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Factors determining the use of e-learning and teaching satisfaction

Factores determinantes en el uso del e-learning y la satisfacción docente

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ABSTRACT

Even though in 2021 many universities have decided to resume teaching activities face to face, we believe that the use of online applications will remain a feature of the educational system due to the flexibility offered and the learning possibilities. We aim to analyze the predictive role of personal factors, such as self-efficacy, technostress creators, technostress inhibitors, and tolerance to uncertainty in the use of e-learning tools for teaching and in the use of these applications in the context of the uncertainty generated by the pandemic. The sample consisted of 1,517 academics. The results showed that technostress creators mediate the relationships between technostress inhibitors, technology self-efficacy, use of applications, and satisfaction with the use of e-learning platforms. Although the current context is dominated by uncertainty, the hypotheses regarding the direct and indirect effects of uncertainty in the use of online s in education were partially sustained. The most important finding of our study is that, although the current context is characterized by uncertainty, the negative impact of the resulting higher levels of stress can be counteracted by a high level of technology self-efficacy which, in turn, predicts a greater extent the use of platforms and the satisfaction of using these platforms.

RESUMEN

Si bien en 2021 muchas universidades han decidido retomar la actividad docente presencial, creemos que el uso de aplicaciones en línea seguirá siendo una característica del sistema educativo por la flexibilidad que ofrece y las posibilidades de aprendizaje. Nuestro objetivo es analizar el papel predictivo de factores personales, como la autoeficacia, los creadores de tecnoestrés, los inhibidores del tecnoestrés y la tolerancia a la incertidumbre sobre el uso de herramientas de e-learning para la enseñanza y sobre el uso de estas aplicaciones en el contexto de la incertidumbre generada por la pandemia. La muestra estuvo conformada por 1.517 académicos. Los resultados mostraron que los creadores de tecnoestrés median las relaciones entre inhibidores de tecnoestrés, autoeficacia tecnológica, uso de aplicaciones y satisfacción hacia el uso de plataformas de e-learning. Aunque el contexto actual está dominado por la incertidumbre, las hipótesis sobre los efectos directos e indirectos de la incertidumbre sobre el uso de la aplicación en línea en la educación se sustentaron parcialmente. El hallazgo más importante de nuestro estudio es que, aunque el contexto actual se caracteriza por la incertidumbre, el impacto negativo de los mayores niveles de estrés resultantes puede ser contrarrestado por un alto nivel de autoeficacia tecnológica que, a su vez, predice en mayor medida el uso de plataformas y la satisfacción de usar estas plataformas.

KEYWORDS | PALABRAS CLAVE

Technology self-efficacy, technostress creators, technostress inhibitors, intolerance to uncertainty, e-learning, satisfaction.
Autoeficacia tecnológica, creadores de tecnoestrés, inhibidores del tecnoestrés, intolerancia a la incertidumbre, e-learning, satisfacción.

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1. Introduction and state of the art

The spread of the coronavirus epidemic generated uncertainty concerning academic life, with nearly 85% of the total enrolled learners in 172 countries being affected (UNESCO, 2020). By the fall of 2020, many universities identified solutions to combine or replace in-person instruction with online instruction, and by the winter of 2020-2021, most universities provided online-only classes based on ICT systems (UNESCO, 2020). Some of these systems offer blended learning, others are of the massive online open courses type, and others only offer a simple platform through which teachers can share content with students, offering video conferencing features to replace in-person classes. Moving all programs online proved challenging for all of them, and many institutions have had to quickly find solutions to replace in-class education. Recent research found that barriers limiting how technology can enhance teaching at universities still exist (Polly et al., 2021).

Although some teachers have positive attitudes towards digital tools, they still need training in the use of ICT tools in teaching and content creation (Casero-Béjar & Sánchez-Vera, 2022) since, even though in 2021 many universities have decided to resume face-to-face teaching activities, the use of online applications will remain a feature of the educational system due to the flexibility offered and the learning opportunities (Hodges et al., 2020). This flexibility is dependent, among other factors, on the characteristics of teachers, such as self-efficacy, technostress, and tolerance to uncertainty, including the context in which the teaching activities take place. In these conditions, the main research question is: are the personal factors affecting the use of e-learning tools for teaching in conditions of uncertainty generated by the pandemic? This research question was tested on a representative sample of Romanian academics from the most important higher education institutions. The following section will present determinants of using e-learning tools among teachers including self-efficacy, technostress creators, inhibitors, and uncertainty, sustained by relevant recent studies.

1.1. Determinants of e-learning satisfaction among university teachers

Mouakket and Bettayeb (2015) found that the perceived usefulness of e-learning is the most important predictor of teachers' satisfaction with e-learning. Satisfaction in online teaching is correlated with perceived effectiveness (Almuwais et al., 2021), even though teacher training has no influence on satisfaction (Al-Samarraie et al., 2018). Ease of use, accessibility of IT Infrastructure (Rokhimah & Sirait, 2021), job-related factors (Marasi et al., 2022), support for flexibility in teaching schedules and appropriate training are more likely to make teachers satisfied with online teaching (Stickney et al., 2019). While these aspects have been debated as factors determining e-learning satisfaction among university teachers, fewer studies have highlighted the role of factors such as technology self-efficacy, technostress, and intolerance to uncertainty. Nevertheless, let's not forget that an e-learning platform is just a tool whose results depend on the teachers' involvement, their teaching skills, or their abilities to adapt.

1.2. Techno self-efficacy (TSE)

According to Bandura's social-cognitive theory, self-efficacy is an important factor in predicting task performance (Bandura, 1997), influencing individuals' emotional reactions or thought patterns in stressful situations. Research has found that highly perceived technology self-efficacy encourages the use of computers while reducing an individual's IT-related anxiety (Pressley & Ha, 2021), generating a constructive atmosphere for supporting efforts and easier adaptation to IT related changes (Bakar et al., 2018). For teachers, TSE is related to the effective use of platform facilities. Research has tested several factors related to technology integration and self-efficacy in teaching, such as setting goals and learning experiences. (Ünal et al., 2017).

Under normal conditions of certainty, the success of the implementation and use of an information system can be quantified by indicators such as actual use (how the system and the apps are being used), perceived usefulness, and intent to use (Yoo et al., 2012), or satisfaction. Given the current situation of uncertainty and the mandatory use of e-learning platforms as well as the need to adapt to highly stressful situations, we will consider satisfaction as a key performance indicator of the successful implementation of an information system for the end user. Based on the existing related research we posit that:

- H1: Technology self-efficacy has both direct and mediated effects on the satisfaction with the use of e-learning platforms.
- H2: Technology self-efficacy has both direct and mediated effects on the effective use of e-learning platforms.
- H3: The use of e-learning applications has both a positive direct effect on satisfaction towards the use of e-learning platforms and a mediated effect between technology self-efficacy and satisfaction.

1.3. Technostress

During the pandemic, teachers were exposed to higher levels of stressors due to the need of being always online. Techno-stressors are stimuli, events or demands related to technology, grouped into five categories of ICT stressors in the working environment (Ragu-Nathan et al., 2008), with connected stressors in a non-working environment (Tarafdar et al., 2020). In an academic environment, techno-overload is perceived when teachers are expected to work harder if they use e-learning systems. Techno-invasion appears when academics perceive the borders between private domains and work to be blurred, a situation that was exacerbated in the pandemic when academics taught from their own homes. Techno-complexity occurs when teachers think they are not capable to use tools because they do not have the required/technical skills. This situation seems to appear especially for men, younger people or those with lower computer literacy (Maier et al., 2017).

Techno-insecurity is related to the anxiety of losing one's job due to information systems. It could occur due to over-technologization and socialization of teaching (e.g. the emergence of MOOCs or technology-enhanced learning applications). Techno-uncertainty could be faced when ICT systems are seen as a source of multiple changes in the organization, focusing on the rate at which the software or hardware change, eventually in a digital transformation process, or when teachers feel anxious about the integration of ICT in their teaching activities, thus creating uncertain work expectations or requirements (Li & Wang, 2021).

Technostress consequences at an individual level consist of reduced job satisfaction, productivity, end user satisfaction, and performance (Tarafdar et al., 2020), and increased burnout (Pflügner et al., 2021). Extended working hours are correlated with higher levels of job stress (Jerrim & Sims, 2021; Syvänen et al., 2016) and the need for permanent change within an environment that appears to have grown into a more and more turbulent one, producing progressively stressful working conditions (Fida et al., 2015). Consequently, we posit that:

- H4: Technostress creators have both direct and mediated effects on the satisfaction with the use of e-learning platforms and on their effective use.

As personal factors, organizations could also help employees decrease technostress by implementing support mechanisms like helpdesks or development programs (facilitating conditions) based on employees' perceptions regarding the resource availability that could remove technological barriers (Venkatesh et al., 2012). Tarafdar et al. (2015) found that the presence of inhibiting mechanisms usually improved the use of information systems, resulting in enhanced outcomes: increased productivity or innovation, increased system use-related satisfaction etc.

Technostress inhibitors represent available facilitating resources that could decrease harmful effects caused by technostress creators. Research conceptualized three technostress inhibitors: literacy facilitation, provision of technical support, and facilitation for user involvement in various technology-related decisions. Literacy facilitation (1) is related to plans intending to enhance knowledge and skills (e.g. professional development plans, teamwork, knowledge sharing) (Skaalvik & Skaalvik, 2017). When challenges occur, technical support (2) via various IT support systems could lower the techno-related stress. Involvement facilitation (3) regards the involvement of teachers in the decision-making process related to the implementation of various information systems related to e-learning and research collaboration (Tarafdar et al., 2020). These findings could show that inhibitors, like a high-quality helpdesk, are expected to increase satisfaction with the use of ICT and e-learning systems and to further indirectly affect teachers' inclination to increase the usage of ICT systems at work. We thus expect:

- H5: Technostress inhibitors have both direct and mediated effects on the satisfaction with the use of e-learning platforms and on their effective use.

1.4. Intolerance to uncertainty

Intolerance of uncertainty is the propensity to negatively react in behavioral, emotional, and mental areas when facing uncertain situations (Dugas et al., 2004). Individuals with a higher degree of intolerance to uncertainty would be more relaxed when predictability is possible and, therefore, would intend to decrease or even eliminate uncertainty (Uzun & Karata , 2020).

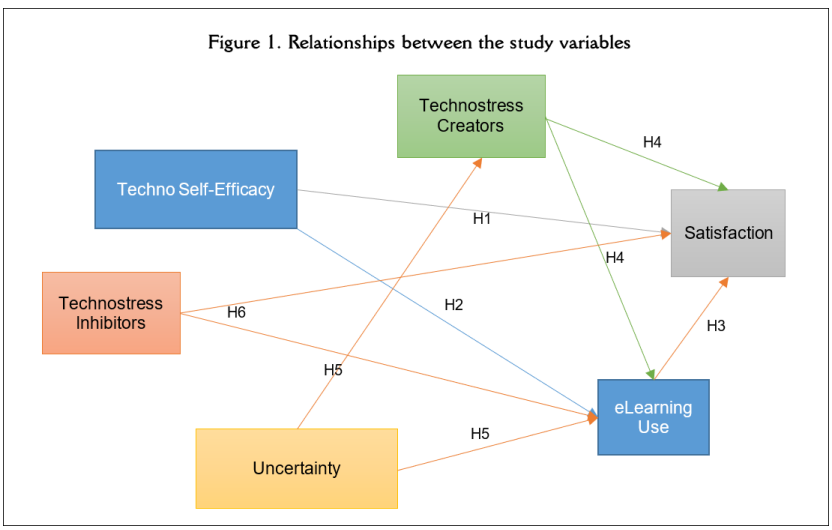
Research on employees' perceived uncertainty at work is scarce. It suggests that perceptions of uncertainty negatively affect job-related satisfaction due to the concern of not being able to foresee what the future will bring, uncertainty being a powerful stressor (Tinaztepe, 2012). It is also possible that individuals with higher intolerance of uncertainty could be more concerned by the uncertainty of further transformations related to the pandemic and its socio-economic consequences (Mertens et al., 2021).

Considering the changing conditions of the current situation, including the suggestions that a state of uncertainty could affect employees' work performance, we posit that:

- H6: The intolerance of uncertainty has indirect effects on the use of e-learning platforms and the satisfaction towards the use of e-learning platforms.

Based on the literature and the above relationships, we assume the existence of the following theoretical model (Figure 1).

Figure 1. Relationships between the study variables



2. Materials and methods

The main objective was to assess the predictive role of technostress creators and inhibitors, techno self-efficacy, and the use of the online platform on teachers' satisfaction in conditions of uncertainty. A quantitative, cross-sectional study was used.

The sample consisted of N=1,517 academics (males 44%) from various Romanian universities from a total of 34,440 individuals, sample error for a confidence level of 95% being +/- 2.5. The sample structure by academic position, fundamental teaching domains, age, and gender are presented in Table 1.

Table 1. Sample characteristics

Academic positions		Fundamental domain		Age (years)	
Assistant	8.2%	Engineering sciences	33.7%	25-35	10.9%
Lecturer	33.4%	Social sciences	26.8%	36-45	34%
Associate Professor	27.7%	Humanities and arts	17.8%	46-55	31.2%
Professor	25.3%	Mathematics and natural sciences	12%	56-60	10.8%
External teacher	5.4%	Biological and biomedical sciences	7.7%	61-65	7.8%
		The science of sports and physical education	2%	Over 65	5.3%

We prepared and sent a set of questionnaires by means of a personalized email: 30,171 email addresses were collected from websites using the open source Abot crawler, then parsing HTML and PDF files for email addresses using regular expressions. The next step consisted of manually cleaning generic email addresses (e.g. contact@, hr@). The results were imported into the survey application. The data was collected in April-May 2021, with a response rate of 5.03%. The participants gave their consent at the beginning of the survey. The study was approved by the council of the Faculty of Psychology and Education Sciences, TRANSYLVANIA University of Brasov, Romania, after checking all the ethical standards for human research studies.

2.1. Instruments

Technostress creators (TC) were measured using the 23-item Technostress scale (Tarafdar et al., 2015). It measures techno-overload (5 items: "I am forced to change my work habits to adapt to new technologies"), Techno-invasion (4 items, "I spend less time with my family due to this technology"), Techno-complexity (5 items, "I often find it too complex to understand and use new technologies"), Techno-insecurity (5 items, "I have to constantly update my skills to avoid being replaced") and techno-uncertainty (4 items, "There are constant changes in the computer software in our organization").

Technostress inhibitors (TI) were measured using the "technostress inhibitors scale"(Ragu-Nathan et al., 2008). The scale conceptualizes three dimensions of technostress: Literacy facilitation (5 items, "Our organization provides end-user training before the introduction of new technology"), Technical support provision (4 items, "The IT department in our organization is well staffed by knowledgeable individuals") and Involvement facilitation (4 items, "We are encouraged to try out new technologies").

The intolerance of uncertainty (IU) was measured using the scale developed by (Carleton et al., 2007). The 12 items are rated on five-point Likert scale measuring responses to uncertainty, ambiguous situations, and the future. They are grouped into two dimensions, Prospective anxiety (7 items; "I can't stand being taken by surprise") and Inhibitory anxiety (5 items; "When it's time to act, uncertainty paralyses me").

Technology self-efficacy (TSE) was measured using the five-item Technology self-efficacy scale (Venkatesh et al., 2012). The 5 items are rated on a five-point Likert scale r and measures the belief in one's ability to successfully perform online tasks in educational settings (e.g., "Whether the use of online technology is difficult or easy"). The use of e-learning platforms in teaching activities (USE) was measured through 8 items created by the authors of this study, measured on a five-point Likert scale. The items were grouped in two dimensions, eee of e-learning platforms in evaluation and monitoring activities (4 items "Monitoring students' progress through evaluation throughout the course") and use of e-learning platforms in teaching activities (4 items: "I use the platform to prepare individualized work tasks").

The satisfaction with the use of e-learning platforms (SAT) was measured through a three-item scale, created by the authors of this study (e.g., "Overall, how satisfied are you with the recent online teaching experience (last month)?"). A ten-point Likert scale was used, ranging from 1 (not at all characteristics of me) to 10 (entirely characteristic of me). Details and results concerning the measurement model and Cronbach's Alpha are provided in the section on Measurement model and online (https://doi.org/10.6084/m9.figshare.19312253).

3. Analysis and findings

The present study employed structural equation modeling, partial least squares (PLS), to analyze data using SmartPLS 3.0 (Ringle et al., 2015). The hypotheses were tested with 5,000 resamples. To analyze and interpret the mediation effects, we used Chin (2010) recommendations. The VIF analysis for evaluating multicollinearity revealed values lower than 3.8, indicating that collinearity is not an issue. All the dimensions were considered reflective while the use of e-learning applications was considered formative.

3.1. Descriptive analysis for the use of online applications and e-learning platforms

The average number of teaching activities in a week for the first semester was 5.26. Most participants (15.9%) stated that they carry out 10 or more activities per week, followed by those who carry out 4 teaching activities per week (15.2%). An in-depth analysis reveals that most professors in teaching positions

(25.6%) spend a long time (between 3-4 hours) preparing an online teaching activity (Table 2). They usually have fewer teaching activities than other teachers, but of a high complexity, which requires careful training. Lecturers are the ones who allocate mostly more than 4 hours a day for the preparation of an activity (24.8%) compared to the associated teachers, who spend less than 1-hour training (11%).

Table 2. Time spent preparing teaching activities for different career levels/teaching positions

		How much time do you spend on average preparing for a 2-hour online teaching activity?					Total
		1-2 hours	2-3 hours	3-4 hours	More than 4 hours	Less than 1 hour	
Assistant	Freq./%	41/32.8%	36/28.8%	17/13.6%	21/16.8%	10/8%	125
Lecturer		142/28%	120/23.7%	99/19.5%	112/22.1%	34/6.7%	507
Associate Professor		118/28.1%	93/22.1%	78/18.6%	104/24.8%	27/6.4%	420
Professor		88/23%	84/21.9%	98/25.6%	87/22.7%	26/6.8%	383
External teacher		27/32.9%	17/20.7%	17/20.7%	12/14.6%	9/11%	82
TOTAL		416/27.4%	350/23.1%	309/20.4%	336/22.1%	106/7%	1,517

An analysis from the perspective of the fundamental teaching domain shows that for exact sciences teachers dedicated more than 4 hours to the preparation of online teaching activities. Between 1 and 2 hours for material, preparation are allocated by teachers in the social sciences fields. Further details regarding preparation time for online teaching activities can be found here: https://doi.org/10.6084/m9.figshare.19312253.

3.2. Measurement model

The model has five constructs with reflective measurements and a construct with formative measurement (the use of e-learning platforms) (Table 3). The composite reliability (CR) (items constantly measure the same construct) for each construct was at least 0.78, showing satisfactory levels of internal consistency.

For assessing convergent validity (how closely a scale is related to other variables or measures of the same construct), the average variance extracted (AVE) for all the constructs were between .550 and .808, satisfying the requirements. The values of indicator loadings for the formative construct were all above .62 indicating adequate convergent validity. Given the good psychometric properties, we kept all the items included in the initial scales.

Table 3. Assessment of the measurement model

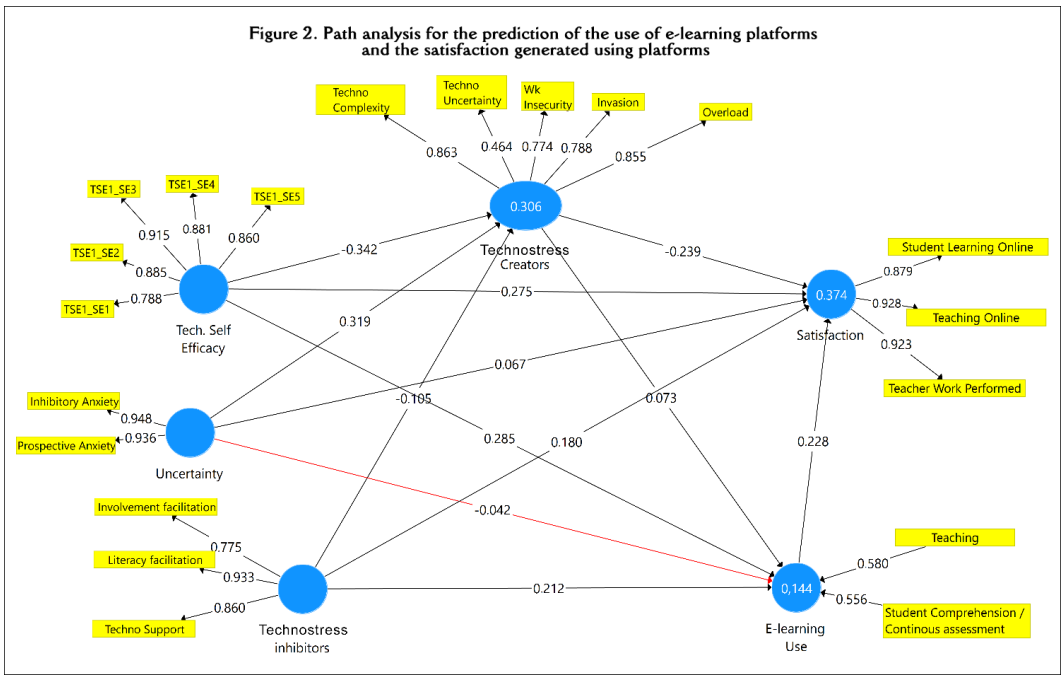
	Cronbach's Alpha	CR	AVE
Intolerance of uncertainty			
Inhibitory anxiety	.848	.892	.623
Prospective anxiety	.795	.859	.552
Technostress inhibitors			
Involvement facilitation	.594	.784	.550
Literacy facilitation	.853	.894	.630
Technical support	.920	.944	.808
Technostress creators			
Complexity	.836	.884	.605
Uncertainty	.774	.868	.687
Insecurity	.791	.856	.546
Invasion	.863	.907	.709
Overload	.859	.898	.642
Technology self-efficacy	.916	.937	.751
Satisfaction towards the use of e-learning	.896	.935	.828

Note. See at https://doi.org/10.6084/m9.figshare.19312253.

3.3. Hypotheses testing

The Pearson correlation (https://doi.org/10.6084/m9.figshare.19312253) showed that TSE was negatively correlated with TC and positively associated with TI, the highest positive association was obtained for SAT, while the associations of TSE with USE was moderate. IU was negatively associated with TI and positively with TC, while the associations with SAT was negative and low. TI correlated positively with the use of e-learning platforms and the satisfaction generated by their use, while the associations of the use dimensions with the TC were negative. To test the hypothesis, we ran several

mediation analyses, using TSE, IU, and TI as antecedents, TC as mediator, and USE and SAT as effects (Figure 2). The total variance explained was 30% for TC, 37% for SAT, and 14% for USE.



The analysis of the direct, indirect, and total effects showed that the relationships between TSE, TI and IU and USE and SAT are mediated by the TC. We found mostly partial mediations, the direct effects between the antecedents and USE and the SAT being significant. We found only one total mediation between the IU and USE through TC. USE does not mediate the association between the IU and SAT, and TC does not mediate the association between TI and the USE (Table 4).

Table 4. Direct, indirect and total effects

Path	Coeff.	t	p	Effect	Hypothesis
TSE→Satisfaction	.275	9.357	<.001	Direct	H1
TSE→TC	-.341	10.914	<.001	Direct	H1
TSE→Use of e-learning	.284	8.970	<.001	Direct	H2
TSE→Use of e-learning→Satisfaction	.064	6.582	<.001	Indirect partial	H3
TC→Use of e-learning	.072	2.279	.022	Direct	H4
Uncertainty→Techno-creators	.318	11.698	<.001	Direct	H6
TI→Satisfaction	.180	7.549	<.001	Direct	H5

Note. See at https://doi.org/10.6084/m9.figshare.19312253.

We have run several multi-group analyses related to gender, academic position and teaching and research domain and none showed significant results.

4. Discussion and conclusions

Most of the study hypothesis were sustained by the data, showing mainly that TC mediates the relationships between TI, TSE and use and satisfaction towards the use of e-Learning platforms. Although the current context is dominated by uncertainty, the hypothesis regarding the direct and indirect effect of uncertainty on the use of the online application in education were partially sustained. In line with previous research, our study showed that TSE is one of the most important antecedents of the use of e-learning platforms and the satisfaction to use them, the direct effects of self-efficacy being positive and significant (Pan, 2020), supporting H1. Other studies showed self-efficacy is a powerful contributing factor related to the ease of use which, combined with behavioral intention, affects the actual use. Our study confirmed previous research, showing that self-efficacy directly impacts the behavioral intention to use technology and actual use (Maican et al., 2019). Our results showed that enhanced self-efficacy is a condition for

technology integration in teaching practices. Regarding the satisfaction with the use of online environments, previous studies confirmed that individuals with high TSE were more satisfied with an online environment, thus self-efficacy could improve satisfaction (Prifti, 2022), supporting H2.

In situations when the mandatory use of a system is studied, the satisfaction of using the system is the most appropriate research performance indicator and not the intention to use it (Chan et al., 2010). Our study showed that the use of e-learning applications has positive direct effects on satisfaction, supporting H3. Furthermore, given the TSE importance, academics' attitudes and involvement are critical for the efficient use of e-learning, leading to increased satisfaction, concluding that usage has a mediator effect between TSE and satisfaction.

It is extensively recognized that self-efficacy is both a supporting factor of work success and a protecting element in stressful working conditions. The negative direct effects of TSE on TC revealed by our results confirm the protective role of self-efficacy against stress (Caprara et al., 2003). High levels of TSE could significantly decrease technostress caused by the complexity of the technology involved in online activities. Academics with higher self-efficacy have higher academic computer-related technology confidence, this belief individuals to prevail over the complexity of the technology, sense of job insecurity, uncertainty, and feelings of techno-invasion in daily academic life (Shu et al., 2011).

Concerning the effects of TC on the use of e-learning, the results showed significant negative effects consistent with a previous study (Upadhyaya & Vrinda, 2021). However, the negative effect of the use of e-learning platforms was smaller than the direct negative effects of TC on user satisfaction. The extensive utilization of ICT in academia could explain the higher levels of technostress which significantly reduce the satisfaction generated by using ICT. Although, previous research focused on general work satisfaction and our results fit into this framework, demonstrating that technostress is responsible for information fatigue, motivation loss, and unhappiness at work (Salah-Eddine & Belaissaoui, 2017). Our results support H4, the partially mediated effect of TSE on USE and SAT, through TC.

TI has a negative direct effect on TC and positive direct effects on USE and SAT. Previous research confirmed the direct effects of TI on job satisfaction and the use of ICT (Upadhyaya & Vrinda, 2021). However, the indirect effects of TI on USE through TC were not significant, albeit marginally, showing that the direct effect of the inhibitors is more important and that this mediation hypothesis is not supported. For SAT, a partial mediation was found, given both the significant direct and indirect effects (through technocreators) of TI. The direct and serial indirect effects of TI on satisfaction (through TC and USE) were also significant. We conclude that TI reduces the effects of technostress (Ragu-Nathan et al., 2008), sustaining organizational mechanisms and adjustment to reduce the negative outcomes of increasing ICT use and thus, explaining a higher satisfaction of using ICT in education (Jena, 2015) (H5 partially supported).

The pandemic has affected billions of people, and the uncertainty of tomorrow has important consequences on individuals' behavior. Uncertainty involves increased anticipation of a negative situation making people less capable of coping with negative events, which can explain higher levels of perceived stress and maladaptive behaviors given the increased anticipation of a negative situation (Grupe & Nitschke, 2013). Stress and uncertainty have left their mark on the work of teachers and students alike. The need to move all activities online created a new context, emergency remote teaching (Hodges et al., 2020). Students and staff were forced to manage technical concerns, spatial arrangements, family/conflicting responsibilities, and physical and mental health issues. Our results confirmed the direct positive effects of uncertainty on technostress creators, showing that uncertainty could explain the increase of technostress.

However, TC had a weak direct positive association with USE, while the direct effect of uncertainty on USE was not significant. The effects of uncertainty on satisfaction towards the use of e-learning were negative, both direct and indirect, showing that satisfaction is connected with uncertainty, even when technostress is involved. Although we expected direct effects between uncertainty and USE, these effects did not occur, perhaps because the uncertainty situation can be seen as a global one, with medium and long-term effects. As employees, teachers did not feel the short-term effects, since they know what skills and tools to use for carrying out their activities. Given that online/remote teaching was the only available option, the relationship between technostress, platform use and uncertainty cannot be very clear, concluding that

H6 is partially supported. While self-efficacy is a protective factor against stress, uncertainty is an aversive state, explaining low levels of satisfaction with the use of technology. Although research focused on the negative associations between uncertainty and job satisfaction (Bordia et al., 2004), we believe our results could also provide empirical evidence for the harmful effects of uncertainty.

The multi-group analysis did not show differences between the analyzed groups (teaching positions, gender, teaching/research field). Previous research found differences in technostress concerning gender and work experience (Marchiori et al., 2019; Ragu-Nathan et al., 2008). Our study did not reveal significant group differences, the results being convergent with recent studies (Li & Wang, 2021). Although we expected differences, the pandemic context probably canceled them out.

Although the pandemic context is fraught with uncertainty in explaining the high level of stress, its negative weight can be counteracted by a high level of TSE. Equally, the support provided by organizations through techno-inhibitors can be a major factor, sustaining the use of online technologies, even under normal conditions. Even if the universities are promoters of advanced research, academics have lifelong learning expectations, even in the case of "basic" tools such as an e-learning platform, especially related to the content which requires a significant effort to transpose for online teaching (i.e., from the platform we want much more than simply sharing presentations). Also, finding solutions for technical disciplines involving special equipment (e.g., remote-virtual-laboratories) also requires training.

This study may contribute to current research on self-efficacy, e-learning use and technostress in uncertain situations. First, TSE is under researched in connection with e-learning use satisfaction, even if self-efficacy is an important factor of task performance. Second, research regarding intolerance to uncertainty among teachers in the context of e-learning is extremely few. Although uncertainty is characteristic of the pandemic, as a factor resulting from the person-situation interaction, uncertainty is not manifested directly over the satisfaction of using e-learning, but only through factors related to the use of technology. Therefore, uncertainty is an indirect "influencer" in certain situations where the state of uncertainty caused by various macrosocial events remains high (e.g., conflicts, environmental issues, various etc.). Third, technostress creators and technostress inhibitors play an important role in satisfaction, confirming the correctness of our choice. A possible implication could result in providing not only technical support but also training programs for teachers to develop their self-regulation and coping strategies in uncertain situations. Forth, we developed a tool to identify teachers' use of e-learning platforms together with a tool for identifying teaching satisfaction. Such tools can be used in the future to evaluate the efficiency of teaching-learning from the students' perspective. These could also be used as self-assessment tools for university teachers to improve their online teaching practices.

The pandemic has marked an essential point in using IT technologies in learning, many once-regular-teachers will use them more intensely in the future, being as an impetus towards digital transformation into HEIs. A possible limitation could refer to the challenging moment when the study was run, with universities struggling to find quick solutions to continue their work. As expected, not all the chosen solutions were the best, since each Romanian university (or even teacher) decided which online platform to use for mandatory online learning, implying differences in system complexity, ease of use, perceived usefulness etc. Another limitation is that some universities have already implemented functional e-learning systems, but which were designed and used on a much smaller scale. Thus, some teachers were already familiar with the e-learning systems, at least partially, and so the pandemic was not as challenging as for those who had not used these systems in the past and had to adapt on the fly.

The lack of data on the actual use of the platforms could be another limitation, as only statistics related to the download of certain applications are public but not information on their use. This limitation could be solved in a future study applied at the level of a single HEI that would allow access to the usage logs of the applications from which the current usage would be extracted. The lack of actual user data and the use of only self-reported values could also cause biased data analysis. In line with this, a possible self-selection bias could be added, given that the participants volunteered to participate in this study, and their participation could have been influenced by their great interest in technology and its use. In addition, the data was collected during the pandemic, when the topic of e-learning was extensively discussed. Another limitation of this study was the cross-sectional nature of the data used, making it impossible to draw causal

inferences. A future direction of study is to identify the degree of use of the most popular platforms as well as the comparative study of the use of e-learning technology at the teacher level after the COVID pandemic.

Authors' Contribution

Idea, A.M.C, C.I.M; Literature review (state of the art), C.I.M; Methodology, A.M.C; Data analysis, A.M.C, C.I.M; Results, A.M.C, C.I.M; Discussion and conclusions, A.M.C, C.I.M; Writing (original draft), C.I.M; Final revisions, A.M.C, C.I.M; Project design and funding agency, A.M.C.

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