# Technostress and Coping: Impact on Job Satisfaction and Moderating Effect of Sociodemographic Variables

Osvaldo Silva[1](✉), Ana Isabel Moniz[2], and Júlia Bento[3]

[1] Faculty of Sciences and Technology, CICS.UAc/CICSNOVA.UAc, University of the Azores, Ponta Delgada, Portugal
osvaldo.dl.silva@uac.pt

[2] Faculty of Economics and Management, CEEAplA, University of the Azores, Ponta Delgada, Portugal
ana.id.moniz@uac.pt

[3] University of the Azores, Ponta Delgada, Portugal
20172380@uac.pt

**Abstract.** During the COVID-19 pandemic, due to lockdowns and social distance rules, many organizations were forced to adopt remote work. The workforce was affected and had to adapt abruptly to update their technology knowledge and skills, to deal with digital technologies, increasing stress levels and often causing technostress. Research proves that technostress can have a negative impact on employee's job satisfaction and organizational outcomes, suggesting that it is relevant to effectively manage technostress and mitigate its adverse consequences. The aim of this work is to assess the influence of sociodemographic variables (gender, age group and academic qualifications) on technological skills, technostress (techno-invasion, techno-complexity, techno-overload, techno-uncertainty and techno-insecurity), coping strategies (individual and organizational) and job satisfaction. The proposed model was tested through a survey of 407 public sector employees in Portugal that were in remote work during the pandemic. It was revealed that technostress and organizational coping strategies influence job satisfaction. There are significant differences between men and women, with men tending to report more that "technology engagement" strategies have a negative impact on techno-invasion and techno-overload, as well as techno-invasion having a negative impact on job satisfaction. The "technological involvement" strategy has a negative impact on techno-uncertainty and techno-insecurity, being significantly stronger in respondents in the older age group, while in the younger age group the "techno involvement" strategy has a significantly stronger positive impact on job satisfaction.

**Keywords:** Technostress · Coping · Job Satisfaction · Moderating Effect


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# 1 Introduction

During covid-19 pandemic, and with the health measures imposed to control it, many of the organizations were forced to lockdowns and to adopt remote work. This unforeseen situation, both for organizations and for their employees, may have contributed to technostress, the stress associated with rapid changes with the use of technology. The constant development and updating of information and communications technology (ICT) can force employees who are in telecommuting to continuously update their knowledge and skills, while dealing with increasingly complex technologies and experiencing stress [1].

This investigation aims to understand technostress and the factors that create it and the coping strategies that can be adopted to mitigate it, as well as the impacts that it may have on the level of job satisfaction of employees. It is also intended to assess the influence of sociodemographic variables (gender, age group and academic qualifications) on these variables under study.

This work is organized into five sections, including the Introduction. Section 2 and its subsections briefly present the literature review, covering technostress, coping strategies and job satisfaction of employees in the context of remote work during the pandemic period. In Sect. 3, we describe the methodological procedures adopted in this study. Section 4 contains the results analysis and respective discussion. Finally, Sect. 5 provides final considerations and some suggestions about the work carried out.

# 2 Literature Review

Technological evolution and its marked presence and adoption in work activities has an impact on organizational structures, communication within the organization and relationships between employees [2]. In the information society, the inability to adapt to rapid technological change can be a source of stress, named technostress. The following subsections briefly explain the constructs associated with technostress, coping and job satisfaction.

## 2.1 Technostress

Brod [3] defined technostress as a modern disease of adaptation caused by an inability to deal with new technologies in a healthy way. Later, Weil and Rosen [4] contributed by noting that this term is not a disease, but a negative psychological, behavioral and physiological impact, caused directly or indirectly by technology. Over time, there have been several changes to this definition, but, in general, they argue that it refers to physical, behavioral and psychological tension [5] as a response to addiction to ICT.

In the organizational environment, technostress is associated with increased workload due to performing tasks in a more technological way [6–8]. According to Salah-Eddine and Belaissaoui [9], most causes of organizational technostress include, but are not limited to, the rapid pace of technology change, lack of adequate training, increased management expectations, and security issues.

The creators of technostress are technostressors [10, 11] and the most commonly named technostressors for the organizational context are: i) Techno-overload, which

consists in the fact that individuals who work with technology feel that they are working harder and faster to carry out their tasks in the shortest possible time, which can cause anxiety and constant tension; ii) Techno-invasion, in which individuals who use technology are subject to situations where they believe they are always connected, which causes a lack of definition between personal and professional life; iii) Techno-complexity, which is associated with the perception of individuals who use technology in relation to their technological capabilities, in which they feel they are inadequate when compared to others; iv) Techno-insecurity, which arises in situations where individuals feel their job is threatened and fear they will be replaced by others who are more capable in technological skills; and v) Techno-uncertainty, where individuals feel instability due to the rapid changes that occur due to modernization and technological transformations [12].

### 2.2 Coping

Coping is defined as a set of cognitive and behavioral strategies developed by people to deal with the internal and external demands of the relationship between the individual and the environment, exceeding the resources possessed by the individual [13]. Coping literature allows us to recognize the general principles of technostress mitigation [14]. It also indicates that individuals can deal differently with technology, to try to deal with the cause (technostressors) and with the consequences themselves (e.g., emotional exhaustion) [14, 15]. Technostress mitigation has been developed from two perspectives: i) an individual perspective, which uses the coping model of Lazarus and Folkman [13], which investigates how individuals who use ICT seek to reduce technostress through behavioral, cognitive, and perceptual efforts; and ii) an organizational perspective [16], that examines mechanisms that can be adopted by organizations to reduce technostress [17].

The individual perspective of technostress coping suggests that the evaluation and coping process determines the impacts of stressors [18], it shows that individuals cognitively assess the perception of technostressors to decide what to do to mitigate their consequences [11]. In response to the results of evaluation processes, individuals adopt various coping strategies, which result in different performance outcomes. These results can be divided into two types of coping strategies. The first type of coping strategies is called proactive coping, which is problem-centered, and consists of a direct focus on the problem in order to prevent direct exposure to technostressors by removing or reducing them [15]. The second type of strategies is called reactive coping (mental non-involvement), which is centered on emotions, in the sense that they seek to change the way individuals interpret the situation and regulate negative emotions [13, 18].

From an organizational coping perspective, although technostress is inevitable due to the characteristics of technology, Ragu-Nathan et al. [16] proposed that the participation of technology users in decision-making regarding technology implementation helps to reduce the effects of technostress. Tarafdar et al. [19] classified technostress inhibitors as: i) literacy support: refers to mechanisms that increase the level of literacy of employees in relation to ICT [20]; ii) provision of technical support: refers to support mechanisms in the sense of institutionalized support [20]; iii) facilitation of technological involvement: refers to mechanisms that reinforce the involvement of employees in

relation to new technologies [20]; iv) support for innovation: refers to mechanisms that encourage employees to experiment and learn [19].

### 2.3 Job Satisfaction

Davis and Newstrom [21] defined job satisfaction as the result of employees' assessment of the degree to which the work environment fulfills individual needs. Job satisfaction is related to the perception that the employee has about the organization and the assertive feeling about their work in the organization, and this perception can be negative or positive [22].

Engaged employees are those who are highly involved with their organizations and who intend to remain part of them, showing a high level of loyalty and a reduction in work-related stress [23]. Professional satisfaction contributes to the professional performance of employees and to the achievement of organizational objectives [24].

Ragu-Nathan et al. [16] found a negative association between technostress and job satisfaction, that is, the increase in technostress in the workplace significantly decreases job satisfaction, which means that job satisfaction can be improved through efficient control of technostress among employees.

This study aims to assess the technostress levels of public sector employees who were developing remote work during the covid-19 pandemic, as well as the coping strategies adopted in their daily lives to mitigate its effects and the possible impact on their job satisfaction. It also aims to assess the influence of sociodemographic variables (gender, age group and academic qualifications) on technological skills, technostress, coping strategies and job satisfaction. Figure 1 presents the schematic diagram of the research model in study.

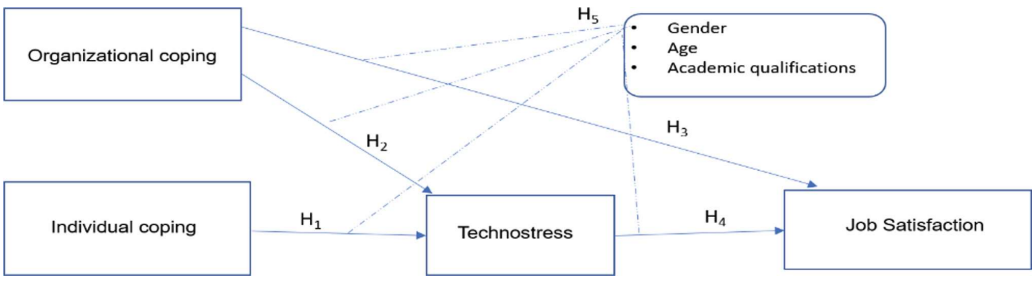


**Fig. 1.** Schematic diagram of the research model

Flow chart illustrating the relationships between organizational coping, individual coping, technostress, and job satisfaction. Arrows indicate hypotheses: H1 from individual coping to technostress, H2 from organizational coping to technostress, H3 from organizational coping to job satisfaction, H4 from technostress to job satisfaction, and H5 from demographic factors (gender, age, academic qualifications) to technostress and job satisfaction. According to the structural model proposed for the investigation, the following hypotheses were formulated:

H1: Individual coping strategies [a) active coping; b) mental non-involvement] used by employees has an impact on technostress (in its five dimensions).

H2: Coping strategies in the organization [a) literacy facilitation; b) provision of technical support; c) facilitation of technological involvement; d) support for innovation] has an impact on technostress (in its five dimensions).

H3: Coping strategies in the organization [a) literacy facilitation; b) provision of technical support; c) facilitation of technological involvement; d) support for innovation] has an impact on job satisfaction.

H4: Technostress (in its five dimensions [a) techno-overload; b) techno-invasion; c) techno-complexity; d) techno-insecurity; e) techno-uncertainty])) has an impact on job satisfaction.

H5: Gender, age and academic qualifications play a moderating role in the impact of coping strategies (individual; in the organization) on technostress and/or job satisfaction.

## 3 Methodology

The investigation was based on a quantitative approach through the implementation of a self-administered questionnaire, from a sample of 407 public sector employees in Portugal. For this purpose, it used cluster sampling approach, defined by type of work activity performed and the number of years in the current work activity by respondents. The first section of the questionnaire was directed towards technological skills (4 questions adapted from Tarafdar et al. [7]). Responses were evaluated through 5-point Likert agreement scale anchored as 1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree and 5 = strongly agree. To assess technostress levels, a second section was included, containing twenty-three questions adapted from Tarafdar et al. [12], evaluated on the same 5-point Likert agreement scale, distributed into five subscales: techno-insecurity, techno-complexity, techno-invasion, techno-overload and techno-uncertainty. To assess the job satisfaction of employees during remote work, a third section was created, with a total of six items, evaluated on the same 5-point Likert agreement scale, these items being adapted from Cappi and Araujo [25]. The fourth section of the questionnaire incorporated questions about the coping strategies used in the organization where the respondents were working (organizational coping), in order to understand how they were being helped to overcome obstacles with technologies. The questions were adapted from Ragu-Nathan et al. [16]. Eighteen questions were included using a 5-point Likert agreement scale, covering four subscales: support for literacy, provision of technical support, facilitation of technology involvement and support for innovation. In the penultimate section of the questionnaire, eight questions were presented (adapted from Weinert et al. [15]), divided into two subscales: active coping and non-mental involvement on individual coping, to find out how respondents face the challenges of carrying out their duties through remote work and how they manage to overcome or mitigate technostress. The final part of the questionnaire contained some questions about the respondent's socio-demographic data, such as gender, age, and academic qualifications.

Data were collected between January and March 2022, and were analyzed using various statistical methods, such as descriptive statistics, some non-parametric tests, and the structural equation model – partial least squares method (PLS-SEM). Non-parametric tests (Mann-Whitney U test and Kruskall-Wallis test) were used to test the existence

of statistically significant differences between technological competences, technostress, coping strategies and job satisfaction taking into account the sociodemographic characteristics (gender, age group and academic qualifications) of employees.

In the implementation of the PLS-SEM, the *SmartPLS* 3.0 software was used, with the purpose of simultaneously estimating several dependency relationships with the objective of clarifying which hypotheses should be rejected or not, among the hypotheses tested.

## 4 Results and Discussion

In order to analyze the psychometric characteristics of the scales used in this research, it was necessary to assess the reliability of each of the dimensions under study (technological skills, technostress, organizational and individual coping strategies, and job satisfaction), noting that the values obtained from Cronbach's alpha coefficient were greater than 0.84, above the recommended values of 0.70, indicating good internal consistency for each of these dimensions.

The normality of the scores obtained in each of the five dimensions under study was checked using the Kolmogorov-Smirnov test, and it should be noted that, regarding technostress ($Z = 0.976$; $p = 0.297$) and organizational coping ($Z = 0.705$; $p = 0.702$), the null hypothesis that the data follow a normal distribution is not rejected. On the other hand, it appears that, in the case of technological skills ($Z = 3.828$; $p = 0.000$), individual coping ($Z = 0.054$; $p = 0.006$), and job satisfaction ($p = 0.000$), the null hypothesis that the data come from a population with normal distribution is rejected.

Considering that technological skills (TS), individual coping (IC) and job satisfaction (JS) do not follow a normal distribution, it was fundamental to use non-parametric tests, more specifically the Mann-Whitney U test and the Kruskal-Wallis test, in order to obtain the results in terms of the research hypotheses, which are shown in Table 1.

**Table 1.** Mann-Whitney and Kruskal-Wallis tests

| | Gender | Age groups | Academic qualifications |
|---|---|---|---|
| TS | $U = 14601$; $p = 0.000$ | $H = 11.938$; $p = 0.008$ | $U = 14953$; $p = 0.934$ |
| IC | $U = 18165$; $p = 0.682$ | $H = 2.233$; $p = 0.526$ | $U = 14776.5$; $p = 0.798$ |
| JS | $U = 18184$; $p = 0.693$ | $H = 7.528$; $p = 0.057$ | $U = 14890.5$; $p = 0.886$ |

To compare the differences between two independent groups, the Mann-Whitney U test was used to verify the influence of gender and academic qualifications on technological skills, individual coping, and job satisfaction. Thus, it appears that there are only significant differences between men ($MR = 232.96$) and women ($MR = 188.98$) in terms of technological skills ($U = 14601$; $p = 0.00$), meaning that men have a higher level of technological skills than women, which is in line with the research by Elie-Dit-Cosaque et al. [26].

Using the Kruskall-Wallis test, we observe the existence of statistically significant differences between at least two of the age groups with regard to technological competences ($H = 11.939$; $p = 0.008$), with reference to the fact that: from 20 to 37 years old, MR = 224.7; from 38 to 45 years old, MR = 218.91; from 46 to 52 years old, MR = 190.37, and from 53 to 66 years old, MR = 176.93. It is thus observed that respondents aged between 20 and 37 years old have higher levels of technological skills than respondents aged between 53 and 66 years old, which is in line with Elie-Dit-Cosaque et al. [26], who claim that older employees experience more conflicts with technology than those who were born in the digital age.

There is a positive and statistically significant correlation between organizational coping strategies and job satisfaction ($rs = 0.409$; $p = 0.00$), which means that the more they use organizational coping strategies, the higher the levels of job satisfaction, as mentioned by Ragu- Nathan et al. [16].

To evaluate the formulated research hypotheses, the data were analyzed using the PLS – SEM, being necessary to evaluate the measurement model and the structural model. About the measurement model, there is good internal consistency and composite reliability, since the values of the Cronbach's alpha coefficient ($\alpha$) were greater than 0.70, as well as the results of the composite reliability, thus considering that the constructs are satisfactory [27]. Regarding convergent validity and discriminant validity, the results obtained allow a satisfactory evaluation of the model under analysis.

The hypotheses formulated through the structural model were tested, and only the statistically significant results are presented. In this way, hypothesis H1-b is not rejected, which means that the strategy of mental non-involvement (individual coping) used by public sector employees has a significant positive impact on their five dimensions of technostress. This result indicates that the adoption of mental non-involvement strategies does not result in the mitigation of the five dimensions of technostress - techno-overload ($\beta = 0.273$, $p = 0.000$), techno-invasion ($\beta = 0.209$, $p = 0.000$), techno-insecurity ($\beta = 0.423$, $p = 0.000$), techno-complexity ($\beta = 0.304$, $p = 0.000$) and techno-uncertainty ($\beta = 0.152$, $p = 0.013$) -, which corroborates the study of Weinert et al. [15].

With regard to hypothesis H3-d, our findings show that organizational coping strategy "support for innovation" has a significant positive impact on job satisfaction ($\beta = 0.302$, $p = 0.001$), which means that the greater the support for innovation, the greater the employee's job satisfaction. These results are in line with the study of Tarafdar et al. [19] that support for innovation promotes a supportive relationship between employees, as well as facilitates communication, discussion between them and the creation of incentives for employees to commit themselves to learning new ICT adopted by the organization.

Regarding the hypothesis H4-d, techno-insecurity has a statistically significant negative impact on job satisfaction ($\beta = -0.130$, $p = 0.036$), which indicates that the greater the techno-insecurity of employees and the threat and fear of being replaced the lower will be the job satisfaction, as also mentioned by Ragu-Nathan et al. and Tarafdar et al. [16, 19].

To investigate all the objectives of this investigation, namely hypotheses H1 to H5, it was also necessary to use the multigroup analysis via the moderating variables: gender, age group and academic qualifications. It is intended to find out in which structural coefficients differences are observed between men and women; between younger individuals

(20 to 45 years old) and older individuals (46 to 66 years old); and between individuals with secondary education or less and those with higher education.

Based on the results obtained, it is concluded that the "technological involvement" strategy (organizational coping) has a significant negative impact on techno-invasion ($\beta$ = -0.594, $p = 0.039$) and techno-overload ($\beta = -0.390$, $p = 0.044$), being significantly stronger in men than in women, in both situations, which is in agreement with what was reported by Tarafdar et al. [19]. It should also be noted that techno-invasion has a significant negative impact on job satisfaction ($\beta = -0.318$, $p = 0.047$) being significantly stronger in men than in women, what is in line with the study by Duarte et al. [28].

Regarding the multigroup analysis, for the case of the variable "age group", it was found that the strategy "support for literacy" (organizational coping) has a significant negative impact on job satisfaction ($\beta = -0.660$, $p = 0.000$), being significantly stronger in respondents aged 46 to 66, than in those aged 20 to 45. However, it is emphasized that the organizational strategy "technological involvement" proved to have a significant positive impact on job satisfaction ($\beta = 0.462$, $p = 0.001$), being significantly stronger in respondents aged 20 to 45, than in those aged 46 to 66 years. This situation may happen since they are younger and, probably, they were born in the digital era [25], which makes respondents aged between 20 and 45 feel more that the "technological involvement" strategy increases job satisfaction. In contrast, the "technological involvement" strategy (organizational coping) has a significant negative impact on techno-uncertainty ($\beta = -0.462$, $p = 0.023$) and techno-insecurity ($\beta = -0.455$, $p = 0.003$), being significantly stronger, in both situations, in the respondents aged 46 to 66, compared to the younger ones.

In the case of "academic qualifications", the "mental non-involvement" strategies have a significant positive impact on job satisfaction ($\beta = 0.343$, $p = 0.045$), being significantly stronger in respondents with secondary education or less, than those with higher education.

## 5 Final Remarks

Public sector employees forced to lockdowns and to adopt remote work during COVID-19 pandemic, in Portugal, revealed to have good technological skills, higher among men and younger individuals. Regarding levels of technostress, no significant differences were found considering the socio-demographic characteristics of employees. There was evidence of a good level of job satisfaction among the employees surveyed, and it was also noted that there is a positive and statistically significant correlation between organizational coping strategies and job satisfaction.

Considering the hypotheses supported by the PLS-SEM model, it is concluded that the adoption of "mental non-involvement" strategies do not result in the mitigation of technostress levels, as well as the conclusion that the greater the support for innovation, the greater the employee's job satisfaction. It is also perceived that the higher the level of techno-insecurity, the lower the employee's job satisfaction. Using the moderating variables (gender and age group), it was shown that the strategies of "technological involvement" (organizational coping) have significant negative impacts on some dimensions of technostress, while, at the level of the variable "academic qualifications", the

strategies of "mental non-involvement" (individual coping) have a significant positive impact on job satisfaction. Thus, taking into consideration the characteristics of the employees in a more detailed way, it makes it possible to better ascertain the significant interrelationships that are established between the variables under study.

About the limitations of this work, it should be noted that data collection took place during the pandemic period, using an online questionnaire, which does not guarantee that the sample obtained is properly representative of the target population.

Concerning possible policy recommendations, it is suggested that organizations should develop strategies and intervention plans at two levels: at the level of the individual, to educate and raise awareness of the self-awareness of stressors, so that the employee can create adjustment strategies and responses suited to technostress; and, at organizational level, to avoid or mitigate sources of stress.

After the COVID-19 pandemic, the prevention and management of psychosocial risks became an even more pressing priority for companies, for the coming years. Lessons were learned, suggesting that there is a need to identify risks and mitigation strategies for the emotional and mental well-being of the employees. Public sector organizations should prepare employees for "online readiness" to cope with any public health issue or natural disaster, programming courses and online training in advance, establishing work ethics and working hours policies, and developing strategic planning regarding necessary resources to prevent technostress.

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