
- **Cluster 2 High technostress and moderate meta-work engagement**: Aligns with the techno-addicted profile in Rosa et al. (2025) study and frustrated survivors in Ylönen et al. (2025) study. This group consists of middle-aged, experienced employees with basic technological skills who face high technostress due to information overload and interruptions and complex technological environment, frequently adapting to constant learning.
- **Cluster 3 Low technostress with effective coping and low meta-work engagement**: Corresponds with the techno-functional profile of Rosa et al. (2025) and motivated digital experts of Ylönen et al. (2025). Younger adults with versatile technological skills and less experience reporting low technostress and a positive relationship with technology, utilizing effective coping strategies.
- **Cluster 4 Low technostress with ineffective coping and very low meta-work engagement**: Unique in highlighting ineffective coping despite low technostress. This group consists of younger adults with basic technological skills and mixed feelings about technology, suggesting potential susceptibility to technostress as they age and gain experience, particularly if their coping and learning are not supported enough.

Overall, these findings provide a nuanced understanding of the diverse experiences of employees in digital work environments.

5.2. Practical implications

Technostress is a pervasive issue that affects a variety of industries equally, making it clear that no sector is immune to its impact. Instead, our findings confirm earlier views that digital practices are influenced by an organization's sociotechnical environment, leading to both valuable resources and challenging demands (Büchi, 2024). Workplace environments can significantly impact technostress and meta-work. In healthcare, a shift to digital routines often decreases autonomy and increases meta-work (Lydahl, 2017). Addressing meta-work can reduce technostress by tackling the cognitive and emotional challenges of managing technology and work–life balance. Flexible work arrangements and support improve this balance (Pensar, 2023), helping to mitigate the effects of technostress and meta-work. Leadership that promotes autonomy and support can lower technostress, whereas focusing on high availability expectations, task orientation, and control can increase it (Rademaker et al., 2025). Furthermore, focusing on task mismatches helps managers prevent burnout effectively (Mihelič et al., 2024).

Rapid technological changes can create anxiety and stress for employees who lack proper training (Pothuganti, 2024). All subgroups highlighted the need for adequate training. Tailored training and support are crucial for helping employees manage advanced digital processes without feeling overwhelmed (Bourlakis et al., 2023; Pekkala, 2024; Scaramuzzino & Martinell Barfoed, 2023). Wang et al. (2021) found that technostress often arises from insufficient technological skills. Additionally, Niu et al. (2022) linked high digital competence with low technostress and low burnout. Our research supports this, as clusters 1 and 2 had moderate to high technostress and possessed only basic technology skills, whereas cluster 3, which had better technological skills, had lower technostress. Thus, our findings align with the JD-R model (Bakker et al., 2014), suggesting that resources such as technological skills can reduce the impact of job demands and technostress. This was evident in the clusters. To address technostress, it is vital to develop digital skills despite busy schedules (Bourlakis et al., 2023; Pekkala, 2024). At the policy level, recognizing technostress as a workplace health and safety issue is essential. Supporting equal and inclusive digital transformation and lifelong learning is necessary.

Employees are frustrated with complex and unreliable technologies, which contribute significantly to meta-work and stress (Dragano & Lunau, 2020; Fischer et al., 2019; Murray et al., 2022; Nastjuk et al., 2024; Siitonen et al., 2022; Tarafdar et al., 2014). The findings show that there is a strong need for user-friendly technology that simplifies workflow and communication to reduce unnecessary meta-work and technostress. Providing technical support and involving users in the design process can alleviate usability issues (Tarafdar et al., 2011), since employees possess the most knowledge about the procedures for completing tasks and the conditions necessary for smooth operations (Mihelič et al., 2024). Choosing purposeful and effective tools can also help combat information overload, which, in light of the findings, is one of the major causes of technostress and meta-work. Developing simple digital tools can reduce the cognitive burden of complex systems. Automating repetitive administrative tasks enables employees to focus on more critical core responsibilities.

5.3. Theoretical implications

Our study extends the technostress theory by incorporating the concept of meta-work. While traditional technostress research usually focuses on direct interactions with technology (Tarafdar et al., 2019), our findings highlight the significant impact of meta-work (e.g., troubleshooting, constant learning) on technostress levels. This suggests that future technostress models should include meta-work as a critical component. Hence, our findings support the JD-R model (Bakker et al., 2014) by showing that meta-work constitutes a significant job demand that can lead to increased stress. The various forms of meta-work adaptation, configuration, communication and information coordination, maintenance and technical work, and monitoring, measuring, and reporting (Aroles et al., 2023; Beer & Mulder, 2020; Bourlakis et al., 2023; Bruun & Krause-Jensen, 2022; Castillo et al., 2023; Huang, 2021; Jarrahi et al., 2017; Justesen & Plesner, 2024; Palen & Salzman, 2004; Scaramuzzino & Martinell Barfoed, 2023) add to employees' workloads and contribute to technostress.

Furthermore, our study findings highlight the importance of job resources, such as technological skills and organizational support, in mitigating technostress, as younger employees with higher technological skills experienced lower technostress. Our study also underscores the importance of considering both social and technical subsystems in understanding technostress. The findings indicate that organizational factors, such as training and support, and the complexity of technological systems, significantly influence technostress levels, which aligns with STS theory (Pasmore et al., 2019), which advocates for optimizing both social and technical aspects of work environments. The organizational context significantly influences technostress profiles. When decisions about technology and equipment are made by those not involved in daily tasks, it can result in inefficiencies and increased technostress.

Four subgroups based on technostress and meta-work experiences provide a more nuanced understanding of technostress profiles. Furthermore, this understanding extends previous research that typically identified three profiles (Ficapal-Cusí et al., 2025; Keshavarz et al., 2025; Rosa et al., 2025; Ylönen et al., 2025), suggesting that technostress experiences are more diverse and complex. The distinction between subgroups with effective and ineffective coping strategies highlights how these mechanisms

impact technostress, underscores the importance of technological proficiency and organizational support for successful coping.

5.4. Limitations and future research

While our study is limited by its exclusive focus on Finnish workers and the use of a self-selection approach, which may constrain generalizability, Finnish working life is deeply embedded within the European and global labor markets. This integration suggests that our findings hold broader relevance. Importantly, our study sheds light on technostress, particularly by emphasizing the significance of meta-work. We received 222 open-ended responses, which, while a reasonable number, underscore the challenge of acquiring comprehensive qualitative data through an online survey, thereby limiting the depth of our findings. However, a strength of our research is the mixed-methods approach we utilized. Using both quantitative and qualitative methods, we triangulated our findings to enhance our understanding of meta-work and technostress. Insights from the open-ended responses provided new perspectives on meta-work, highlighting its significance. Notably, distinguishing meta-work from core responsibilities can be challenging (Scaramuzzino & Martinell Barfoed, 2023). Therefore, future research should better track instances of meta-work and explore its long-term impact alongside technostress. Additionally, our analysis revealed that the techno-overload and techno-complexity scales demonstrate low reliability. This suggests that there may be an opportunity to refine and update the technostress scale for improved accuracy in a continuously digitalizing and evolving world. Based on the findings of Sellberg and Susi (2014) the negative effects observed may be similar in other workplaces, highlighting the importance of our findings. Understanding the impact of technostress and meta-work on employees and their professional identity is crucial, as digital technologies can reshape how employees perceive their roles (Eteläpelto et al., 2013; Kaihlanen et al., 2023). It is also important to explore the relationships between employees' digital work–life skills and both technostress and meta-work—for instance, how problem-solving skills influence perceived technostress and the ability to manage meta-work (Hämäläinen et al., 2017). Therefore, further research in this area is needed. Researching and developing coping strategies for technostress and increasing meta-work in the future is also important. Addressing both technostress and meta-work is crucial for improving employee well-being and productivity, requiring a balance between employee needs and technology benefits (Pasmore et al., 2019).

6. Conclusion

The study investigated technostress and meta-work among Finnish employees, identifying four distinct clusters: (1) moderate technostress with intensive meta-work, (2) high technostress with moderate meta-work, (3) low technostress with effective coping and low meta-work, and (4) low technostress with ineffective coping and very low meta-work. Meta-work was particularly prevalent in clusters 1 and 2, which experienced higher technostress.

Key findings highlight that technological skills can mitigate job demands and technostress, with clusters 1 and 2 showing higher technostress due to only basic technological skills. Organizational context and demands also play an important role. Understanding and considering meta-work could thus alleviate technostress, especially in sectors such as healthcare. Our findings indicated that employees involved in meta-work may face unique challenges, simultaneously highlighting the need for meta-work and technostress management and coping strategies.

Recommendations include developing digital skills through training, supporting workplace learning, and recognizing technostress as a health concern in workplace policies. User-friendly digital tools can reduce meta-work-related cognitive load, and automating administrative tasks can help employees focus on core responsibilities. Addressing technostress and meta-work is essential for fostering positive digital workplaces and sustainable work environments. Our study extends technostress theory by incorporating meta-work, highlighting its significant impact on stress levels and suggesting its inclusion as a critical component in future models. Future research should explore the long-term effects of meta-work and technostress, update measurement scales to reflect current technological trends, and develop coping strategies for technostress and increasing meta-work.

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Data availability statement

The participants of this study did not give written consent for their data to be shared publicly, so due to the sensitive nature of the research supporting data is not available.

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