

Technostress in Higher Education: A Systematic Literature Review on Psychological Impacts and Academic Outcomes

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Abstract

The rapid integration of digital technologies in higher education has significantly increased the prevalence of technostress among students and academic staff, making it a critical issue within the field of human resource management (HRM). As universities increasingly function as knowledge-based organizations, the management of human capital in digitally intensive environments has become essential. This study aims to systematically review the existing literature on technostress in higher education by examining research trends, geographical distribution, and its theoretical and practical implications. This study employed a Systematic Literature Review (SLR) using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework. Secondary data were collected from the Scopus database through a structured keyword search related to technostress and higher education. Journal articles were selected using predefined inclusion and exclusion criteria, resulting in a final sample of 105 Scopus-indexed open-access articles published in English. Data were analyzed using bibliometric analysis to identify publication patterns and thematic analysis to synthesize major research themes and knowledge gaps. The findings indicate that research on technostress in higher education has grown substantially, particularly following the COVID-19 pandemic, reflecting its increasing importance in digitally mediated academic environments. Bibliometric analysis reveals that research is globally distributed but concentrated in several countries, institutions, and journals, while thematic analysis shows that existing studies predominantly focus on the negative psychological consequences of technostress, including stress, fatigue, burnout, and reduced academic performance in digital learning environments. Furthermore, technostress is primarily conceptualized as a technological demand, whereas contextual resources and supportive organizational factors remain underexplored. This study concludes that technostress has become a strategically important research area in higher education and highlights the need for future studies to adopt more balanced, resource-oriented perspectives to support sustainable human resource management and digital transformation in universities.

Keywords: *Technostress, Higher Education, Digital Learning, Psychological Well-Being, Human Resource Management, Systematic Literature Review*

Introduction

The growing integration of digital technologies in higher education has significantly increased the prevalence of technostress among both students and educators, making it an increasingly important area of scholarly inquiry. Technostress, commonly defined as the inability to cope effectively with information and communication technologies (ICTs), has consistently been associated with reduced academic productivity, psychological well-being, and learning effectiveness (Salazar-Concha et al., 2022; Upadhyaya, 2021). The rapid digital transformation accelerated by the COVID-19 pandemic further intensified this phenomenon by compelling universities to adopt online and hybrid learning environments, thereby increasing

dependence on digital technologies while simultaneously exposing deficiencies in institutional readiness and technological support (Biggins & Holley, 2022; Jain et al., 2024). Recent empirical studies have identified various antecedents and consequences of technostress; however, their findings remain fragmented and sometimes inconsistent. For example, the previous studied emphasized that cognitive overload, mobile technology addiction, and privacy concerns significantly reduce students' subjective well-being and academic expectations (Pang & Wang, 2025).

Argued that technology use may also generate techno-eustress, whereby appropriate technological support enhances motivation and job satisfaction among university educators (Nascimento et al., 2025). Similarly, the previous studied demonstrated that technostress negatively affects students' productivity during online learning (Salazar-Concha et al., 2022). That individual characteristics such as digital competence and time spent online moderate the severity of technostress (Cazan et al., 2024). These contrasting findings indicate that technostress cannot be understood solely as a negative psychological phenomenon but should also be examined from organizational and contextual perspectives (Erdawati & Zulkifli, 2021).

Although the literature on technostress has expanded considerably, existing reviews still exhibit several important limitations. Previous systematic reviews have primarily focused on workplace environments or specific psychological outcomes such as stress, burnout, and mental health (Jain et al., 2024; Castro, 2024). Other studies have concentrated on bibliometric trends without integrating theoretical and practical implications for higher education institutions (Oppedisano et al., 2024). Moreover, limited attention has been given to the role of contextual resources, including institutional support, digital literacy, and self-efficacy, which may mitigate the adverse effects of technostress (Araya-Ugarte et al., 2025; Cazan et al., 2024). Consequently, existing knowledge remains fragmented across different theoretical frameworks, empirical contexts, and disciplinary perspectives.

This study addresses these gaps by conducting a comprehensive Systematic Literature Review (SLR) that integrates the PRISMA protocol, bibliometric analysis, and thematic synthesis to examine technostress specifically within higher education. Unlike previous reviews that predominantly emphasized psychological consequences or bibliometric trends, this study provides an integrated perspective by synthesizing publication patterns, theoretical foundations, dominant research themes, and practical implications from a Human Resource Management (HRM) perspective.

The novelty of this study lies in its comprehensive integration of bibliometric mapping and thematic analysis to identify emerging research directions and resource-based strategies for managing technostress in digitally transformed universities. Ultimately, this review contributes to advancing the HRM literature by offering a clearer understanding of current research developments, identifying critical knowledge gaps, and proposing future research agendas to support sustainable digital transformation and human capital development in higher education. The literature on technostress in university contexts is predominantly grounded in three major theoretical frameworks, namely the Person–Environment Fit Theory, the Stressor Strain Outcome (SSO) model, and the Job Demands–Resources Theory, each offering complementary perspectives in explaining the emergence and impact of technostress.

The Person Environment Fit Theory emphasizes the mismatch between individuals' technological capabilities and the demands of technology-enhanced learning environments, suggesting that technostress arises when students perceive an imbalance between their skills

and academic requirements, which in turn affects productivity and learning outcomes (Salazar-Concha et al., 2022; Solano Castro, 2024; Wang et al., 2020). Meanwhile, the Stressor Strain Outcome (SSO) model conceptualizes technostress as a process in which specific technological stressors, such as techno-overload and techno-complexity, lead to psychological strain, including anxiety and burnout, ultimately influencing outcomes such as academic performance and satisfaction (Abd Aziz et al., 2023; Solano Castro, 2024).

In contrast, the Job Demands–Resources (JD-R) theory provides a more integrative perspective by explaining technostress as the result of an imbalance between demands (e.g., increased academic workload due to technology) and resources (e.g., digital literacy and institutional support), while also acknowledging the dual role of technology as both a stressor and a potential source of motivation (Kulikowski et al., 2022). Collectively, these theories highlight that technostress is a multifaceted phenomenon shaped by the interaction between individual capabilities, technological demands, and contextual resources, offering a comprehensive foundation for understanding its causes, processes, and outcomes in higher education.

Technostress is widely recognized as a psychological phenomenon arising from individuals' interaction with information and communication technologies (ICTs). It is generally defined as a form of stress experienced when individuals are unable to cope effectively with technological demands in a healthy manner (Stich & Tarafdar, 2024). This condition often manifests in the form of frustration, anxiety, cognitive overload, and emotional strain, particularly when users are required to continuously adapt to rapidly evolving digital systems (Rajput & Kumari, 2024). As technology becomes increasingly embedded in daily activities, technostress has emerged as a critical issue affecting both personal and professional domains.

In work-related contexts, technostress is closely associated with the intensive and continuous use of ICTs, which can lead to negative outcomes such as reduced job satisfaction, increased anxiety, and burnout (Peñalver & Díaz-Mena, 2023; Thurik et al., 2024). One of the most commonly discussed aspects of technostress is techno-overload, where individuals are compelled to work faster and longer due to technological demands. This phenomenon highlights how technology, while designed to enhance productivity, can paradoxically increase pressure and reduce overall well-being. Such conditions are particularly evident in environments that require constant connectivity and rapid information processing.

From a psychosocial perspective, technostress is also understood as a condition that affects emotional and mental well-being. It can generate feelings of uncertainty, fear, and resistance toward technology use, especially in situations involving sudden transitions, such as remote work or online learning during the COVID-19 pandemic (Bahamondes-Rosado et al., 2023; Guerra et al., 2022; Syukur & Sutrisno, 2023). In higher education contexts, these challenges are amplified as both students and educators must quickly adapt to digital platforms, often without adequate preparation or support. Furthermore, the literature identifies several key dimensions of technostress that explain its multifaceted nature. These include techno-overload (excessive workload due to ICTs), techno-invasion (the blurring of boundaries between work and personal life), techno-complexity (difficulties in learning and using new technologies), and techno-fatigue (exhaustion resulting from prolonged technology use) (Khlaif et al., 2023; La Torre et al., 2019). These dimensions illustrate that technostress is not a single construct but a complex interplay of technological, cognitive, and emotional factors that collectively influence individuals' experiences. Beyond professional settings,

technostress also extends to personal life, where excessive dependence on technology can lead to behavioral issues such as technology addiction, stress, and discomfort when access to digital tools is restricted (Salo et al., 2022). This highlights the pervasive nature of technostress, which transcends boundaries between work and personal domains.

In summary, technostress is a multidimensional construct encompassing psychological, emotional, and social challenges associated with technology use. It is influenced by various factors, including workload demands, technological complexity, and the pervasive presence of ICTs in modern life (La Torre et al., 2019; Stich & Tarafdar, 2024). Understanding these dimensions is essential for developing effective strategies to mitigate technostress and improve well-being, particularly in increasingly digitalized environments such as higher education.

Method

This study employed a Systematic Literature Review (SLR) to comprehensively synthesize existing knowledge on technostress in higher education. The review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) guidelines to ensure methodological rigor, transparency, and reproducibility throughout the identification, screening, eligibility, and inclusion stages. The SLR approach was selected because it enables researchers to systematically identify, evaluate, and synthesize empirical evidence from previous studies while minimizing selection bias and enhancing the reliability of research findings.

The data source used in this study was the Scopus database, which was selected because it is one of the largest and most reputable international citation databases covering high-quality peer-reviewed journals across multiple disciplines. Only journal articles indexed in Scopus were considered to ensure the academic quality and credibility of the reviewed literature. The literature search was conducted between January and February 2026 using a structured search strategy. Initially, broad keywords related to technostress were employed, including *"technostress"*, *"higher education"*, *"university"*, *"college"*, *"academic staff"*, and *"students"*. Boolean operators (AND, OR) were used to refine the search query. To improve contextual relevance, the search was narrowed by combining the keyword *"technostress"* AND *"university"*, thereby excluding studies conducted in non-higher education settings.

The selection of articles was performed using predefined inclusion and exclusion criteria to ensure consistency throughout the review process. Studies were included if they (1) were published in Scopus-indexed journals, (2) focused on technostress within higher education contexts, (3) were written in English, (4) were available as full-text open-access articles, and (5) reported empirical or review findings relevant to the objectives of this study. Conversely, studies were excluded if they (1) were conference proceedings, book chapters, editorials, or notes, (2) focused on technostress outside higher education, (3) were written in languages other than English, or (4) were inaccessible in full text.

Table 1. Inclusion and Exclusion Criteria

Criteria	Inclusion	Exclusion
Database	Scopus	Other databases
Document type	Journal articles	Conference papers, books, editorials
Language	English	Non-English
Accessibility	Open access	Restricted access
Research context	Higher education/university	Non-higher education
Publication focus	Technostress	Unrelated topics

The study selection process was conducted according to the PRISMA framework (Figure 1). During the identification stage, a total of 1,639 records were initially retrieved from the Scopus database using broad technostress-related keywords. To improve contextual relevance, the search strategy was refined by incorporating the term "university", which reduced the dataset to 213 records.

In the screening stage, the remaining records were evaluated based on document type, resulting in the exclusion of 41 non-journal publications. The remaining 172 journal articles were subsequently screened according to language criteria, leading to the exclusion of 15 non-English publications. Consequently, 157 articles proceeded to the eligibility assessment.

During the eligibility stage, the full texts of all 157 articles were assessed against the predefined inclusion criteria. Since this review prioritized transparency and accessibility of evidence, only open-access publications were retained. As a result, 52 articles were excluded because they were not publicly accessible. The final dataset consisted of 105 journal articles, which formed the basis of the systematic review. This transparent and criteria-based selection process enhanced the methodological rigor, reproducibility, and reliability of the review.

The selected studies were analyzed using two complementary analytical approaches. First, bibliometric analysis was employed to examine publication trends, geographical distribution, institutional affiliations, authorship patterns, collaboration networks, and keyword co-occurrence using Scopus metadata and VOSviewer visualization. Second, a thematic synthesis was conducted to identify dominant research themes, theoretical foundations, antecedents, consequences, and research gaps related to technostress in higher education. The integration of bibliometric and thematic analyses enabled both quantitative mapping of the literature and qualitative interpretation of the conceptual development of the field.

To guide the review process, the study addressed the following research questions: 1). RQ1: Is technostress in higher education a research topic that continues to demonstrate significant scholarly development? 2). RQ2: How are studies on technostress distributed geographically, institutionally, and conceptually within higher education research? 3). RQ3: What theoretical insights, practical implications, and future research directions can be derived from the existing literature on technostress in higher education?

Results

Presented below are the results and discussion derived from the systematic literature review of 105 articles, highlighting key findings related to employee technostress in university, as well as their theoretical and practical implications.

Table 2. Summary of Previous Studies Supporting the Main Themes

Aspect	Previous Studies	Main Findings
Publication trend	Oppedisano et al. (2024); Jain et al. (2024)	Publications increased after COVID-19
Geographic distribution	Rajput & Kumari (2024); Oppedisano et al. (2024)	Asia dominates technostress research
Collaboration network	Jain et al. (2024)	International collaboration is increasing
Psychological impacts	Cazan et al. (2024); Salazar-Concha et al. (2022)	Stress and burnout are dominant themes
HRM implications	Nascimento et al. (2025); Cook & Van Belle (2022)	Organizational support reduces technostress

RQ1: Is technostress in university a research topic that continues to hold significance for future scholarly inquiry?

To address the first research question (RQ1), which examines the extent to which technostress in higher education remains a relevant topic for future scholarly inquiry, this study analyzes the temporal distribution of publications over time. By examining publication trends across years, this analysis provides insights into the evolution, growth patterns, and sustained research interest in technostress within university contexts. Understanding these trends is essential to determine whether technostress continues to gain scholarly attention and to identify critical periods that have influenced its development as a research domain.

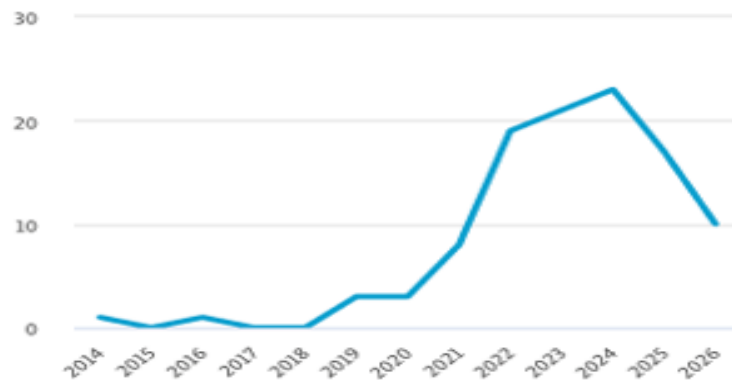


Figure 1. Documents by year

The annual distribution of publications on technostress in higher education from 2014 to 2026 is presented in Figure 2. Overall, the results indicate a substantial increase in scholarly interest over time, particularly during the post-pandemic period. Between 2014 and 2018, publication output remained relatively low and stable, suggesting that technostress had not yet become a major research topic within higher education. A gradual increase was observed in 2019 and 2020, reflecting the emergence of growing academic attention toward the challenges associated with digital technology adoption in universities.

Research activity accelerated considerably from 2021 onward, with the highest number of publications recorded in 2024. This trend coincides with the rapid expansion of online and hybrid learning environments following the COVID-19 pandemic, which significantly increased dependence on digital technologies among students and academic staff. These findings are consistent with previous studies, who reported that the widespread implementation of digital learning intensified concerns regarding student well-being and technostress (Biggins and Holley, 2022). Similarly, Concluded that the COVID-19 pandemic served as a major catalyst for technostress research due to the unprecedented digital transformation experienced by higher education institutions (Jain et al., 2024). Moreover, the bibliometric analysis conducted by previous studies also identified a marked increase in publications on technostress within academic environments after 2020, indicating that the topic has become an increasingly important area of scientific inquiry (Oppedisano et al., 2024).

Although publication output appears to decline after 2024, this pattern should be interpreted cautiously because records for 2025 and 2026 are likely incomplete, as not all articles indexed during these years had been published at the time of data collection. Therefore, the observed decrease does not necessarily indicate diminishing scholarly interest but may instead reflect the ongoing indexing process.

These findings confirm RQ1, demonstrating that technostress remains a rapidly expanding research area in higher education. The continuous growth in publication output reflects increasing global recognition of technostress as a critical issue affecting teaching, learning, and human resource management in digitally transformed universities. From a theoretical perspective, this trend also supports the Job Demands–Resources (JD-R) Theory, which suggests that the growing integration of digital technologies creates new job and learning demands that require adequate institutional and personal resources to prevent psychological strain and sustain academic performance.

RQ2: What is the current distribution and focus of research on technostress in university contexts?

To address the second research question (RQ2), which explores the current distribution and focus of research on technostress in higher education, this study conducts a comprehensive bibliometric analysis. The analysis includes the distribution of publications based on country, collaboration networks, institutional affiliations, publication sources, authorship, and thematic keyword mapping. This multi-dimensional approach enables a systematic understanding of how research on technostress is geographically distributed, institutionally developed, and conceptually structured across the academic landscape.

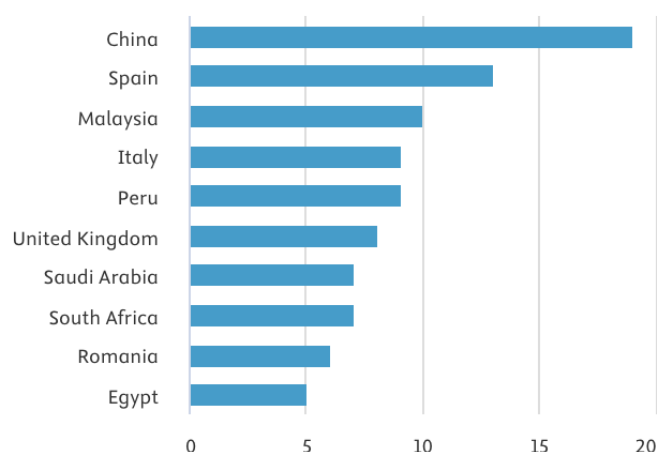


Figure 2. Documents by country

The analysis of the distribution of research on technostress in university was conducted by categorizing the selected 105 articles based on country or territorial contribution. This classification provides insights into the geographical concentration of scholarly work and highlights the global research landscape of technostress in university contexts.

The findings indicate that research on technostress in higher education is unevenly distributed across countries, with a strong concentration in several leading regions. China emerged as the leading contributor to technostress research in higher education, accounting for 19 publications, followed by Spain (13 publications) and Malaysia (10 publications). Italy and Peru each contributed nine studies, while the United Kingdom accounted for eight publications. This distribution suggests that research activity is concentrated in countries that have experienced rapid digital transformation in higher education and have invested substantially in educational technologies. The finding is consistent with Oppedisano et al. (2024), who reported that technostress research has expanded most rapidly in countries with strong digitalization initiatives and active research ecosystems. Similarly, Jain et al. (2024) argued that the accelerated adoption of digital technologies has stimulated growing scholarly

attention to technostress, particularly in countries where online and hybrid learning have become integral components of higher education.

Further contributions are observed from Saudi Arabia and South Africa, each with 7 publications, followed by Romania with 6 studies and Egypt with 5 studies. This distribution demonstrates that research on technostress in university settings is primarily concentrated in Asia and Europe, with emerging contributions from regions such as Africa and South America.

These findings suggest that technostress has gained considerable attention in countries experiencing rapid digital transformation in university. The dominance of countries such as China and Malaysia may reflect their strong adoption of educational technologies and increasing reliance on digital platforms in academic environments.

The geographical distribution highlights both the growing global relevance of technostress and the existing imbalance in research contributions, indicating opportunities for further studies in underrepresented regions.

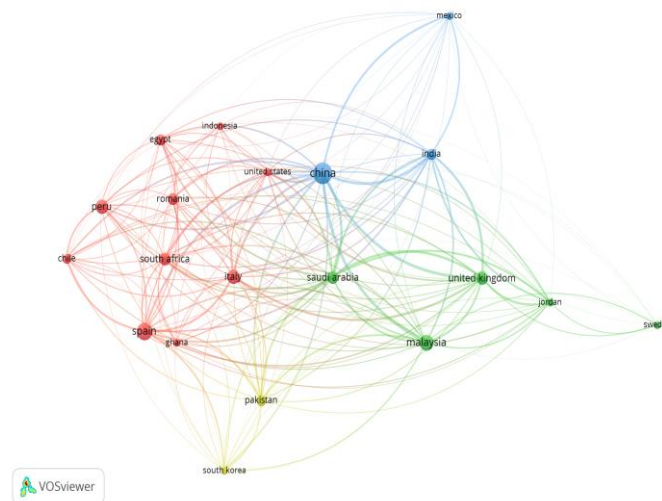


Figure 3. Network country visualization

Figure 4 presents a network visualization of international research collaboration on technostress in higher education, generated using VOSviewer. The map illustrates the co-authorship relationships between countries, where nodes represent countries and links indicate collaborative research connections. The size of each node reflects the number of publications, while the thickness of the connecting lines indicates the strength of collaboration.

The analysis reveals several prominent clusters of collaboration. China appears as a central and influential node within the network, exhibiting strong collaborative ties with multiple countries, including India, the United States, and Mexico. This suggests that China plays a key role in facilitating international research on technostress in higher education.

Another major cluster is dominated by European and developing countries, including Spain, Italy, Romania, South Africa, Peru, and Egypt. These countries are closely interconnected, indicating active collaboration within this group. Spain, in particular, emerges as a significant contributor within this cluster, with extensive collaborative links.

A third cluster includes countries such as the United Kingdom, Malaysia, Saudi Arabia, and Jordan. Among these, the United Kingdom and Malaysia demonstrate strong bilateral and multilateral collaborations, suggesting their important role in bridging research efforts between

regions. Additionally, countries such as Pakistan and South Korea form smaller clusters, indicating more localized or emerging collaboration networks. Sweden appears to have relatively limited connections, suggesting a more peripheral role in the collaboration network.

The network visualization highlights that research on technostress in higher education is characterized by a combination of strong regional collaborations and a few globally connected hubs. Countries such as China, the United Kingdom, and Malaysia play central roles in the global research network, while other regions demonstrate growing but still limited collaboration. This pattern indicates opportunities for expanding international research partnerships, particularly involving underrepresented countries.

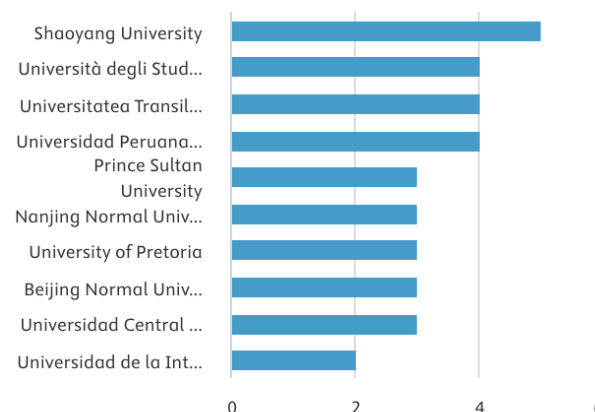


Figure 4. Documents by affiliation

The distribution of research on technostress in higher education was further analyzed based on institutional affiliation to identify leading academic contributors in this field. This analysis provides insight into which universities or research institutions are most actively engaged in advancing the study of technostress within university contexts.

The findings indicate that research contributions are relatively dispersed across institutions, with no single institution demonstrating overwhelming dominance. However, several universities emerge as key contributors. Shaoyang University ranks as the most productive institution, with a total of 5 publications. This is followed by Università degli Studi di Napoli Federico II, Universitatea Transilvania din Braşov, and Universidad Peruana de Ciencias Aplicadas, each contributing 4 publications. In addition, several institutions show moderate research output, including Prince Sultan University, Nanjing Normal University, University of Pretoria, and Beijing Normal University, each with 3 publications. Other institutions, such as Universidad Central de Chile and Universidad de la Integración de las Américas, contribute a smaller number of studies.

The affiliation-based distribution suggests that research on technostress in higher education is not concentrated within a few dominant institutions but is instead spread across a diverse range of universities worldwide. This pattern reflects the global relevance of the topic and indicates that scholarly interest in technostress is emerging across various academic contexts. Furthermore, the presence of institutions from different regions including Asia, Europe, Africa, and South America highlights the international scope of research efforts. However, the relatively low number of publications per institution also suggests that the field is still developing, with opportunities for more sustained and concentrated research contributions in the future.

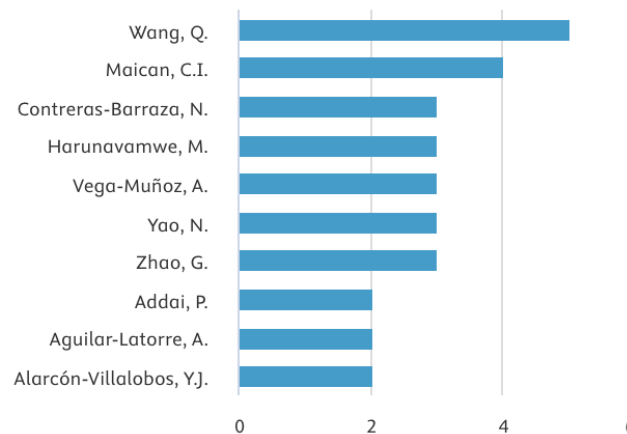


Figure 5. Documents by author (top 10 authors)

The distribution of technostress research in higher education was further analyzed based on authorship to identify the most influential contributors to this research field. Authorship analysis provides insight into the development of scientific knowledge by identifying productive researchers and illustrating the maturity of a research domain.

The findings indicate that research productivity remains relatively dispersed, with no single author demonstrating overwhelming dominance. Wang, Q. emerged as the most productive author, contributing five publications, followed by Maican, C. I. with four publications. Several other researchers, including Contreras-Barraza, N., Harunavamwe, M., Vega-Muñoz, A., Yao, N., and Zhao, G., each contributed three publications, while Addai, P. and Aguilar-Latorre, A. contributed two publications each. This distribution suggests that although several scholars have made substantial contributions, technostress research in higher education has not yet been dominated by a single leading research group.

This finding is consistent with the bibliometric analysis conducted by previous studies, which reported that technostress research in academic environments is characterized by contributions from numerous researchers rather than a few dominant authors (Oppedisano et al., 2024). Similarly, Observed that the rapid expansion of technostress research has encouraged participation from scholars across multiple disciplines, resulting in a relatively fragmented authorship structure (Rajput & Kumari, 2024). Such fragmentation reflects the interdisciplinary nature of technostress research, which integrates perspectives from psychology, education, information systems, and human resource management.

The relatively balanced distribution of author productivity also indicates that the field is still evolving. Emerging research areas typically exhibit dispersed authorship because scientific knowledge is still being developed by independent research groups before more consolidated research networks are established (Jain et al., 2024). Therefore, the absence of highly dominant authors suggests that technostress remains an expanding research domain with considerable opportunities for new scholarly contributions.

From a bibliometric perspective, the diversity of contributing authors also reflects the global nature of technostress research. Researchers from different countries and disciplinary backgrounds have investigated various aspects of technostress, including psychological well-being, digital learning, organizational behavior, and technology adoption. This interdisciplinary collaboration enriches theoretical development while broadening the applicability of research findings across different higher education contexts.

Overall, these findings indicate that technostress research has progressed through collaborative contributions from numerous scholars rather than being concentrated within a limited number of research groups. This pattern suggests significant opportunities for future international collaboration, interdisciplinary research, and the development of more integrated theoretical frameworks that can advance understanding of technostress in higher education.

RQ3: What theoretical and practical implications can be derived from existing studies to inform future research on technostress in university?

To address the third research question (RQ3), which aims to derive theoretical and practical implications from existing studies on technostress in higher education, this study employs a thematic and conceptual analysis based on keyword co-occurrence and linkage strength. By identifying dominant themes, conceptual relationships, and research patterns, this analysis provides a deeper understanding of how technostress has been theoretically framed and empirically investigated. Furthermore, it enables the identification of research gaps and offers directions for future studies, particularly in advancing more balanced and integrative perspectives on technostress.

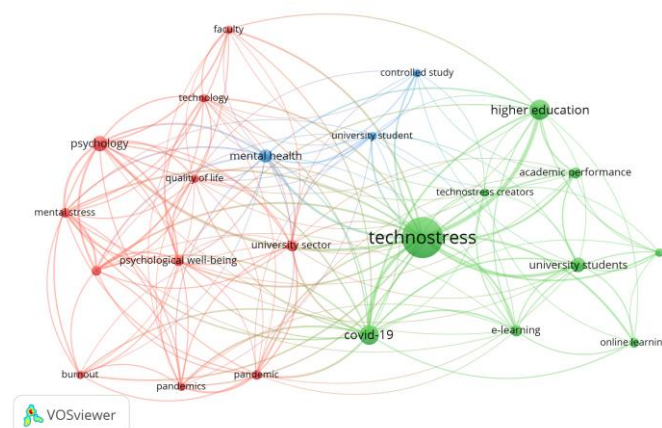


Figure 6. Co-occurrence framework and representation of key terms

As illustrated in Figure 6, *technostress* occupies the most central position in the keyword co-occurrence network and is closely connected with psychological, health-related, and higher education themes. The relative importance of these keywords is further quantified in Table 3 through their total link strength values, providing a clearer indication of the dominant concepts within the research field.

Table 3. Keywords by link strength

Rank	Keywords	Total link strength
1	Technostress	322
2	Psychology	207
3	Covid-19	138
4	Mental health	133
5	Mental stress	118
6	Stress, psychological	118
7	Psychological well-being	86
8	Burnout	70
9	Controlled study	68
10	E-learning	47

The thematic and conceptual structure of technostress research in higher education was analyzed using keyword co-occurrence mapping and total link strength indicators. This

approach provides a comprehensive understanding of the dominant research themes and conceptual relationships that characterize the current body of literature. The results indicate that technostress has primarily been conceptualized from a psychological perspective, as reflected by the strong co-occurrence of keywords such as *psychology*, *mental health*, *mental stress*, and *psychological well-being*.

The high total link strength associated with these keywords suggests that existing studies have predominantly examined the adverse psychological consequences of technology use, including stress, burnout, anxiety, and reduced well-being. This finding is consistent with the previous studied, who identified psychological distress as the principal outcome of technostress across multiple organizational contexts (La Torre et al., 2019). Similarly, demonstrated that technostress significantly affects the psychological well-being of both students and teachers, and that increased technostress reduces students' productivity and learning effectiveness (Cazan et al., 2024; Salazar-Concha et al., 2022).

The prominence of COVID-19 as one of the strongest keywords further indicates that the pandemic substantially accelerated research on technostress. The sudden transition to emergency remote teaching forced universities to adopt digital technologies on an unprecedented scale, thereby exposing students and educators to new technological demands. These findings corroborate those of previous studied, who emphasized that the rapid implementation of online learning significantly increased technostress and negatively affected student well-being (Biggins and Holley, 2022). Likewise, Concluded that the COVID-19 pandemic became a major catalyst for the expansion of technostress research because digital transformation fundamentally altered teaching and learning practices in higher education (Jain et al., 2024).

From an educational perspective, the frequent occurrence of keywords such as *e-learning*, *online learning*, *higher education*, *university students*, and *academic performance* indicates that technostress has been investigated primarily within digitally mediated learning environments. This finding supports previous studies by the previous studied, which demonstrated that excessive technological demands reduce students' academic performance, learning engagement, and overall educational experiences (Cook & Van Belle, 2022; Essel et al., 2021). Collectively, these studies confirm that technostress has become a critical issue in digital education and requires greater institutional attention.

The keyword clustering analysis further reveals three dominant research themes: (1) psychological impacts, (2) digital learning environments, and (3) pandemic-related contexts. This thematic pattern suggests that the existing literature has focused predominantly on understanding the negative consequences of technology use, while comparatively limited attention has been devoted to identifying protective factors and organizational resources that may mitigate technostress. Similar observations were reported by previous studied, who argued that previous technostress studies have concentrated largely on stress outcomes rather than on resilience-building mechanisms or institutional interventions (Castro, 2024).

From a theoretical perspective, these findings indicate that technostress has predominantly been interpreted through the Job Demands–Resources (JD-R) Theory, where digital technologies are viewed primarily as job or learning demands that increase psychological strain when adequate resources are unavailable. This interpretation aligns with the previous studied, who emphasized that excessive technological demands without sufficient institutional support contribute directly to technostress among university students (Kulikowski et al., 2022). However, the relatively limited occurrence of resource-related constructs, such

as digital literacy, psychological empowerment, institutional support, and self-efficacy, suggests an important research gap. Previous studies by previous studied have demonstrated that these resources can reduce technostress and even facilitate techno-eustress, indicating that future research should adopt a more balanced perspective that incorporates both negative and positive consequences of technology use (Nascimento et al., 2025; Araya-Ugarte et al., 2025).

Practically, these findings highlight the importance of developing comprehensive institutional strategies to reduce technostress in higher education. Universities should strengthen digital literacy programs, provide continuous technological and psychological support, and design human-centered digital learning environments that enhance adaptability among students and academic staff. Such recommendations are consistent with those proposed by previous studied, who emphasized that organizational support and continuous digital capacity development are essential for promoting sustainable digital transformation in higher education (Cook & Van Belle, 2022; Nascimento et al., 2025).

Overall, the findings answer RQ3 by demonstrating that current technostress research remains heavily oriented toward psychological problems and pandemic-related digital learning, whereas resource-based perspectives and positive organizational approaches remain insufficiently explored. Consequently, future research should expand beyond identifying the negative effects of technostress and investigate organizational capabilities, digital resilience, and human resource management strategies that enable universities to manage technological change more effectively.

Discussion

The present systematic literature review provides a comprehensive overview of the evolution, distribution, and thematic development of technostress research in higher education. By integrating bibliometric analysis and thematic synthesis, this study demonstrates that technostress has evolved into a rapidly expanding research domain closely associated with the digital transformation of universities. Unlike previous studies that primarily focused on specific psychological outcomes or individual empirical contexts, this review synthesizes global publication trends, research networks, dominant themes, and theoretical implications, thereby offering a broader understanding of the current state of technostress research.

The bibliometric findings indicate a substantial increase in publications after 2020, with research output reaching its highest level in 2024. This trend suggests that the COVID-19 pandemic acted as a major catalyst for accelerating scholarly interest in technostress. The widespread implementation of online and hybrid learning environments required universities to rapidly adopt digital technologies, exposing students and educators to new technological demands and challenges. These findings are consistent with the previous studied, who argued that the transition toward digital learning significantly increased concerns regarding students' well-being and technology-related stress (Biggins & Holley, 2022). Similarly, that digital transformation has fundamentally reshaped higher education and stimulated a rapid expansion of technostress research (Jain et al., 2024). The findings also corroborate the bibliometric review conducted by the previous studied, which identified continuous growth in publications focusing on academic environments after the COVID-19 pandemic (Oppedisano et al., 2024). Collectively, these findings confirm that technostress has become an increasingly important issue within higher education and is likely to remain a major research topic as universities continue their digital transformation.

The geographical distribution of publications further demonstrates that technostress research is concentrated in countries with advanced digital infrastructures and strong investments in educational technologies. China emerged as the leading contributor, followed by Spain, Malaysia, Italy, Peru, and the United Kingdom. This pattern suggests that countries experiencing rapid digitalization have responded more actively to the challenges associated with technology adoption in higher education. These findings are consistent with the previous studies, who reported that countries with greater technological development contribute more substantially to technostress research (Rajput & Kumari, 2024). Likewise, Observed that international research output is concentrated within regions characterized by mature research ecosystems and extensive digital transformation initiatives (Oppedisano et al., 2024). Nevertheless, the relatively limited contributions from developing countries indicate that geographical disparities remain evident, suggesting opportunities for broader international collaboration and comparative research across different educational systems.

The collaboration network analysis further indicates that technostress research has become increasingly international and interdisciplinary. China, Spain, Malaysia, and the United Kingdom occupy central positions within global collaboration networks, demonstrating that knowledge development is increasingly supported by cross-country partnerships. Such collaboration facilitates knowledge exchange and encourages the integration of perspectives from psychology, education, information systems, and human resource management. However, several countries remain weakly connected within the collaboration network, indicating that future research should strengthen international partnerships to enhance the diversity and generalizability of technostress research. Expanding collaboration between developed and developing countries would also improve understanding of contextual differences in technological adoption and organizational support within higher education institutions.

The keyword co-occurrence analysis reveals that technostress research remains predominantly oriented toward psychological outcomes. Keywords such as psychology, mental health, mental stress, burnout, and psychological well-being exhibit the highest link strength, indicating that most existing studies conceptualize technostress primarily as a psychological phenomenon. These findings support the systematic review conducted by previous studies, which identified stress, burnout, and psychological strain as the principal consequences of technostress (La Torre et al., 2019). Similarly, that technostress significantly affects both teachers' and students' psychological well-being (Cazan et al., 2024). while the previous studies reported that technostress reduces students' productivity and academic performance (Salazar-Concha et al., 2022). Collectively, these findings indicate that psychological consequences remain the dominant research focus within the existing literature.

Despite the strong emphasis on psychological outcomes, the present review also identifies an important conceptual gap. Resource-related constructs, including digital literacy, institutional support, self-efficacy, and psychological empowerment, appear relatively infrequently within keyword networks. This suggests that previous studies have concentrated primarily on explaining the negative consequences of technostress while paying comparatively less attention to organizational resources capable of mitigating its adverse effects. Similar observations were reported by previous studies, who argued that existing technostress research remains heavily oriented toward stress outcomes rather than resilience-building mechanisms (Castro, 2024). Moreover, introduced the concept of techno-eustress, demonstrating that technology may also generate positive outcomes when accompanied by adequate organizational support and digital competence (Nascimento et al., 2025). Therefore,

future research should move beyond problem-oriented perspectives by investigating organizational capabilities that enable individuals to adapt successfully to digital transformation.

From a theoretical perspective, the findings strongly support the Job Demands–Resources (JD-R) Theory. The dominance of keywords associated with stress, burnout, and psychological strain suggests that digital technologies continue to function primarily as demands rather than organizational resources. According to JD-R Theory, excessive technological demands without sufficient institutional support increase psychological strain and reduce performance. The bibliometric evidence presented in this study aligns with previous studies, who emphasized that technological demands significantly contribute to technostress among university students when institutional resources are inadequate (Kulikowski et al., 2022). At the same time, the limited occurrence of resource-oriented constructs indicates that future theoretical development should incorporate organizational resilience, digital capability, and technology acceptance perspectives to complement traditional stress theories.

From a practical perspective, the findings suggest that higher education institutions should adopt more comprehensive strategies for managing technostress. Universities should not limit their interventions to technological infrastructure but should also strengthen institutional support through continuous digital literacy training, psychological counseling services, workload management, and human-centered technology implementation. Organizational policies that encourage adaptive technology use and continuous professional development may reduce psychological strain while improving academic productivity. These recommendations are consistent with the previous studies, who emphasized that organizational support and digital capability development play crucial roles in reducing technostress and promoting sustainable digital transformation (Cook & Van Belle, 2022; Nascimento et al., 2025).

Finally, this review identifies several directions for future research. First, future studies should investigate positive dimensions of technology use, including techno-eustress, digital resilience, and organizational learning. Second, longitudinal and mixed-method designs are needed to better understand the dynamic development of technostress over time. Third, comparative cross-country studies should be conducted to examine how cultural, institutional, and technological differences influence technostress in higher education. Finally, emerging technologies such as artificial intelligence, generative AI, immersive learning, and digital human resource management systems should receive greater scholarly attention, as these innovations are likely to redefine both the sources and consequences of technostress in universities.

Conclusion

This study systematically reviewed the development of technostress research in higher education using the PRISMA framework, bibliometric analysis, and thematic synthesis. From 1,639 initially identified records, 105 Scopus-indexed open-access journal articles met the eligibility criteria and were included in the review. The findings indicate that technostress research has expanded substantially over the past decade, with publication output increasing rapidly after 2020 and peaking in 2024. China was the leading contributor (19 publications), followed by Spain (13) and Malaysia (10), highlighting the concentration of research in countries undergoing rapid digital transformation in higher education.

The review addressed all research questions. First, technostress remains a rapidly growing and strategically important topic, particularly following the widespread adoption of digital learning technologies after the COVID-19 pandemic. Second, although research is globally distributed, it is concentrated among a limited number of countries, institutions, and prolific authors, suggesting an expanding yet fragmented research landscape. Third, dominant themes include psychological well-being, mental stress, burnout, online learning, and COVID-19, while resource-oriented perspectives such as digital literacy, institutional support, self-efficacy, psychological empowerment, and techno-eustress remain underexplored.

Theoretically, this review integrates bibliometric mapping with thematic synthesis and confirms the continued relevance of the Job Demands–Resources (JD-R) Theory in explaining technostress in higher education. It also highlights opportunities to enrich future research through resource-based and positive organizational perspectives, including digital resilience and organizational support. Practically, higher education institutions should strengthen digital literacy initiatives, provide continuous technological and psychological support, and adopt human-centered digital transformation strategies to reduce technostress while enhancing academic performance and well-being. Future studies should incorporate broader databases, longitudinal and mixed-method approaches, and emerging topics such as artificial intelligence, generative AI, sustainable human resource management, and digital resilience to better understand technostress in evolving educational environments.

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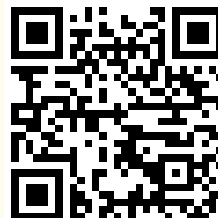
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