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Unpacking Technostress: A Systematic Review on its Effects and Mitigation

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Abstract:
The exponential growth of technology in everyday life has given rise to technostress, a condition marked by negative psychological and physiological effects. This systematic review synthesizes current research on technostress, examining its global definition, regional variations, impacts, opportunities and mitigation strategies. Drawing on established theories such as the Technostress Model, Job Demands-Resources Model, and Person-Environment Fit Model, the review explores the complex interplay between technology use and stress. The technostress model posits that technostress arises from negative reactions to technology use, fueled by information overload, task demands, and lack of control. The job demands-resource model views technology as either a stressor or a resource, impacting well-being based on organizational context and individual traits, while the person-environment fit model links technostress to capability-demand mismatches. Studies link technostress to anxiety, depression, and physical health problems. The review underscores the importance of tailored interventions, emphasizing organizational support, user-centered design, and individual coping mechanisms in managing technostress, especially in regions with high prevalence rates. In addition to these interventions, the review emphasizes the need for ongoing education and awareness campaigns to promote digital literacy and healthy technology habits. By equipping individuals with the knowledge and skills to navigate the complexities of the digital landscape, these initiatives can empower them to make informed decisions and effectively manage technostress in their daily lives. Highlighting the significance of culturally-tailored interventions, future research aims to refine mitigation strategies and investigate the potential benefits of technology use, ultimately fostering a balanced relationship with technology to minimize drawbacks and maximize advantages.

Keywords: Technostress, systematic review, regional variations, adaptation, mitigation strategies

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INTRODUCTION

The relentless integration of technology into every facet of our lives has brought undeniable advancements. However, this constant connection also presents a challenge: technostress. This systematic review explores the current understanding of technostress, its impact on individuals across various regions, and potential opportunities for managing it.

Global Definition and Conceptualizations. Technostress, a term coined by Brod (1984), refers to the negative psychological and physiological effects resulting from using technology (as cited in Mpungose, 2022). Ragu-Nathan et al. (2008) identified five key dimensions of technostress: techno-overload, techno-invasion, techno-complexity, techno-insecurity, and techno-uncertainty. These highlight the various factors that contribute to technostress, including information overload, the blurring of work-life boundaries, and difficulties using new technologies.

Regional Variations in Technostress. Research across various continents reveals a common core definition of technostress but also sheds light on regional nuances. Here's a breakdown of key findings: in *North America*, studies by McClellan et al. (2022) and Bond et al. (2021) highlight information overload, constant connectivity, pressure to keep up with advancements, and feelings of inadequacy due to a lack of technological skills as key stressors. The consequences can be severe, with Yildirim and Correia (2023) finding a correlation between technostress and anxiety, depression, and burnout, and Chang et al. (2020) linking it to physical problems like headaches and sleep disturbances. In *Latin America*: Fernandes et al. (2021) identify workload, lack of control over technology use, and a constant feeling of needing to be connected as stressors. Unclear communication regarding technology use policies further exacerbates the issue (Rojas-Lizcano & Lopez-Carmona, 2020).

In *Europe*, there is a recent surge in European studies that explores the positive and negative impacts of technostress. In the *Middle East*, Al-Emran et al. (2019) define technostress as a stress response caused by the inability to cope with the demands of ICTs. Dwivedi et al. (2020) highlight the negative impact on work-life balance, leading to stress and anxiety. Yildiz (2022) explores the link between excessive technology use and musculoskeletal problems, while McCole et al. (2021) investigate the connection between technostress and sleep disturbances.

In *Asia*, Lee and Kim (2021) emphasize information overload and the pressure to keep up with constant technological changes, while Çoklar et al. (2019) highlight the stress associated with the inability to learn and use new technologies effectively, particularly for educators. Whereas in Australia, Smyth et al. (2019) define technostress as a negative psychological state resulting from using modern technologies, with information overload, task demands, and lack of control being key factors. Research by Burke et al. (2020) links it to burnout, reduced productivity, and absenteeism, while Jackson and Dunn (2021) find connections to anxiety and depression. Here in the *Philippines*, in particular, Dimzon (2007) highlights the relevance of technostress within the Philippine workforce, particularly among librarians and professionals undergoing technology-intensive training. Caguiat (2021) emphasizes the growing concern. And in the *Cordillera Administrative Region* (CAR): Studies by researchers affiliated with CAR

institutions (Sebullen, 2023) explore the prevalence of technostress among students and faculty, highlighting the growing concern within academic settings.

Theoretical Underpinnings. Unveiling the complex interplay between technology and stress necessitates drawing upon established theoretical models. This review integrates three key frameworks. The Technostress Model (TMS) by Brod (1984) proposes that negative reactions to technology use, fueled by information overload, task demands, and lack of control, lead to technostress [1]. The Job Demands-Resources Model (JD-R Model) by Demerouti et al. (2001) suggests technology can be a double-edged sword, acting as a job demand (increasing stress) or a job resource (enhancing well-being) depending on organizational context and individual characteristics [2]. This model highlights the importance of organizational support and user-centered design in mitigating technostress. Finally, the Person-Environment (PE) Fit Model by Naylor et al. (1989) posits that a mismatch between individual capabilities and technology demands can lead to stress [3]. This framework emphasizes the need for interventions that bridge the skill gap, promoting a sense of competence and control. By integrating these theoretical perspectives, this review offers a comprehensive understanding of factors contributing to technostress and potential avenues for mitigation.

While the Technostress Model (TMS), Job Demands-Resources Model (JD-R Model), and Person-Environment (PE) Fit Model offer valuable insights, a more nuanced understanding of technostress emerges when considering their interconnections. The TMS identifies core stressors like information overload and lack of control. However, the JD-R Model sheds light on how organizational factors, such as inadequate training or poor design, can exacerbate these stressors within the TMS framework. For example, a lack of training (JD-R) can worsen information overload (TMS) and reduce a sense of control over technology. Furthermore, the PE Fit Model complements the TMS and JD-R models by highlighting individual differences. While the TMS and JD-R models focus on general stressors, the PE Fit Model emphasizes how individual coping mechanisms and skillsets can moderate the impact of these stressors. For instance, an individual with high computer literacy (PE Fit) might experience less technostress from information overload (TMS) compared to someone with lower skills.

By integrating these perspectives, we can move beyond a singular focus on individual factors (TMS, PE Fit) or organizational aspects (JD-R). Instead, we can explore how both individual characteristics and organizational contexts interact to create a complex web of influences on technostress. This multi-faceted approach allows for more targeted interventions that address individual needs and organizational shortcomings. This deeper analysis not only strengthens the theoretical foundation of your research but also opens avenues for further exploration. You could investigate how specific organizational interventions (e.g., training programs) can improve the PE Fit for employees, thereby mitigating technostress as outlined by the TMS.

Significantly, this systematic review has explored the multifaceted concept of technostress, its global presence, and potential management strategies in our increasingly tech-reliant world. It established a foundational understanding of technostress as a negative psychological and physiological response to technology, encompassing factors like overload,

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invasion, and uncertainty. The review then highlighted regional variations in technostress experiences and identified common themes like information overload and constant connectivity. By integrating established theoretical models, the review shed light on the complex relationship between technology and stress, emphasizing the potential for technology to act as both a source of stress and a resource. Finally, the review underscores the importance of tailored interventions, organizational support, user-centered design principles, and skill development in fostering a healthier relationship with technology and promoting individual well-being.

LITERATURE OVERVIEW FINDINGS

Positive Aspects of Technostress. The universality of the Issue of technostress is a growing concern worldwide, impacting individuals in Australia (Schwartz et al., 2023; Cook et al., 2022) North America (McClellan et al., 2022; Bond et al., 2021) Asia (Lee and Kim, 2021), Latin America (Castaño-Cárdenas and Montoya-Restrepo, 2020), Africa (Mpungose, 2022), Europe (Meier et al., 2020), and the Middle East (Al-Emran et al., 2019).

Technology's Double-Edged Sword technology offers undeniable benefits like improved communication, collaboration, and efficiency (Meier et al., 2020; Califf et al., 2020), its constant presence can be overwhelming and lead to stress (Burke, 2022). The Importance of Balance in a central theme across all regions is the need for a balanced approach to technology. This includes promoting digital literacy (Shwartz et al., 2023; Maier et al., 2015), establishing healthy tech habits (Ragu-Nathan et al., 2008), and taking breaks from technology (Ngwenya and Mnjama, 2019) [cited in Mpungose, 2022].

Organizational support studies emphasize the importance of organizational support in managing technostress. This can involve training programs (Castillo & Dayag, 2023; Dimzon, 2007), clear policies on technology use (Bedoya-Vanegas et al., 2023), and promoting a culture of open communication (Lee and Kim, 2021). Developing individual coping mechanisms, such as time management techniques (Tarafdar et al., 2010) and setting boundaries between work and personal life (Ngwenya and Mnjama, 2019) [cited in Mpungose, 2022], is crucial for mitigating technostress.

There is limited research on the positive aspects of technostress, most research focuses on the negative aspects of technostress, some studies suggest it can motivate individuals to develop coping mechanisms and improve technology skills (Yuang & Luo, 2020). Further exploration of this perspective is needed in most regions. By understanding these commonalities, individuals, and organizations worldwide can develop effective strategies to manage technostress and foster a healthier relationship with technology.

Negative Effects of Technostress: A Global Phenomenon. Technostress, a condition arising from the negative aspects of human-technology interaction, has been studied extensively across the globe, revealing its detrimental impact on individuals' well-being and work performance. Research by Mpungose (2022) and Le Roux (2020) in Africa highlights how technostress, exacerbated by unfamiliar technology use during the COVID-19 pandemic,

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negatively affects job satisfaction and productivity among professionals (Mpungose, 2022; Le Roux, 2020). Similar findings emerge from North America, where McClellan et al. (2022) and Bond et al. (2021) identify stressors like information overload and inadequate technological skills as key contributors to technostress, emphasizing its detrimental effects on individuals (McClellan et al., 2022; Bond et al., 2021). These negative consequences extend to mental health, with studies by Yildirim and Correia (2023) and Chang et al. (2020) finding correlations between technostress and anxiety, depression, burnout, and physical symptoms like headaches and sleep disturbances (Yildirim & Correia, 2023; Chang et al., 2020).

The negative impacts of technostress are not confined to specific regions. In Latin America, Baptista et al. (2022) and Lopez-Guzman et al. (2023) linked technostress to increased anxiety, depression, burnout, and sleep disturbances, further emphasizing its negative influence on health (Baptista et al., 2022; Lopez-Guzman et al., 2023). European studies by Nastjuk et al. (2023) and Harunavamwe and Ward (2022) highlight how technostress contributes to work-life imbalance, decision fatigue, and mental health issues among IT professionals and office workers (Nastjuk et al., 2023; Harunavamwe & Ward, 2022). Research by Tarafdar et al. (2017) in Europe also revealed a significant correlation between technostress and mental health problems like anxiety and depression, underlining the pervasive nature of this issue (Tarafdar et al., 2017).

Several Middle Eastern researchers have shed light on the psychological strain caused by technology dependence. Al-Emran et al. (2019) define technostress as a stress response caused by the inability to cope with the demands of information and communication technologies (ICTs), while Dwivedi et al. (2020) highlight the negative impact of ICT dependence on work-life balance, leading to stress and anxiety (Al-Emran et al., 2019; Dwivedi et al., 2020).

Beyond psychological effects, technostress can also manifest physically. Yildiz (2022) explores the link between excessive technology use and musculoskeletal problems, while McCole et al. (2021) investigate the connection between technostress and sleep disturbances, highlighting the potential for broader health issues (Yildiz, 2022; McCole et al., 2021).

The Philippine Context and Call for Culturally-Appropriate Interventions. Research conducted within the Philippines aligns with global concerns regarding technostress. Studies by Dimzon (2007) on librarians and Castillo & Dayag (2023) on teachers during the COVID-19 pandemic highlight the challenges individuals face due to computer-related issues and lack of support, impacting stress levels and work performance (Dimzon, 2007; Castillo & Dayag, 2023). Magsambol & Peralta (2021) from the Cordillera Administrative Region (CAR) specifically explored the link between technostress and mental and physical health issues, including anxiety, depression, sleep disturbances, and decreased productivity (Magsambol & Peralta, 2021).

These Philippine-based studies underscore the need for further research to gain a deeper understanding of technostress within the country's specific socio-cultural context. This deeper understanding can inform the development of culturally-appropriate interventions to mitigate the

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negative effects of technostress and promote well-being in the technology-driven academic environment.

Opportunities for Managing Technostress. These opportunities can be broadly categorized into universal strategies applicable across various contexts and regional considerations that cater to specific cultural or geographical nuances.

Universal Strategies for Mitigating Technostress. A) Enhancing Digital Literacy: Equipping individuals with the necessary skills to navigate technology effectively emerges as a crucial theme across a wide range of studies. Research from Europe (Maier et al., 2015) and Australia (Shwartz et al., 2023) highlights the effectiveness of digital literacy training programs in reducing technostress. By fostering a deeper understanding of technology and its functionalities, individuals can overcome challenges and navigate tech-related demands with greater confidence, leading to reduced stress levels.

B) *Promoting Healthy Technology Habits:* Cultivating healthy tech habits is another key strategy for managing technostress. Research conducted in Europe by Ragu-Nathan et al. (2008) underscores the efficacy of interventions that promote practices like designated offline periods and ergonomic workspace design. These measures help individuals establish boundaries between work and personal life, minimize physical discomfort associated with prolonged technology use, and ultimately foster a healthier relationship with technology.

C) *Supportive Work Environments:* The role of supportive work environments in mitigating technostress cannot be overstated. Studies from North America (Burke, 2022) emphasize the importance of clear boundaries between work and personal life. Similarly, research in Australia (Ling et al., 2020) and Latin America (Bedoya-Vanegas et al., 2023) advocate for flexible work arrangements and clear organizational policies around technology use. By creating supportive environments with established guidelines and flexibility, organizations can contribute significantly to employee well-being and minimize technostress.

D) *User-Centered Technology Design:* Technology designed with user-friendliness in mind plays a crucial role in reducing the cognitive load and frustration associated with technostress. Research by Tarafdar et al. (2010) in Europe suggests that user-centered design principles that prioritize clear functionalities and intuitive interfaces can significantly improve user experiences and reduce technostress. By focusing on user needs and ease of use, technology developers can contribute to a more positive and stress-free interaction with technology.

Regional Considerations for Tailored Interventions. While the strategies mentioned above offer a solid foundation for managing technostress, the review also reveals regional variations warranting tailored approaches. For instance, research in North America (Burke, 2022) highlights the specific challenge of achieving a healthy balance between the benefits and drawbacks of technology, given the constant pressure to be connected. In contrast, studies in

Latin America (Rodriguez-Muñoz et al., 2022) suggest that mindfulness training programs can be particularly beneficial in managing the psychological demands of technology use in that region.

Similarly, research in Asia (Lee & Kim, 2021) emphasizes the importance of fostering a culture of open communication where employees feel comfortable seeking help with technological challenges. The Middle East presents a unique context where Al-Saggaf et al. (2020) advocate for implementing digital wellness programs promoting healthy technology use among employees.

Interestingly, by considering the cultural context of the Cordillera and the established theoretical models here are some possible original practices that could be explored: [1] singing or dancing Local Songs or Dances. Incorporating traditional songs or dances into tech break activities provides a dynamic outlet for expression and connection. These culturally informed interventions not only promote physical movement and relaxation but also serve as avenues for storytelling and community bonding. By engaging in rhythmic movements and harmonious melodies, individuals can alleviate tension and foster a sense of unity, thereby enhancing resilience against technostress. Further, developing or utilizing existing apps featuring relaxation techniques, meditation exercises, or breathing exercises translated into indigenous languages (e.g., Ifugao, Kankanaey) to improve accessibility and cultural relevance. [2] another is through gardening or nurturing cacti or succulents. Cultivating plants or succulents indigenous to the Cordillera region offers a therapeutic and grounding experience. Participants can immerse themselves in the nurturing process, tending to the needs of living organisms while fostering a deeper connection to nature. Gardening activities provide opportunities for mindfulness and reflection, allowing individuals to unplug from technology and reconnect with the natural world. Moreover, the act of caring for plants instills a sense of responsibility and accomplishment, contributing to overall well-being and resilience in the face of technostress. Lastly, [3] professional chat as break from technostress could spare a day. While professional chat can offer social connection and problem-solving benefits during the workday, it can also contribute to information overload and work-life imbalance Al-Saggaf et al. (2020). For a true break from technostress, consider setting boundaries and using chat strategically to minimize its downsides.

Mitigating Technostress: A Multifaceted Approach. Combating technostress requires a multifaceted approach encompassing both preventive and interventional measures. These strategies can be effectively understood through the lens of the three theoretical models introduced earlier. For the *Primary Prevention*, one key strategy is fostering open communication between employers and employees (Adam et al., 2017). This aligns with the Job Demands-Resources Model (JD-R Model) by addressing job demands (technostress) and promoting resources (organizational support). By openly discussing technostress concerns, organizations can implement solutions that reduce job demands and enhance employee well-being. Additionally, equipping employees with the necessary technological skills through

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training programs (Adam et al., 2017) aligns with the Person-Environment (PE) Fit Model. By bridging the skill gap and promoting competence, these programs can significantly reduce stress associated with technology use. Finally, implementing positive technologies with user-centered design can promote positive interactions with technology (Bala & Venkatesh, 2016). This directly addresses the negative reactions to technology use outlined in the Technostress Model (TMS). A robust knowledge base of such technologies empowers organizations to select the most effective ones (Al-Fudail & Mellar, 2008), further mitigating technostress.

For the *Secondary Prevention and Intervention*, several strategies can be implemented after technostress has emerged. Mindfulness training, for example, has been shown to reduce stress and improve emotional regulation (Burke, 2020). This directly addresses the negative psychological effects of technostress outlined in the Technostress Model (TMS) [1]. Encouraging scheduled breaks from technology and promoting digital detox practices (Mark & Gudith, 2020) aligns with the JD-R Model by reducing job demands associated with constant technology use [2]. This can also promote a sense of control over technology use, as highlighted by the TMS. Additionally, optimizing workspace ergonomics (Cho et al., 2021) can help prevent musculoskeletal problems, a potential consequence of technostress not explicitly addressed in the core models but nonetheless relevant to overall well-being.

Lastly, *Contextual Considerations*. It's important to recognize that the effectiveness of specific interventions can be influenced by cultural factors and individual technology skill levels (Mark & Gudith, 2020; Yildiz, 2022). Therefore, a tailored approach that considers these contextual elements is crucial for optimal impact. By integrating these theoretical perspectives with practical mitigation strategies, this review underscores the importance of a multifaceted approach to managing technostress in today's technology-driven world. Understanding technostress across cultures requires going beyond existing models. Researchers can delve into cultural values around work-life balance, stress management, and technology use. This allows for adapting existing models like the JD-R or PE Fit to consider cultural influences on job demands and how individuals interact with technology. Furthermore, culturally-specific interventions can be explored, incorporating traditional practices or leveraging existing social structures. Finally, researchers should consider the digital divide and cultural preferences when designing interventions or technological solutions. This multi-faceted approach provides a richer understanding of technostress in a globalized world. Hence, emphasizes the necessity of culturally-tailored interventions and a multifaceted approach to effectively manage technostress amidst the pervasive integration of technology in modern society.

CONCLUSION AND RECOMMENDATIONS

Leveraging an AI-powered literature search engine, this systematic review synthesizes current research on technostress, examining its global definition, regional variations, impacts, and, importantly, mitigation strategies. Studies published between 2010 and 2023 were included. While emerging research suggests technostress might have some positive aspects, its primary

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effects are demonstrably negative. Across diverse regions, studies consistently link technostress to a decline in job satisfaction, productivity, and mental well-being. Furthermore, it disrupts work-life balance and is associated with a range of adverse health outcomes, including anxiety, depression, burnout, sleep disturbances, and even musculoskeletal problems.

To mitigate these detrimental effects, a multi-pronged approach is necessary. Organizations can foster a supportive environment by promoting open communication, providing effective training, involving employees in technology adoption processes, ensuring timely tech support, and establishing balanced work-reward systems. Implementing user-centered technology design principles and encouraging breaks from technology are also crucial.

Individuals experiencing technostress should be encouraged to seek professional help and develop personal coping mechanisms. Future research should prioritize exploring and refining mitigation strategies at both individual and organizational levels. Furthermore, delving deeper into the potential positive aspects of technostress and how they can be leveraged for growth is an important area for further investigation.

By implementing these recommendations, individuals and organizations can foster a healthier relationship with technology, minimizing the negative impacts of technostress while potentially harnessing its potential benefits. This approach can contribute to a more positive and productive technology experience for all stakeholders.

Paper Focus and Scope

This systematic review aims to provide a comprehensive understanding of technostress, a growing concern in our technologically saturated world. We define technostress, explore its global understanding, and examine both its positive and negative effects on individuals. The review delves into potential opportunities for positive adaptation to technology use, alongside effective mitigation strategies to manage its negative impacts. To capture the latest research advancements, we focus on studies published in English between 2019 and 2024.

Our commitment to a geographically diverse perspective is reflected in the selection criteria. We searched esteemed academic databases for literature originating from Asia (including the Philippines and the Cordillera Administrative Region), North and Latin America, Europe, Australia, and the Middle East/Africa. Keywords employed in the search included "technostress," "technology-related stress," "workplace well-being," and "mitigation strategies."

This review excludes studies solely focused on specific technologies (e.g., social media) to maintain focus on the broader concept of technostress. Additionally, grey literature (unpublished reports, conference proceedings) falls outside the scope of this review. By incorporating sample references from various regions, this review showcases the global nature of technostress research.

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