

# Human Factors Associated With Techno-Eustress and Techno-Distress

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## ABSTRACT

Digital stress, also known as technostress, has become a significant challenge for organizations undergoing digital transformation. A major concern relates to employees' perceived physical and mental health in connection with the use of digital tools and software, as well as their level of digital competence. While negative technostress, i.e., distress has received considerable attention due to the increasing digital demands at work and during leisure time, the positive form, i.e., eustress has been mentioned far less frequently in previous studies. Moreover, the mechanisms underlying techno-eustress are not yet well understood and warrant investigation at the organizational level. This study aimed to identify the human factors associated with perceived techno-eustress and techno-distress. Specifically, it examined why some employees view digital tools and software positively, while others perceive them negatively. A large survey using modified versions of the Salanova's and Tarafdar's technostress instruments was conducted among public-sector organizations in Finland in spring 2025, yielding 607 responses. The data were analysed using SPSS-29, employing independent samples t-tests and Pearson correlation tests. The findings indicate that employees within the same population may experience eustress or distress depending on their digital competence, age, work tasks and attitudes towards artificial intelligence tools. Overall, the results suggest that organizations can develop digital strategies that emphasize human factors positively associated with techno-eustress.

**Keywords:** Technostress, Eustress, Digital skills, Artificial intelligence

## INTRODUCTION

Stress is a general concept referring to psychological and physiological responses to perceived demands that exceed an individual's coping resources (Lazarus & Folkman, 1984). Work stress represents a domain-specific manifestation of stress that arises from job-related demands and organizational conditions (Lukan et al., 2022). Within the context of work stress, technostress refers to stress reactions associated with the use of information and communication technologies, particularly when technological demands exceed users' abilities or available resources (Tarafdar et al., 2015). Digistress can be understood as a contemporary subtype of technostress, emphasizing strain related to intensive digital work practices such as cognitive overload, ergonomic challenges, and socially mediated

digital interaction (Salanova et al., 2013). Accordingly, digistress represents a specific form of technology-related work stress embedded within broader stress processes in modern working life.

The terms technostress and digistress are often used interchangeably in the literature, and contemporary technostress research has largely focused on identifying technology-related stressors and their negative consequences. Traditionally, both general stress research and technostress research have conceptualized stress primarily as a factor that undermines well-being and performance. Key sources of technostress have been identified by Tarafdar et al. (2014), who highlight information overload, technology invasion, system complexity, user uncertainty, and continuous technological change as central stressors. Empirical research has further linked technostress to outcomes such as anxiety, fatigue, skepticism, reduced efficacy beliefs, and technoaddiction, defined as excessive and compulsive technology use (Salanova et al., 2014).

While digital overload has traditionally been associated with negative stress (i.e., distress), recent research suggests that digital work can also generate positive eustress and enhance organizational performance (Hargrove et al., 2013; Tarafdar et al., 2019). This emerging line of research draws on stress theories that conceptualize stressors as fundamentally neutral and not inherently positive or negative; rather, the experienced stress response depends on an individual's cognitive appraisal and capacity to cope with the stressor (Lazarus & Folkman, 1984; Salanova et al., 2013). In contrast, LePine et al. (2005) argue that stressors are not always neutral, proposing that some demands may be inherently distress-inducing or eustress-inducing.

Accordingly, researchers have increasingly examined the positive effects of stress and technostress, showing that digital work demands do not uniformly produce negative outcomes. Instead, under certain conditions, increased digital workload may make work more enjoyable and stimulating (Turja et al., 2023) and contribute to higher levels of work engagement (Hakanen, 2009; Mäkineniemi et al., 2019). Importantly, the mechanisms underlying eustress appear to be diverse and are not necessarily driven by workload intensity alone.

The use of AI is an emerging issue in research on technostress, techno-distress, and techno-eustress. Hakimjavadi et al. (2025) report that AI applications can elicit either eustress or distress, depending on employees' digital skills, the specific AI application, and workplace conditions. Issa et al. (2024) suggest that commonly recognized negative technostressors, such as techno-complexity and techno-insecurity, may also be associated with increased techno-eustress when users perceive them as positive challenges and motivational demands in technologically demanding situations.

Hasanein et al. (2026) examined AI use in the hotel industry and found that employees' awareness of AI is positively associated with eustress. Högemann et al. (2025) investigated generative AI (GenAI) and reported that GenAI may increase techno-eustress through efficiency gains and learning opportunities, while also increasing techno-distress related to data protection concerns, copyright issues, and the reliability of AI outputs.

Finally, Sapkota et al. (2025) conducted a systematic review examining factors associated with the relationship between AI systems and workplace stress. They identified five AI-specific stressors, such as loss of autonomy and ethical and moral conflict, which are distinct from established technostressors (e.g., techno-complexity or techno-overload) and suggest that traditional technostress frameworks may be insufficient for capturing AI-related technostress.

This study is grounded in transactional stress theory, according to which independent variables may give rise to perceived techno-eustress or techno-distress. For example, an individual's competence in using digital systems and applications may result in either techno-distress or techno-eustress, depending on how the demands are appraised.

## METHODS

An online survey with the Webropol tool was conducted, and the data were analyzed using the IBM SPSS-29 statistical package. Statistical analyses included correlation and independent samples t-tests. The number of respondents was 607 (Men: 101; Women: 498; Other gender: 8), and the mean age of respondents was 45.9 years ( $SD = 11.4$ ). The average work experience in the current position was 8.6 years ( $SD = 9.7$ ). The main dependent variable was perceived work eustress-distress level, measured on a 5-point Likert scale with the question: "How would you rate your current stress level at work?" The response options were: 1) stress impairs performance and feeling anxious, 2) stress feels burdensome and feeling irritable, 3) experiencing stress but still able to work effectively, 4) motivated and experiencing stress from time to time, 5) relaxed and only occasionally experiencing mild stress. For analysis, response options 4 and 5 were dichotomized as eustress, and the remaining responses were considered distress. We emphasize that respondents were not asked to assess their eustress or distress levels directly, as few were familiar with the concept of eustress-distress. Instead, we categorized responses according to recent research on eustress (Cohen, 2024).

In correlation analyses, we also used a six-item eustress-distress sum variable (Cronbach's  $\alpha = 0.88$ ), which comprised the following items: I feel full of energy when I use digital technologies in my work, I feel efficient when using digital devices and software, I feel that using digital devices and software in my work is easy, I am confident that I can perform my work properly when using digital devices, I am enthusiastic about using digital technologies in my work, I am fully absorbed in using digital technologies in my work.

Several independent variables, such as digital competence, use of digital tools, attitudes toward artificial intelligence, hybrid work, and time to learn new skills, were examined in relation to eustress and distress.

## RESULTS

A correlation analysis was conducted to examine the relationships among the study variables (see Table 1). The results indicated that the eustress–distress positive sum variable was significantly positively correlated with positive

and energetic feeling when using digital tools ( $r = .39, p < .01$ ), confidence when using digital tools ( $r = .49, p < .01$ ), understanding and utilization of digitalization ( $r = .46, p < .01$ ), and perceived technological competence ( $r = .43, p < .01$ ).

Positive and energetic feeling was also positively associated with perceiving digitalization as interesting and useful ( $r = .42, p < .01$ ) and with confidence in using digital tools ( $r = .49, p < .01$ ). Similarly, digitalization being perceived as interesting and useful was positively correlated with confidence in using digital tools ( $r = .46, p < .01$ ) and with understanding and utilization of digitalization ( $r = .38, p < .01$ ).

Age showed small but significant negative correlations with eustress–distress ( $r = -.08, p < .05$ ), perceived usefulness of digitalization ( $r = -.12, p < .01$ ), and technological competence ( $r = -.37, p < .01$ ). Naturally, understanding and utilization of digitalization was strongly associated with perceived technological competence ( $r = .63, p < .01$ ). The findings suggest that positive experiences and confidence with digital tools are closely linked with both the perceived usefulness of digitalization and technological competence, while age showed modest negative associations with some digitalization outcomes.

**Table 1:** Relationship between some study variables.

Variable	1	2	3	4	5	6	7
1. Eustress–distress positive sum variable	—						
2. Relaxed, focused, and energetic when using digital tools	.39**	—					
3. Digitalization is interesting and useful	.62**	.42**	—				
4. Confidence when using digital tools	.49**	.49**	.46**	—			
5. Age	-.08*	.02	-.12**	-.04	—		
6. Understanding and utilization of digitalization	.46**	.13**	.38**	.33**	-.22**	—	
7. Perceived technological competence	.43**	.13**	.32**	.36**	-.37**	.63**	—

Values are Pearson correlation coefficients ( $r$ ).  $N = 607$  for Variables 1–5 and  $N = 568$  for Variables 6–7.  $p < .05^*$ ,  $p < .01^{**}$  (two-tailed).

Independent-samples  $t$ -tests were conducted to compare distress and eustress groups on the perceived strain and fatigue associated with digital devices and software (Table 2). Participants with perceived distress reported significantly higher workload and time pressure due to digital tools, including working more than before ( $t(601) = 8.33, p < .001$ , mean difference = 0.83, 95% CI [0.64, 1.03]), increased feelings of hurry at work ( $t(600) = 8.65, p < .001$ , MD = 0.96, 95% CI [0.74, 1.18]), and the need to cope with new ways of working ( $t(600) = 6.14, p < .001$ , MD = 0.65, 95% CI [0.44, 0.86]) compared with the participant with perceived eustress.

The distress group also reported greater post-work fatigue and difficulty relaxing, including difficulty relaxing after workdays following extensive digital use ( $t(605) = 8.31, p < .001$ , MD = 0.92, 95% CI [0.70, 1.14]), feeling

tired after working with digital software ( $t(605) = 8.32, p < .001, MD = 0.89, 95\% CI [0.68, 1.10]$ ), and difficulty concentrating after using digital tools ( $t(605) = 7.54, p < .001, MD = 0.80, 95\% CI [0.59, 1.00]$ ). They also experienced higher tension and anxiety when using digital devices ( $t(605) = 6.80, p < .001, MD = 0.63, 95\% CI [0.44, 0.81]$ ). These results indicate that distress is associated with greater digital workload, cognitive strain, and emotional tension, whereas participants experiencing eustress report lower levels of strain and better recovery after work.

**Table 2:** Perceived strain and fatigue associated with digital devices and software.

Variable	Distress n	Distress M (SD)	Eustress n	Eustress M (SD)	t	p	Mean Diff.	95% CI
Digital devices and software force me to work more than before	436	3.17 (1.11)	167	2.34 (1.07)	8.33	< .001	0.83	[0.64, 1.03]
Digital devices and software have increased the feeling of hurry at work	435	3.60 (1.13)	167	2.64 (1.25)	8.65	< .001	0.96	[0.74, 1.18]
Digital devices and software have required new ways to cope with my work	435	3.69 (1.06)	167	3.04 (1.19)	6.14	< .001	0.65	[0.44, 0.86]
I find it difficult to relax after workdays if I have used digital devices and software extensively	439	3.11 (1.23)	168	2.19 (1.20)	8.31	< .001	0.92	[0.70, 1.14]
I feel tired after working with digital software	439	3.53 (1.17)	168	2.64 (1.19)	8.32	< .001	0.89	[0.68, 1.10]
It is difficult to concentrate after using digital devices and software	439	3.03 (1.18)	168	2.23 (1.13)	7.54	< .001	0.80	[0.59, 1.00]
I feel tense and anxious when using digital devices and software	439	2.28 (1.17)	168	1.65 (0.95)	6.80	< .001	0.63	[0.44, 0.81]

Values are means with standard deviations in parentheses. Mean differences are reported as Distress – Eustress. All tests were two-tailed. The response scale used was Likert scales 1-5 (1= strongly disagree, 5= strongly agree)

Table 3 presents perceived skills, workload, autonomy, and flexibility related to digital work. The respondents in the eustress group reported significantly higher mastery of digitalization in their work ( $t(600) = -2.91$ ,  $p = .004$ , mean difference =  $-0.29$ , 95% CI  $[-0.48, -0.09]$ ) and industry-specific software ( $t(605) = -2.25$ ,  $p = .023$ , MD =  $-0.18$ , 95% CI  $[-0.33, -0.02]$ ). They also reported having more autonomy in using digital tools at work ( $t(605) = -3.79$ ,  $p < .001$ , MD =  $-0.40$ , 95% CI  $[-0.61, -0.19]$ ) and slightly more flexible working hours in hybrid work settings ( $t(605) = -2.25$ ,  $p = .025$ , MD =  $-0.16$ , 95% CI  $[-0.31, -0.02]$ ).

In contrast, the distress group reported higher demands related to digital work. They were more likely to need to use free time to keep up with digital developments ( $t(605) = 3.94$ ,  $p < .001$ , MD =  $0.41$ , 95% CI  $[0.20, 0.61]$ ), reported that they must constantly update their digital skills to maintain their job ( $t(605) = 2.26$ ,  $p = .024$ , MD =  $0.24$ , 95% CI  $[0.03, 0.45]$ ), and experienced more interference of digitalization with leisure time ( $t(124) = 5.37$ ,  $p < .001$ , MD =  $1.12$ , 95% CI  $[0.71, 1.54]$ ). They also reported having less time to familiarize themselves with devices and software ( $t(605) = -7.77$ ,  $p < .001$ , MD =  $-0.85$ , 95% CI  $[-1.07, -0.64]$ ). In all, these findings indicate that eustress is associated with greater mastery, autonomy, and flexibility in digital work, whereas distress is linked with higher digital workload and time pressure.

**Table 3:** Skills, workload, autonomy, and flexibility related to digital work.

Variable	Distress n	Distress M (SD)	Eustress n	Eustress M (SD)	t	p	Mean Diff.	95% CI
I master the use of digitalization in my work	435	3.57 (1.18)	167	3.86 (1.05)	-2.91	.004	-0.29	[-0.48, -0.09]
I have to use my free time to keep up with digital work development	439	2.25 (1.31)	168	1.84 (1.06)	3.94	< .001	0.41	[0.20, 0.61]
I have enough time to familiarize myself with devices and software	439	2.49 (1.20)	167	3.35 (1.22)	-7.77	< .001	-0.85	[-1.07, -0.64]
I must constantly update my digital skills to keep my job	438	2.59 (1.17)	167	2.35 (1.16)	2.26	.024	0.24	[0.03, 0.45]
Digitalization of working life interferes with my leisure time	93	2.67 (1.39)	33	1.55 (0.87)	5.37	< .001	1.12	[0.71, 1.54]
I have autonomy to decide how I use digital tools at work	439	2.88 (1.16)	168	3.28 (1.19)	-3.79	< .001	-0.40	[-0.61, -0.19]

(Continued)

**Table 3:** Continued.

Variable	Distress n	Distress M (SD)	Eustress n	Eustress M (SD)	t	p	Mean Diff.	95% CI
I master the industry-specific software used in my work	439	4.01 (0.87)	168	4.18 (0.84)	-2.25	.023	-0.18	[-0.33, -0.02]
Hybrid work enables flexible working hours in remote work	439	4.31 (0.90)	168	4.48 (0.77)	-2.25	.025	-0.16	[-0.31, -0.02]

Values are means with standard deviations in parentheses. Mean differences are reported as Distress - Eustress. All tests were two-tailed. The response scale used was Likert scales 1-5 (1= strongly disagree, 5= strongly agree)

Table 4 presents that participants in the eustress group reported significantly higher levels of energy ( $t(605) = -6.45, p < .001$ ) mean difference =  $-0.59, 95\% \text{ CI} [-0.77, -0.41]$ ), enthusiasm ( $t(605) = -5.54, p < .001, \text{ MD} = -0.55, 95\% \text{ CI} [-0.74, -0.35]$ ), absorption ( $t(605) = -4.13, p < .001, \text{ MD} = -0.41, 95\% \text{ CI} [-0.61, -0.22]$ ), and enjoyment of learning new ways of working ( $t(566) = -5.59, p < .001, \text{ MD} = -0.56, 95\% \text{ CI} [-0.75, -0.36]$ ) compared with the distress group.

Eustress participants also scored higher on composite measures: feeling relaxed, focused, and energetic ( $t(605) = -8.86, p < .001, \text{ MD} = -0.87, 95\% \text{ CI} [-1.06, -0.68]$ ), perceiving digitalization as interesting and useful ( $t(605) = -6.32, p < .001, \text{ MD} = -0.55, 95\% \text{ CI} [-0.72, -0.38]$ ), and feeling confident and competent when using digital tools ( $t(605) = -5.93, p < .001, \text{ MD} = -0.50, 95\% \text{ CI} [-0.66, -0.33]$ ).

Differences in understanding and utilization of digitalization ( $t(566) = -1.88, p = .061$ ) and perceived technological competence ( $t(566) = -1.73, p = .085$ ) were not statistically significant in this case. These results suggest that participants experiencing eustress have more positive energy, engagement, and confidence related to digital tools compared with those experiencing distress.

**Table 4:** Distress versus eustress on attitudes, feelings, and perceived competence related to digital tools.

Variable	Distress n	Distress M (SD)	Eustress n	Eustress M (SD)	t	p	Mean Diff.	95% CI
I feel full of energy when using digital tools at work	439	2.49 (0.99)	168	3.08 (1.06)	-6.45	< .001	-0.59	[-0.77, -0.41]
I am enthusiastic about using digital solutions at work	439	3.09 (1.09)	168	3.64 (1.08)	-5.54	< .001	-0.55	[-0.74, -0.35]
I am fully absorbed when using digital solutions at work	439	2.29 (1.09)	168	2.70 (1.12)	-4.13	< .001	-0.41	[-0.61, -0.22]

(Continued)

**Table 4:** Continued.

Variable	Distress n	Distress M (SD)	Eustress n	Eustress M (SD)	t	p	Mean Diff.	95% CI
I use digital tools because I enjoy learning new ways of working	414	3.32 (1.09)	154	3.88 (1.04)	-5.59	< .001	-0.56	[-0.75, -0.36]
I understand the possibilities of digitalization and can utilize them in my work	414	3.84 (1.02)	154	4.01 (0.94)	-1.88	.061	-0.17	[-0.35, 0.01]
I feel that I have sufficient technological competence	414	3.63 (1.11)	154	3.81 (1.04)	-1.73	.085	-0.17	[-0.37, 0.02]
I feel relaxed, focused, and energetic when using digital devices (sum)	439	2.78 (1.08)	168	3.64 (1.07)	-8.86	< .001	-0.87	[-1.06, -0.68]
Digitalization is interesting and useful to me (sum)	439	3.54 (1.03)	168	4.09 (0.92)	-6.32	< .001	-0.55	[-0.72, -0.38]
I feel confident and trust my competence when using digital tools (sum)	439	3.79 (1.03)	168	4.29 (0.88)	-5.93	< .001	-0.50	[-0.66, -0.33]

Values are means with standard deviations in parentheses. Mean differences are reported as Distress – Eustress. All tests were two-tailed. The response scale used was Likert scales 1-5 (1= strongly disagree, 5= strongly agree)

Finally, t-tests were conducted to examine differences between distress and eustress groups in perceptions and emotional responses related to AI use at work (Table 5). Participants experiencing eustress reported significantly more positive emotions evoked by AI ( $t(605) = -4.12$ ,  $p < .001$ , mean difference =  $-0.93$ , 95% CI  $[-1.38, -0.49]$ ) and greater enthusiasm for work due to AI ( $t(605) = -3.38$ ,  $p < .001$ , MD =  $-0.34$ , 95% CI  $[-0.53, -0.14]$ ) compared with the distress group.

Eustress participants also perceived AI as bringing new positive aspects to their work ( $t(605) = -2.62$ ,  $p = .009$ , MD =  $-0.25$ , 95% CI  $[-0.44, -0.06]$ ), enhancing their professional competence ( $t(605) = -2.22$ ,  $p = .027$ , MD =  $-0.24$ , 95% CI  $[-0.45, -0.03]$ ), and increasing the appreciation of their work ( $t(605) = -3.20$ ,  $p = .001$ , MD =  $-0.31$ , 95% CI  $[-0.51, -0.12]$ ).

These findings suggest that eustress is associated with more positive emotional and professional responses to AI use, whereas distress is linked with weaker enthusiasm and perceived benefits from AI.

**Table 5:** Perceptions and emotional responses related to AI use at work.

Variable	Distress M (SD)	Eustress M (SD)	t	p	Mean Difference	95% CI
Emotions evoked by AI use	5.73 (2.46)	6.67 (2.59)	-4.12	< .001	-0.93	[-1.38, -0.49]
AI increases my enthusiasm for work	2.44 (1.08)	2.77 (1.13)	-3.38	< .001	-0.34	[-0.53, -0.14]
AI brings new positive aspects to my work	2.93 (1.06)	3.18 (1.09)	-2.62	.009	-0.25	[-0.44, -0.06]
AI increases my professional competence	2.70 (1.16)	2.94 (1.22)	-2.22	.027	-0.24	[-0.45, -0.03]
AI increases the appreciation of my work	2.15 (1.06)	2.46 (1.14)	-3.20	.001	-0.31	[-0.51, -0.12]

Values are means with standard deviations in parentheses. Mean differences are reported as Distress – Eustress. All tests were two-tailed. The response scale used was Likert scales 1-5 (1= strongly disagree, 5= strongly agree) or 1-11 (1= strong negative, 11= strong positive)

## CONCLUSION

This study examined the role of eustress and distress concerning employees' experiences with digital tools, digitalization, and AI in three different public organizations and in various work tasks. Consistent with transactional stress theory our findings highlight that stress responses to digital demands are not inherently negative; rather, the outcomes depend on individuals' competence, attitudes, and coping resources. However, the gender and respondents' age were not significantly associated with perceived eustress or distress, even if higher age correlated negatively with perceived technological competence. Participants experiencing eustress reported higher energy, enthusiasm, and absorption when using digital tools, as well as greater confidence and perceived competence. In contrast, those experiencing distress reported higher workload, time pressure, cognitive strain, fatigue, and interference with leisure time, reflecting the negative impacts traditionally associated with technostress and digistress (Tarafdar et al., 2015; Salanova et al., 2013).

Notably, our results extend previous research on eustress in digital work contexts (Hargrove et al., 2013; Turja et al., 2023), demonstrating that eustress is linked not only with positive energy and engagement but also with greater mastery, autonomy, and flexibility in digital work. These findings suggest that digital demands can function as motivational eustressors under favourable conditions, supporting prior evidence and reports that digital workload may not undermine well-being (Hakanen, 2009; Mäkinen et al., 2019; Turja et al., 2023; Vänni et al., 2024).

Importantly, the study highlights the role of AI in shaping workplace experiences, an increasingly relevant and debated issue in organizations today. Participants experiencing eustress reported significantly more positive emotions, greater enthusiasm, enhanced professional competence, and increased appreciation of their work in response to AI. This suggests that AI, when approached with confidence and positive appraisal, can serve as a source of professional growth and motivational engagement, rather than an

additional negative stressor. These findings complement emerging literature on AI and work, emphasizing that novel technological innovations are not inherently stress-inducing and can contribute to eustress under supportive conditions (LePine et al., 2005; Tarafdar et al., 2019).

Overall, the results underscore the importance of individual competence, attitudes, and coping resources in shaping whether digital work and use of AI tools may generate eustress or distress. Interventions that enhance employees' digital skills, provide autonomy in technology use and hybrid work, and foster positive attitudes toward AI may help organizations harness the motivational potential of digital work while mitigating negative digistress (Issa et al., 2024; Hakimjavadi et al., 2025; Högemann et al., 2025; Hasanein et al., 2026). The methods used in this study provided preliminary insights into the causes of digistress and enabled comparisons between eu-stressed and distressed individuals. The data analysis indicated that relationships among digistress related variables are complex, suggesting that future research should also employ e.g., confirmatory factor analysis. Future studies should further examine the responsible use of AI (Sapkota et al., 2025) and the mechanisms through which eustress can be promoted and investigate how organizational support can optimize the balance between digital demands and employee well-being. Of particular interest is whether AI tools could be used to enhance eustress among individuals who perceive digital tools and software as difficult and stress-inducing.

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