JYU DISSERTATIONS 870

Antti Hämäläinen

Browse, Play, Stress, Repeat

Extending the View of Technostress and Coping in Smartphone Use, Social Media Interactions, and Digital Gaming

UNIVERSITY OF JYVÄSKYLÄ
FACULTY OF INFORMATION TECHNOLOGY

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Esitetään Jyväskylän yliopiston informaatioteknologian tiedekunnan suostumuksella
julkisesti tarkastettavaksi yliopiston vanhassa juhlasalissa S212
tammikuun 10. päivänä 2025 kello 12.

Academic dissertation to be publicly discussed, by permission of
the Faculty of Information Technology of the University of Jyväskylä,
in building Seminarium, Old Festival Hall S212, on January 10, 2025, at 12 o'clock.

JYVÄSKYLÄN YLIOPISTO
UNIVERSITY OF JYVÄSKYLÄ

JYVÄSKYLÄ 2025

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Cover picture generated with Dall-E.

ISBN 978-952-86-0466-2 (PDF)
URN:ISBN:978-952-86-0466-2
ISSN 2489-9003

Permanent link to this publication: http://urn.fi/URN:ISBN:978-952-86-0466-2

ABSTRACT

Hämäläinen, Antti
Browse, play, stress, repeat: Extending the view of technostress and coping in smartphone use, social media interactions, and digital gaming
Jyväskylä: University of Jyväskylä, 2025, 137 p. (+ the individual articles)
(JYU Dissertations
ISSN 2489-9003; 870)
ISBN 978-952-86-0466-2 (PDF)

This dissertation investigates technostress and coping with it. Technostress is defined as an individual's experience of stress resulting from information technology (IT) use. The specific focus is on voluntary IT use for leisure and personal purposes, such as browsing smartphones to pass time, using social media to connect with others, and playing digital games for entertainment. Understanding the emergence of technostress and the ways to cope with it is crucial, as there is extensive evidence on how technostress presents significant issues for individuals, organizations, and societies across work and non-work contexts. This dissertation extends previous understandings by explaining technostress antecedents from the perspective of cognitive and behavioral aspects, the social dynamics of how technostress and coping unfold, and the perspective of individuals' goals and related coping strategies in the technostress process. Moreover, the dissertation examines technostress through both negative and positive lenses, where IT use threatens or challenges users, respectively.

The dissertation consists of six articles, for which three qualitative datasets were collected and analyzed (30 interviews with smartphone/social media users; 22 interviews with digital gamers; and 5120 social media comments from a gaming community). Based on these, the findings contribute to the ongoing discourse about the "dark side of IT" by explaining how users' cognitive and behavioral patterns affect technostress and how users cope with its consequences. The dissertation proposes several theoretical contributions, including the identification of new antecedents of technostress, an understanding of the social dynamics of technostress and coping, and a novel focus on goal hindrances as technostress consequences and coping as goal shielding. Furthermore, the dissertation expands technostress research into the area of digital gaming, where competition and cooperation enable the emergence of unique technostressors. Practical implications for IT users, service providers, employers, and decision-makers are discussed, offering strategies to mitigate technostress, and promoting a more balanced integration of IT in both leisure and professional contexts.

Keywords: technostress, coping, smartphone use, social media, digital games

TIIVISTELMÄ (ABSTRACT IN FINNISH)

Hämäläinen, Antti
Selaa, pelaa, stressaa, toista: Teknostressin ja hallintakeinojen näkökulman laajentaminen älypuhelimen käytössä, sosiaalisen median vuorovaikutuksessa ja digitaalisessa pelaamisessa
Jyväskylä: Jyväskylän yliopisto, 2025, 137 s. (+ yksittäiset artikkelit)
(JYU Dissertations
ISSN 2489-9003; 870)
ISBN 978-952-86-0466-2 (PDF)

Tässä väitöskirjassa tutkitaan teknostressiä ja siihen liittyviä hallintakeinoja. Teknostressi määritellään yksilön kokemaksi stressiksi, joka aiheutuu informaatioteknologian (IT) käytöstä. Tutkimuksessa keskitytään erityisesti IT:n käyttöön vapaa-ajalla ja henkilökohtaisiin tarkoituksiin, kuten älypuhelimen selaamiseen ajankuluksi, sosiaalisen median käyttöön yhteydenpitoon ja digitaalisten pelien pelaamiseen viihteen vuoksi. Teknostressin syntymisen ja sen kokemiseen liittyvien hallintakeinojen ymmärtäminen on tärkeää, sillä on näyttöä siitä, miten teknostressi aiheuttaa merkittäviä ongelmia yksilöille, organisaatioille ja yhteiskunnalle niin töissä kuin vapaa-ajallakin. Tämä väitöskirja laajentaa aiempaa ymmärrystä selittämällä teknostressin taustatekijöitä kognitiivisten ja käyttäytymiseen liittyvien näkökulmien kautta, teknostressin ja hallintakeinojen sosiaalista dynamiikkaa sekä yksilöiden tavoitteiden ja niihin liittyvien hallintakeinojen roolia teknostressiprosessissa. Lisäksi väitöskirja tarkastelee teknostressiä sekä negatiivisesta että positiivisesta näkökulmasta huomioiden tilanteet, joissa IT:n käyttö joko uhkaa tai positiivisella tavalla haastaa käyttäjiä.

Väitöskirja koostuu kuudesta artikkelista, joita varten kerättiin ja analysoitiin kolme laadullista aineistoa (30 haastattelua älypuhelimen ja sosiaalisen median käyttäjien kanssa; 22 haastattelua digitaalisten pelien pelaajien kanssa; 5120 sosiaalisen median kommenttia peliyhteisöstä). Näiden pohjalta väitöskirjan löydökset edistävät keskustelua IT:n ”pimeästä puolesta” selittämällä, miten käyttäjien kognitiiviset ja käyttäytymiseen liittyvät tekijät vaikuttavat teknostressiin. Väitöskirja esittää useita teoreettisia kontribuutioita, kuten uusia teknostressin taustatekijöitä, teknostressin ja hallintakeinojen sosiaalisen dynamiikan laajentamista sekä lähestymistavan, jossa teknostressin seurauksia tarkastellaan tavoitteiden estymisen näkökulmasta ja teknostressin torjumista tavoitteiden suojaamisena. Lisäksi väitöskirja laajentaa teknostressin tutkimusta digitaaliseen pelaamiseen, jossa kilpailu ja yhteistyö mahdollistavat ainutlaatuisten teknostressitekijöiden syntymisen. Käytännön näkökulmasta väitöskirja tarjoaa ehdotuksia teknostressin lieventämiseen ja IT:n tasapainoisempaan sisällyttämiseen ihmiselämään sekä töissä että vapaa-ajalla.

Avainsanat: teknostressi, hallintakeinot, älypuhelin, sosiaalinen media, digitaaliset pelit

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ACKNOWLEDGEMENTS

The past four years have gone by quickly, and the journey has certainly had its ups and downs. Still, I am glad that I was brave enough to embark on the ride of pursuing a doctoral degree. This is to everyone who has believed in me, especially during times I myself did not.

I probably would not have even started this journey if it weren't for my primary supervisor, Professor Markus Salo. I was a somewhat lost master's student without a thesis topic when I entered Markus' master's thesis seminar in 2019. Prior to the seminar, Markus emailed the participants that he would supervise theses on technostress. Never having heard of such a thing, I became intrigued after a quick search and contacted Markus, and so, in a way, everything that has led here began. Thank you, Markus, for being the best supervisor anyone could hope for. You have supervised me with diligence and care while also giving me room to make mistakes and learn from them. These years working under your supervision, first as a master's student, then as a research assistant, and finally as a doctoral researcher, have been superb in many ways. I am looking forward to the next chapters of our collaboration. To my second supervisor, Professor Henri Pirkkalainen, thank you for providing me with extremely insightful comments on my work, not to mention all the helpful career advice you have given me. Your relaxed yet professional outlook on everything has taught me so much. All your help and support during both good and bad times have been invaluable.

To my closest colleagues, the "IT and Human Behavior research team": you are the best. Thank you Saana Mehtälä, Anna Lampi, Valtteri Siitonen, Saima Ritonummi, Markus Makkonen, Juuli Lumivalo, and Jenny Elo, for all the support and fun times together. While I appreciate all the work-related stuff we have shared, I especially value all the not-so-work-related discussions in person and on WhatsApp, in addition to all our after-work activities. And sorry Anna (and now also Saana) for all the distractions I have caused – and will keep causing – in our shared office space by sighing (or even talking) out loud when frustrated. Also, thanks to everyone in the Value Creation for Cyber-Physical Systems and Services (CPSS) research group for all the interesting talks and discussions on various topics. Moreover, thanks to all the doctoral researchers who have participated in our Doctoral Researcher Coffee Breaks – these sessions have been fun and have contributed to the open and caring environment we have. Building on that, to everyone on the fifth floor of the D-block in Agora: thank you for all the laughs and fun discussions in our coffee room.

Thanks to the Faculty of Information Technology for funding my work; I have done my best to be a worthwhile investment. To the reviewers of my dissertation, Professor Sven Laumer and Dr. Stephen McCarthy, thank you so much for your insightful and encouraging comments on my work in your evaluations; I truly appreciate them. To Professor Andreas Eckhardt, I am extremely grateful and honored that you accepted the role of opponent for my defense.

Thank you to my parents, Sari and Tapani, for always being supportive of everything I do. You have taught me that education is important, but you never pressured me into anything. Already when I was young, I was told that if you do your best, you shouldn't worry about the results. I have tried to live by this. To my sister Sanna, thank you for being the best big sister, in addition to being the greatest beer pong teammate. Ranting with you about how floorball is sometimes neither easy nor fun and sharing the highs and lows of following the Counter-Strike pro scene have provided me with a nice escape from work troubles. To my friends in the Huhtasika WhatsApp group: thank you for all the summer cottage trips, shared jokes both online and offline, and all the fun and games that have helped me maintain an entertaining life outside of work.

And finally, thank you, Vilma, for being there with me through everything. I know that my work and the sometimes-twisted schedules have not been easy for you to understand, but you have nevertheless supported me at every step of this journey. Having you by my side has helped me immensely with all the pressure I have experienced. I am always deeply glad to come home and hear your happy greetings from the corner of the sofa; thank you for being you.

Jyväskylä 8.12.2024
Antti Hämäläinen

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II Hämäläinen, A., Salo, M., & Pirkkalainen, H. (2022). "One more, one more... You get stuck" – The role of craving in smartphone-related technostress. In Proceedings of the 30th European Conference on Information Systems, 27. https://aisel.aisnet.org/ecis2022_rp/27

III Hämäläinen, A., Salo, M., & Lampi, A. (2024). The role of game elements in shaping three dimensions of techno-distress and techno-eustress in online multiplayer games. In Proceedings of the 15th Scandinavian Conference on Information Systems, 24. https://aisel.aisnet.org/scis2024/24

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VI Hämäläinen, A., Salo, M., & Pirkkalainen, H. (2024). Uncovering individual and collective ambivalences in digital gaming: The triggering role of game design paradoxes. In Proceedings of the 16th Mediterranean Conference on Information Systems, 6. https://aisel.aisnet.org/mcis2024/6

Antti Hämäläinen, the dissertation's author, is the first author of all the included articles, making him the main contributor to each. In addition to writing the articles, he collected all the data and was responsible for conducting the analyses. Also, he was the main contributor in terms of doing the literature reviews and theorizing for the articles. The other authors contributed by providing guidance, ideas, and feedback on research problems, research designs, methods, and text. Additionally, they helped by rewriting, editing, and contributing new text to some sections of the articles.

[1] Preliminary version published in a conference: Hämäläinen, A., Salo, M., & Pirkkalainen, H. (2023). Smartphone use and technostress: Hindrances to users' humanistic and instrumental goals. In Proceedings of the 9th International Conference on Socio-Technical Perspectives in Information Systems (CEUR Workshop Proceedings).

1 INTRODUCTION

This dissertation studies technostress, which refers to an individual's experience of stress resulting from IT use (Tarafdar et al., 2007; 2019), investigating both the emergence of technostress and strategies for coping with it. The specific focus is on technostress and coping in the context of voluntary IT use for leisure and personal purposes, such as browsing smartphones to pass time, using social media to connect with others, and playing digital games for entertainment. Overall, this dissertation contributes to the wider discussion of the "dark side of IT," including its potential mitigation (D'Arcy et al., 2014a; Tarafdar et al., 2011), offering insights that can help promote balanced integration of IT into our society.

1.1 Motivation, background, and research contexts

The ambivalent nature of IT use has been a subject of discussion for decades. As the technological world is evolving rapidly, questions about the Internet raised as early as the 1990s by Kraut et al. (1998) still remain relevant: How could a technology designed for social interaction diminish social involvement and psychological well-being? Not only regarding the Internet but also in general, IT has transformed modern life, embedding itself into our daily routines and fundamentally altering how we communicate, work, and spend our free time. While this has positively reshaped human interactions and productivity, it has also introduced and amplified the phenomenon of technostress. Although the concept of technostress originated in the work context, it has also been acknowledged as remarkably prevalent in voluntary IT use for leisure and personal purposes (e.g., Nastjuk et al., 2023; Salo et al., 2022). However, despite the growing body of research in such contexts, many questions remain unanswered.

Understanding the emergence of technostress and the ways to cope with it is crucial, as there is extensive evidence from extant research on how technostress

presents significant threats for both individuals and organizations across work and non-work contexts. For individuals, detrimental effects include issues for concentration, social relationships, and overall well-being (Hughes & Burke, 2018; Nastjuk et al., 2024; Salo et al., 2019; Tarafdar et al., 2019). In organizations, technostress can lead to reduced productivity, lower job satisfaction, and even burnout (Califf et al., 2020; Pflügner et al., 2024; Tarafdar et al., 2011). Technostress in leisure and personal contexts, the focus of this dissertation, presents a significant concern, as leisure time is traditionally associated with restoration and recovery from the demands of everyday life, and the rise of IT use during leisure (e.g., social media) has introduced new avenues for stress to emerge (Maier et al., 2015b, 2015c; Tarafdar et al., 2020). Thus, the very activities meant to promote relaxation and well-being could actually do the opposite. There is a pressing need to further investigate how technostress disrupts IT users' leisure time, as its negative impacts can be significant. This is particularly important given that popular forms of leisure and personal IT activities—such as smartphone use, social media browsing, and digital gaming—engage billions of users worldwide daily. Also, technostress can lead to unfavorable consequences for service providers, as it often contributes to discontinued use (Luqman et al., 2017; Maier et al., 2015c), which could pose economic implications. Thus, technostress is a significant and an extremely widespread issue, posing problems for many different stakeholders, ranging from end users in leisure time, to employees, employers, and service providers alike.

As IT continues to evolve, the opportunities for individuals to seek and obtain both enjoyment and increased productivity through IT engagement have become highly dynamic and seemingly limitless. While these developments offer new possibilities for societal advancement, they also introduce significant threats. Therefore, it is increasingly important to understand how diverse outcomes unfold through human interactions with IT. In their seminal work, Ayyagari et al. (2011, p. 852) pose the following statement:

> Most of IS research is concentrated on understanding what technology can do *for* you. However, given the significance of technostress, and stress in general, it is important that organizations be aware of what technologies can do *to* you. (Ayyagari et al., 2011, p. 852)

Moreover, information systems (IS) scholars have stressed the importance of balancing the humanistic (e.g., enhanced well-being) and instrumental (e.g., increased productivity) aspects of IT use (Sarker et al., 2019). Regarding this, the dissertation aims to provide insights to address

> a lack of ethical standing of the discipline in society due to the failure of IS scholars and practitioners to reflect on the consequences of information technology, and to critique and actively oppose initiatives where IT might facilitate the development of a dehumanized and dystopian society (Sarker et al., 2019, p. 696).

Addressing such issues from the technostress perspective, the phenomenon is seen as a process in which IT-related conditions are perceived as taxing demands, prompting coping responses that ultimately result in (negative) psychological, physical, and behavioral outcomes for the individual (Tarafdar et al., 2019). Thus,

technostress emerges when individuals encounter technostressors (i.e., IT-related sources of stress) that are perceived as threatening or challenging (Tarafdar et al., 2019; 2024). When individuals face technostressors, this transaction leads to various types of strains and other outcomes. For example, a social media user experiencing information overload due to excessive and rapid information intake may develop concentration issues (Salo et al., 2019). Additionally, the emergence of technostress is influenced by several other factors, including personality traits (Lee et al., 2014; Hsiao, 2017; Pflügner et al., 2021), IT and its features (Ayyagari et al., 2011; Salo et al., 2019; Tugtekin et al., 2020), and use patterns and practices (Maier et al., 2015b; Salo et al., 2022). Moreover, it is essential to recognize that (techno)stress manifests not only negatively, as (techno)-distress, but also positively, as (techno)-eustress (Califf et al., 2020; Selye, 1974; Tarafdar et al., 2024). Techno-eustress specifically refers to how users are challenged and motivated to use IT in ways that enhance their competence, improve efficiency, and help solve problems (Benlian, 2020; Maier et al., 2021; Tarafdar et al., 2024).

Furthermore, a critical component of the technostress process is the coping strategies employed to manage it. Coping refers to

> constantly changing cognitive and behavioral efforts exerted to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person (Lazarus & Folkman 1984, p. 141).

Previous research has demonstrated that there are many ways for individuals to cope with and organizations to support them in coping with technostress. For example, individuals can adopt problem-focused (e.g., developing skills or using workarounds) or emotion-focused coping strategies (e.g., conducting mental reinterpretations or detaching emotionally), and organizations can provide training and technical support (Arnetz et al., 1996; Benlian, 2020; Fuglseth & Sørebø, 2014; Mattern et al., 2024; Ragu-Nathan et al., 2008; Salo et al., 2022; Tarafdar et al., 2020).

This dissertation examines technostress in voluntary IT use for leisure and personal purposes within three contexts: smartphone use, social media use, and digital gaming. While these contexts do not represent all possible forms of IT use for leisure and personal purposes, they were selected due to their prominence as some of the most popular activities for personal engagement. Although each context has distinct characteristics, they are interconnected, particularly smartphone use and social media, as social media is the most common smartphone activity. I posit that focusing on specific IT use contexts is crucial, as contextualizing technostress within different IT environments has been identified as key to advancing the theoretical understanding of the phenomenon; contextualizing the generalized understanding of a phenomenon can contribute to even deeper theoretical insights (Tarafdar et al., 2015). The selection of the three contexts was informed by multiple factors, which I elaborate on next.

With smartphones, they have revolutionized how we interact with IT. These powerful devices, which can perform tasks traditionally done on computers, have reshaped the expectations and objectives regarding IT use. Despite their recent introduction, smartphones have become indispensable to users while also

serving as a source of technostress. Thus, smartphones are often described as a "double-edged sword" (Dén-Nagy, 2014) or compared to "sleeping with the frenemy" (Hughes & Burke, 2018). Moreover, social media, a major component of smartphone use, impacts people globally across all age groups. As interactive IT services (e.g., Instagram, WhatsApp, Facebook, TikTok), social media allow users to share, co-create, and discuss content, fostering a participatory online environment (Kietzmann et al., 2011; Vaast et al., 2017). Built around social interactions, social media provides a unique environment for examining the socially constructed nature of IT use and related technostress. Finally, digital games offer both benefits, such as cognitive enhancement and stress relief, and downsides, such as addiction (Kuss & Griffiths, 2012; Lobel et al., 2014). Digital games, with their intricate blend of technical, competitive, and cooperative elements, provide numerous opportunities to study technostress. Moreover, the rise of gamification, or integrating game elements into non-gaming activities, highlights the importance of understanding the varied impacts of gaming across different types of environments (Riar et al., 2022).

In essence, these three contexts of leisure and personal IT use each possess distinct characteristics that warrant further investigation in terms of technostress and coping. While studying smartphone and social media use in isolation can be challenging, focusing on the specific aspects of smartphones as devices and social media as services can provide more nuanced insights into technostress within these contexts. In contrast, digital gaming represents a unique IT environment for technostress research, wherein elements such as cooperation and competition play a prominent role in user engagement. Moreover, the complexity of technostress in these contexts is emphasized due to the involvement of multiple stakeholders, each with diverse motivations and goals, presenting numerous opportunities for further investigation. Therefore, all the IT studied can be understood through the lens of technology as ensembles, particularly as embedded systems and structures that are dynamic and evolving within complex social environments (Orlikowski & Iacono, 2001). Having introduced the motivation and research contexts, I will now discuss the research objectives, gaps, and questions of the dissertation.

1.2 Research objectives, gaps, and questions

This dissertation seeks to expand our understanding of the technostress process by investigating the cognitions and behaviors that precede user interactions with IT and examining the consequences of technostress beyond general strains and other outcomes. To fully capture the multifaceted nature of technostress, the dissertation examines the roles of IT characteristics, user cognitions and behaviors, and the social interactions between users within the technostress process. This approach is aligned with the IS discipline's core focus on the socio-technical nature of IT and its use (Sarker et al., 2019). Additionally, the dissertation investigates the social aspects of technostress and coping, explaining

how IT can mediate the technostress arising from social conditions and how coping strategies can be understood within social dynamics. Furthermore, the dissertation extends technostress research into the underexplored context of digital gaming. Here, it identifies new conditions, stimuli, and events that contribute to technostress, providing new insights into the interplay between the social and technical aspects of IT use in the technostress process. In essence, this dissertation seeks to enhance our understanding of the dual nature of IT use, offering insights into how to balance its positive and negative impacts.

By addressing six research questions (RQs) across six articles, this dissertation sets to extend the view of technostress and coping across divergent leisure and personal IT use contexts. The articles, their thematic positions, and the studied use contexts are illustrated in Figure 1.

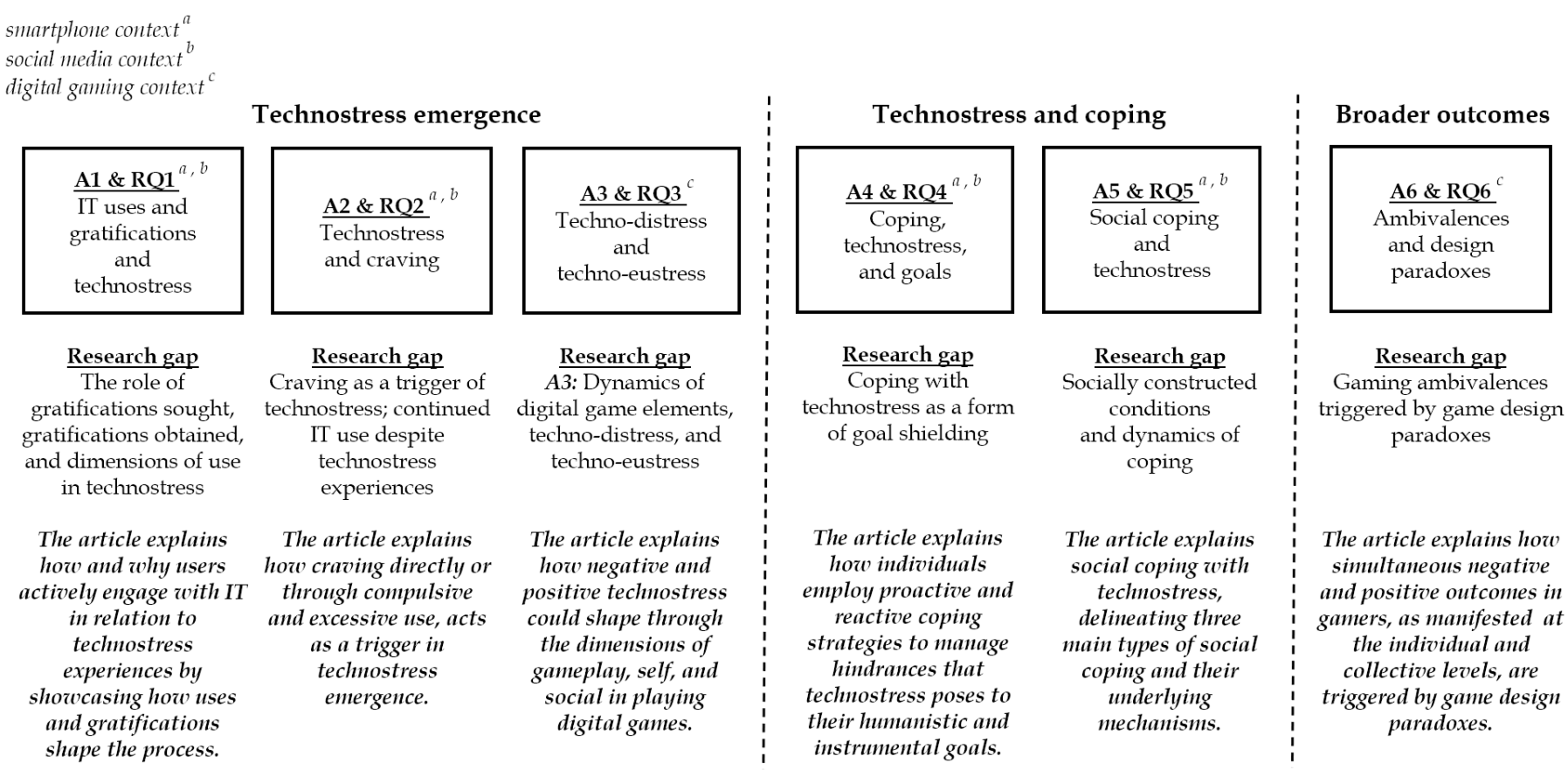

FIGURE 1 The dissertation articles (As), research gaps, and summarized findings and contributions

In the following, I introduce the research question of each individual article, as well as an overview of the articles, the research problems they address, the gaps they fill, and their contributions.

RQ1 How do the dimensions of smartphone use, the associated gratifications, and technostress interplay in voluntary use for leisure and personal purposes? (Article I)

Despite existing research on technostress antecedents, there is a limited understanding of the role that the gratifications sought and obtained (Quan-Haase & Young, 2010; Palmgreen & Rayburn, 1979) play in the emergence of technostress. To address this gap, our study contributes to the literature by demonstrating how, for example, a mismatch between the gratifications sought and those obtained via smartphone use can act as a source of technostress. Furthermore, Article I conceptualizes the dimensions of smartphone use, defined as the nature of the activities performed by users to interact with information delivered via smartphones. By examining gratifications and the dimensions of use, the study provides deeper insights into the "hows" and "whys" of smartphone use in relation to technostress. The findings shed light on the balance or imbalance between the positive and negative aspects of IT use, thereby advancing our understanding of the cognitive and behavioral patterns underlying technostress emergence.

However, the results do not address the role of uncontrollable cognitions and behaviors underlying technostress. Because of this, Article II answers the following research question:

RQ2 What forms does craving take in leisure and personal smartphone use, and how is it associated with technostress? (Article II)

In extant research, craving, an uncontrollable user cognition, has not been linked to technostress, despite its strong associations with other concepts often discussed alongside technostress, such as compulsive and excessive IT use (Dhir et al., 2018; Lee et al., 2014). Additionally, while prior studies have explained how technostress can lead to use discontinuance (Maier et al., 2015c), the reasons for users continuing to engage with IT despite experiencing technostress have been largely overlooked. To address these gaps, the study investigates IT use associated with technostress that exhibits uncontrollable characteristics without being classified as addiction, positioning craving as the central concept. This approach is particularly useful in cases in which the term "addiction" may be too extreme. Craving is defined as "an unstoppable and uncontrollable desire that can lead to use (a drug, a technology), despite its negative and detrimental effects" (De-Sola et al., 2017, p. 2). Article II contributes to the literature by explaining how craving can serve as a trigger for technostress, either directly or through compulsive and excessive use. Additionally, the study introduces three levels of craving, namely stimuli, content, and sensation, which provide a more nuanced understanding of craving in relation to technostress, in addition to providing insight into continued use despite technostress.

While Articles I and II address the highly popular use context of smartphones, they do not capture the technostress experiences that could be present in various IT use contexts, such as digital gaming. Because of that, Article III answers the following research question:

RQ3 How and why do game elements shape the emergence of technostress in playing digital games? (Article III)

Despite the significant attention various forms of IT have received from the technostress perspective, digital games remain a neglected area of inquiry. This is a critical oversight, as digital gaming involves unique factors that may give rise to new forms of technostress, particularly due to IT-mediated competition and cooperation in voluntary settings, which are central to gaming. The inherently challenging nature of digital gaming also presents an opportunity to examine positive technostress, in which challenge plays a pivotal role. To address this research gap, we explain how technostress emerges in the context of online multiplayer games, which are games that enable real-time interaction, cooperation, and competition among players via the Internet. Article III contributes to the literature by identifying novel technostressors specific to this IT environment, such as issues in game meta (i.e., the optimal way of playing) and smurfing (i.e., highly skilled and experienced players playing on accounts that are ranked much lower than their actual playing skills). Furthermore, while the negative aspects of technostress have been extensively studied, its potentially positive aspects remain underexplored, particularly in the context of personal IT use (Tarafdar et al., 2019; 2024). The study contributes to the understanding of the dynamics between techno-distress and techno-eustress by showcasing how the same technostressors can produce both negative and positive outcomes. Moreover, technostress is shown to be not solely IT focused; it can also arise through social interactions (Fischer & Riedl, 2017). By examining the role of game elements in shaping three dimensions of technostress—gameplay, social, and self—we expand on existing theories to illustrate how technostress is influenced by not only IT-embedded transactions and user traits but also the social conditions and dynamics inherent in gaming environments.

While Articles I–III provide a nuanced understanding of how technostress emerges, they do not focus on how to cope with it. Because of this, Article IV harnesses the lens of individuals' goals in answering the following research question:

RQ4 How can individuals cope with technostress that manifests as goal hindrances? (Article IV)

While existing research has identified numerous negative outcomes of technostress, these are often discussed at a general level (e.g., exhaustion or use discontinuance). However, there is limited exploration of how these outcomes may hinder individuals' specific and concrete goals (e.g., dedicating time for personal interests and managing information timeliness). Additionally, studies have yet to address how individuals might manage such hindrances effectively. To address this gap, we explain how the negative outcomes of technostress

impact individuals' goals and how they can cope with such. It is well established that situations and events are stressful because they threaten important goals (Folkman, 2008). Building on this, the study explains how technostress manifests as goal hindrances and emphasizes how coping could be approached from a goal-shielding perspective. Our contribution to the literature includes a discussion of how technostress hinders goals at various levels of abstraction, underlining the hierarchical nature of goals. Furthermore, Article IV explains that more explicit goals tend to require an anticipatory coping approach, while reactive coping strategies are often sufficient for more implicit goals.

While Article IV outlines different types of coping, social elements in the coping process are not addressed. Because of this, Article V answers the following research question:

RQ5 How do users socially cope with technostress caused by social media use, and how do the types of social coping fundamentally differ? (Article V)

Coping has historically been studied with a focus on the individual (Folkman & Moskowitz, 2004; Skinner et al., 2003). However, it is crucial to also view coping as a social phenomenon, considering that stress is "a collective problem because humans function in society" (Lazarus & Folkman, 1984, p. xi). Despite the identification of various strategies for managing technostress, much of the existing IS research has largely neglected the social dimensions of coping. This is a significant gap given the inherently social nature of many IT tools and platforms, such as social media. Therefore, the prevailing individual-focused research in IS literature needs to be re-examined to conceptualize coping as socially constructed efforts. To address this gap, we advance a social perspective on coping in the context of social media. Article V contributes to the literature by identifying three distinct types of social coping: negotiation-focused, reflection-focused, and modification-focused. These encompass specific strategies, such as building a social media availability reputation, rationalization regarding the authenticity of social media content, and turning off activity information. In addition, we explain the underlying mechanisms of these three types of social coping.

While Articles I–V offer a detailed investigation of technostress and coping, a broader view of the outcomes related to the balance between the negative and positive aspects of IT use remain unaddressed. Targeting this void, Article VI harnesses insights from the digital gaming context in answering the following research question:

RQ6 What ambivalences and paradoxes are present in digital gaming and game design, and how are they associated with one another? (Article VI)

Ambivalences, defined as the simultaneous presence of both positive and negative evaluations of a situation or object (Conner & Sparks, 2002), and their connection to paradoxes, which are characterized by actions or events containing contradictory elements (Jarvenpaa & Lang, 2005), remain unexplored in the context of digital gaming. This gap in research is notable for two main reasons. First, although ambivalences and paradoxes are not inherently problematic,

existing studies suggest they can lead to adverse outcomes (Lewis, 2000; Van Harreveld et al., 2009). Second, digital gaming contributes to manifold outcomes, both beneficial and harmful, such as reducing distress (Barr & Copeland-Stewart, 2022) while also contributing to increased distress (Porter & Goolkasian, 2019). Therefore, exploring how these dynamics unfold in gaming environments is essential. To address this gap, we focus on identifying game design paradoxes and explaining their role in eliciting ambivalences within the gaming experience. This approach offers new insights into how gamers' experiences are shaped by specific game design choices. It is essential to investigate how design elements can lead to ambivalent responses, as these may have negative implications for both players (e.g., reduced well-being) and game developers (e.g., decreased player retention). Existing research suggests that individuals often try to avoid ambivalence due to the discomfort it causes through perceived inconsistencies (Schneider & Schwarz, 2017). To explain the emergence of ambivalences and address the potential threats and challenges they pose, our study contributes to the literature by identifying three interrelated game design paradoxes and illustrating how they trigger both individual and collective ambivalences.

1.3 Methods, contributions, and structure of the dissertation

The dissertation employs a qualitative research approach that includes data from semi-structured interviews and social media discussions with end users. The methods were deemed appropriate for gathering rich, experience-driven data (Monteiro et al., 2022; Schultze & Avital, 2011). Qualitative methods enable the effective capture of complex, nuanced interactions between users and IT. This approach allowed us to examine how users engage with smartphones, social media, and digital games, which is consistent with the view that qualitative research is well-suited to studying phenomena that require a deep, detailed understanding (Schultze & Avital, 2011). The rich data obtained from the interviews provided comprehensive insights into participants' behaviors and experiences, which are particularly valuable in studying subjective and dynamic processes such as (techno)stress and coping (Lazarus & Folkman, 1984; Tarafdar et al., 2019). One of the strengths of semi-structured interviews is their flexibility, allowing us to tailor each interview based on a participant's stories and thus better capture the dynamics of technostress.

In summary, this dissertation contributes to IS literature by offering a multifaceted perspective on the dual nature of IT use, which serves as a central theme throughout the work. Article I introduces the balance between benefits (gratifications obtained) and drawbacks (technostress). In contrast, Article II highlights uncontrollable behavior, shedding light on why individuals continue IT use despite experiencing technostress. These themes are developed further in Article III, where negative and positive technostress are examined. Article IV, in contrast, discusses the conflicts and synergies between various types of goals, technostress, and coping strategies, where more instances of conflict than

synergy are revealed, consistent with extant findings in organizational contexts (Sarker et al., 2019). Article V further elaborates on coping and technostress from a social perspective, discussing the dual role of social dynamics in IT use: they not only create a platform for increased technostress but also offer opportunities for coping with it. Finally, Article VI contributes to the body of knowledge by adopting the lens of ambivalences to shed light on the diverse outcomes that arise from paradoxical design choices in digital games.

In addition to multiple research contributions, the dissertation presents several key practical implications for users, social media providers, game companies, employers, and decision-makers. For users, the findings offer insights into their IT use, cognitions, behaviors, and outcomes, enabling more informed IT use decisions. Social media providers are encouraged to collaborate with users to improve platform functionalities intended to help users cope with technostress, as many users find the current tools inadequate. Game companies can apply the findings on how certain game elements contribute to technostress to design games that balance revenue generation with player well-being. Employers can use the insights to understand how personal IT use during work hours, particularly given the rise of remote work, affects performance and how to educate employees about cyberslacking. Lastly, decision-makers may consider legislation that will pressure social media providers to modify platforms and reduce their harmful effects, as participants highlighted concerns regarding a lack of support in managing technostress in social media.

The remainder of this dissertation is organized as follows. First, I provide the theoretical background for the dissertation, along with a review of relevant literature. After that, I outline the research methods employed in the articles. This is followed by a detailed discussion of the findings derived from each article. Finally, I summarize the research contributions, outline the practical implications of the dissertation, address its limitations, and suggest directions for future research.

2 THEORETICAL FOUNDATION AND RELATED WORK

This chapter provides the theoretical foundation for this dissertation and a review of the relevant literature. The fundamentals of the studied phenomena are established, and information is given for the analysis and interpretation of the dissertation findings.

First, the concept of technostress is unpacked. Built on the foundations of research on general stress, technostress has emerged as a crucial concept for understanding issues and challenges associated with IT use (Maier et al., 2021; Salo et al., 2022). While the emergence of technostress is commonly attributed to technostressors causing various types of strains and other outcomes (Nastjuk et al., 2024; Salo et al., 2019; Tarafdar et al., 2019), it is crucial to understand the manifold and complex factors that lead to interactions with IT that can create technostress. This chapter discusses the necessity of understanding various human cognitions and behaviors to fully grasp technostress. This chapter also provides a review of existing technostress research across various IT use contexts, with a particular emphasis on smartphones, social media, and digital games. By examining the relevant literature and key concepts in these areas, the review aims to enhance the understanding of technostress within each context, facilitating the integration of the dissertation's findings into the broader body of research.

Furthermore, coping strategies for managing technostress are central to this discussion, and core aspects of existing work on the topic are presented. Subsequently, various broader drivers and outcomes of IT use are discussed and linked with technostress.

2.1 Stress

In essence, stress is an inevitable part of life for everyone, though its emergence varies from person to person and is influenced by individual motives, goals, characteristics, and capabilities (Folkman, 2008; Lazarus & Folkman, 1984). Here,

stress is defined as a dynamic transaction between individuals and their environment in which the individuals' resources are not sufficient to manage the demands imposed by the transaction (Cooper et al., 2001; Lazarus, 1966; Lazarus & Folkman, 1984). In this dissertation, the focus is on psychological stress. While (techno)stress can also be examined from, for example, a physiological perspective (Tams et al., 2014), the decision to concentrate on psychological stress stemmed from the primary aim of this work: understanding and explaining the cognitions, behaviors, experiences, and perceptions of users as they navigate the complexities of IT use in their daily lives. While physiological responses to stress, such as changes in heart rate or cortisol levels (e.g., Dickerson & Kemeny, 2004; Riedl et al., 2012), can provide valuable information, they do not fully capture the complexities of how individuals experience and manage stress in the context of their interactions with IT. While both psychological and physiological stress are connected to cognitive and behavioral responses (Lazarus, 1999), psychological stress is often more directly tied to the mental and emotional reactions individuals exhibit when encountering stress related to IT use.

Stress is a crucial phenomenon to investigate in various disciplines and fields, leading to discrepancies in terms of defining and operationalizing the concept (Cooper et al., 2001). While stress can originate due to several reasons, situations that are unpredictable, uncontrollable, or overloading are central in stress (Cohen et al., 1983). At the early stages of stress research, stress was discussed as a response on the part of an individual (Selye, 1974). A different view emerged when stress was viewed from the perspective of the stimuli that create stress (Holmes & Rahe, 1967). This view, however, was criticized due its failure to consider the personal characteristics of individuals experiencing stress (Hobföll, 1989). Thus, a model that considers stimuli, responses, and individual characteristics was needed. Psychological stress, which I focus on, has been predominantly described as a transaction between individuals and their environments (Lazarus, 1966; Lazarus & Folkman, 1984). The transactional model of stress highlights the subjective and dynamic nature of stress by considering the nature of the stimulus encountered, the individual's response, and how this affects their ability to function (Lazarus & Folkman, 1984). In essence, when individuals perceive their interaction with the environment as overly demanding and their resources as insufficient to meet these demands, stress emerges (Cooper et al., 2001; Lazarus & Folkman, 1984).

Thus, stress is viewed as forming due to an individual's own appraisal of a given transaction, making stress not a static state but, rather, a complex and evolving process that reflects the ongoing transaction between an individual's personal resources and the environmental demands they face (Lazarus & Folkman, 1984). A key aspect of stress is the appraisal process, which involves assessing both the perceived threat of a stimulus or event and an individual's capacity to manage it (Lazarus & Folkman, 1984). These appraisals have been termed primary and secondary, respectively:

> [Primary appraisal] has to do with whether or not what is happening is relevant to one's values, goal commitments, beliefs about self and world, and situational inten-

> tions, [while secondary appraisal] refers to a cognitive-evaluative process that is focused on what can be done about a stressful person-environment relationship, especially when there has been a primary appraisal of harm, threat, or challenge" (Lazarus, 1999, pp. 75–76).

Consequently, stress-inducing stimuli and events, or stressors, lead to various psychological, physical, and behavioral reactions, collectively termed strain, via appraisal processes (Cooper et al., 2001; Lazarus & Folkman, 1984). While stress is sometimes described as forming through stressors, strains, and outcomes (Koeske & Koeske, 1993; Whelan et al., 2020), the present dissertation does not differentiate between strains and other outcomes, an approach that has become common in technostress research (e.g., Ayyagari et al., 2011; Maier et al., 2019; Pflügner et al., 2021a). Here, I also wish to highlight the fact that even though stress can emerge due to tragic or extreme stimuli and events and is often associated with highly uncomfortable or adverse situations, it is essential to recognize that even smaller, daily stressors can build up and have significant impacts over time (Charles et al., 2013). This accumulation can occur, for example, through IT interactions, resulting in increased technostress (Salo et al., 2022). More specifically, research indicates that the negative effects of social media use on psychological well-being may develop gradually, even when initial experiences are positive or inconclusive (Lin et al., 2023).

Stress is sometimes associated with individuals' goals, and it has been said that "stressful situations are often stressful precisely because they threaten or harm valued goals" (Folkman, 2008, p. 9). Goals are closely tied to fundamental human drivers for meaning in life (Emmons, 2003), making it essential to understand the factors that can impede them, as well as how to address such issues. Here, individuals' goals can be discussed as humanistic and instrumental: At the individual level, humanistic goals involve the pursuit of happiness, self-worth, and belonging (Austin & Vancouver, 1996), while instrumental goals may include career advancement, academic success, or task completion (Tkach & Lyubomirsky, 2006). Also, goals can be viewed at different levels of abstraction (Carver & Scheier, 2001; Höchli et al., 2018). Explicit goals are concrete, consciously planned, and specific, whereas implicit goals are more abstract, less planned, and shaped by unconscious influences (Bittner, 2011). These are often interconnected, as achieving specific, explicit goals can be critical to reaching broader, implicit ones (McIntosh et al., 1995). Associated with stress and goals, even minor daily stressors can disrupt both explicit goals (e.g., meeting a work deadline) and implicit goals (e.g., experiencing happiness) (Verkuil et al., 2015). This illustrates how instrumental goals can impact the achievement of more abstract humanistic goals, highlighting the need for alignment across goal types and levels of abstraction to understand (techno)stress.

It is also important to recognize that stress can manifest in both negative (distress) and positive (eustress) forms (Selye, 1974). In essence, eustress can be viewed as "a result of positive perception of stressors" (Le Fevre et al., 2003, p. 729). Eustress can, for example, motivate individuals and promote growth and development (Cavanaugh et al., 2000). Eustress has been especially studied in the context of working life, both from managers' and leaders' perspectives

(Cavanaugh et al., 2000; Little et al., 2007) and those of general workers (Simmons & Nelson, 2001). Often, negative stress and positive stress are approached in terms of two types of stressors: hindrance-stressors and challenge-stressors, respectively (Lepine et al., 2005). While hindrance-stressors have a negative influence on both performance and motivation, challenge-stressors' influence on these is positive (Lepine et al., 2005). Thus, eustress could contribute to greater individual and organizational success.

In summary, stress is a complex and dynamic process shaped by various individual and environmental factors, manifesting through their transaction. As this dissertation draws from the ideas of the transactional model of stress, it is important to note that this view is not without criticism. It has been criticized, for example, for being "circular" or "tautological" (Hobföll, 1989). However, the transactional model of stress also resonates with other widely used stress models, such as the person-environment fit model, in which the misfit between an individual and their environment results in strain (Ayyagari et al., 2011; Cooper et al., 2001). By reviewing various approaches to stress, the transactional model was deemed suitable for the studies conducted in this dissertation, as it enabled us to study the outcomes (i.e., the stress responses) of users interacting (i.e., cognitive and behavioral aspects) with IT (i.e., the IT that creates environmental conditions, stimuli, and events), in addition to it having been established as a key approach to studying technostress (see, e.g., Maier et al., 2019; Ragu-Nathan et al., 2008; Salo et al., 2022).

Below, I will discuss technostress in more detail.

2.2 Technostress

In this dissertation, the focus is on an individual's experience of stress resulting from IT use, which is known as technostress (Tarafdar et al., 2007; 2019). While the concept of technostress was coined in the 1980s (Brod, 1982) and Brod (1984) wrote a book on technostress entitled *Technostress: The human-cost of the computer revolution*, research on technostress only became widespread in the 2000s (e.g., Ragu-Nathan et al., 2008; Tarafdar et al. 2007; Tu et al., 2005). Technostress originally referred to the negative effects experienced by users who are unable to cope with the demands imposed by emerging technologies (Brod, 1982). In the 1990s, technostress was defined "as any negative impact on attitudes, thoughts, behaviors or psychology caused directly or indirectly by technology" (Weil & Rosen, 1997, p. 5).

In the present, technostress has been described as a process (Tarafdar et al., 2019, p. 8):

1. It includes the presence of 'technology environmental conditions'.
2. These conditions are appraised as demands or 'techno-stressors' that are taxing on the individual and require a change.
3. The demands set into motion 'coping response'.

4. The response leads to psychological, physical, and behavioural 'outcomes' for the individual.

Thus, technostress exemplifies the transactional model of stress, in which the environmental demands associated with IT use are perceived as exceeding an individual's resources (Lazarus & Folkman, 1984; Tarafdar et al., 2019). In essence, technostress is seen as forming through technostressors, which arise when individuals appraise transactions with IT environments as excessively demanding or challenging, leading to strains or psychological, physical, and behavioral outcomes (Ayyagari et al., 2011; Tarafdar et al., 2019; 2024). Technostress can be linked to specific IT characteristics, such as ubiquity and constant connectivity, that are perceived as demands or threats that exceed users' coping abilities (Tarafdar et al., 2019). Like general stress, technostress can manifest not only negative but also positive aspects. The holistic technostress model differentiates between techno-distress and techno-eustress, which arise from different types of technostressors: hindrance-technostressors and challenge-technostressors, respectively (Califf et al., 2020; Maier et al., 2021).

Next, I will discuss technostress antecedents, focusing especially on technostressors. Subsequently, the consequences of technostress, specifically various strains and other outcomes, are discussed. Finally, I shift the focus to the defining aspects of technostress in the IT use contexts studied in this dissertation.

2.2.1 Technostress antecedents: technostressors and other underlying factors

Initially, much of the technostress research focused on organizational settings in which the use of IT is mandated, particularly for productivity purposes (Tarafdar et al., 2010; Tu et al., 2005). Technostress is often approached from the perspective of technostressors, which refer to IT-related sources of stress that are perceived as threatening or challenging (Tarafdar et al., 2019; 2024), such as techno-overload, techno-invasion, techno-complexity, techno-insecurity, and techno-uncertainty (Ragu-Nathan et al., 2008; Tarafdar et al., 2007). These could be dubbed as the "original five" technostressors, and they have been studied extensively since their introduction in the major IS journals in the seminal works by Tarafdar et al. (2007) and Ragu-Nathan et al. (2008). Despite these technostressors being rooted in organizational research, they have also been adapted to studies of personal IT use (e.g., Maier et al., 2015c; Tarafdar et al., 2020).

While these technostressors were established more than 15 years ago, they are still commonly used in research. For example, a recent study showed how these technostressors could be viewed as leading to different outcomes through a configurational approach (i.e., combinations of technostressors) (Pflügner et al., 2024). However, some have suggested that the technostressor inventory could be updated. While Gimpel et al. (2024) demonstrated that the original five technostressors remain valid, they also proposed a new set of second-order technostressors, which are referred to as digital hindrance stressors: technology-related overload, technology-related task obstruction, technology-related

ineffectiveness, technology-related surveillance, and technology-related rumination. Associated with trial period IT use, Maier et al. (2022) show how technostressors such as personalization complexity, transition costs, and habit disruptions affect user satisfaction and the intention to reject IT. These advancements demonstrate that despite its long-standing presence, technostress research is still maturing.

While having an established set of technostressors can be beneficial, when users interact with various types of IT, many types of technostressors can emerge. This is especially the case when research expands from traditional IT use contexts, such as mobile phones and email (Tams et al., 2020; Stich et al., 2019a), to more modern IT contexts, such as artificial intelligence (AI; Cadieux et al., 2021; Duong et al., 2024), virtual reality (VR; Khan et al., 2024), and robots (Lampi et al., 2023). For example, working with AI can contribute to technostressors, such as AI-induced misinformation (Cadieux et al., 2021); VR has introduced technostressors related to the uncanny valley, which refers to the eerie feeling created by not-quite-human representations of humans (Khan et al., 2024); and the inadaptability of robots can manifest as a technostressor based on physical insecurity (Lampi et al., 2023). Thus, it can be said that with new IT emerging and becoming more widespread all the time, understanding the contextual factors surrounding technostress is crucial.

As the "original five" technostressors were identified in organizational IT use contexts, studies on personal IT use have uncovered additional technostressors. While an established set of technostressors has not yet been compiled for personal IT use, Nastjuk et al. (2024) proposed a collection of six technostressors drawn from other studies (Maier et al., 2015c; Tarafdar et al., 2020): pattern, disclosure, complexity, invasion, uncertainty, and social overload. In this context, "pattern" refers to users' behaviors while managing their habitual IT use in response to social conditions, while "disclosure" emphasizes the negative emotions linked to sharing personal information online, along with the pressure to stay up to date with others (Maier et al., 2015c). Also, some technostressors, such as techno-invasion and techno-overload, have been shown to appear in both work and non-work contexts. While the list above provides an appropriate collection of personal IT use technostressors, it is not exhaustive. Other studies have discussed technostressors such as privacy issues, social comparison, fear of missing out (FOMO), dependency, and online turbulence (Dhir et al., 2019; Fox & Moreland, 2015; Salo et al., 2019; 2022; Zhang et al., 2021), among others.

Focusing on positive technostress, a number of challenge-technostressors have been proposed. When technostressors are viewed as challenging, users perceive the demands of IT as beneficial, potentially leading to personal growth and learning (Maier et al., 2021). The challenge-technostressors identified in previous research often revolve around IT users' ability to efficiently and rapidly manage high workloads and solve complex problems using IT (Benlian, 2020). Thus, when IT use provides users with a suitable level of challenge and motivation, positive technostressors can emerge (Tarafdar et al., 2024). Though it

does not use the term "challenge-technostressors," recently, a categorization for positive technostressors ("techno-eustress creators") has been proposed (Tarafdar et al., 2024), resonating with the ideas of the "original five" negative technostressors. Drawn from self-determination theory (Ryan & Deci, 2000), these stressors are techno-mastery, techno-autonomy, techno-relatedness, and techno-enrichment (Tarafdar et al., 2024). For all the proposed technostressors, challenge and motivation are identified as a core element.

In addition to technostressors, various IT characteristics contribute to the emergence of technostress (Ayyagari et al., 2011; Tarafdar et al., 2019). In workplace settings, key factors include the ubiquity of IT, its ease of use, the expectation of constant availability (presenteeism), and the rapid pace of technological change (Ayyagari et al., 2011; Tarafdar et al., 2019). When implementing new IT in organizations, the complexity of the change, along with the associated costs and benefits, can influence technostress due to the shift in the environment (Laumer et al., 2016). In addition, affordances have been described as explaining user behavior associated with technostress (e.g., Califf, 2022; Fox & Moreland, 2015; Salo et al., 2022), portraying the process as highly dynamic and complex. Focusing on a specific use context of gig economy, Cram et al. (2022) show how algorithmic controls (gatekeeping and guiding) affect both negative and positive technostress. Working with systems that have more agency, the autonomy characteristics can affect how technostress manifests; systems with more autonomy could increase technostress (Ulfert et al., 2022). Thus, with new IT emerging and becoming more widespread, studying more varied characteristics of IT will need to be addressed. Collectively, these examples underscore the diverse mechanisms through which different aspects of IT, acting across different contexts, contribute to technostress. Understanding these specific factors is crucial in developing effective strategies via which to mitigate technostress in various IT applications, for instance, by focusing on their design (Tarafdar et al., 2019).

Moreover, the personal characteristics of IT users have been discussed as factors influencing the emergence of technostress, which is particularly relevant given that stress itself is often defined by its subjective nature, emphasizing the role of the individual. Studies have shown that certain personality traits make some individuals more prone to experiencing technostress (Maier et al., 2019; Pflügner et al., 2021a; Srivastava et al., 2015). Early research highlighted how specific personality traits contribute differently to technostress outcomes, with some traits increasing negative effects (e.g., neuroticism) and others enhancing positive outcomes (e.g., openness) (Srivastava et al., 2015). Additionally, it has been emphasized that the interplay of the Big Five personality traits creates unique personality profiles that should be considered when examining how technostress is perceived (Pflügner et al., 2021a). Also, in their study of personality traits and technostress, Maier et al. (2019) point out that the personal nature of technostress also varies by generation, with baby boomers experiencing the highest levels of technostress and Generation Z experiencing the lowest. Although not an extremely common approach, other studies have also shown

that IT users' age affects their technostress experiences (e.g., Baham et al., 2023; Cheng et al., 2023), highlighting how the subjective nature of technostress can be explored from multiple perspectives. In addition to its various antecedents, another key aspect of technostress is its consequences, which I will discuss in the following section.

2.2.2 Consequences of technostress: strains and other outcomes

In general, the outcomes of technostress are commonly discussed as psychological, physical, or behavioral reactions to technostressors (Tarafdar et al., 2019), with negative outcomes often referred to as strains (e.g., Ayyagari et al., 2011). While existing research has primarily focused on psychological and behavioral strains and other outcomes, there is a stream of research that approaches technostress from a physiological perspective, which could offer a more objective way of measuring the outcomes of technostress (Riedl, 2013). Such studies have highlighted how technostress can manifest as elevated stress hormones such as cortisol (Riedl et al., 2012). In essence, understanding biological outcomes could be used to complement self-measures in terms of understanding the health outcomes of technostress (Riedl, 2013). Furthermore, some studies have explicitly discussed physical outcomes, such as neck pain, eye strain, and headaches, as outcomes of technostress (Al-Fudail & Mellar, 2008; Boonjing & Chanvarasuth, 2017).

Studies examining technostress in work settings have highlighted its potential to reduce productivity, lower job satisfaction, and even leading to burnout (Ayyagari et al., 2011; Califf & Brooks, 2020; Maier et al., 2019; Pflügner et al., 2021b; Pirkkalainen et al., 2019; Srivastava et al., 2015). Such issues can also manifest as or through role stress or conflicts associated with newly implemented IT in organizations (Laumer et al., 2016; Pullins et al., 2020). Regarding some specific issues, technostress has been discussed alongside violations in terms of information security behavior (D'Arcy et al., 2014b; Hwang & Cha, 2018). Moreover, technostress could trigger deviant behavior in employees, which could be costly for the employer (Chiu et al., 2023). Thus, when individuals experience technostress, it can harm the organizations that they are part of (Ragu-Nathan et al., 2008). While organizational and work-related technostress has been dominant in research, especially today, the line between work life and leisure time has been blurred, offering new avenues via which to study this topic. Thus, the outcomes of technostress can manifest as different types of work-home conflict (Tams et al., 2020). For instance, negative experiences of work-related technostress can harm individuals' relationships (Benlian, 2020).

In personal IT use contexts, the outcomes experienced often differ from those experienced in organizational settings or work life in general. While some negative outcomes, such as fatigue and exhaustion, are common to both contexts (Cao et al., 2018; Dhir et al., 2019), personal IT use can also result in more unique and context-specific strains. These include

- issues with concentration, sleep, and social relationships (Hughes & Burke, 2018; Salo et al., 2019),
- reduced happiness (Brooks, 2015),
- regret (Cao & Sun, 2018),
- mental health problems (Rasmussen et al., 2020),
- reduced perceived usefulness and enjoyment (Yao & Cao, 2017), and
- neglected unintended audience concern and lurking (Zhang et al., 2021).

Given that IT use in personal contexts is voluntary, technostress can also lead to discontinued use (Maier et al., 2015c; Sun & Lee, 2022). Moreover, the technostress caused by personal IT use (e.g., smartphones and social media) has been linked to decreased academic performance (Luqman et al., 2021; Whelan et al., 2022). Also, as IT is often harnessed for education through educational technologies, if it is not implemented correctly, it can also negatively impact educational results due to technostress (Upadhyaya & Vrinda, 2021; Wang et al., 2020). Thus, the consequences of technostress are manifold, often manifesting as cognitive or behavioral strains or other outcomes.

Focusing on positive technostress, the outcomes include better job satisfaction, attrition, and work performance (Califf et al., 2020; Nascimento et al., 2024). While technostress has been associated with partner dissatisfaction due to negative experiences of technostress, positive technostress can increase partnership satisfaction, which can lead to increased work productivity, creating a positive feedback loop (Benlian, 2020). Based on how various IT are implemented, the same potential causes of technostress can lead to positive outcomes, such as empowerment (Luoma et al., 2020) or accomplishment (Hämäläinen et al., 2023, 2024a). In the education context, techno-eustress has been shown to increase student satisfaction, retention (Zhao et al., 2023), and active participation (Fu et al., 2023). Interestingly, however, almost no studies have investigated techno-eustress in voluntary IT use for personal and leisure purposes.

Tables 1-6 compile prominent antecedents and consequences of technostress, in addition to different coping and mitigation strategies, as identified in the literature. The works included in the tables were selected based on their relevance within (leading) journals in IS and related fields. While the review process was not systematic, it focused on capturing the most influential studies that shape the current understandings of technostress. As such, the tables represent a comprehensive, though not exhaustive, summary of key literature in the field.

TABLE 1 Technostressors in technostress research

Technostressors	Example references
"Original five" technostressors (techno-overload, techno-invasion, techno-complexity, techno-insecurity, techno-uncertainty) or a subset of them	Agogo & Hess, 2018; Califf & Brooks, 2020; Chandra et al., 2019; Chiu et al., 2023; D'Arcy et al., 2014; Dutta & Mishra, 2024; Fischer & Riedl, 2022; Fuglseth & Sørebø, 2014; Gimpel et al., 2024; Harris et al., 2022; Ioannou et al., 2024; Lanzl, 2023; Leung & Zhang, 2017; Li & Wang, 2021; Ragu-Nathan et al., 2008; Maier et al., 2015a, 2015c, 2019; Pflügner et al., 2021a, 2021b, 2024; Reis et al., 2024; Sharma & Gupta, 2023; Shu et al., 2011; Tarafdar et al., 2007, 2011, 2014, 2015; Tu et al., 2005; Turel & Gaudioso, 2018; Wang et al., 2008; Yener et al., 2021; Zhao et al., 2020
Social media stressors (e.g., social media use, social media overdependence, life comparison discrepancy, online discussion conflict, fear of missing out, disclosure, pattern, online turbulence, pressure with being present)	Dhir et al., 2018; Lin et al., 2023; Maier et al., 2015c; Malik et al., 2021; Mehtälä et al., 2023; Salo et al., 2019; Tarafdar et al., 2020; Xiao et al., 2019; Zhang et al., 2021
Privacy and security technostressors (e.g., privacy invasion, privacy and security uncontrollability, privacy threats, privacy concerns, lack of privacy)	Ayyagari et al., 2011; Benlian et al., 2019; Cao et al., 2018; Cheikh-Ammar, 2020; Dhir et al., 2019; Fox & Moreland, 2015; Hwang et al., 2022; Loh et al., 2022; Maier et al., 2022; Malik et al., 2019; Mehtälä et al., 2023; Salo et al., 2019, 2022; Suh & Lee, 2017; Xiao & Mou, 2019; Yao & Cao, 2017
IT disruptions (e.g., IT-related interruptions/disturbances, system breakdowns, malfunctions, errors, techno-unreliability, task obstruction)	Al-Fudail & Mellar, 2008; Becker & Lanzl, 2023; Beham et al., 2023; Cheng et al., 2023; Galluch et al., 2015; Gimpel et al., 2024; Hurbean et al., 2023; Maier et al., 2021; Mehtälä et al., 2023; Sumiyana & Sriwidharmanely, 2020; Tams et al., 2014, 2018b, 2020; Weinert et al., 2020
Conflict technostressors (e.g., role conflict, technology-work conflict, work-home conflict)	Banerjee & Gupta, 2024; Benlian, 2020; Cao & Yu, 2019; Harris et al., 2022; Issa et al., 2024; Khedhaouria & Cucchi, 2019; Leung & Zhang, 2017; Mahmud et al., 2017; Oh & Park, 2016
IT use technostressors (e.g., compulsive use, excessive use)	Cao & Yu, 2019; Cao et al., 2018; Dhir et al., 2018; Duong et al., 2024a, 2024b; Hsiao, 2017; Hsiao et al., 2017; Lee et al., 2014; Luqman et al., 2017, 2021; Zheng & Lee, 2016

Technostressors	Example references
Overload technostressors (e.g., information overload, communication overload, social (media) overload, work overload, e-mail overload, interruption overload, system feature overload, role overload)	Cheikh-Ammar, 2020; Choi & Lim, 2016; Christ-Brendemühl & Schaarschmidt, 2020; Day et al., 2012; Fu et al., 2020; Hu et al., 2023; Hung et al., 2015; Hurbean et al., 2023; Islam et al., 2021; Khedhaouria & Cucchi, 2019; Kim et al., 2022; Laumer et al., 2016; Lee et al., 2016a; Lin et al., 2021; Loh et al., 2022; Mahmud et al., 2017; Maier et al., 2015b, 2015c; Stich et al., 2019a, 2019b; Suh & Lee, 2017; Sumiyana & Sriwidharmanely, 2020, Sun & Lee, 2022; Tugtekin et al., 2020; Tams et al., 2020; Tarafdar et al., 2020; Yao & Cao, 2017; Yin et al., 2018; Yu et al., 2023; Zhang et al., 2016
Work stressors (e.g., job (in)security, job conditions, work (over)load)	Ayyagari et al., 2011; Galluch et al., 2015; Hwang et al., 2018; Maier et al., 2015a; Stich et al., 2017, 2019a, 2019b; Yan et al., 2013
Challenge-technostressors and techno-eustress creators (e.g., complex task performance, rapid task performance, efficient work completion, problem solving, techno-mastery, techno-autonomy, techno-relatedness, techno-enrichment, techno-coolness, techno-escapism)	Benlian, 2020; Califf et al., 2020; Califf, 2023; Cheng et al., 2023; Cram et al., 2022; Fu et al., 2023; Maier et al., 2021; Nascimento et al., 2024; Shirish et al., 2021; Zhao et al., 2024; Zhu et al., 2023

TABLE 2 Strains and other outcomes in technostress research

Strains and other outcomes	Example references
Mental drain (e.g., (social media/video conferencing) exhaustion, (social media/video conferencing) fatigue, sleep disturbances, cognitive load)	Abramova & Gladkaya, 2024; Cao & Sun, 2018; Cao et al., 2018; Cheikh-Ammar, 2020; Dhir et al., 2019; Fu et al., 2020; Hughes & Burke, 2018; Hu et al., 2023; Islam et al., 2021; Khedhaouria & Cucchi, 2019; Kim et al., 2015; Kim et al., 2022; Lee et al., 2016a; Loh et al., 2022; Luqman et al., 2021; Maier et al., 2015a, 2015b, 2015c; Malik et al., 2021; Salo et al., 2019; Sun & Lee, 2022; Thomée et al., 2007; Tugtekin et al., 2020; Turel & Gaudioso, 2018; Weinert et al., 2020; Whelan et al., 2020; Xiao & Mou, 2019; Xiao et al., 2019, Zhang et al., 2016
Emotional strains and other outcomes (e.g., reduced happiness, reduced (psychological) well-being, loneliness, negative affect, reduced life satisfaction)	Abramova & Gladkaya, 2024; Brooks, 2015; Choi & Lim, 2016; Duong et al., 2024a; Lin et al., 2023; Stich et al., 2019a; Taser et al., 2022

Strains and other outcomes	Example references
(Mental) health strains and other outcomes (e.g., depression, anxiety, addiction, nomophobia)	Brooks et al., 2017; Choi & Lim, 2016; Dhir et al., 2018; Hughes & Burke, 2018; Lin et al., 2023; Rasmussen et al., 2020; Salanova et al., 2013; Tarafdar et al., 2020; Thomée et al., 2007
Social strains and other outcomes (e.g., social relation problems, partner (dis)satisfaction, AI-related altered communication dynamics, social avoidance, neglected unintended audience concern, lurking)	Benlian, 2020; Cheng et al., 2023; Issa et al., 2024; Salo et al., 2019; Zhang et al., 2021
Physical strains and other outcomes (e.g., neck pain, eye strain, headaches)	Al-Fudail & Mellar, 2008; Boonjing & Chanvarasuth, 2017; Mehtälä et al., 2023
Use related strains and outcomes (e.g., discontinued service use, discontinuance intention, rejection, reduced use, resistance behavior)	Cao & Sun, 2018; Chen et al., 2019; Cram et al., 2022; Fu et al., 2020; Hew et al., 2024; Hu et al., 2023; Joo et al., 2016; Lin et al., 2021; Loh et al., 2022; Luqman et al., 2017; Maier et al., 2015b, 2015c, 2022; Steelman & Soror, 2017; Sun & Lee, 2022; Verkijika, 2019; Wang et al., 2024; Zhang et al., 2016;
Work-related strains and other outcomes (e.g., (reduced) job satisfaction, (reduced) work productivity, reduced work performance, reduced organizational commitment, worsened innovation, burnout, security violations, cyberslacking, workaround use, work-home boundary issues, innovative and routine use)	Bao et al., 2024; Becker & Lanzl, 2023; Boonjing & Chanvarasuth, 2017; Brooks & Califf, 2017; Califf & Brooks, 2020; Califf et al., 2020; Chandra et al., 2019; Chiu et al., 2023; Cram et al., 2022; D'Arcy et al., 2014; Day et al., 2012; Dutta & Mishra, 2024; Fischer & Riedl, 2022; Fu et al., 2023; Fuglseth & Sørebø, 2014; Gimpel et al., 2024; Güğerçin, 2020; Harris et al., 2022; Hung et al., 2015; Hurbean et al., 2023; Hwang & Cha, 2018; Hwang et al., 2022; Ioannou et al., 2024 Jena, 2015; Khedhaouria & Cucchi, 2019; Kim et al., 2015; Kumar et al., 2023; Li & Wang, 2021; Mahmud et al., 2017; Maier et al., 2015a, 2019, 2021; Nascimento et al., 2024; Nasirpouri Shadbad & Biros, 2022; Oh & Park, 2016; Oksa et al., 2022; Pirkkalainen et al., 2019; Pflügner et al., 2021b, 2024; Ragu-Nathan et al., 2008; Sasidharan, 2022; Stich et al., 2019a; Suh & Lee, 2017; Tarafdar et al., 2017, 2011, 2014, 2015; Tu et al., 2005; Yener et al., 2021; Yin et al., 2018; Zhao et al., 2020; Zhu et al., 2023
Academic/education strains and other outcomes (e.g., worsened/bettered academic performance, reduced academic productivity, worsened academic writing skills)	Al-Abdullatif et al., 2020; Cao et al., 2018; Dhir et al., 2019; Duong et al., 2024b; Hsiao et al., 2017, Malik et al., 2021; Masood et al., 2020; Qi, 2019; Upadhyaya & Vrinda, 2021; Wang et al., 2020; Zhao et al., 2024

TABLE 3 Technostress coping/mitigation strategies in technostress research

Technostress coping/mitigation strategies	**Example references**
(Organizational) support (e.g., technical support, literacy facilitation, involvement facilitation, social support, colleague support, family support)	Al-Fudail & Mellar, 2008; Arnetz, 1996; Benlian, 2020, Bao et al., 2024; Califf et al., 2020; Califf & Brooks, 2020; Fuglseth & Sørebø, 2014; Goetz & Boehm, 2020; Hauk et al., 2019; Hung et al., 2011; Hwang et al., 2022; Joo et al., 2016; Kim et al., 2015; Lanzl, 2023; Li & Wang, 2021; Maier et al., 2019; Nascimento et al., 2024; Ragu-Nathan et al., 2008; Sharma & Gupta, 2023; Tarafdar et al., 2011, 2014, 2015; Weinert et al., 2020; Yan et al., 2013; Zhao et al., 2020; Zhao et al., 2020; Zhao et al., 2024
Cognitive and emotional adaptation (e.g., mindfulness, positive reinterpretation, self-monitoring, positive framing, denial, distraction, psychological distancing)	Hung et al., 2015; Ioannou et al., 2024; Lin et al., 2021; Nascimento et al., 2024; Pflügner et al., 2021b; Pirkkalainen et al., 2019; Qi, 2019; Tarafdar et al., 2020; Tuan, 2022; Zhang et al., 2021; Zhao et al., 2020; Zhao et al., 2024; Zhu et al., 2023
Control (e.g., IT control, schedule control, method control, criteria control, time management)	Pirkkalainen et al., 2019; Tams et al., 2018a, 2020; Yener et al., 2021; Yin et al., 2018
IT use adaptation (e.g., distancing from IT, modifying IT use, switching to an alternative IT, taking a temporary break, quitting use permanently)	Pirkkalainen et al., 2019; Salo et al., 2022; Zhao et al., 2020; Zhu et al., 2023
(Distress) venting	Pirkkalainen et al., 2019; Sharma & Gupta, 2023; Zhao et al., 2020; Zhu et al., 2023
Leadership and competition (e.g., positive leadership climate, low competitive climate)	Turel & Gaudioso, 2018
Technological, cultural, and social mitigation measures	Reis et al., 2024

TABLE 4 Features and attributes of IT in technostress research

Features and attributes of IT	Example references
IT characteristics and environmental conditions (e.g., perceived usefulness, perceived complexity, and perceived reliability, push notifications, algorithmic control, system autonomy, intrusive features such as presenteeism and monitoring, pace of change, accessibility)	Ayygari et al., 2011; Chen et al., 2019; Cram et al., 2021; Hu et al., 2023; Hung et al., 2015; Liu et al., 2019; Ma et al., 2024; Nascimento et al., 2024; Salo et al., 2022; Truta et al., 2023; Ulfert et al., 2022; Zhu et al., 2023
Social media characteristics (e.g., push notifications, real-time information renewability, information relevancy, system pace of change, anonymity, number of friends)	Lee et al., 2016a; Maier et al., 2015b; Salo et al., 2019; Tugtekin et al., 2020; Xiao & Mou, 2019
IT affordances (e.g., social media affordances such as searchability, editability, accessibility, content shareability, and constant connectivity, information archiving and coordinating affordances)	Califf, 2022; Fox & Moreland, 2015; Islam et al., 2021; Salo et al., 2022

TABLE 5 Cognitive antecedents in technostress research

Cognitive antecedents	Example references
Gratifications (e.g., cognitive, social, personal, and affective benefits)	Ardèvol-Abreu et al., 2023; Baabdullah et al., 2022
Individual predispositions (e.g., locus of control, need for touch, materialism, (IT) dependency, (IT) self-efficacy, cognitive preoccupation, psychological entitlement, experience, work-home segmentation preference, video conference self-view frequency)	Abramova & Gladkaya, 2024; Banerjee & Gupta, 2024; Becker & Lanzl, 2023; Cheng et al., 2023; Harris et al., 2022; Lee et al., 2016c; Liu et al., 2019; Qi, 2019; Sharma & Gupta, 2023; Shu et al., 2011; Tams et al., 2018b; Truta et al., 2023; Ulfert at al., 2022; Yener et al., 2021; Zheng & Lee, 2016

TABLE 6 Personal(ity) and demographic factors in technostress research

Personal(ity) and demographic factors	Example references
Personality traits (e.g., the big five personality traits or a subset of them, i.e., openness, conscientiousness, extraversion, agreeableness, neuroticism, hierarchical levels of personality traits, i.e., broad traits, stable and dynamic context-specific traits, proactive personality traits)	Hsiao, 2017; Hung et al., 2015; Khedhaouria & Cucchi, 2019; Korzynski et al., 2021; Maier et al., 2019; Pflügner et al., 2021a; Shokouhyar et al., 2018; Sumiyana & Sriwidharmanely, 2020; Tiwari, 2021; Xiao & Mou, 2019; Zhao et al., 2020
Age and gender	Cheng et al., 2023; Baham et al., 2023; Hauk et al., 2019; Hu et al., 2023; Nascimento et al., 2024; Nimrod, 2018, 2022; Maier et al., 2015b; Sasidharan, 2022

Because stress is "a context-specific phenomenon" (Tarafdar et al., 2015, p. 107), I will now shift the focus to technostress within the three IT use contexts studied in this dissertation, thereby grounding the concept in these specific contexts and their nature (Hong et al., 2014; Orlikowski & Iacono, 2001).

2.2.3 Technostress and the IT use contexts of this dissertation

Technostress is a pervasive issue across various personal and leisure IT activities, particularly smartphone use (Cheng et al., 2023; Masood et al., 2021) and social media interactions (Cheikh-Ammar, 2020; Maier et al., 2015b, 2015c; Salo et al., 2019). More recently, technostress has also been discussed in digital gaming, expanding the understanding of its presence in diverse IT environments (Hämäläinen et al., 2023, 2024a; Mehtälä et al., 2023). Studies have also integrated ideas from gaming to examine technostress caused by gamification elements, connecting personal and organizational technostress (Yang & Li, 2021). Focusing on the three central IT use contexts of this dissertation, each presents distinct characteristics that influence both user cognitions, behavior, and the ensuing technostress.

Smartphones, for example, have fundamentally transformed human life through their defining characteristic of portability, allowing continuous and unrestricted access to communication and entertainment services anytime and anywhere (Melumad et al., 2020). As a result, users can remain constantly connected, which has reshaped expectations surrounding IT use. Such advancements have profoundly influenced how people engage with and utilize IT (Lee et al., 2023). Consequently, some have even argued that smartphones are more than simply another IT tool replacing computers; they can be seen as companions that accompany users in their daily lives (Fullwood et al., 2017; Park et al., 2019). This integration of smartphones into daily routines has altered both the technological and social landscapes, creating new possibilities for technostress.

As smartphones have become increasingly popular, the consequences of their use have been approached from varied perspectives, technostress among them. Within such a perspective, smartphone use is often discussed as problematic. More specifically, compulsive (Hsiao et al., 2017; Lee et al., 2014) and excessive use of smartphones (Cao et al., 2018; Luqman et al., 2021) has been described as contributing to increased technostress. For example, mobile shopping on smartphones has been shown to contribute to information overload, which can ultimately lead to user frustration and the discontinuation of use (Chen et al., 2019). Interestingly, while the technological failures of smartphones are often associated with negative technostress, these challenges can also lead to positive technostress when users are able to successfully overcome them (Salo et al., 2018). However, these positive experiences require users to be technologically savvy and motivated to solve problems.

Social media is among the most widely used IT worldwide, impacting people across countries and age groups. Regarding the massive changes in the socio-technical landscape created by social media, the co-founder of Twitter aptly

noted, "[Twitter is] really the messaging service we didn't know we needed until we had it" (Sundar & Limperos, 2013, p. 504). While it has been difficult to unambiguously define social media (Kane et al., 2014) and there have been numerous definitions throughout the years (Aichner et al., 2021), social media platforms, which can be defined as interactive IT services that facilitate the sharing, co-creation, and discussion of user-generated content (Kietzmann et al., 2011; Vaast et al., 2017), create highly participatory and dynamic online environments. Furthermore, social media often consist of endless feeds of highly personalized content, which have significant potential to attract and retain users. Thus, such services provide users with content that is aligned with their interests while simultaneously offering novel content, as the feeds continuously and dynamically update. The personalized nature of social media use, in which continuously updating content that is aligned with user preferences is browsed, plays a central role in sustaining user engagement, which can also affect how technostress emerges (Hämäläinen et al., 2024b).

Other specific features of social media, such as push notifications, multipurpose functionality, real-time information renewability, self-disclosure capabilities, and a paucity of information cues, significantly contribute to technostress (Salo et al., 2019). The curated nature of social media content, in which users often present idealized versions of their lives, amplifies the likelihood of social comparison (Salo et al., 2019). The seminal works by Maier et al. (2015a, 2015b) have highlighted how various aspects of social media, its use, and key social media stressors contribute to exhaustion, ultimately leading to discontinued use. In more extreme cases, social media technostress has even been linked to addiction (Brooks et al., 2017; Tarafdar et al., 2020). Moreover, using social media for personal purposes during work can negatively affect productivity (Brooks & Califf, 2017).

While social media is predominantly viewed as a personal IT use context, many organizations utilize enterprise social media, with similar technostressors, such as information and social overload, being highlighted (Chen & Wei, 2019). In their study, Chen and Wei (2019) suggest that a paradox involving the positive and negative impacts of using enterprise social media exists, which is affected by not only the characteristics of the IT (communication visibility) but by the purposes for which it is used (work use or social use). The paradoxical effects of technostress in social media use have also been highlighted in the personal context, in which social media can both increase and decrease technostress (Cheikh-Ammar, 2020). While the dominant view is that social media contributes to negative technostress, some have pointed out that positive technostress can emerge, for example, through benign (i.e., positive) envy (Zielonka & Rothlauf, 2022). Interestingly, some social media platforms, such as Snapchat, employ gamification to increase user engagement (Hristova et al., 2022). This demonstrates how social media and digital gaming, though distinct, share characteristics that influence technostress.

Digital gaming provides a further context in which technostress is shaped by social interaction, in addition to competition and collaboration between

players. While games have been characterized in various ways over time, in simplistic terms, games can be seen as systems in which players engage in artificial conflict that is governed by rules, leading to quantifiable outcomes (Salen & Zimmerman, 2004). Integrating multiple approaches, digital games have been referred to as systems that consist of players, their experiences, and various artifacts (Ralph & Monu, 2015). As many modern games are now continuously evolving services, they are becoming more than simply entertainment systems; they are complex artifacts that warrant further study.

Despite their popularity, digital games remain underrepresented in IS research. For example, there was a call for more research on esports (i.e., competitive digital gaming) due to their relevance to core IS concepts, such as organizations, people, and technology (Ke et al., 2022). While competition is not emphasized in the definition of digital games, it undeniably plays a key role in many games and could significantly enhance player motivation (Sepehr & Head, 2018). Interestingly, much of the existing IS research on digital games has focused on motivation (Meng et al., 2021). Furthermore, considerable attention has been paid to gamification (Koivisto & Hamari, 2019; Riar et al., 2022), which can foster "meaningful engagement" (Liu et al., 2017). Although gamification and digital games overlap, gamification typically involves an extrinsic goal, even though it can evoke intrinsic, game-like experiences. This approach highlights the importance of studying digital games as significant IT artifacts and bridges a gap by connecting their practical use with theoretical insights in IS.

Regarding digital gaming, technostress can stem from mismatches between players' skills and the game requirements, which highlights the complex interplay between game features and user capabilities (Hämäläinen et al., 2023, 2024a; Mehtälä et al., 2023). Furthermore, in gamified environments, elements such as competition and interactivity can introduce stressors such as privacy invasion and social overload, which may lead to strains such as exhaustion (Yang & Li, 2021). Various aspects of digital gameplay, such as player-versus-player and player-versus-environment competition, have been reported to contribute to positive technostress (Hämäläinen et al., 2023; 2024a).

Thus, each of the studied IT use contexts has its own unique characteristics, while also being somewhat interconnected. Specifically, (1) smartphones offer a context in which IT is constantly present, (2) social media allow for the exploration of highly social dimensions of IT use, and (3) digital gaming provides a context in which IT-mediated interaction, collaboration, and competition are present.

To summarize the foundations of technostress, while significant progress has been made in understanding technostress across contexts, further investigation is needed on the underlying factors for IT use that lead to technostress, as well as on the potentially positive aspects of technostress. A comprehensive understanding of these factors is crucial in mitigating the adverse impacts of technostress on individual well-being, as well as organizations' efficiency. Furthermore, while recognizing the importance of understanding how technostress emerges through various antecedents, such as technostressors, and

its consequences, including strains and other outcomes across IT use contexts, it is equally essential to explore how individuals cope with these demands. Therefore, I will now turn to a discussion of coping.

2.3 Coping

Everyone possesses unique resources to use in handling situations; for example, some people are more adept at managing stress than others (Lazarus, 1990). When an individual's resources are depleted, stress management strategies are employed to re-establish the balance between the individual's abilities and the environment. The concept of coping, which is defined as dynamic cognitive and behavioral efforts to manage taxing demands (Folkman & Moskowitz, 2004), plays a crucial role in the transactional stress process (Lazarus & Folkman, 1984). When individuals face stressful events or stimuli, they engage in a process of appraisal to evaluate the situation. Primary appraisal involves assessing the potential threat posed by the event, while secondary appraisal focuses on evaluating one's resources and capacity to manage or cope with the situation. Although the terms may suggest a linear sequence, this is not the case, and these appraisals are highly dependent on one another, with individuals continuously reassessing both the nature of the threat and their coping abilities (Lazarus, 1999). Coping strategies, therefore, emerge from this dynamic interplay between the perceived threats and challenges and the resources available to cope with them (Folkman & Moskowitz, 2004).

However, coping does not guarantee an immediate resolution of a stressful situation. Instead, coping often involves ongoing adjustments, in which new strategies are employed as appraisals shift in response to evolving circumstances. This underscores the continuous and context-dependent nature of coping, with each iteration of appraisal guiding further coping efforts (Lazarus, 1993). Moreover, individuals may engage in various coping strategies, such as mental disengagement, to manage stress, which interferes with goal attainment (Carver et al., 1989). In this context, coping can be understood as a form of goal shielding, in which individuals employ strategies to protect their pursuit of specific objectives (Bélanger et al., 2013; Shah et al., 2002).

Traditionally, coping research has centered on two broad types of coping strategies: problem-focused coping, which seeks to manage or alter the source of distress, and emotion-focused coping, which is aimed at regulating emotional responses to a problem (Lazarus & Folkman, 1984). While these categories have been widely used, they have also faced criticism. For example, Skinner et al. (2003, p. 227) argue that the categories "are not conceptually clear, mutually exclusive, or exhaustive". Recognizing these limitations, I avoid relying solely on these categories to define coping strategies in my own work. Coping, after all, is a highly dynamic process, and an alternative approach is to consider it from a temporal perspective, in which stages and strategies emerge over time.

Within this view, coping unfolds across various dimensions, such as reactive coping, anticipatory coping, proactive coping, and preventive coping (Reuter & Schwarzer, 2012). For example, proactive coping involves continuous efforts to gather resources in preparation for potential stressors (Aspinwall & Taylor, 1997), whereas anticipatory coping focuses on addressing known risks before they materialize (Reuter & Schwarzer, 2012). Moreover, it is crucial to acknowledge that coping strategies can vary in their effectiveness. Not all coping strategies yield positive outcomes; some may be adaptive and functional, while others may be maladaptive and dysfunctional (Brown et al., 2005; Gaudioso et al., 2017). In other words, coping strategies can be seen as "good" or "bad" depending on their ability to alleviate stress and support well-being. With this understanding of coping, I now turn to its application in the context of technostress.

2.3.1 Coping and technostress

A growing body of research has leveraged the concept of coping to better understand users' interactions with IT. For example, Beaudry and Pinsonneault (2005) illustrate how users apply coping strategies, which are informed by their primary and secondary appraisals, to navigate IT-related challenges and incidents associated with user adaptation. Building on this, Salo et al. (2020) explain how IT users' coping strategies are not static and can interact and evolve incrementally. They highlight the fact that users may initially respond to a negative IT incident by expressing frustration, either online or offline, before attempting to resolve the issue. Ultimately, they may switch to another IT (Salo et al., 2020). This emphasizes that coping strategies are not isolated, one-time responses but, rather, part of a dynamic, interconnected process, in which one strategy may influence or give rise to another, as highlighted in seminal works on stress (Lazarus, 1999).

In organizational settings, in which IT use may be mandatory, coping becomes even more nuanced. Here, individuals employ coping strategies to manage the pressures arising from these imposed conditions. Users' responses depend largely on how they appraise the situation: whether they see it as an opportunity or a threat and whether they perceive themselves as having a high or low level of control over the situation (Bhattacherjee et al., 2018). Interestingly, similar appraisal processes occur even when IT use is less constrained or mandated (Beaudry & Pinsonneault, 2010). This highlights the fact that IT incidents are rarely viewed in purely negative or positive terms; they can simultaneously represent both opportunities and threats, leading to complex, mixed coping responses (Stein et al., 2015). Here, it is important to note that awareness of a given situation (e.g., information security awareness) affects individuals' coping efficacy (Jaeger & Eckhardt, 2021). Moreover, while organizations themselves may not typically be seen as agents of coping, they do play a role in supporting employees' coping efforts. In doing so, they help facilitate both humanistic goals, such as improving well-being and job

satisfaction, and instrumental goals, such as enhancing productivity and profitability (Chatterjee et al., 2021; Sarker et al., 2019).

In coping with technostress, individuals rely on both internal and external resources (Tarafdar et al., 2019). Internal coping strategies often include maintaining control over IT use, positively reinterpreting IT experiences, and distancing oneself from stressful IT environments (Pirkkalainen et al., 2019). Being optimistic about IT (Christ-Brendemühl & Schaarschmidt, 2020), practicing mindfulness (Pflügner et al., 2021), and engaging in online or offline distraction (Tarafdar, 2020) are also significant internal strategies. Moreover, individuals may handle disturbances and preserve their well-being by managing their emotional responses and adopting self-preservation tactics (Chen et al., 2019), such as consciously limiting IT use or containing negative emotions (Schmidt et al., 2021). Drawing on the widely recognized categories of problem-focused and emotion-focused coping, technostress research demonstrates that individuals often seek instrumental support (problem-focused) or engage in psychological distancing or venting (emotion-focused) to manage the impact of technostress on productivity (Zhao et al., 2020). Additionally, from a temporal perspective, coping strategies regarding technostress may be either proactive, such as a positive reinterpretation of IT, or reactive, as in the case of distancing oneself from stressful IT environments (Pirkkalainen et al., 2019). Mindfulness has also emerged as an important coping mechanism, providing individuals with the mental clarity needed to manage technostress effectively (Ioannou et al., 2022; Pflügner et al., 2021b). While some technostress coping strategies are functional, such as seeking support, others may be dysfunctional, such as denial (Lin et al., 2021).

In non-work settings, coping has been examined from various perspectives across different contexts. Generally, coping strategies in personal environments can involve tolerating stressful situations, recovering from strain, or addressing the underlying causes of stress (Salo et al., 2017). Additional approaches include distraction as a coping strategy (Tarafdar et al., 2020) or completely avoiding IT when it becomes overwhelming (Maier et al., 2015c). On a more specific context, individuals may use behavioral and cognitive strategies to navigate situations where IT threatens their sense of identity (Nach & Lejeune, 2010). For instance, Schmidt et al. (2021) demonstrate how adolescents consciously choose coping strategies, for instance, by limiting themselves to one device or deleting social media accounts, reflecting behavior and technology adaptation, respectively. Although Salo et al. (2022) do not explicitly address the issue from a coping perspective, their categories of technostress mitigating strategies (modifying IT use, switching to alternative IT, taking a temporary break, or quitting use permanently) underscore the role of self-regulation in the process, resonating with the concepts related to problem-focused coping. Additionally, the sometimes paradoxical nature of technostress is evident when users attempt to alleviate stress by increasing their reliance on technology (Cheikh-Ammar, 2020), which may, in turn, contribute to further issues, such as addiction (Tarafdar et al., 2020), highlighting the complex interplay between IT use, technostress, and

coping. In these cases, users may apply a variety of coping strategies, not only to mitigate technostress but also to harness IT as a resource for emotional support and stress relief.

Moreover, service providers also play a critical role in shaping how users can cope with technostress. System features such as anonymity (Xiao & Mou, 2019) and audience management capabilities (Zhang et al., 2021) have been shown to reduce technostress in social media use. Similarly, anthropomorphic design elements can help alleviate the intrusive nature of smart home assistants, underscoring the importance of both service providers and users in addressing technostress as a shared social issue (Benlian et al., 2020). This sets the stage for a discussion of social coping, which is explored in the next section.

2.3.2 Social coping

Despite extensive research on coping, its social manifestations have often been overlooked, aside from discussions of social support. Thus, coping is frequently discussed as an individualistic process, neglecting its social and collective aspects (Folkman & Moskowitz, 2004; Skinner et al., 2004). Here, "social coping" refers to one's cognitive and behavioral coping efforts that are shaped through interpersonal dynamics. For instance, Berg et al. (1998) highlight that coping efforts can be embedded within social contexts and often involve engaging with others in ways that extend beyond simple support, yet such approaches have received limited attention. Given the prominence of social support in the literature on social coping, I will begin by addressing this aspect.

Social support refers to the coping resources available within an individual's social network (Lazarus & Folkman, 1984) and it is widely recognized as a key component of social coping. It involves seeking either practical or emotional assistance from others, typically categorized into two forms: instrumental support, focusing on concrete help, and emotional support, focusing on empathy and understanding (Carver et al., 1989; Lazarus & Folkman, 1984). In addition to broader coping literature, social coping has been applied in studies focusing on IT use (e.g., Love & Irani, 2007; Hauk et al., 2019). For instance, research suggests that using social media to seek social support during stressful events may influence coping effectiveness (Chen & Lemmer, 2024). Moreover, with technostress, social support has been explored in both professional environments (Lanzl, 2023; Weinert et al., 2020) and personal settings (Lo, 2019). As in broader coping literature, social support for managing technostress can be categorized into instrumental and emotional types. For instance, strategies such as fostering a sense of community or receiving support from family and colleagues can be viewed as forms of social coping with technostress (Lanzl, 2023). A more specific example is seen in occupational online communities, which can offer crucial support, helping employees cope with the moral taint that arise in their digital work environments (Vaast & Levina, 2015). Moreover, in educational settings, teachers' sociability could help in alleviating emotional exhaustion students experience due to technostress (here, through

techno-overload and techno-complexity) caused by online classes (Stoeckl & Eckhardt, 2023).

While much of the research on coping from a social perspective focuses on social support, other strategies have also been identified. For example, employees can manage stress by setting boundaries around their availability and responsiveness, clearly communicating their preferences to colleagues (Mattern & Klein, 2022). In the workplace, teams can also mitigate technostress by promoting opportunities for "off-screen" communication (Reis et al., 2024). In social media use, research has demonstrated how peer behavior influences users' motivation to decrease their usage to deal with negative consequences (Osatuyi & Turel, 2020). Also, social media users may cope with feelings of social exclusion by expressing affection, for example, using the "like" function (Reich et al., 2023). When it comes to smartphone use during face-to-face interactions, both direct approaches (e.g., asking someone to stop using their phone) and avoidant strategies (e.g., turning to one's own phone) have been explored, highlighting the intersection of online and offline interactions (Stevic & Matthes, 2023). This online-offline dynamic also influences support-seeking behavior, where online support provides immediate and diverse assistance, while offline support tends to be more personal and tangible (Gentina & Chen, 2019; van Ingen & Wright, 2016). During the COVID-19 pandemic, many turned to social media to cope with stress and loneliness, underscoring IT's dual role as both a source of stress and a tool for coping, also within the social dynamics (Cauberghe et al., 2021; Mäntymäki et al., 2022).

The social dimensions of coping extend to both communal and collective coping processes. Communal coping involves shared efforts to manage stress, where individuals come together to support each other (Lyons et al., 1998). In contrast, collective coping refers to strategies employed by groups (Kuo, 2013). Individuals who engage in these forms of coping acknowledge that stress is not solely an individual experience but can also affect and be addressed by groups. In sum, understanding social coping as a broader phenomenon is important because stress is widely recognized as a social issue, many IT platforms inherently foster social interactions, and researchers have specifically called for more research on the social and interpersonal aspects of coping with technostress (Tarafdar et al., 2019).

To conclude, technostress and coping with it are complex issues that involve numerous underlying factors and consequences. A key element of both the emergence of technostress and coping with it is IT use, which plays a central role in these processes. Therefore, the following section will discuss various broader drivers and outcomes of IT use to support our analysis and explanation of its role in the emergence of technostress and coping with it.

2.4 Linking technostress to broader drivers and outcomes of IT use

Although the primary focus of this dissertation is on technostress and coping, it is necessary to outline various aspects of IT use, including its broader drivers and outcomes, to fully understand the phenomena. Therefore, it is crucial to consider the role of IT use within the broader context of IS research. Historically, the field of IS has concentrated on managerial and organizational perspectives, with research being primarily rooted in these contexts. Thus, to appreciate the evolution of IT use research, it is important to recognize that traditional theories and models have predominantly addressed work-related IT use.

Building on foundational theories, such as the technology acceptance model (Davis, 1989), the theory of reasoned action (Fishbein & Ajzen, 1975), and social cognitive theory (Bandura, 1986; Compeau & Higgins, 1995), Venkatesh et al. (2003) introduced the unified theory of the acceptance and use of technology (UTAUT). This theory identifies four key drivers of IT use intention and actual IT use: performance expectancy, effort expectancy, social influence, and facilitating conditions (Venkatesh et al., 2003). While extant seminal works on technostress do not often draw from the traditional IT use literature directly, some studies have pointed how technostress can negatively impact things such as perceived usefulness and IT adoption (Verkijika, 2019).

Over the years, IT use research has primarily focused on user behavior. However, understanding broader elements in the process, such as emotion and cognition, has increasingly emerged more focal (Burton-Jones et al., 2020). Aligning with this shift, this dissertation not only addresses the behaviors associated with IT use but also the broader drivers and outcomes influencing these behaviors. A central element of our research is the dynamic nature of IT use (Burton-Jones et al., 2020). This involves addressing the various factors surrounding IT use, such as the characteristics of the IT, the nature of its use, the underlying motivations driving the use, and related issues.

While IT originally emerged as a tool to increase productivity in organizational contexts, its use has notably expanded into voluntary, personal, and leisure activities. Although the focus on work-related IT use remains significant, there has been a growing interest in the study of "hedonic IS" (Van der Heijden, 2004), particularly in relation to social media use (Vaghefi et al., 2023). While not all leisure IT use is hedonistic, hedonism plays a substantial role in this domain. Recognizing this shift, recent research has focused on context-specific approaches that address the unique characteristics of voluntary IT use in leisure and personal contexts. Such use is typically pleasurable and associated with emotional satisfaction, in contrast to the practical or instrumental focus of traditional IT use. Thus, some traditional theories and models have been adapted to better fit these leisure contexts. For example, Venkatesh et al. (2012) extended UTAUT to create UTAUT2, which specifically addresses consumer IT use, rather than organizational IT use. This extension introduces three additional drivers

(hedonic motivation, price value, and habit) to explain consumer IT use more effectively (Venkatesh et al., 2012).

Furthermore, IS research has begun to focus also on specific types of personal IT use, such as digital gaming (e.g., Rapp, 2023). However, IS studies in this area are still in their early stages, making it crucial to study various phenomena surrounding such IT use contexts. Investigating digital gaming, for example, can offer valuable insights into interactions within IS contexts that extend beyond gaming itself (Rapp, 2023). While this dissertation focuses on leisure perspectives on IT use, the line between leisure and non-leisure is exceedingly blurred due to game elements, which is often associated with leisure perspectives, being implemented in various non-leisure contexts, such as work life (Bizzi, 2023) and education (Huber et al., 2023). Regardless of the context, my research objectives necessitate that we understand the users' cognitions and behavior underlying their IT use. To address these topics, I draw on insights from fields where they have long been a focus, such as communication studies and psychology. To begin, I explore how and why users engage with IT, applying uses and gratifications theory, as discussed in the following section.

2.4.1 IT uses, gratifications sought, and gratifications obtained

The uses and gratifications theory offers a framework within which to explore user cognitions and behavior, particularly the reasons and ways of using IT. The theory suggests that users have specific needs they seek to fulfill and, as a result, make active choices to achieve gratification (Katz et al., 1974). While the uses and gratifications theory is not a traditional IS theory but, rather, originates from the field of mass communication from over 60 years ago (Ruggiero, 2000), its usefulness in addressing topics relevant to the field of IS have been demonstrated in numerous studies throughout the years (e.g., Chiu & Huang, 2015; Krasnova et al., 2019; Li et al., 2017; Xu et al., 2019). The choice of the uses and gratifications theory as a lens was motivated by its flexibility, as it does not rely on fixed variables (Lin, 1996; Mäntymäki & Riemer, 2014). Furthermore, the theory was chosen due to it having been established as a central framework for understanding the hedonic, utilitarian, and social aspects of IT use (Chiu & Huang, 2015; Huang et al., 2014; Krasnova et al., 2017), all of which are of interest to the dissertation's objectives.

While some studies have emphasized the significance of both gratifications sought and obtained, this approach has received relatively limited attention (Bae, 2018; Palmgreen & Rayburn, 1979). Here, gratifications sought represent the anticipated satisfaction or benefits individuals aim to achieve through their active behavior (here: IT use), whereas gratifications obtained refer to the actual outcomes or fulfilled aspirations that result from engaging in that behavior (Li et al., 2017; Palmgreen & Rayburn, 1979; Quan-Haase & Young, 2010). When the gratifications sought align with those obtained, individuals are more likely to continue engaging with the source (Krasnova et al., 2017; Rokito et al., 2019). However, if there is a mismatch between the two, dissatisfaction may arise, leading to decreased use (Bae, 2018).

Beyond the distinction between gratifications sought and obtained, gratifications can also be classified according to what individuals specifically seek and gain from media and IT use. One common framework divides gratifications into three categories: hedonic (related to enjoyment or pleasure), utilitarian (focused on practical utility), and social (centered on social interaction) (e.g., Li et al., 2015; Mäntymäki & Riemer, 2014). To give an example for smartphone use, prior research has demonstrated that it is linked to entertainment (hedonic; Ha et al., 2015), communication (social; Gentina & Rowe, 2020), and information-seeking (utilitarian; Joo & Sang, 2013) gratifications. Thus, the theory has been applied to many different types of media and IT, including the internet (LaRose & Eastin, 2004; Stafford et al., 2004), smartphones (Gentina & Rowe, 2020; Joo & Sang, 2013), social media (Bae, 2018; Chiu & Huang, 2015; Ku et al., 2013), and digital gaming (Huang et al., 2024). Additionally, some studies have explored uses and gratifications in relation to technostress (Baabdullah et al., 2022; Sun et al., 2020), with a focus primarily on the gratifications sought but not on those obtained.

As the name of the theory suggests, both use and gratifications are of interest. While use can be discussed based on specific gratifications such as information-seeking and entertainment (van Deursen & van Dijk, 2014), more traditionally, use has been categorized as either instrumental (i.e., more goal-oriented use) or ritualistic (i.e., more habitual use) (Rubin, 1984). The concept of use has also been explored through context-specific perspectives, such as work-related, political, or non-work uses, highlighting how these types can serve as antecedents to technostress (Ardèvol-Abreu et al., 2023).

To better understand use within the framework of uses and gratifications theory, I conceptualize use through its various dimensions. For instance, in smartphone use, dimensions of use can reflect process and social dimensions (Elhai et al., 2017). Furthermore, Bonds-Raacke and Raacke, (2010), outline dimensions such as information dimension (e.g., learning about events), friendship dimension (e.g., maintaining contact with friends), and connection dimension. Beyond uses and gratifications theory, use can be described in terms of amount (how much users engage in), variety (how many different activities they engage in), and types (the specific activities they engage in) (Blank & Groselj, 2014). Similarly, the term "usage characteristics" has been employed to refer to aspects such as usage experience (Kim et al., 2016), as well as social media usage (Maier et al., 2015b).

I view uses and gratifications as distinct yet interconnected concepts and argue that existing typologies, such as types of use (van Deursen & van Dijk, 2014) and dimensions of use focused on specific activities (Bonds-Raacke & Raacke, 2010), are insufficient for the dissertation's purposes. Instead, I approach the concept of use at a higher level of abstraction, asking: What is the underlying nature of the use? As such, for instance, constant use has been mentioned in extant research (Duke & Montag, 2017; Gerlach & Cenfetelli, 2020; Salo et al., 2022). Constant, however, is an ambiguous word, as it could reflect either repeated or continuous dimensions. Thus, a comprehensive categorization of

such dimensions appears to be lacking. Although the uses and gratifications theory explains how IT users actively choose to engage with different services, use can also be more uncontrollable. To further investigate such a perspective, I turn to the concept of craving.

2.4.2 Craving as a driver of IT use

While some researchers (e.g., Kozlowski & Wilkinson, 1987) limit the concept of craving to instances involving extreme desire, others contend that craving can arise independently of addiction (Kavanagh et al., 2005; Franken, 2003). Thus, the experience of craving does not automatically indicate addiction. This differentiation is especially crucial in comprehending problematic IT use more broadly, as craving can be viewed as a natural reaction to specific stimuli, rather than a necessarily pathological condition (Franken, 2003; Kavanagh et al., 2005). Recognizing this distinction enhances our understanding of how technostress emerges and persists associated with uncontrollable behavior, providing a refined perspective on the role of craving in this dynamic.

Craving can be understood from two distinct viewpoints: it may either be an attempt to avoid withdrawal symptoms or center on the expected rewards associated with the desired object (Tiffany & Conklin, 2000). Typically, craving is linked to a strong urge to engage in specific behaviors (Sayette et al., 2000). Historically, much of the research and discussion surrounding craving has been rooted in addiction studies, particularly concerning substances such as alcohol (e.g., Addolorato et al., 2005) and drugs (e.g., Robinson & Berridge, 1993). Over time, the scope of the concept has broadened to encompass other areas, such as social media (Savci & Griffiths, 2021), Internet (Niu et al., 2016), and smartphone use (De-Sola et al., 2017). Savci and Griffiths (2021), in their literature review, emphasize that while craving has traditionally been studied in the context of substance addictions, it is increasingly relevant for understanding IT-related behaviors.

Moreover, craving has been associated with problematic IT use. For instance, Busch and McCarthy (2021, p. 3) describe problematic smartphone use as a "recurrent craving to use a smartphone in a way that is difficult to control and leads to impaired daily functioning." Problematic smartphone use often co-occurs with psychological issues, including stress (Busch & McCarthy, 2021), resonating with the core concept of the dissertation. More specifically, craving is closely linked to the concepts of compulsive and excessive IT use, which are often discussed alongside technostress. In brief, compulsive use refers to the inability to control use, while excessive use involves overuse beyond normal limits. Both types of problematic IT use pose distinct issues and have the potential for negative consequences. Compulsive and excessive behaviors have been observed with various technologies, such as the internet (e.g., Van den Eijnden et al., 2008; Weinstein & Lejoyeux, 2010), smartphones (e.g., Wang & Lee, 2020; Wolniewicz et al., 2018), and social media (e.g., Cao & Yu, 2019; Dhir et al., 2018). While there are overlaps between compulsive and excessive use and they have been used

interchangeably (Widyanto & Griffiths, 2006), important distinctions between the two exist.

O'Guinn and Faber (1989, p. 148) define compulsion as a

> response to an uncontrollable drive or desire to obtain, use, or experience a feeling, substance, or activity that leads an individual to repetitively engage in a behavior that will ultimately cause harm to the individual and/or others (O'Guinn & Faber, 1989, p. 148).

Compulsive use, therefore, is marked by an uncontrollable urge and is driven by these internal impulses (Caplan, 2010), making it closely related to craving. Excessive use, on the other hand, focuses more on the amount of use and can be defined as behavior that exceeds what the user perceives as normal (Luqman et al., 2017). This perception leads individuals to believe their use surpasses what they consider normal or exceeds the use of others. In the context of smartphones, excessive use has been associated with negative consequences such as interpersonal conflicts and reduced academic performance (Cao et al., 2018; Zheng & Lee, 2016). Given that IT use can result in both positive and negative outcomes, often reflected in conflicting cognitions and behaviors, it frequently appears ambivalent or even paradoxical, as I will explore in the next section.

2.4.3 Paradoxes as triggers for ambivalent outcomes in IT use

Ambivalence has been conceptualized in various ways and from multiple perspectives over time, but it generally refers to the coexistence of both positive and negative assessments of an object or a situation (Conner & Sparks, 2002). For example, ambivalence may encompass conflicting positive and negative thoughts or emotions directed at people, goals, tasks, or technology (Ashforth et al., 2014). Ambivalence is defined by the presence of opposing emotions and cognitions, often creating a complex and uncomfortable state (Rothman et al., 2017; Van Harreveld et al., 2009).

Although ambivalence does not directly dictate behavior, it can influence specific actions or provoke behavioral responses. This complexity has been explored in relation to various types of IT, including social media (Turel & Qahri-Saremi, 2022) and digital gaming (Snodgrass et al., 2016). For instance, research has shown that social media users may experience both positive experiences of interaction and unfavorable social comparisons simultaneously (Krasnova et al., 2015). Associated with gaming, ambivalence can emerge due to conflicts and tensions associated with frustration and satisfaction (Kosa & Uysal, 2022). While not often discussed explicitly together, technostress can be viewed ambivalently when it is simultaneously positive and negative, thus resonating with work on techno-eustress and techno-distress (Fu et al., 2023). To further understand how ambivalences emerge, I turn to work on paradoxes, which can act as triggers for ambivalence (Ashforth et al., 2014).

The concept of paradox has been examined across a variety of contexts, from everyday experiences to deeper theoretical discussions. In simple terms, paradox refers to "a situation, act, or behavior that seems to have contradictory

or inconsistent qualities" (Jarvenpaa & Lang, 2005, p. 7). In their seminal work, Smith and Lewis (2011, p. 387) define paradoxes as "contradictory yet interrelated elements (dualities) that exist simultaneously and persist over time; such elements seem logical when considered in isolation, but irrational, inconsistent, and absurd when juxtaposed." An everyday example is the paradox of choice, where having more options can actually make decision-making less satisfying (Schwartz, 2004). Thus, when elements involve conflicting demands, opposing viewpoints, or seemingly illogical patterns within organizational or technological environments, they can be understood as paradoxes (Lewis & Smith, 2014). Paradoxes often represent complex, evolving situations shaped by interactions between actors and events. For example, digital transformation frequently introduces paradoxes between efficiency and innovation, control and flexibility, or stability and change (Farjoun, 2010; Smith & Lewis, 2011). In relation to the core concept of this dissertation, technostress has been studied from a paradox perspective; social media use and digital gaming, for instance, can alleviate and exacerbate technostress simultaneously (Cheikh-Ammar, 2020; Hämäläinen et al., 2024a).

Both ambivalences and paradoxes have been widely examined in organizational research (e.g., Ashforth et al., 2014; Schad et al., 2016) and in areas like personal social media use (e.g., Qahri-Saremi & Turel, 2020). While they are related, there are key distinctions between them: paradoxes are generally viewed as external conditions, whereas ambivalence refers to the internal cognitive or emotional conflicts experienced by individuals or groups (Ashforth et al., 2014). Interestingly, prior studies indicate that both ambivalences (Van Harreveld et al., 2009) and paradoxes (Lewis, 2000) can lead to negative outcomes. For example, individuals often seek to avoid ambivalence because it signifies inconsistency (Schneider & Schwarz, 2017), and ambivalence can influence IT adoption or rejection, with user behavior frequently shaped by social norms (Chen et al., 2023) or the impact of others' opinions and actions on one's own IT use (Maity et al., 2019). Paradoxes, such as those created by IT-enabled real-time communication, where IT improves responsiveness but reduces autonomy by pressuring users to stay constantly available, can provoke emotional ambivalence, such as simultaneous feelings of pride and anxiety (Sui et al., 2024), underscoring the dual-natured aspect of this concept.

2.5 Summary of the theoretical foundation and related work

This dissertation examines voluntary IT use for leisure and personal purposes across three contexts: smartphones, social media, and digital games. Smartphone and social media use are particularly interconnected, as social media constitutes a significant portion of overall smartphone activity, both in general and among the study participants. However, smartphones as devices and social media as services possess distinct characteristics that justify separate consideration. Although technostress has been studied a great deal over the past fifteen years,

with various theories and models explaining its emergence and associated coping strategies, there remains a need for the further investigation of the dynamics of this process.

In summary, our review identifies gaps regarding

1. both the onset and end of the technostress process,
2. the understanding of technostressors across diverse use contexts,
3. their associated negative and positive outcomes at various levels of abstraction,
4. coping with hindrances technostress poses to individuals' goals (i.e., coping as a form of goal shielding),
5. the social conditions that shape technostress and the coping process, and
6. broader ambivalent outcomes that are triggered by various paradoxical aspects of IT and its use.

Addressing the identified gaps, this dissertation contributes to a more comprehensive understanding of how individuals navigate and cope with technostress in contemporary digital environments. Specifically, I address the underlying factors of user cognitions and behavior in relation to technostress, the situation-specific and experience-centric creators and consequences of technostress, as well as social coping with technostress. Furthermore, the phenomenon of techno-eustress in voluntary IT use settings intended for leisure and personal purposes, and the ambivalent outcomes of IT use triggered by perceived design paradoxes are addressed. Accordingly, the definitions of the key concepts used in this dissertation are compiled in Table 7.

TABLE 7 The dissertation's key concepts and their definitions

Concept	Definition
Stress	"relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well being" (Lazarus & Folkman, 1984, p. 19).
Technostress	Individual's experience of stress resulting from IT use (Tarafdar et al., 2007; 2019).
Technostressor	IT-related sources of stress that are perceived as threatening or challenging (Tarafdar et al., 2019; 2024).
Strains or other outcomes (of technostress)	(Negative) psychological, physical, and behavioral reactions to technostressors (Cooper et al., 2001; Lazarus & Folkman, 1984; Tarafdar et al., 2019).
Coping	"constantly changing cognitive and behavioral efforts exerted to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person" (Lazarus & Folkman 1984, p. 141).
Gratifications **sought** and **obtained**	Gratifications **sought** represent the anticipated satisfaction or benefits individuals aim to achieve through their active behavior (here: IT use), whereas gratifications **obtained** refer to the actual outcomes or fulfilled aspirations that result from engaging in that behavior (Li et al., 2017; Palmgreen & Rayburn, 1979; Quan-Haase & Young, 2010).
Craving	"an unstoppable and uncontrollable desire that can lead to use (a drug, a technology), despite its negative and detrimental effects" (De-Sola et al., 2017, p. 2).
Ambivalence	The coexistence of both positive and negative individuals' assessments of an object or situation (Conner & Sparks, 2002).
Paradox	"A situation, act, or behavior that seems to have contradictory or inconsistent qualities" (Jarvenpaa & Lang, 2005, p. 7).

Technostress has traditionally been explained through the characteristics of IT, technostressors, and resulting strains (Ayyagari et al., 2011; Nastjuk et al., 2023; Tarafdar et al., 2019). I seek to fill the gaps in these existing models by incorporating insights derived from the literature on uses and gratifications, as well as craving, to better understand the underlying elements of user cognitions and behavior that shape the technostress process. By focusing on the context of digital gaming, I expand the range of known technostressors, highlighting the critical role of specific IT use scenarios in the emergence of technostress. Additionally, drawing on the literature on human goals, I demonstrate how technostress can manifest as hindrances to goals that may not be directly associated with IT use itself. While coping with technostress has been studied from various perspectives, with social support being identified as a key coping mechanism (Hauk et al., 2019; Weinert et al., 2020), the dissertation further enriches this understanding by integrating diverse social elements into the coping process.

Finally, as also identified in technostress research, the outcomes of using IT can be highly ambivalent, often emerging due to paradoxical design choices. As such, I investigate this in the context of digital gaming, further underlining the manifold issues surrounding individuals' voluntary IT use for leisure and personal purposes. Further details about the theoretical background of the research can be found in the individual articles the dissertation is based on.

Next, I introduce the research methods harnessed to address the problems and gaps highlighted by the review of existing work.

3 RESEARCH AND METHODOLOGICAL APPROACHES

In all the articles included in this dissertation, I employed qualitative research methods. Such an approach was deemed suitable given the emergent nature of the phenomena under study, which benefited from the use of rich, experience-centered data (Monteiro et al., 2022; Schultze & Avital, 2011).

3.1 General research approach

Every research project is grounded in the researcher's underlying assumptions about how the world functions and how it can be viewed. As one of the most influential stress researchers writes, "It is important for scholarly researchers and theoreticians to make their ideological prejudices known at the outset" (Lazarus, 1999, p. 3). My research is based on the fundamental assumption that to fully comprehend stress, we must listen to the stories of those who experience it. This approach acknowledges that meaning is not inherent but co-constructed through the researcher's interpretation of participants' accounts. I posit that understanding is inherently subjective, shaped by the observer's perspective. Given that stress is a deeply personal and subjective phenomenon, such an approach is especially appropriate. Moreover, I argue that phenomena like stress cannot be separated from the context in which they are experienced and observed. Therefore, contextual factors are essential for any meaningful understanding of stress in research.

To position this dissertation within IS research traditions, it is essential to highlight the rise of qualitative research in our field, as Sarker et al. (2013, p. iii) point out in their *MIS Quarterly* editorial: "Indeed, qualitative research is now seen as a legitimate enterprise in much of the IS research community." In attempts to understanding user behavior in IS research, qualitative methods are effective in capturing complex, nuanced interactions with IT. Thus, I leveraged such methods to gain a contextual understanding of how users interact with the

studied IT, in addition to providing explanations for their experiences based on the extant research. This approach is aligned with the view that qualitative research is particularly suited to examining phenomena for which a rich, detailed understanding is essential (Schultze & Avital, 2011). The richness of the data obtained through qualitative interviews provided comprehensive insights into the participants' behavior and experiences. As (techno)stress is a subjective and dynamic process (Lazarus & Folkman, 1984; Tarafdar et al., 2019), this proved especially useful. Also, the strengths of qualitative research have been highlighted, especially in emerging areas of IS, in which the extant research may be limited (Monteiro et al., 2022), further emphasizing the suitability of my approach.

3.2 Data collection

In this dissertation, I employed two complementary data collection methods, semi-structured interviews and manual collection of social media data. This approach allowed for methodological triangulation, enhancing the rigor of the research. However, as the social media data were only used in one article (Article VI), their role was secondary, with the interviews forming the backbone of the work. The semi-structured interviews allowed me to gather in-depth insights directly from participants. In Article VI, the social media data provided broader support for the findings, offering insights that were less subject to researcher influence as compared to the interview data. Table 8 summarizes the datasets, data collection methods, and articles utilizing the datasets.

TABLE 8 Datasets, their collection methods, and the articles utilizing them

Dataset	Data collection method	Articles utilizing the dataset
Dataset A: 30 interviews with smartphone/social media users	Semi-structured interviews (conducted in 2019 and 2021)	Articles I-II, IV-V
Dataset B: 22 interviews with digital gamers	Semi-structured interviews (conducted in 2023 and 2024)	Article III (subset, n=19), Article VI
Dataset C: Social media discussions (30 discussion threads and 5,120 comments in them, totaling 253,491 words)	Manually collected social media data (posts and comments from the years 2022–2024; collected in 2023 and 2024)	Article VI

3.2.1 Semi-structured interviews

The primary method of data collection for this dissertation was semi-structured interviews (Dataset A: n = 30; Dataset B: n = 22). I conducted all the interviews for both datasets, which helped during the following analysis phases. The

interview approach offered me notable advantages, such as the ability to gather rich data, though it also has its drawbacks, including the interview situation being "artificial" (Myers & Newman, 2007). Furthermore, interviews provide deep insights

> by engaging participants directly in a conversation with the researcher in order to generate deeply contextual, nuanced and authentic accounts of participants' outer and inner worlds, that is, their experiences and how they interpret them" (Schultze & Avital, 2011, p. 1).

Recognizing these aspects, it was crucial for interviewees to articulate their experiences and emotions in their own words, while I maintained a neutral stance and allowed the conversation to evolve naturally (Myers & Newman, 2007). Although eliciting rich stories and detailed narratives can be challenging, various strategies can enhance the comfort level of interviewees, thus encouraging openness (Myers, 2019). To foster deeper discussions, I utilized techniques such as mirroring, where I incorporated the participants' own words into follow-up questions (Myers & Newman, 2007). This approach encouraged participants to expand on specific topics, providing valuable and deep insights into their experiences. For instance, if a participant mentioned stress, I would prompt them to describe the experience in more detail. My role involved actively listening and guiding the conversation to deepen understanding, while using empathy and encouragement to create an environment that facilitated open and honest sharing.

The dissertation includes two interview datasets: 30 interviews on smartphone/social media users' experiences and 22 interviews on digital gamers' experiences. After conducting the interviews, I determined that sufficient saturation had been reached, indicating that additional data would not significantly enhance the current level of explanation (Strauss & Corbin, 1998, p. 136). The first dataset was collected in two phases. The initial phase, which was conducted between June and August 2019, involved ten interviews—nine face-to-face interviews and one conducted via video chat. The second phase, which was carried out from February to April 2021, consisted of 20 interviews, all of which were conducted remotely using video or voice chat. The second dataset was collected by conducting 22 remote interviews with digital gamers (via video and voice chat) in 2023–2024.

To identify interviewees for the dissertation, I prescreened potential participants to confirm their experiences of technostress as a prerequisite for inclusion. Thus, participants were sought as "information-rich cases for in-depth study" (Patton, 2002, p. 230), meaning they were selected based on their active IT use and experiences of technostress. Thus, I employed purposeful sampling (Patton, 2002). Further eligibility criteria included being over 18 years old and a native Finnish speaker. Once the initial participants were identified, I utilized a snowball sampling technique to recruit additional interviewees (Patton, 2002). This was the case for both interview datasets.

In both interview datasets, the interviews were structured around pre-developed schemes. However, as is typical of semi-structured interviews,

participants' responses occasionally introduced new perspectives, leading to the exploration of additional questions to gain a deeper understanding of their experiences (Myers & Newman, 2007). Thus, despite following a broad scheme, the flexible nature of semi-structured interviews allowed for exploring unexpected lines of inquiry and incorporating emergent questions based on the interviewees' answers and experiences (Myers, 2019). Additionally, during the interviews, I demonstrated engagement and empathy through facial expressions, such as smiling and nodding, further fostering an environment of trust (Myers & Newman, 2007). This helped minimize social dissonance, making the interaction as comfortable and genuine as possible and encouraging participants to be candid about their experiences (Myers & Newman, 2007). Social dissonance was also reduced due to my deep understanding of various aspects of smartphone use, social media interaction, and digital gaming, which helped, for example, in using and understanding appropriate jargon (Myers & Newman, 2007). Both interview schemes used to guide the data collection are detailed in Appendix 1. They provided the basis for doing the interviews, but all interview situations were unique, and, for instance, the themes and specific questions were discussed in different temporal orders, based on how the interview unfolded.

The first interviews focused especially on general smartphone/social media use (i.e., how and why participants used their smartphones/social media) and the stressful or negative consequences of smartphone/social media use, including participants' coping strategies. The interviews lasted between 34 and 77 minutes, with an average duration of 54 minutes. Among the 30 participants, 19 identified as women and 11 as men. The participants were aged between 22 and 41, with an average age of 27. All participants were either students, employed, or both, with professions including pharmacist, analyst, human resources specialist, firefighter, masseuse, and early childhood educator, among others. The most used applications and services were Instagram and WhatsApp. The participants also reported using other social media platforms, such as Facebook, Snapchat, TikTok, and Reddit. Additionally, many participants accessed various news sources on their smartphones, including tabloid news, local media, and news related to specific interests, such as the economy. The amount of time participants spent on their smartphones ranged from less than an hour to nine hours per day, with an average usage time of approximately five hours.

For the second interview dataset, I investigated participants' neutral, positive, and negative experiences related to playing digital games. Initially, participants were asked to describe the overall emotions evoked by gaming and reflect on the significance of gaming in their lives. Following this, I inquired about various aspects of distress and the negative side of gaming, as well as the coping mechanisms participants employed to manage these issues. Interviewees were also asked about the role of challenge in their gaming, with these questions aimed at understanding the various positive stress responses associated with gaming. The interviews lasted between 35 and 71 minutes, with an average duration of 57 minutes. To gain a comprehensive understanding of potential

technostress experiences in gaming, I did not restrict the sample to specific types of gamers based on playing time or game genre. Participants were recruited from a variety of sources, including email lists, gaming communities, and the author's own networks. The demographic consisted of 13 men and nine women, averaging 27 years of age, mirroring the gender distribution within the gaming community generally. We focused on this age group, as it represents the most active segment of the gaming population. Participants reported an average weekly gaming time of approximately 30 hours, with individual times ranging from 1 to 100 hours. The games most frequently played included first-person shooter (FPS) games (e.g., Counter-Strike), multiplayer online battle arena (MOBA) games (e.g., Dota 2), and massively multiplayer online role-playing games (MMORPGs; e.g., World of Warcraft). Additionally, participants mentioned playing Rocket League ("soccer with cars"), strategy games, card games, vehicular combat games, and gacha games (i.e., games that use the "gacha mechanic", where players spend in-game currency, often bought with real money, to obtain random virtual rewards).

3.2.2 Social media discussions

To complement the interviews, I also gathered data from social media discussions. By using multiple data collection methods, I was able to mitigate the limitations of each and enhance validity and credibility through triangulation in Article VI. Here, triangulation was achieved by collecting data from various individuals and contexts (Miles & Huberman, 1994). Also, social media data allowed for less researcher influence compared to interviews, as noted by Chenail (2011).

Between 2023 and 2024, I collected data from a popular social media platform, which remains unspecified to protect user anonymity. While I deviated from the typical informed consent process, permission was granted by the university's ethics committee, and strategies were implemented to ensure user anonymity. These included not collecting any personal information or the usernames of the discussants and extensively paraphrasing comments used as evidence. When managed appropriately, collecting social media data can be ethical and offer valuable insights (Proferes et al., 2021).

I focused on a discussion group for a popular MOBA game frequently mentioned in the interviews, chosen for its evolving nature and active competitive scene. Initially, I used the platform's search function with keywords like "negative," "positive," "stress," and "fun" to locate relevant posts. The search returned the 250 most relevant posts, which were analyzed preliminarily. However, many were outdated (some over 10 years old), so I manually searched for posts from 2022 to 2024 using a third-party search tool. Based on the preliminary analysis, I refined the keywords to include "frustrating" and "enjoy." I then sorted the results by the number of comments to identify popular discussions, as the interactions between users in the comments was key to the analysis. From each year, I selected the ten most-commented-on posts that reflected the dual nature of gameplay or game design. For deeper analysis, I

chose the five most popular comments and their sub-comments from these posts, resulting in over 5,120 comments for analysis. Altogether, the social media data comprised 253,491 words.

3.3 Data analysis

I employed similar analysis processes for both interview datasets and the social media dataset, which are described in detail in Articles I–VI. Here, I provide a general summary along with specific examples. While the same datasets supported multiple articles, the analysis for each was conducted independently. For example, in Article III, we focused on the role of various digital game elements in technostress, shaping the direction of our analysis. In contrast, when analyzing the same dataset for Article VI, we did not concentrate on specific game elements, leading to a different analytical approach. Similarly, Articles IV and V both examined coping with technostress. However, Article IV emphasized the factors driving participants to engage in coping, while Article V explored the specific strategies they employed, particularly in relation to social dynamics.

In general, the approach adhered to Lune and Berg's (2017, p. 184) established guidelines for qualitative data analysis. The process involved several steps:

Step 1. The collected data were converted into a readable format by transcribing the interviews and then read and re-read.
Step 2. The transcribed data were systematically coded by assigning labels to relevant words, sentences, and paragraphs.
Step 3. The codes were grouped into categories based on similar characteristics.
Step 4. The data underlying the codes were reviewed and analyzed to identify emerging patterns and processes and thus understand the detailed aspects of the identified codes and categories represented, as well as their interconnectedness.
Step 5. The patterns identified were compared with the existing literature to contextualize the findings.

The analysis was enhanced and complemented by incorporating simultaneous coding, which involves assigning multiple codes to complex text portions. This approach is effective when "the richness or complexity of an event or participant's story makes it difficult for a researcher to assign only one major code to the datum" and is useful for exploring relationships between codes (Saldaña, 2013, p. 82). Although I primarily conducted the coding and analysis, the emerging codes and categories, as well as their interconnections, were discussed with the author teams. For example, the codes, categories, and underlying data were collaboratively reviewed to reach a consensus on the emerging patterns for all the analyses. The analyses were primarily conducted using NVivo software, which facilitated systematic coding and data

organization. Additionally, certain phases of the analyses were performed using Microsoft Word and Excel to support various aspects of managing the data.

To illustrate the analysis process with an example from Article I, first, the relevant parts of the interviews were transcribed. Subsequently, I thoroughly reviewed the transcriptions and annotated observations of interest (**Step 1**). This initial review facilitated a deeper understanding of the data. Following this, I systematically coded the transcriptions using NVivo software, assigning descriptive labels to words, sentences, or paragraphs that captured the key phenomena studied. Given the primary focus on technostress, I initially carefully identified and coded all occurrences related to this concept. This process was guided by the approach of "asking the data a specific and consistent set of questions" (Strauss, 1987, p. 30), ensuring that the coding remained focused and aligned with the research objectives. In addition to technostress, the initial coding round also encompassed data related to the participants' smartphone/social media use practices, aligning with the research objectives. (**Step 2**).

To answer the article's research question (How do the dimensions of smartphone use, the associated gratifications, and technostress interplay in voluntary use for leisure and personal purposes?), in Article I, the codes were initially assigned to three groups: the reasons for smartphone use, stressful or negative events and situations encountered due to smartphone use, and stressful or negative consequences stemming from such use. During this phase, it became apparent that understanding not only why but also how participants used their smartphones was crucial in comprehending their cognitions, behaviors, and experiences. Consequently, a fourth category was added: the way participants used their smartphones. Subsequently, I began combining the codes and creating categories based on them (Lune & Berg, 2017; Saldaña, 2013). For example, the codes "too much content to browse" and "overflow of information" were grouped under the category "information overload," which was later renamed "online information overload." In alignment with previous studies, I identified online information overload as a technostressor (other technostressors were identified similarly). Although the approach was primarily data driven, existing research was utilized to enrich the understanding of the observations and ensure the rigor of the analysis (Saldaña, 2013; **Step 3**).

Next, I re-read the entire dataset, ensuring that the created codes and categories accurately reflected the interviewees' statements. This phase involved the constant comparison of the data, codes, and categories, allowing for the reorganization or elimination of codes as necessary to ensure they captured the essence of the participants' responses (Saldaña, 2013). Subsequently, the analysis proceeded with a predominantly inductive approach, which was intended "to discover the crucial patterns that can best explain the data" (Lune & Berg, 2017, p. 194). The goal was to investigate how various concepts are interconnected, particularly how the specific dimensions of smartphone use and gratifications are linked to technostress and *vice versa*. For example, the participants often described seeking entertainment, which led to continuous smartphone browsing and the subsequent neglect of other tasks. Conversely, some reported

experiencing exhaustion due to a constant flow of messages from various services, which was indicative of information overload. By analyzing these patterns, I was able to identify situations where versatile smartphone use, aimed at obtaining social gratifications, contributed to technostress. (**Step 4**). To understand the phenomenon comprehensively, the author team collectively analyzed the relationships between the categories. Based on these observations and discussions, we developed a model explaining the emergence of technostress, interpreting the data by further exploring the meanings embedded in participants' narratives (Patton, 2002). Thus, we utilized the existing literature to contextualize the findings, facilitating their integration with and contribution to current research (Lune & Berg, 2017; **Step 5**). Throughout the analysis, constant comparison was employed to identify similarities and differences between participants' experiences (Glaser & Strauss, 1967). The findings that were reported as central were those corroborated by multiple participants, thus confirming the conclusions through triangulation (Lune & Berg, 2017). This process ensured the robustness of the analysis and the reliability of the conclusions. Table 9 summarizes the example of the analysis process in Article I. Additionally, an example of how we moved from data the broader categories in Article V is presented in Table 10, to provide further details about the data analyses in this dissertation.

TABLE 9 Steps of the data analysis process with an example from Article I

Analysis step	Actions during the step
Step 1 — The collected data were transformed into a readable format by transcribing them, and were then read and re-read	Interviews were transcribed from audio to text form by the dissertation's author and a professional transcription service. Subsequently, the text was read and re-read, and initial notes about relevant phenomena were made (e.g., narratives about how social media use had brought forward stressful experiences).
Step 2 — The data were systematically coded: labels were added to relevant words, sentences, and paragraphs; this was complemented by simultaneous coding	Words, sentences, and paragraphs were given labels that described the text. Examples of codes were as follows: "To see what friends are doing" and "There is always someone better." With simultaneous coding, the same text portion could have multiple codes attached to it.
Step 3 — The codes were categorized: codes with similar characteristics were placed in groups with the help of the existing literature	For example, the code "To see what friends are doing" was categorized as "Social connection," which was identified as a social gratification previously established in the literature. "There is always someone better" was categorized as "Negative life-comparison," which is a stressor previously identified in the literature.
Step 4 — The data were read to understand the factors reflected by the identified codes and categories: the underlying data were scrutinized to identify emerging patterns and processes, which was complemented by constant comparison	Negative life-comparison seemed to be connected to using a smartphone in a personalized manner to socially connect with others (e.g., by browsing social media). The link was established and compared with the data. Triangulation was performed by ensuring that the findings were recurrent in the data.
Step 5 — The identified codes, categories, and their patterns were reflected in terms of the existing literature	By examining the findings related to the various dimensions of use and the gratifications sought and obtained in the context of technostress, we observed that while various explanations of the underlying elements of technostress had been mentioned, this approach had not. Therefore, we integrated our findings with the extant technostress research by highlighting the importance of these underlying elements and proposing an alternative framework for discussing the emergence of technostress through the lens of uses and gratifications.

TABLE 10 Coding and categorization example from Article V

Example of an interview quote	Initial code	Category	Main type
"And then when I removed them [certain social media accounts], **I told everyone** I had ongoing conversations with, for example, in Messenger. **I told them that 'I'm now removing this; can we move to WhatsApp?'** I dealt with that in such a way so that contact with people is maintained."	Informing close ones of use breaks	Communicating social media use modifications	**Negotiation**-focused social coping
"And then there is this comparison of yourself to others on social media. [...] **It's a bit unrealistic.** Many people make such an effort on their posts, **even though it really isn't like that.** Like, you yourself make crazy efforts on your own posts even though it's just one moment**. So, it's not realistic,** but you don't remember it all the time."	Realizing the 'polished' content	Rationalizing social media content realness	**Reflection**-focused social coping
"For example, this week, I was eating with my friends, **and I don't read WhatsApp messages during such situations.** [...] I think it's pretty rude if it takes up too much attention; you should be present in the social situation you're in. [...] If the meeting takes one-and-a-half hours, **I really don't have to read my WhatsApp messages during that.**"	Trying not to use during social situations	Adjusting social media habits during offline interaction	**Modification**-focused social coping

3.4 Ethical considerations

We (i.e., my supervisors and I) meticulously followed the university guidelines for conducting ethical research, which included formulating documents that outline the research notification and the privacy notice of the study, and I provided these documents to the participants prior to the interviews. In the research notification, central aspects and conditions of participation, such as the voluntariness of participating in the research and how the research is carried out, were outlined. In the privacy notice, how the personal information of the participants would be handled and protected was discussed. In essence, we adhered to ethical standards by obtaining informed consent from all interview participants. Prior to and during the interviews, I explicitly informed participants that their personal information and any other identifying details that could compromise their privacy or anonymity would not be disclosed in the published studies.

For the collected social media data, the university ethics board instructed us that a formal ethical review was needed, as we had to deviate from informed

consent. Following the university's instructions, we filled out the formal ethical review application consisting of the research plan, the ethical assessment, the data management plan, the privacy notice, and the research notification, gaining the permission for our research. In the application, we explained that because technostress is a major issue and the findings are expected to benefit society, it would be ethically problematic not to pursue the research. Here, social media provides access to unique and vast data that could not be obtained from other sources, as users in large networks communicate and share their experiences. Informed consent was also bypassed for practical reasons, as it would have been impossible to obtain consent from every individual whose posts or comments were collected from social media. Acquiring informed consent from all discussion participants could have rendered the research project unfeasible, raising the ethical concerns surrounding not conducting the study at all. With the social media data, we meticulously followed various steps to ensure the anonymity of the discussants, such as not using direct quotes as evidence for the findings drawn from the data (i.e., disguising; Reagle & Kaur, 2022). Also, a key ethical consideration regarding the social media data was that we did not collect any direct personal information about the discussants.

Furthermore, I disclose that ChatGPT (versions 3.5, 4.0, and 4.0o) was utilized for proofreading and text editing this dissertation. The tool was employed to refine ambiguous sentences with its suggestions being reviewed and selectively implemented by me, similar to traditional proofreading or academic editing services. Additionally, ChatGPT was used to translate direct interview quotes from their original language into English, which are presented as evidence in the original articles. These translations were carefully reviewed to preserve the original meaning, with modifications being made where necessary. While manifold opportunities and challenges involved in using generative AI to conduct research have been identified, the general opinion seems to be that generative AI, when used correctly and ethically, can be a useful tool for conducting research (e.g., see the opinion piece in which tens of researchers discuss the issue; Dwivedi et al., 2023).

4 FINDINGS OF THE ARTICLES

This chapter outlines the findings derived from the individual articles of this dissertation. Each article serves as a standalone piece of research, contributing distinct perspectives on the phenomena under investigation. In this chapter, the main findings of each article are summarized, with full versions being provided at the end of the document if available. Collectively, these articles enhance our understanding of the research questions presented in the introduction, offering a comprehensive view of the issues addressed throughout this dissertation.

4.1 Article I: Technostress in smartphone browsing from the perspective of gratifications and the dimensions of use

Hämäläinen, A., Salo, M., & Pirkkalainen, H. (2024). Surfing, scrolling and stressing: Technostress in browsing digital content feeds on smartphones from the gratifications and dimensions of use perspective. Human Technology, 20(3), 640-675.

In Article I, we discuss the roles of uses and gratifications associated with technostress. Gratifications have been categorized in numerous ways in the extant research, but here, we focus on three types of gratifications: hedonic, social, and utilitarian (e.g., Li et al., 2015; Mäntymäki & Riemer, 2014). Central to the uses and gratifications theory is the principle that users actively select media platforms based on the gratifications, such as entertainment or social connection, they wish to obtain. By discussing both the gratifications sought and obtained and, thus, adopting the dual perspective on gratifications (Palmgreen & Rayburn, 1979; Palmgreen et al., 1980), the article explains how technostress experiences can differ based on the types of gratifications sought and whether they are obtained.

Based on the interviews conducted with smartphone/social media users, we explain how the gratifications sought, gratifications obtained, and dimensions of smartphone use form a "smartphone use loop," which explains

user cognitions and behavior underlying technostress in smartphone use. This concept integrates both the motivations ("whys") and practices ("hows") of smartphone use in technostress situations and experiences. For example, when a user seeks social gratifications and instantly engages (*instant dimension of use*) with their smartphone, disrupting the current task, this can lead to technostress (e.g., due to techno-invasion). If gratifications are not obtained, the positive feelings that could alleviate stress are absent. Furthermore, seeking gratifications again can lead to repeated use (*repeated dimension of use)*, which may result in increased technostress (e.g., due to techno-procrastination). The study states that when users obtain gratifications they highly value, technostress experiences are less prevalent (e.g., social gratifications emerged as most valued in our data). Conversely, not obtaining gratifications can increase technostress. Thus, technostress experiences can vary based on the gratifications sought and obtained and whether the sought gratifications are, in fact obtained.

Furthermore, the dimensions of smartphone use offer insights into the nature of activities users engage in when interacting with information on smartphones in technostress situations. Importantly, these dimensions do not directly reflect technostress experiences, but instead shed light on behaviors that may contribute to technostress. For instance, personalized use can lead to technostress when users encounter online information bubbles. The study identified five dimensions of smartphone use (instant, repeated, continuous, personalized, and versatile) that offer insights into how smartphones are used when users experience technostress. Finally, the article identifies previously unrecognized technostressors and negative outcomes. Gratification mismatch, online information bubbles, and techno-procrastination emerged as new technostressors. Additionally, worsened boredom tolerance was identified as a negative outcome of technostress.

Table 11 summarizes the central situations of the interplay between technostress, gratifications sought and obtained, and dimensions of smartphone use, drawn from the analysis of Dataset A. For example, the interviewees could tell that they were seeking entertainment and, therefore, browsed their smartphones continuously, due to which they neglected other tasks. This was also done in the other direction. The interviewees could tell that they experienced exhaustion due to the constant flow of messages (online information overload) from different services. By examining the data, such situations could be pinned down to, for example, versatile use performed to obtain social gratifications.

TABLE 11 Technostress, gratifications sought and obtained, and dimensions of use

Technostress elements and an example	**Situation 1**	**Situation 2**	**Situation 3**	**Situation 4**	**Situation 5**
Dimensions of smartphone use	Instant	Repeated	Continuous	Personalized	Versatile
Central gratifications	Hedonic gratifications sought and obtained	Hedonic gratifications sought and obtained	Hedonic gratifications sought (but not) obtained	Utilitarian/social gratifications sought but not obtained	Social gratifications sought but not obtained
Central technostressors	Interruptions; techno-invasion	Techno-procrastination; online information overload	Gratification mismatch; techno-dependency	Online information bubbles; negative life comparison	Online information overload; fear of missing out
Central strains/other outcomes	Worsened boredom tolerance; frustration; annoyance; fatigue	Anxiety; exhaustion	Guilt; sleep problems	Fear; inadequacy	Exhaustion; anxiety
Description of an example situation	Despite obtaining gratifications related to, for example, passing time, instant smartphone use leads to interruptions and eventually, worsened boredom tolerance (e.g., due to a person becoming used to instant gratification).	Despite obtaining gratifications related to, for example, escapism, the individual's repeated smartphone use leads to techno-procrastination and anxiety (e.g., due to not progressing on important tasks).	Despite initially obtaining gratifications related to, for example, entertainment, continuous smartphone use is not ultimately gratifying, leading to gratification mismatch and guilt (e.g., due to spending time on something that is not gratifying or important).	Due to personalized use, one encounters online information bubbles and is unable to see different perspectives on information, which can increase fear (e.g., of polarization).	Due to versatile use, one encounters online information overload, which can lead to exhaustion (e.g., due to too much information being delivered via social media platforms and instant messaging services).

4.2 Article II: The role of craving in smartphone-related technostress

Hämäläinen, A., Salo, M., & Pirkkalainen, H. (2022). "One more, one more... You get stuck" - The role of craving in smartphone-related technostress. In Proceedings of the 30th European Conference on Information Systems, 27.

While Article I explained how users' active choices can underlie technostress, Article II investigates how users' uncontrollable cognitions and behaviors may contribute to this process through the lens of craving. Although various concepts closely associated with craving, such as addiction, dependency, and compulsive or excessive use, have been discussed alongside technostress (see, e.g., Lee et al., 2014; Salo et al., 2022; Tarafdar et al., 2020), craving has not been studied before with technostress. Understanding the link between craving and technostress is crucial, as it provides a perspective on user behavior underlying technostress, which can exhibit uncontrollable characteristics without necessarily indicating addiction. Drawing from the interviews conducted with smartphone/social media users, the study identifies three types of craving (stimuli craving, sensation craving, and content craving) and discusses how craving can directly or indirectly contribute to the emergence of technostress. Direct craving–technostress relationships do not require active smartphone use; the mere experience of craving can trigger technostress (Path 1). Alternatively, craving can lead to compulsive (Path 2) or excessive use (Path 3), both of which contribute to the emergence of technostress. This process and several examples are illustrated in Figure 2.

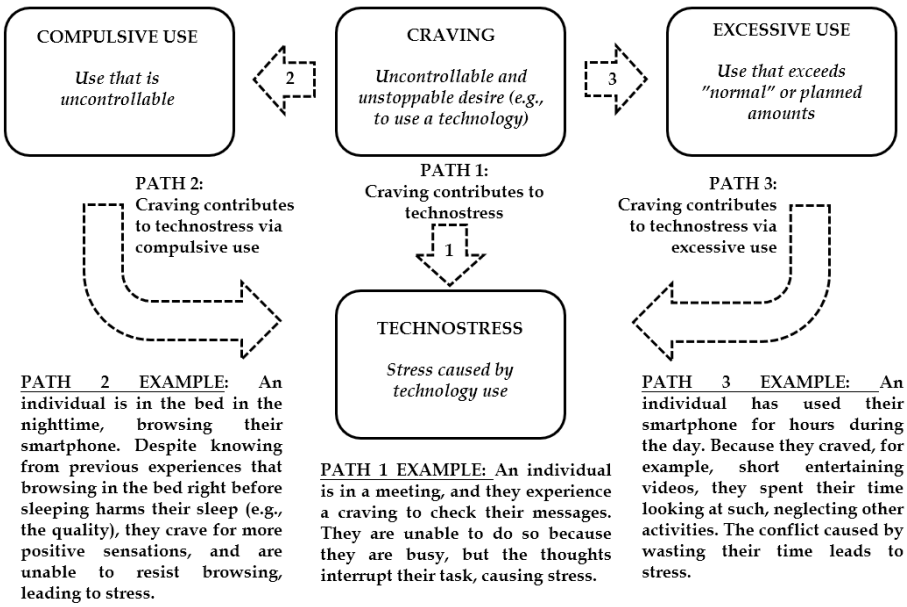

FIGURE 2 Three paths of craving and technostress

In Path 1, no active use is required for technostress to emerge. Simply the presence of a smartphone (e.g., on a table) can trigger craving, which leads to technostress. While definitions of technostress emphasize IT use, it can be unclear when IT use actually begins. For instance, if a smartphone is on a table but not actively being used, is it still considered "in use"? Yet, even in such cases, it can still contribute to technostress. In Path 2, craving prompts compulsive use, often during times when smartphones should not be used, resulting in experiences of technostress (e.g., before sleep or during social situations). In Path 3, craving leads to excessive use, in which individuals spend too much time on their devices, often engaging with content that is neither necessary nor particularly enjoyable. This can contribute to technostress, especially due to conflicting feelings about such behavior. One may realize that they are using too much but still be unable to change their behavior due to strong feelings of craving. By recognizing the various types of craving and acknowledging the different pathways through which craving can contribute to the emergence of technostress, we advance the understanding of technostress by identifying the cognitive and behavioral patterns that precede the conditions leading to its development. By harnessing the concept of craving, we associate users' uncontrollable desire with continued use despite the negative effects (De-Sola et al., 2017).

4.3 Article III: Game elements shaping three dimensions of techno-distress and techno-eustress

Hämäläinen, A., Lampi, A., & Salo, M. (2024). The role of game elements in shaping three dimensions of techno-distress and techno-eustress in online multiplayer games. In Proceedings of the 15th Scandinavian Conference on Information Systems, 24.

Article III addresses technostress in online multiplayer games. While technostress has been discussed in various IT use contexts, its application to digital gaming has been scant. By focusing on this highly popular IT use context, which is associated with numerous negative and positive outcomes, we provide a new perspective on gaming through the lens of technostress. Although research and media have highlighted various adverse consequences of gaming, such as problematic gaming and gaming addiction (Kuss & Griffiths, 2012; McCaffrey, 2023), the findings derived from the technostress perspective could help reduce various taboos and stigmas concerning gaming. Furthermore, by discussing online multiplayer games, in which competition and cooperation are central, we can understand the various social dynamics and conditions of technostress, which has received relatively little scrutiny despite it being an important part of the process.

By analyzing the interviews with digital gamers, we aimed to understand how different game elements, (negative) technostressors, and strains and other outcomes are associated. One key finding was that technostress could shape

through three different dimensions: gameplay, self, and social. In the gameplay-dimension, various game elements directly contributed to technostress emergence. In the self and social dimensions, the role of IT was indirect. It is important to note that while the dimensions of gameplay and self are often present in technostress emergence, per the established theoretical foundations, we explain how the process can take shape centrally through one of these dimensions. For example, sometimes, a non-stress-creating instance of gameplay triggers a social condition that manifests as a technostressor. This suggests that although IT is essential in the emergence of technostress, it can enable the development of stressful situations, with the actual stressor shaping through external factors, such as social interaction.

I wish to highlight that we did not delineate specific outcomes/strains associated with certain technostressors, game elements, or dimensions of technostress. Similar group of outcomes/strains were seen throughout the participants' experiences (negative: annoyance, frustration, anger, exhaustion, use discontinuance; positive: accomplishment, progress, development). Tables 12-14 outline the main findings of the article.

TABLE 12 Gameplay-dimension of technostress in playing online multiplayer games

Gameplay-dimension	**Techno-distress**	**Techno-eustress**	**Game elements**
Technostress emerges directly from player–game element interaction. This means that players specifically appraise the stimuli and events associated with gameplay as stressful.	Central technostressors associated with techno-distress in this dimension include grinding overload, unfair gameplay, game meta issues, poor matchmaking, game-challenge.	Central technostressors associated with techno-eustress in this dimension include poor matchmaking, game-challenge.	Central game elements associated with technostress in this dimension include grinding, rewards, (daily/weekly) missions, random number generation, player-versus-player competition, game characters and their abilities, matchmaking.

TABLE 13 Social-dimension of technostress in playing online multiplayer games

Social-dimension	**Techno-distress**	**Techno-eustress**	**Game elements**
Technostress emerges **indirectly** from the player–game element interaction. This means that, for technostress to emerge, the player–game element interaction must be emphasized by other players interacting with the game elements (e.g., by abusing them in cases of toxicity or smurfing).	Central technostressors associated with techno-distress in this dimension include communication toxicity, gameplay toxicity, smurfing, social pressure.	Central technostressors associated with techno-eustress in this dimension include gameplay toxicity, smurfing, game-challenge.	Central game elements associated with technostress in this dimension include game chat (text/voice), player-versus-player competition, game characters and their abilities, game length.

TABLE 14 Self-dimension of technostress in playing online multiplayer games

Self-dimension	Techno-distress	Techno-eustress	Game elements
Technostress emerges **indirectly** from the player–game element interaction. This means that, for technostress to emerge, the player–game element interaction must be emphasized by the player's own expectations and perceptions of their interaction with the game elements (e.g., performance in competitive settings as compared with self–standards).	Central technostressors associated with techno-distress in this dimension include overdependence, grinding overload, substandard gaming performance.	Central technostressors associated with techno-eustress in this dimension include substandard gaming performance, game-challenge.	Central game elements associated with technostress in this dimension include (daily/weekly) missions, player-versus-player competition, game characters and their abilities, game length.

The results also indicated that playing online multiplayer games can elicit unique technostressors, such as game meta issues, poor matchmaking (i.e., how the game decides which teams/individuals play against each other), smurfing, communication toxicity, and gameplay toxicity. Furthermore, we observed that positive technostress is an integral part of playing online multiplayer games. Depending on various situational elements, the same technostressors can manifest negatively or positively. Among the study participants, technostress experiences were often mixed and dynamic, and at times, it was unclear whether their experiences were positive or negative, as they could be both simultaneously. In these situations, individuals appraise and reappraise the circumstances they encounter, which influences the outcomes they experience. For example, engaging in a new, extremely challenging gaming activity may initially feel distressing, but as the gamer learns to manage the situation, it can eventually lead to positive technostress outcomes.

4.4 Article IV: Coping with technostress-related goal hindrances: Multidimensional and hierarchical nature of goals

Hämäläinen, A., Salo, M., & Pirkkalainen, H. (2024) Coping with technostress-related goal hindrances: Multidimensional and hierarchical nature of goals. Under review for a journal (2nd round; major revision). [2]

While Articles I–III focused on the antecedents and outcomes of technostress, Article IV addresses coping with technostress, a topic that has received less attention than technostress emergence, despite growing interest. This omission

[2] Preliminary version published in a conference: Hämäläinen, A., Salo, M., & Pirkkalainen, H. (2023). Smartphone use and technostress: Hindrances to users' humanistic and instrumental goals. In Proceedings of the 9th International Conference on Socio-Technical Perspectives in Information Systems (CEUR Workshop Proceedings).

is particularly prevalent in various personal and leisure-oriented IT use contexts. The article discusses how stress and unmet goals are related (Folkman, 2008) by highlighting how technostress manifests in the form of goal hindrances, as well as coping with technostress as a form of goal shielding (Bélanger et al., 2013; Shah et al., 2002). The study begins with the idea that "stressful situations are often stressful precisely because they threaten or harm valued goals" (Folkman, 2008, p. 9) and individuals can employ coping strategies, such as mental disengagement, to manage stress that impedes goal attainment (Carver et al., 1989). Anchoring technostress and its coping mechanisms within a goal-oriented perspective can provide insights into managing the unintended, experience-centric, and situation-specific consequences of IT use.

By analyzing the interviews with smartphone/social media users, we investigated how technostress-related interruptions and concentration issues can disrupt personal interests (e.g., engaging in hobbies) or routine tasks (e.g., completing chores efficiently). This often requires goal shielding through coping strategies, such as adjusting one's use, settings, or attitudes. A key finding from the study was that technostress can hinder goals across nine categories. We classified all goals as either humanistic or instrumental, with each category containing more specific sub-goals. As we analyzed these further, we observed differences in how explicit the participants' goals were. For instance, goals related to identity were more nuanced and tied to personal values, whereas academic goals were clearer and more explicit (e.g., completing assignments on time).

The results show that when individuals' goals are more explicit (e.g., the instrumental goal of completing study assignments on time), individuals tend to have more control over the situation, and their coping strategies lean toward being anticipatory. Conversely, when goals are more implicit (e.g., the humanistic goal of being happy), individuals tend to cope reactively and impulsively in the moment. For instrumental goals, which were observed to be explicit, anticipatory coping strategies were predominant. With humanistic goals being both explicit and implicit, the coping strategies varied. However, it is important to note that reactive coping can also be helpful for explicit goals and that anticipatory coping can be useful for implicit goals, although the findings primarily reflected the central patterns in the data. Tables 15 and 16 highlight the key findings and results of the article.

TABLE 15 Coping with technostress manifesting as hindrances to humanistic goals

Humanistic goals	Technostress example	Coping and an example
Meaningful life attainment (experiencing happiness; having fun; avoiding time-waste) – more implicit	Browsing a smartphone excessively throughout the day contributes to technostress via internal conflict and guilt, which manifests as hindrances to goals associated with meaningful life attainment.	Dominant coping: reactive **Example: reactive use modification.** After realizing that time is being wasted during smartphone use, ceasing browsing and doing something else instead can reduce the technostress caused by internal conflict, providing more meaningful experiences.
Identity management (maintaining self-image; practicing self-acceptance; following personal values and opinions) – more implicit goals	Browsing a smartphone to explore the "perfect" lives of social media influencers contribute to technostress via dysfunctional comparison behavior and issues with self-image, which manifests as hindrances to goals associated with identity management.	Dominant coping: reactive **Example: reactive attitude modification.** After encountering online content that negatively affects one's self-image, reminding oneself that social media content is often not an accurate representation of reality can reduce the technostress caused by dysfunctional comparison behavior, positively affecting one's identity.
Personal interest engagement (dedicating time, motivation, and concentration for hobbies; engaging with interesting online content) – implicit/explicit goals	Browsing uninteresting or non-useful content on a smartphone contributes to technostress via interest-mismatch and frustration, which manifests as hindrances to goals associated with personal interest engagement.	Dominant coping: none **Example: anticipatory/reactive use modification.** When browsing online content, modifying one's use according to how interesting or useful one finds the content can reduce the technostress caused by interest-mismatch.
Relaxation and recovery (dedicating time and concentration to relaxation; ensuring that downtime allows for recovery; sleeping well) – implicit/explicit goals	Receiving constant stimuli while browsing content on a smartphone contributes to technostress via information overload and exhaustion, which manifests as hindrances to goals associated with relaxation and recovery.	Dominant coping: none **Example: anticipatory/reactive settings modification.** When browsing a smartphone during downtime, disabling notifications (either prior to or during the situation) to reduce incoming stimuli can reduce the technostress caused by information overload, providing grounds for increased relaxation and recovery.
Social relationship maintenance (dedicating time for social relationships; concentrating during social situations) – more explicit goals	Using a smartphone while spending time with others contributes to technostress via overdependence and social conflicts, which manifest as hindrances to goals associated with social relationship maintenance.	Dominant coping: anticipatory **Example: anticipatory use modification.** When spending time with a partner/friends/family, consciously separating oneself from one's smartphone in advance, either by choice or due to deals made with others, can reduce the technostress caused by social conflicts, enhancing social relationships.

TABLE 16 Coping with technostress manifesting as hindrances to instrumental goals

Instrumental goals	Technostress example	Coping and an example
Study effectiveness (dedicating time, motivation, and concentration to studying; being efficient in studying; completing assignments on time; exceling in studying) – more explicit goals	Constantly checking social media while attempting to study contributes to technostress via distraction and disturbances, which manifests as hindrances to goals associated with study effectiveness.	Dominant coping: anticipatory **Example: anticipatory use modification.** When one must focus on studying, separating oneself from certain services (e.g., social media) can reduce the technostress caused by constant browsing and distractions, increasing concentration on studying.
Work performance (having the motivation and concentration needed for work; being efficient in work; exceling at work) – more explicit goals	Receiving constant notifications on a personal smartphone device at work contributes to technostress via interruptions, information overload, and disturbances, which manifests as hindrances to goals associated with work performance.	Dominant coping: anticipatory **Example: anticipatory settings modification.** While at work, muting one's smartphone or disabling notifications can reduce the technostress caused by constant interruptions and information overload, increasing efficiency at work.
Mundane task maintenance (dedicating time, motivation, and concentration to mundane tasks; being efficient in mundane tasks) – more explicit goals	Browsing a smartphone instead of completing necessary mundane tasks, such as doing chores, contributes to technostress via procrastination and annoyance, which manifests as hindrances to goals associated with mundane task maintenance.	Dominant coping: anticipatory **Example: anticipatory use modification.** When planning to complete mundane tasks, completely distancing oneself from one's smartphone can reduce the technostress caused by procrastination, enabling the completion of the planned mundane tasks.
Personal information management (maintaining information security; managing information timeliness and quality) – more explicit goals	Using smartphone applications that collect personal data, such as location data, contributes to technostress via information security worries and increased anxiety, which manifests as hindrances to goals associated with personal information management.	Dominant coping: anticipatory **Example: anticipatory attitude modification.** When using smartphone applications that collect personal data, such as location data, adopting a neutral stance and accepting the situation can reduce the technostress caused by information security worries, ensuring sufficient personal information management.

One key finding of the study was that, in many cases, participants encountered conflicts when employing coping strategies to shield certain goals. This meant that shielding one goal, for example, often resulted in hindrances to achieving other goals. Humanistic goals, such as fostering social relationships and seeking relaxation, frequently conflicted with instrumental goals related to work and academic pursuits. While this may seem obvious, it was particularly interesting that when participants temporarily reduced smartphone/social media use to focus on academic goals, this shift often jeopardized their ability to maintain social connections, which were largely reliant on smartphone/social media interactions. Although minimizing such use could improve study efficiency, it also triggered feelings of unhappiness due to the diminished real-time interactions with others, highlighting the tension between humanistic and instrumental goals. Thus, regarding the synergy and conflicts between humanistic and instrumental goals in IT use, the results revealed more instances of conflict than synergy, which was in alignment with findings derived from organizational contexts (Sarker et al., 2019).

4.5 Article V: Toward a social coping perspective for technostress

Hämäläinen, A., Salo, M., & Pirkkalainen, H. (2024). Toward a social coping perspective for technostress. Under review for a journal.

Article V extends technostress and coping research toward a social perspective (i.e., social coping), which has received little attention aside from studies of social support. This is problematic because stress and coping are frequently intertwined with various social conditions and dynamics, even though these factors are not the sole determinants of how the technostress process unfolds. The article refers to social coping as one's cognitive and behavioral coping efforts that are shaped through interpersonal dynamics.

Drawing from interview data on smartphone/social media users' experiences, this study presents various forms of social coping, enhancing our understanding of the social dynamics and conditions related to technostress and coping. As stress can affect diverse social contexts and social media use inherently involves manifold and complex social situations, understanding how users can employ social coping to manage such technostress is crucial. By iteratively analyzing the data, we identified that various strategies could be classified based on their underlying objectives or functions. Some codes and categories highlighted conversations about IT use and related stress within social contexts, indicating strategies grounded in social interactions and agreements (negotiation-focused). Others captured instances of introspection, where users reflected on their IT use and the stress it created in social dynamics (reflection-focused). Finally, some codes and categories revealed direct adjustments in IT use or IT artifacts in response to social conditions (modification-focused).

Here, we define (1) negotiation-focused social coping as coping efforts that prioritize interpersonal interaction, involving active engagement, communication, and social support associated with users' social media use within social dynamics; (2) reflection-focused social coping as coping efforts that prioritize introspection and analysis of an individual's feelings and behavior associated with their social media use within social dynamics; and (3) modification-focused social coping as coping efforts that prioritize adjusting IT settings and one's behavior associated with their social media use within social dynamics.

In negotiation-focused social coping, users interact with others to cope with technostress by, for example, discussing stressful experiences with their partners, friends, or family. In reflection-focused social coping, users reflect on their own use and experiences, for example, by comparing their use and experiences to those of others. In modification-focused social coping, users modify their use within the social sphere, for example, by turning off the activity information on social media. Tables 17-19 present more detailed information about the identified and established coping types and more specific strategies, alongside evidence from data.

TABLE 17 Negotiation-focused social coping

Strategy	Description	Evidence from interview data
Discussing social media culture	Having discussions about social media culture and the associated issues with others who have similar experiences or otherwise helpful insights on the phenomenon.	"And also, talking about it, accepting that it takes a lot of time. I somehow feel like that sounds like AA [referencing to Alcoholics Anonymous] [laughs], but saying that you know you use it a lot [helps]. [...] I feel like it's more present in public discussions all the time, so the worry is there. [...] Just last week, I was talking about it in a friend group. People of the same age are thinking the same [things]."
Sharing personal social media experiences	Having discussions with others (e.g., a partner, friends, or family) about one's own or their social media use experiences.	"And we discuss this with my partner. Is it so important [social media use] that it's more important than what we're doing together in the present? So yeah, we do talk about it a lot and think about our behavior and how it changes and when phone use brings anxiety and when it doesn't."
Commenting on others' social media use habits	Commenting on someone's social media (non)use in a negative light to either vent frustration with their behavior or attempt to spark behavioral change in them.	"Yeah, well…. Or it annoys me. I have some friends with whom I go somewhere, for example, and they immediately must update [social media] or take a picture and update their stories [ephemeral status updates in social media], and they start to think about the text. [...] I don't always say anything, but sometimes I say, 'Hey, did you know that you could update that story afterward? Let's go and not stay and think about the story'."
Communicating social media use modifications	Informing relevant parties (e.g., a partner, friends, or family) of impending or current changes to one's social media use.	"You feel like you should notify your friends that 'I'm taking a break; see you on Monday'. Or your family. Nowadays, if you don't answer, people are so used to you being available all the time, so someone could be worried if they don't hear from you or when you don't answer."
Building social media availability reputation	Building one's reputation of social media availability by telling everyone about their preferences in communication (e.g., by explicitly telling others that they do not necessarily answer immediately).	"I used to be, like, that I had to answer my friends right away. And I got hurt if they didn't answer me. [...] But I have realized that even for my friends, I don't need to be available all the time. [...] Now I have told my friends that I'll answer when I have time, that I'm not ignoring them."

TABLE 18 Reflection-focused social coping

Strategy	Description	Evidence from interview data
Accepting others' social media use during offline social situations	Accepting situations during which others do not focus on the ongoing offline interaction due to browsing social media simultaneously through reflection (e.g., its not their place to comment other's social media use).	"And when I realize how much I use it, and then I try to reduce it and then he doesn't, it annoys me that I try to do something about this, and he doesn't. But we have never fought about it. I kind of accept it and note that he can do what he wants. I can't interfere with what he does when he doesn't interfere with what I do."
Reasoning that information on social media will reach one in a timely manner	Convincing oneself that important or time-sensitive information shared on social media will reach them in a timely manner (e.g., via other channels) regardless of their own social media behavior.	"Now that [laughs] I don't get notifications from WhatsApp, I sometimes forget to check them, so it might be a few days that I don't go there, and then someone has tried to reach me. It irks me a bit, but on the other hand, if it was something acute, they could've called me."
Reframing social media behavior expectations	Understanding that certain types of behavior (e.g., constant availability and instant answers) are not actually mandatory or forced on social media, despite what certain user groups or society at large seem to state.	"Sometimes I, like, don't answer anyone or anything for a couple of hours because I'm annoyed with it [being present all the time]. [...] It's pretty sad. As if I don't have anything else in my life. I don't know, especially Snap[chat], and sometimes it annoys me a lot. I don't feel like being active, and some are, and they keep rapidly sending me messages and talking on there and then I'm, like,… I have sometimes said, 'I don't have time to talk now,' and they're, like, 'What else do you have to do?' 'Well, life. I don't feel like watching the screen all the time'."
Accepting expected social media conduct	Making peace with that some types of behavior (e.g., using certain services) is expected relating to social media use to keep up with the world.	"But then I realized that somehow the social world and all the groups and the whole social framework started to trickle into smartphones, and I felt like I was forced to get one, and now I can't imagine life without it, even though I really want to. [...] But I feel, like, that you can't separate 'the real world' from the '[online] social world'. Like, how they're intertwined. It's not only… I don't think that it's only about my use habits, but the whole world. Like, it's difficult to stay up to date if you don't follow certain [users]."

Strategy	Description	Evidence from interview data
Assessing the social dynamics in use prioritization	Evaluating and prioritizing social media situations to assess their urgency and importance (e.g., based on the content, sender, or service).	"Actually, I have always said that I'm really bad at messaging. I might have a message on WhatsApp for, like, a week, and then I'm, like, 'Oops, I forgot to answer this'. [...] If I notice that it [the message] is not, like, that [important], I mentally answer it, but I don't answer the person [laughs] because I realize that it's not absolutely necessary so that I can easily postpone the answer."
Comparing own social media use to others' use	Seeking comfort about one's social media use habits (e.g., perceived overuse) through reflecting that others (e.g., a partner, friends, or family) use even more (i.e., things could be worse).	"I often realize when I compare [my social media use] to my friends who use it a lot that maybe compared with them, I don't use it that much. Or with family members, I sometimes realize that they have the phone in their hands very often. Compared with that, I'm happy and feel pretty balanced with my use."
Detaching from social media feedback	Not caring about feedback (e.g., number of likes) received on social media; taking the stance that popularity on social media is not important.	"I don't care anymore how many likes my pictures receive on IG [Instagram]. [...] Of course, it's nice being, like, 'Yeah, yeah, this received over a hundred likes'. Maybe that feels good, but I don't 'die' if a picture gets 15 likes or something."
Rationalizing social media content realness	Rationalizing that social media often only portrays the best aspects of users' lives; thus, it should not be compared with one's own life.	"Maybe it's something like envy and comparing it with my own boredom. [...] But yeah, of course I have thought about how the pictures and updates don't tell everything. [...] You easily create a certain kind of image in there, also yourself, that isn't based on the absolute truth about your life. [...] But maybe, yeah, it's a little bit of an illusion of, … like, now we have so much fun here and so on [laughs]."
Recognizing social media bubbles	Being aware of social media bubbles caused by everyone seeing different things on their feeds based on their own following and algorithmic-enhanced reinforcement, recognizing that this is only their own feed and does not represent all the perspectives on different phenomena.	"Yeah, that is also something that really bothers me, that everyone doesn't realize that it's a bubble. I feel like I get it, like, this content is only for me, but in reality, there is a whole world of different kinds of content, and other users see different things. But other people don't [perceive the bubbles], and it's awful. [...] People already have been sucked into their own bubbles, and there is nothing we can do–– the bubbles have already formed."

TABLE 19 Modification-focused social coping

Strategy	Description	Evidence from interview data
Adjusting social media habits during offline interaction	Making changes to use during offline social situations (e.g., restricting use) to cope with the stress social media use could cause, for example, due to conflicts and concentration issues.	"I have had all kinds of rules, and I actually have a kind of rule all the time that if I'm in a social situation, I don't use Insta[gram] or anything like that. Some people do so, and they start taking a story and then they start adjusting the text in the story while being with me, I don't know, like, while having a coffee, and that is super annoying. It's a big no for me. If I take a picture, then I just take the picture. I don't update it anywhere [during the social situation]."
Collaboratively adjusting social media practices	Making changes to use as a collective (e.g., restricting use together with a partner, friends, or family) to cope with the stress social media use may cause, for example, due to conflicts and concentration issues.	"And then we have this thing that we have tried. I have talked with my partner that when eating together, the phone stays off. They'd rather browse a magazine or something. It's something that I don't want our kid getting used to, that everyone has their phones at the table, and everyone browses with their own phones. That's something we now pay attention to."
Controlling social visibility through activity indicators	Managing online presence by controlling (e.g., turning off) activity indicators (e.g., read receipts and last log-in).	"Nowadays, it's a huge issue if you have read a message…. I have disabled the 'read receipts' because sometimes people get mad when I read a message, but don't answer. And, like, am I online, and why have I been online and not answered them. Yeah, sometimes I miss the old times."
Ensuring that no social media content is missed	Browsing social media in such a way that no important, relevant, or acutely interesting social media content is missed (e.g., by giving certain users and their content special attention).	"I'm pretty dedicated to some accounts I follow. I have a handful from which I really want to read every post and watch every video and all that. It's important that you get to that point and you feel like you're in the inner circle when you follow actively so you don't want to miss anything. [...] If you think about the social media influencers of today, they talk about their life, and I want to know the people, and I want to see all the information they share. I don't want to be, like, 'Oh, they had told that thing; I didn't know about it'."
Avoiding conflicts in social media interaction	Avoiding participating or reading about conflicts in social media by, for example, removing certain applications or by simply ignoring such content.	"I think that first I stopped using Facebook. [...] And maybe, even more than the comparison, I'm annoyed––or was annoyed then––by people's hostile behavior; you could even say bullying. It felt like it wasn't about discussing, it's just about your own absolute [opinions].... Like, if you eat a piece of cheese, you can't call yourself vegan. It was so exaggerated and extreme."

Strategy	Description	Evidence from interview data
Decreasing social information flow	Muting/blocking users/groups or modifying a smartphone (e.g., disabling notifications) to manage social overload.	"If there has been [a group chat for] something, like, planning someone's birthday or a party or something, that has a lot of messages. Right after the things have been taken care of, I'll leave the group. I don't like having a lot of old stuff there."
Minimizing social comparison	Minimizing social comparison by unfollowing social media content that triggers negative social comparison behavior.	"I was really interested in influencers who travel a lot, the kind that update wonderful posts, but at some point, I started envying them a lot and thinking why I can't just travel and visit all these nice places. [...] At some point, I stopped following people whose life looked perfect, so to speak. It has been very helpful."

Some of the identified strategies are novel in the context of coping with technostress, such as reframing social media behavior expectations, controlling social visibility through activity indicators, and ensuring that no social media content is missed. Interestingly, some coping strategies reflected increased social media use or a belief that more activity is needed, while others reflected reduced use or the understanding that being active is not necessary. For example, strategies such as ensuring that no social media content is missed and reasoning that information on social media will reach one in a timely manner both have a similar underlying goal but approach the issues from completely different perspectives.

Moreover, we identified the fundamentally different underlying mechanisms for the different types of social coping. Negotiation-focused coping emphasizes interpersonal interaction, involving active engagement with others and relying on mechanisms such as communication, interaction, and support, with social media use itself often becoming a subject of negotiation. In contrast, reflection-focused coping revolves around social introspection, using mechanisms like self-awareness and self-analysis within social contexts. Lastly, modification-focused coping involves changing social circumstances through external behaviors as well as adjustments to internal IT settings.

4.6 Article VI: Uncovering core ambivalences of digital gaming

Hämäläinen, A., Salo, M., & Pirkkalainen, H. (2024). Uncovering individual and collective ambivalences in digital gaming: The triggering role of game design paradoxes. In Proceedings of the 16th Mediterranean Conference on Information Systems, 6.

In contrast to Articles I–V, Article VI discusses broader aspects and outcomes of using IT, rather than focusing on technostress and coping with it. Examining the context of digital gaming, we draw from the paradox and ambivalence literature to understand how game design paradoxes affect the ambivalences players

experience. While previous research has shown how paradoxes can act as triggers for ambivalence, such has not been investigated in digital gaming. As we sought to understand how ambivalences in digital gaming manifested in both the individual and collective dimensions, we observed that these often emerged due to the various interconnected paradoxes of game design. Thus, the paradoxes act as triggers for the ambivalences. We define game design paradoxes as situations in which various aspects of game design are in constant conflict and tension, leading to outcomes that elicit ambivalent responses from players. These paradoxes can manifest in various aspects of game development, including gameplay mechanics, reward systems, and player interactions.

Drawing from the interview data with digital gamers, in addition to the collected social media data, we identified three core paradoxes of game design that could trigger four individual and two collective ambivalences. For example, in the interview data, we found patterns of how the paradox of designing for casual versus hardcore players could elicit the ambivalence of experiencing distress/eustress. Both too easy and too difficult a challenge could create such experiences, highlighting the complexity of balancing the challenge in digital games. The social media data especially highlighted ambivalences of "hostility/harmony" and "overplaying/underplaying" where the design paradoxes of "catering to hardcore gamers versus casual gamers" and "shallow gameplay loop/monetization versus sustained player satisfaction" were particularly significant triggers, respectively. The identified ambivalences and paradoxes are summarized in Tables 20-22.

TABLE 20 Individual ambivalences of playing digital games

Ambivalence	**Definition**
Obligation/volition	This ambivalence occurs when players experience an obligation to play even when the activity is supposedly voluntary and enjoyable.
Distress induction/ distress reduction	This ambivalence highlights how gaming can simultaneously induce and reduce distress in players.
Experiencing distress/eustress	This ambivalence reflects how gaming can simultaneously elicit both negative stress (distress) and positive stress (eustress) in players.
Overplaying/ underplaying	This ambivalence addresses the conflict between overplaying and underplaying, which affects whether one is pulled toward or away from the game.

TABLE 21 Collective ambivalences of playing digital games

Ambivalence	**Definition**
Exclusion/inclusion	This ambivalence arises when a game offers various ways of playing but the community simultaneously exhibits exclusion and inclusion for these various ways of playing, often enforcing unwritten rules, leading to gatekeeping.
Hostility/harmony	This ambivalence occurs when, in multiplayer games requiring teamwork, the players approach situations with hostility despite harmony being essential for success.

TABLE 22 Central paradoxes of digital game design

Paradox	**Definition**
Constant change versus status quo	This paradox commonly arises in servitized online games that frequently update, in which constant changes can be detrimental if players prefer the stability of previous versions, despite the changes also being needed for games' success.
Shallow gameplay loop/monetization versus sustained player satisfaction	This paradox involves the balance between designing a game with the sole goal of increasing revenue and player engagement, which carries the risk of decreasing player satisfaction and can ultimately lead to reduced player retention and revenue loss.
Catering to hardcore gamers versus casual gamers	This paradox highlights the challenge of designing games based on feedback from a vocal minority, such as professional players and content creators, which may not reflect the preferences of the more extensive, quieter player base.

Although digital games are designed to be challenging, players can be overwhelmed by complex mechanics, especially in constantly updated games where the meta frequently shifts. Keeping up with these changes takes time, and falling behind can lead to frustration. Learning new strategies can also contribute to feelings of overload, though some players find this aspect valuable. This highlights the difficulty in designing games that cater to all types of players, revealing the interconnectedness of game design paradoxes. Such paradoxes can lead to ambivalent outcomes, like feelings of exclusion or inclusion, and hostility or harmony. For example, competitive games can encourage optimal gameplay but also create conflicts within teams, even in cooperative settings. This ambivalence often arises from the paradox between constant change and maintaining the status quo. Games that do not evolve risk becoming monotonous, while constant updates can cause both distress and eustress, such as feeling overwhelmed while pursuing mastery. Designers must strike a balance by creating a stable core gameplay loop with enough variation to maintain engagement. Managing these game design paradoxes is crucial for eliciting beneficial, rather than detrimental, ambivalent reactions.

At the individual level, gaming can be both an enjoyable leisure activity and feel like an obligation. Some participants likened gaming to work, particularly in games involving grinding, where repetitive tasks are required to earn rewards. These repetitive gameplay loops kept players engaged but not always satisfied, illustrating how design paradoxes can trigger ambivalence. While gaming often serves to relieve distress, it can also lead to increased distress. Though this study did not focus explicitly on technostress, this finding aligns with it. The volume of content can cause frustration, anxiety, and exhaustion, all of which are relevant to technostress. On the other hand, overcoming challenges and achieving mastery reflect positive stress, or eustress. This creates a dynamic where the type of stress—positive or negative—becomes ambiguous. Collectively, the ambivalence between hostility and harmony is evident when players act against gaming objectives, such as being hostile toward teammates, despite harmony being key to success. Additionally, gaming communities may impose informal rules that restrict player freedom, sometimes conflicting with official game rules.

5 DISCUSSION

Although technostress has been extensively studied over the past fifteen years, its relevance and significance have only continued to grow. While in-depth insights into the technostress process have the potential to advance discussions across various research fields, the primary contributions of this dissertation are situated within core IS research, emphasizing the social and technical dimensions of the investigated phenomena (Sarker et al., 2019). Furthermore, addressing the need for greater emphasis on humanistic aspects within IS research, the dissertation adopts a humanistic approach which contrasts the predominantly instrumental focus seen in much of the existing IS literature. As such, the dissertation also investigated the synergy and conflicts between humanistic and instrumental goals and outcomes, highlighting the thematic dual nature of the dissertation's topic (Sarker et al., 2019). Furthermore, while abstraction and generalization are essential components of theorizing in IS (Gregor, 2006), the dissertation underscores the value of context-specific theorizing (Hong et al., 2014). Moreover, Tarafdar et al. (2015, p. 108) point out about technostress that "contextualization presents an important theoretical development opportunity".

In adopting the ensemble view of technology, particularly by viewing technology as embedded systems and structures (Orlikowski & Iacono, 2001), this dissertation explains the multifaceted ways in which technostress emerges within complex socio-technical environments and how IT users can cope with the technostress they experience. In the following, I discuss the research contributions that emerge from a synthesis of the individual research articles included in the dissertation. Subsequently, the practical implications of the dissertation are discussed. Finally, the limitations of the dissertation are addressed and potential directions for future research are outlined. Whereas the key contributions emerge from an aggregated view of a combination of research articles, the research questions of the dissertation are addressed in each research article individually, as specified in Table 23.

TABLE 23 Answers to the dissertation's research questions (RQs)

Research question	Answer to the research question
RQ1: How do the dimensions of smartphone use, the associated gratifications, and technostress interplay in voluntary use for leisure and personal purposes?	Gratifications sought, gratifications obtained, and dimensions of use form a smartphone use loop that can explain both cognitions and behavior underlying technostress. When gratifications, especially those that are valued highly, are obtained, technostress is not as prevalent as compared to when gratifications are not obtained.
RQ2: What forms does craving take in leisure and personal smartphone use, and how is it associated with technostress?	Craving can be present on three levels (stimuli, sensation, content). Craving can trigger technostress either directly (no active use needed) or through compulsive or excessive use.
RQ3: How and why do game elements shape the emergence of technostress in playing digital games?	Game elements' role in technostress emergence can be either direct (gameplay- dimension of technostress) or indirect (self-dimension and social-dimension of technostress). Similar game elements can play a role in the emergence of both techno-distress and techno-eustress.
RQ4: How can individuals cope with technostress that manifests as goal hindrances?	Coping can be employed as a form of goal shielding to manage the goal hindrances imposed by technostress. Based on the explicitness of the goals, coping tends to be predominantly anticipatory with explicit goals, while with implicit goals, coping tends to be more reactive.
RQ5: How do users socially cope with technostress caused by social media use, and how do the types of social coping fundamentally differ?	Social coping with technostress has three main types: negotiation focused, reflection focused, and modification focused. These types have fundamentally different underlying mechanisms. Negotiation-focused social coping is driven by external engagement with others, reflection-focused social coping emphasizes internal social introspection, and modification-focused social coping involves changing social circumstances through both external IT use behaviors and internal IT settings.
RQ6: What ambivalences and paradoxes are present in digital gaming and game design, and how are they associated with one another?	In digital gaming, both individual (e.g., distress induction/distress reduction) and collective (e.g., hostility/harmony) ambivalences are present. They are often triggered by game design paradoxes, such as constant change versus the status quo and catering to hardcore versus casual gamers.

5.1 Research contributions

Through a synthesizing compilation of six research articles, this dissertation proposes four key contributions to IS research:

1. extending the understanding of technostress antecedents,
2. uncovering the social dynamics of the technostress and coping process,
3. identifying goal hindrances as a consequence of technostress and goal-shielding as coping,
4. extending technostress, ambivalences, and paradoxes to the context of digital gaming.

In the following, the research contributions of the dissertation are discussed, synthesizing them according to the answers to the research questions in the included articles.

5.1.1 Extending on the antecedents of the technostress

The first key contribution of this dissertation is the extension of the prevalent understandings of the technostress process from the perspective of its antecedents. In addition to often highlighted technostressors, previous research has tended to view the origins of the technostress process from the perspective of various IT-related factors, such as "technology environmental conditions" (Tarafdar et al., 2019), IT characteristics (Ayyagari et al., 2011), or social media characteristics (Salo et al., 2019). While some studies have examined user-related aspects, such as personality traits in conjunction to technostress (Maier et al., 2019; Pflügner et al., 2021a; Srivastava et al., 2015), little attention has been paid to other types of antecedents. In specific, previous studies have not examined the role of cognitive and behavioral elements, such as gratifications (both sought and obtained), craving, and dimensions of use in technostress emergence. This limits the state-of-the-art understanding of the technostress process from the user perspective, particularly for explaining continued IT use (Burton-Jones et al., 2020) despite of the perceived technostress (Steelman & Soror, 2017). Therefore, contributing to the body of knowledge on the technostress process (e.g., Ayyagari et al., 2011; Taradfar et al., 2019), this dissertation provides a new perspective for understanding both the active (gratifications) and uncontrollable (craving) cognitive antecedents of technostress.

By adopting a dual perspective for gratifications, the dissertation explains the role of both gratifications sought and obtained in the technostress process. Although gratifications have been discussed alongside technostress (e.g., Baabdullah et al., 2022; Sun et al., 2020), this dissertation emphasizes the significance of both the gratifications sought and those actually obtained (Palmgreen & Rayburn, 1979), an approach that has received little attention. The dual perspective for understanding gratifications contributes to the literature by deepening the understanding of what users seek and receive from their IT use in relation to technostress, offering valuable insights into user cognitions. Moreover, while previous studies have discussed hedonic enjoyment in relation to technostress (Cheikh-Ammar, 2020; Salo et al., 2022; Steelman & Soror, 2017), this dissertation extends the discourse by examining the roles of social and utilitarian gratifications in the technostress process. Thus, the findings particularly contribute to the challenges of understanding continued use of IT in use situations where individuals seek gratifications from IT use but concurrently experience technostress as a result of their actions.

Furthermore, the dissertation emphasizes the importance of understanding uncontrollable user cognitions that precede IT use in relation to technostress. More specifically, the dissertation provides a novel approach for understanding such behavior by harnessing the concept of craving. Even though craving is often associated with addiction, it can exist without it (Franken, 2003; Kavanagh et al.,

2005). While addiction has been studied with regard to technostress (Brooks et al., 2017; Tarafdar et al., 2020), the concept of craving provides a way to view uncontrollable underlying elements of technostress without necessarily reflecting addiction (Kavanagh et al., 2005; Franken, 2003). This is crucial as while addiction can be a part of the technostress process, labeling something as an addiction when it does not necessarily represent such a condition can be problematic. Therefore, the dissertation demonstrates that craving can be directed toward stimuli in general, specific sensations (e.g., comfort), or specific content (e.g., videos), contributing to nuanced understanding of craving in relation to technostress. Thus, building on Articles I and II, the dissertation contributes with in-depth understanding of the cognitive underlying factors of technostress.

Additionally, the dissertation's nuanced insights provided into the nature of IT use distinguish dimensions of use (i.e., instant, repeated, continuous, personalized, and versatile), offering in-depth understanding of user behavior. The proposed categorization extends previous research especially within the uses and gratifications theory, which has discussed the nature of IT use in broader terms (e.g., ritualistic versus instrumental use) (Rubin, 1984) or by specific gratifications (e.g., information-seeking, entertainment) (van Deursen & van Dijk, 2014). Also, while the term "constant use" (Duke & Montag, 2017; Gerlach & Cenfetelli, 2020; Salo et al., 2022) has been employed in previous IS studies, it fails to capture the nuances between immediate use (e.g., following a trigger), multiple instances of use, and prolonged use. Additionally, with the introduction of content-focused dimensions (personalized and versatile), Article I demonstrates that the nature of IT use is influenced not only by temporal factors but also by how the content is accessed. A key distinction regarding the dimensions is that they do not reflect technostress experiences; rather, they can be used to explain various types of behavior that ultimately manifests as technostress. As implications, such findings could be harnessed to further understand *why* individuals use IT voluntarily in such ways that increase technostress.

Moreover, the dissertation reconceptualizes compulsive and excessive IT use, typically viewed as technostressors in technostress research (Hsiao et al., 2017; Lee et al., 2016b). The proposed perspective highlights user behavior as a precursor to technostressors, distinguishing between compulsive use, which is characterized by uncontrollability (Caplan, 2010) and excessive use, which is defined by individuals' perceptions of their time spent (Caplan, 2002; Caplan & High, 2006). While these two types of use have been used interchangeably (Widyanto & Griffiths, 2006), Article II demonstrates how craving can trigger both compulsive and excessive behavior, potentially leading to technostress experiences that are different based on the type of preceding behavior. As implications, these ideas could be used to specifically link different types of behavior to different types of technostressors and the associated strains and other outcomes.

5.1.2 Uncovering the social dynamics of technostress and coping

As a second key contribution, this dissertation expands on the role of social dynamics in the technostress and coping process, an area that has received limited attention: individualistic approach to stress and coping "neglects the fact that individuals experience stressors within a social context" (Berg et al., 1998, p. 240). Here, I propose a move toward a social coping perspective for understanding the dynamics of coping with technostress. The social coping perspective is a crucial extension to prior technostress and coping literature which has tended to overlook social aspects despite of their central role in the emergence of stress (Lazarus & Folkman, 1984). The introduced social coping perspective allows for explanations into how to address technostress that (1) may arise from the social dynamics and conditions of IT use, (2) may be triggered by others' use of IT, and (3) requires collaborative efforts for effective coping. While research has acknowledged social support as a coping mechanism (Hauk et al., 2019; Weinert et al., 2020), this is an extremely limited view of social coping.

In Article V, three main types of social coping are identified (negotiation-focused, reflection-focused, modification focused) and their fundamentally different underlying mechanisms are explained. For instance, social coping can reflect both collective and individual effort, despite both highlighting the social conditions and dynamics (Berg et al., 1998). While the collective approach was more prominent, some of the issues we observed were individual-focused, requiring self-efforts, but from a social perspective (e.g., social-comparison and unfollowing certain users). Building on prior research that highlights peer activities to curb excessive social media use (Osatuyi & Turel, 2020), this work extends on such perspectives by explaining the broader social dynamics involved in reducing use. Moreover, I contend that coping strategies should not focus solely on reducing use but also on reshaping the contexts and circumstances in which social media is used. Interestingly, some coping strategies reflected increased social media use or believing more activity is needed, and some reflected reduced use or understanding that being active is not necessary. This highlights the contextual and personal factors in the stress and coping process even further. By introducing this categorization of coping strategies, the dissertation contributes to the understanding of how coping behaviors can be categorized (see Skinner et al., 2003), with a particular emphasis on social dimensions. The categorization could be useful for further research on social coping with technostress, which is still needed. This approach directly responds to Tarafdar et al.'s (2019, p. 16) call for further exploration of the "social and interpersonal related" aspects of coping with technostress.

Also, Article V explores the fundamentally different mechanisms underlying the main types of social coping. Negotiation-focused coping involves engaging with others externally, relying on communication, interaction, and support, with social media serving as the object of negotiation. This type of coping requires direct social interaction, being the most heavily tied to the social dynamics. On the other hand, reflection-focused coping emphasizes social introspection, using mechanisms like self-awareness and self-analysis within the

social context. Although this type involves social elements, individuals can engage in this form of coping without direct interaction with others, meaning outside actors are not necessarily required. Lastly, modification-focused coping involves adjusting social circumstances through both external IT behaviors and internal settings, using strategies such as limit-setting and technical adjustments, either independently or collaboratively. In this case, both direct and indirect forms of social engagement are present. These coping mechanisms demonstrate both collective and individual efforts while highlighting social conditions and dynamics (Berg et al., 1998). As communal coping research shows (Lyons et al., 1998), many of the stressful situations observed were collective problems, demanding group efforts, such as maintaining social relationships. However, some issues were more individual in nature, though still framed within a social context, such as managing social comparisons or unfollowing certain users. Thus, social coping addresses both collective and individual stressors within social media use.

As introduced in the findings of Article III, this dissertation emphasizes the social dimension of technostress, highlighting the role of both IT and social aspects of IT use in its emergence (Fischer & Riedl, 2017). For instance, IT can act as a medium for social interaction that elicits stress. Moreover, the interplay between competition, cooperation, and the actions of game developers plays a crucial role in shaping how technostress develops, as highlighted in research on online multiplayer games. This perspective views online multiplayer games as dynamic systems within a complex social environment (Orlikowski & Iacono, 2001, p. 126), impacting the technostress process. Not only are these games continuously evolving through patches and updates, but player engagement with the games is also in constant flux. This was reflected in the interviews, particularly regarding challenges related to the game meta. While IT is a key factor in shaping technostress (Tarafdar et al., 2019), this dissertation suggests that the phenomenon can be approached from various perspectives, including the social environment (Fischer & Riedl, 2017).

Furthermore, I argue that acknowledging the role of informal norms in IT use (Chen et al., 2023) is crucial for understanding various outcomes users experience. Drawing from the findings of Article VI, ambivalence emerges from the simultaneous exclusion and inclusion of diverse user behaviors, which reflect evolving norms and the perceived optimal ways to engage. Therefore, designed dynamics of IT use can inform broader practices and facilitate change. Specifically, the dissertation elucidates how changes in IT use can be optimized and shaped by both design factors and the social conditions, including informal norms, that influence user behavior, as delineated in Article VI. Furthermore, by examining how design paradoxes in digital gaming trigger ambivalence, this work contributes to the less-explored social dynamics of paradoxes (Hargrave et al., 2017). Also noteworthy in design of IT, craving can trigger technostress without direct or active IT use, as proposed in Article II. This insight further underlines the indirect role of IT in technostress emergence (Fischer & Riedl, 2017).

5.1.3 Goal hindrances and coping with technostress

The third contribution of this dissertation is associated with coping by disentangling a range of situation-specific negative consequences from the individual user perspective, contributing to the previous understandings of coping as a consequence of technostress. Previous studies have tended to discuss the consequences of technostress as strains or other negative outcomes of IT use that reflect the end of the process. However, this interpretation does not always support the realism of technostress consequences, especially in situations where technostress inhibits IT users from reaching goals that are unrelated to their IT use. In line with Emmons (1986), the dissertation showcases that conflicting goals can be a source of stress. The presence of conflicting goals forces individuals to prioritize, weighing the positive and negative consequences of their coping strategies as they work to shield certain goals. While the pursuit of specific goals may initiate positive change in managing technostress, these changes can also undermine other goals, potentially leading to additional stress, as a manifestation of the dual nature of IT use.

This dissertation extends previous understandings of the dynamics of the technostress process from the perspective of goals and related coping strategies. The adopted approach posits that stress and unmet goals are associated (Folkman, 2008), and technostress can manifest as goal hindrances, wherein strains or other negative outcomes might not reflect the end of the process. More specifically, I argue that strains and other negative outcomes of technostress could inhibit IT users from reaching different goals, often not even related to their IT use. To understand how to deal with this, this dissertation investigates coping with technostress as a form of goal shielding (Bélanger et al., 2013; Shah et al., 2002) with a range of situation-specific negative consequences from the individual user perspective in smartphone use for leisure and personal purposes. This approach extends the extant understandings of goals and technostress of IT use (Califf, 2023) and the presenteeism perspective to humanistic and instrumental goals and coping with technostress (Luoma et al., 2020), undertaken in previous, contextualized studies in organizational settings. Building on previous studies and contributing to existing understandings of technostress consequences, I argue that interruptions and concentration issues can disrupt users' personal interests (e.g., engaging in hobbies) or everyday tasks (e.g., completing chores efficiently). This necessitates goal shielding through coping strategies, such as adjusting use, settings, and attitudes (see Salo et al., 2017). Since individuals' goals are composed of smaller sub-goals (Austin and Vancouver, 1996), this contribution to technostress consequences involves identifying sub-goals for both humanistic goals, like achieving a meaningful life (e.g., feeling happy), and instrumental goals, such as managing personal information (e.g., maintaining privacy). This approach addresses the multidimensional and hierarchical nature of goals (Wicker et al., 1984).

As discussed in Article IV, I argue that when goals are more explicit, such as the instrumental goal of completing assignments on time, individuals tend to exert more control over the situation, often employing anticipatory coping

strategies (i.e., anticipatory coping; Folkman & Lazarus, 1985; Reuter & Schwarzer, 2012). In contrast, when goals are more implicit, such as the humanistic goal of pursuing happiness, coping tends to be more reactive and impulsive (i.e., reactive coping; Pirkkalainen et al., 2019; Reuter & Schwarzer, 2012). This suggests that goals can be understood through an explicit-implicit dynamic (Bittner, 2011), and technostress-related goal disruptions can be viewed from this perspective. The findings indicate that for explicit instrumental goals, anticipatory coping strategies are dominant. Likewise, when humanistic goals include both explicit and implicit elements, coping strategies tend to vary.

This identification of coping strategies linked to goal types adds depth to the discussion on technostress consequences. Specifically, the dissertation highlights the types of coping strategies likely to be employed in different situations and explores the underlying reasons for these strategies, contributing to an understanding of how coping with technostress unfolds over time (Pirkkalainen et al., 2019). The findings suggest that when individuals clearly know what they want to achieve or become, they may find it easier to anticipate potential goal disruptions caused by technostress. Furthermore, anticipatory coping may function as a form of goal setting, highlighting the connection between coping and goal orientation in this context. However, when aspirations are more implicit and abstract, coping often happens reactively without clear goal setting.

By highlighting how humanistic goals, such as fostering social relationships and seeking relaxation, often conflict with instrumental goals related to work and academic pursuits, the challenge of balancing IT-mediated personal lives with work demands becomes apparent (Benlian, 2020; Burleson & Greenbaum, 2019; Tams et al., 2020). For example, observations in Article IV revealed instances where individuals temporarily reduced smartphone use to focus on achieving instrumental goals, particularly those related to studying. However, this decision created difficulties in maintaining social connections, many of which were sustained through smartphone interactions. Although limiting smartphone use may improve study efficiency, it also led to feelings of unhappiness due to decreased real-time social engagement, further emphasizing the tension between humanistic and instrumental goals.

5.1.4 Digital gaming as an IS research context: technostress, ambivalences, and paradoxes

Fourth, this dissertation proposes a contextual contribution, extending previous work on technostress, ambivalences, and paradoxes to the novel context of digital gaming. While technostress has been studied in many different and specific IT use contexts, digital gaming has received limited attention, aside from a few mentions of mobile gaming and technostress (Hsiao, 2017; Mehtälä et al., 2022) and one study that focuses on a single game (Hämäläinen et al., 2023). I argue that recognizing context-specific technostressors is essential for advancing both research and practical applications, complementing prior studies on general technostressors, such as techno-unreliability (Fischer et al., 2019) and online

discussion conflict (Salo et al., 2019). Article III examines online multiplayer games, a particularly useful context for studying technostress due to the intricate combination of technical, competitive, and cooperative elements characteristic to these games. Additional factors include incentives for consistent play, the fast-paced updates of servitized online games, players' significant temporal and monetary investments, and the strong connection between digital gamers' identities and the games they engage with. Online multiplayer games, as constantly evolving and complex IT artifacts (Orlikowski & Iacono, 2001), offer a unique environment that may introduce new and distinct technostressors.

For example, Article III identified technostressors such as game meta issues, poor matchmaking, toxicity, and smurfing, none of which are among the technostressors investigated in previous literature. While poor matchmaking could be seen as a form of techno-unreliability (Fischer et al., 2019), matchmaking often functions as intended, and perceiving it as flawed does not always indicate that the system is unreliable or broken. Additionally, Article III emphasizes the role of players' egos in toxicity, drawing parallels to issues of identity seen in technostress and social media use (Salo et al., 2019). However, the explicit element of competition, which is more dominant in gaming, differentiates toxicity in games from conflicts on social media. Toxicity has been closely linked to competitive gameplay in existing research (Kwak et al., 2015), suggesting that player-versus-player competition drives certain technostress experiences. While game chat is often the medium through which toxicity is expressed, it can also emerge through gameplay itself. This dissertation offers context-specific insights, which are essential for developing context-specific theories (Hong et al., 2014). By identifying particular game elements that shape IT environmental conditions appraised as stressful, we extend the literature by highlighting specific aspects of the IT artifact in the technostress process. This builds on prior studies that examined technostress and related IT characteristics in organizational settings (Ayyagari et al., 2011) and social media use (Salo et al., 2019). Our focus on how game elements contribute to negative stress outcomes in players provides valuable insights, which can inform future research on the adverse effects of gamification (Riar et al., 2022).

Furthermore, the dissertation's work on technostress in digital gaming extends the minimally studied topic of positive technostress in personal and leisure IT use. As there has been a call for more such research (Tarafdar et al., 2024), this is crucial. Technostress is now recognized for its dual nature, and as leisure IT use is extremely popular, understanding "both sides of the coin" is more important than ever. Also, while existing research has shown that individuals' appraisals of various IT conditions can result in either positive or negative technostressors (Califf et al., 2020; Tarafdar et al., 2019; 2024), this dissertation demonstrates that technostressors are often neutral, with outcomes varying based on context, which is aligned with prior research on psychological stress (Lazarus & Folkman, 1984). Thus, our findings indicate that the same set of environmental stimuli can contribute to both distress and eustress (Le Fevre et al., 2003). Previous research has demonstrated that situations in competitive

games can be simultaneously perceived as both threats and challenges, making it difficult to clearly differentiate between negative and positive technostress (Poulus et al., 2020). Our findings highlight how techno-distress and techno-eustress can be viewed as dynamic and overlapping phenomena, showing that similar interactions between players and games can be appraised in either a negative or positive light, resulting in different outcomes. For instance, encountering smurfing—where players face opponents with significantly higher skill levels—can feel like a waste of time for some players. However, those focused on improving their gameplay may see it as an opportunity to grow (Tarafdar et al., 2024). Additionally, various sociocultural factors can influence the processes of eustress and distress in online multiplayer gaming. For example, the social pressure of team play may cause eustress to shift into distress (Snodgrass et al., 2016). Such findings add to the explanations of the *dynamic* nature of the technostress process.

Moreover, the dissertation contributes to the body of knowledge by using the lens of ambivalence to explore the varied outcomes resulting from paradoxical design choices in digital games. As discussed in Article VI, the dissertation demonstrates how paradoxical design can trigger both individual and collective ambivalences, thereby extending the research on ambivalent outcomes and ambivalence triggers (Ashforth et al., 2014). By identifying interconnected design paradoxes within digital gaming, Article VI provides a framework for understanding how these paradoxes evoke ambivalence in players. While previous research has primarily focused on organizational triggers of ambivalence, such as the tension between continuity and change (at the collective level) and role conflict (at the individual level) (Ashforth et al., 2014), this article specifically examines these triggers from the perspective of game design paradoxes. It highlights how ambivalences arise from the evolving nature of IT, which continually introduces new features, standards, and uses (Orlikowski & Iacono, 2001). This is particularly pertinent for IT systems characterized by constant change, as seen in the game design paradoxes explored in this study. While paradoxical tensions between stability and change have been widely explored in organizational settings (e.g., Farjoun, 2010), they have received less attention in the context of voluntary IT use for leisure and personal activities.

This oversight is significant, as the tension in game design between maintaining stability and introducing change can evoke ambivalence in players, particularly when balancing feelings of obligation with volition. Such ambivalence can negatively impact player well-being and retention. These findings deepen the understanding of the paradox between stability and change (Farjoun, 2010) and provide insights into how to balance the need for reliable, consistent game mechanics with the desire for fresh, innovative updates. Achieving harmony between these elements is crucial for enhancing the player experience. Furthermore, since design features can help manage paradoxes (Jarvenpaa & Lang, 2005), it is important to understand how these dynamics

manifest in different IT use contexts, especially when the design itself reflects paradoxical elements.

While existing research often highlights the harmful effects of ambivalence (Van Harreveld et al., 2009), it is important to recognize that ambivalence does not always result in negative outcomes. It can also promote adaptation and flexibility (Rothman et al., 2017). This perspective invites a re-evaluation of traditional views, suggesting that ambivalence can have a constructive role in complex leisure activities like digital gaming. In fact, the ambivalent nature of gaming may enhance its appeal, particularly through the balance of distress and eustress (Snodgrass et al., 2016). The findings suggest that this ambivalence frequently arises from a fundamental game design paradox: the tension between constant change and maintaining the status quo. Games that remain static risk becoming dull, while constant updates can evoke both distress and eustress, as players may feel overwhelmed yet motivated to achieve mastery. Game designers must navigate this tension by developing a stable core gameplay loop that provides a reliable framework while introducing enough variety and novelty to sustain engagement. Successfully managing this balance could help address economic challenges faced by gaming companies, especially regarding player retention (Strååt & Verhagen, 2018).

5.2 Practical implications

This dissertation proposes practical implications from the perspectives of four stakeholder groups: users of smartphones/social media, and digital gamers; service providers (including social media and gaming companies); employers and managers; and decision-makers. Beginning with the users, interviews conducted with smartphone/social media users revealed that many participants found it eye-opening to reflect on their use habits, particularly the associated stress and other negative experiences. The findings of this dissertation can further support users in engaging in deeper reflection on their interactions with these kinds of IT. Specifically, the scenarios discussed in Article I provide valuable insights for users seeking to understand how certain patterns of smartphone/social media use contribute to technostress. This awareness can be instrumental in encouraging behavioral changes. Furthermore, users may benefit from considering the relationship between the gratifications they seek and those they actually obtain in connection with technostress. This evaluation can serve as a basis for assessing whether their IT use is genuinely rewarding. In this regard, reflecting one's behavior through the lens of the smartphone use loop defined in Article I could offer users a more nuanced understanding of technostress, which is key for alleviating it.

Moreover, the three-level categorization of smartphone-related craving in Article II may assist users who struggle with compulsive or excessive use. By identifying whether their craving is triggered by all stimuli, specific sensations, or particular types of content, users can better recognize the elements that

contribute to their overuse. With regard to coping mechanisms, the findings from Article IV highlight the significance of understanding both explicit and implicit goals. Such an understanding enables users to align their aspirations with more proactive, anticipatory coping strategies for managing technostress. Striving for a balance between conflicting goals, for example, by prioritizing those that align with healthier smartphone/social media use, can help individuals achieve greater harmony in their technology interactions. Also, the interviews indicated that while users frequently contemplate changes to their IT use, they often struggle to implement them. The dissertation offers concrete strategies that users can adopt to more effectively cope with technostress, empowering them to translate their intentions into meaningful actions.

Second, the informants across the datasets in this dissertation emphasized that managing the negative consequences of IT use is not solely the responsibility of the user; it is also a critical issue for service providers. This point is particularly pertinent given that prior studies have shown technostress can contribute to users discontinuing the use of services (e.g., Luqman et al., 2017; Maier et al., 2015c). Participants highlighted that social media platforms, which are intentionally designed to deliver stimuli that users find gratifying, often make it difficult to resist engaging in extended browsing, leading to technostress. A number of informants noted the lack of features aimed at helping users cope with these issues, calling on providers to be more attentive to user feedback and to introduce functionalities that address technostress-related concerns. Although service providers focus on fostering user engagement and maximizing profits, social media companies could incorporate features that offer greater transparency and control over personalized use. For example, the findings from this dissertation could inform the design of tools aimed at mitigating technostress, such as content filters or mechanisms for monitoring and even restricting one's use. Emerging practices in this area have already begun to surface; in China, for instance, users under the age of 14 are restricted from using Douyin (the Chinese version of TikTok) for more than 40 minutes per day or between the hours of 10 p.m. and 6 a.m. (Dent, 2021). By drawing on the dissertation's findings, service providers could better comprehend the impact of smartphone/social media use on users and develop supportive measures to aid in coping with technostress.

Regarding the gaming context, the dissertation's findings on specific game elements contributing to technostress could serve as a valuable resource for game developers when designing future games. While game companies already have access to extensive player data, integrating established theoretical frameworks and user experiences can offer deeper insights. The results provide a means for developers to balance the pursuit of revenue with ensuring player satisfaction and well-being. Additionally, game designers could incorporate choices that highlight the positive aspects of ambivalences and paradoxes. By adopting a "paradox mindset" (Miron-Spektor et al., 2018), game developers could leverage these tensions for beneficial outcomes rather than harm. It is crucial that player well-being and satisfaction are not sacrificed for profit, and gaming companies

could enhance transparency by clearly communicating how they manage this paradox. Understanding how players perceive and value their time in games can guide developers in creating more fulfilling gaming experiences, ultimately fostering greater player well-being and long-term satisfaction. Also, a recurring theme in the interviews was the perception that digital games have been compromised by the influence of newer monetization strategies, such as microtransactions, which have their roots in mobile gaming. Loot boxes, which are a particularly contentious example, are often criticized by players (McCaffrey, 2023). However, removing these features poses financial risks for gaming companies (Carvalho, 2021). By gaining a deeper understanding of player behavior, the dissertation's findings could help companies navigate these competing pressures.

Third, while this research primarily examines IT use for leisure and personal purposes, the findings offer valuable insights for employers and managers. For instance, if employees feel mentally exhausted due to personal IT use, it can negatively affect their work performance. The results provide employers with an understanding of which types of personal IT use, particularly during working hours, may be detrimental and which might offer benefits—such as short breaks that allow employees to release tension through gratifying activities. A pertinent issue to consider is the rise of remote work following the COVID-19 pandemic, which has amplified opportunities for cyberslacking. Over time, such behaviors could harm both employees and organizations. Employers would benefit from educating their workforce on the potential consequences of personal IT use during work hours, drawing on perspectives such as those provided by this dissertation. This education could be formalized through guidelines that incorporate these findings.

Further, organizations using gamification across different functions could draw on the dissertation's findings to optimize the emotional impact on users. Gamification is intended to evoke the positive emotions associated with gaming; however, studies have also identified potential downsides, such as unhealthy competition and heightened performance monitoring (Koivisto & Hamari, 2019). While the focus was on digital gaming, the integration of game elements into various systems is blurring the distinction between gaming and gamified environments. The identification of specific game elements and their associated stress reactions—both positive and negative—could help guide the development of gamified systems to evoke favorable emotions in users. Moreover, based on the results, it is not only the game elements themselves that are crucial but also the role of the surrounding social environment and the individual users' preferences and perceptions. For instance, gamified systems frequently rely on point-based scoring systems and leaderboards. As the dissertation's findings suggest, the optimal way of playing a game may not always align with users' desires and may, in fact, become a source of stress. Therefore, gamified systems should be designed and implemented with careful attention to creating an engaging and desirable optimal way of using the system (i.e., drawing ideas from the game metas).

Finally, the findings of this dissertation hold significance for decision-makers. Many participants expressed frustration that social media providers have not taken adequate steps to help users cope with the adverse effects of technostress. This suggests that there is a need for interventions to encourage or compel service providers to adopt more user-centric approaches. For instance, decision-makers could draw from the initial measures seen in countries like China, where restrictions on platform use for younger users have already been implemented. Although such interventions must be tailored to respect cultural and societal values, they demonstrate the growing recognition of the need for regulatory oversight in addressing technostress. Decision-makers could also encourage transparency from service providers, requiring them to disclose how their platforms are designed to capture user attention and offering users the ability to make informed decisions about their IT use. By integrating insights from research on technostress, decision-makers could enact legislation that promotes a more sustainable, human-centered approach to IT design and use. The development of guidelines that promote responsible platform design and use across various sectors would further align societal goals with individual well-being, ultimately benefiting both service providers and users; and especially, the society at large.

5.3 Limitations

It must be acknowledged that this dissertation has several limitations. First, because I relied on self-reported data, there is the potential for memory bias, as participants were required to recall past experiences. Although precautions were taken, such as providing time for reflection, inaccuracies in recollection remain a potential limitation. Second, the interview samples consist of relatively homogeneous groups of primarily young adults from similar cultural and educational backgrounds. This lack of diversity may limit the applicability of the results to other demographic groups or cultural contexts. Given that qualitative research methods were employed, the findings cannot be generalized to a broader population. Third, portions of the data collection occurred during the COVID-19 pandemic, which may have influenced participants' IT use. For example, several participants reported increased usage due to spending more time at home. While efforts were made to account for pandemic-related influences in the data, the unique circumstances of the pandemic may have impacted the results.

Several limitations of this dissertation are reflected at the individual article level. First, Articles I, II, IV, and V focus solely on techno-distress, omitting positive aspects of technostress. In Article II, the concept of craving and its connection to addiction is a possible limitation; while some scholars argue that craving can exist without addiction, most studies link it to addiction. Although I adopted the position that experiencing craving does not imply addiction, this may be a point of contention. In Article III, some participants did not experience

significant stress, particularly those who highly valued their time spent gaming. This highlights a difference between technostress in gaming and, for example, social media use. Additionally, in Article III, certain stressors may occur in non-digital games or other competitive contexts. In Article IV, ambiguity in terms of distinguishing explicit from implicit goals, as well as categorizing humanistic and instrumental goals, poses challenges. To mitigate these challenges in the analyses, I followed previously established rigorous methodological procedures and employed triangulation. Furthermore, while the data collection conducted in Article V did not exclusively focus on social coping, social conditions and dynamics emerged as central for both technostress and coping. In Article VI, to protect the anonymity of the social media data, I paraphrased user quotes, which could have impacted credibility of the presented evidence. However, I took great care to ensure that the paraphrases accurately reflected the original meanings by meticulously cross-referencing the texts.

5.4 Future research

First, while this dissertation focuses on technostress within the context of three individual IT environments, many participants revealed frequent and concurrent use of multiple IT systems to manage the demands of constant connectivity. This suggests that technostress often arises from the interaction between multiple systems, rather than isolated IT use. This observation aligns with Gerlach and Cenfetelli's (2022, p. 478) call for further investigation into the role of multiple IS in technostress: "We believe that technostress research could benefit from a more explicit treatment of multiple IS and their interactions in the future." Although this dissertation did not explicitly focus on this issue, some of the findings highlight its relevance. Future research could explore different types of IT ensembles and their technostress implications (Hu et al., 2023), using approaches such as the configurational method (Pflügner et al., 2024).

Second, this dissertation revealed preliminary examples of how different social coping strategies interplay. For instance, discussing IT use with others (negotiation-focused) can lead to reflecting on one's own use (reflection-focused). This suggests that social coping strategies often influence one another, as noted in the broader literature on IT use and coping (Salo et al., 2020). Future research could explore how these strategies interact and evolve. Additionally, the findings show that social media use, technostress, and coping are often intertwined with offline social contexts. For example, technostress can emerge when individuals feel pressured to manage both online and offline social interactions simultaneously, requiring nuanced coping strategies. Exploring this interaction across online and offline spaces could provide valuable insights into the role of IT in technostress. Moreover, cultural shifts, such as changes in the perceived significance of social media feedback, also emerged from the data. Future research could further investigate the implications of these shifts for technostress and coping.

Third, future research could build on this dissertation's findings on goals and conflicts related to technostress and coping. One area of interest is how certain coping strategies might inadvertently create new technostressors. For example, when users implement specific coping mechanisms, they may generate additional stressors through different pathways, a phenomenon that warrants further investigation. Furthermore, IT systems are often driven by instrumental goals, but these goals frequently coexist with humanistic outcomes, even in systems primarily designed for welfare (Weeger et al., 2021). More research is needed to understand how IT artifacts can support both humanistic and instrumental goals without compromising either, contributing to better IT system design that reduces technostress.

Fourth, the uses and gratifications theory posits that individuals actively choose the media they consume (Katz et al., 1974). However, with the rise of personalized feeds, this active role may need reconsideration. Perceptions of algorithmic recommendations vary among individuals, influencing their use of services that rely on these algorithms (Min, 2019). Exploring how perceptions of algorithms shape users' media consumption—particularly on social media—could redefine the understanding of active media consumption. While algorithms affect use, people's attitudes toward personalization could still represent an active aspect of media use. Investigating this could lead to a reconsideration of the foundational assumptions of the uses and gratifications theory, especially regarding IT use in algorithm-driven environments.

Fifth, longitudinal research could deepen our understanding of key aspects highlighted in this dissertation. For instance, longitudinal methods could be applied to understand how persistent technostress from playing digital games impacts players over extended periods. Some participants reported technostress experiences that were not particularly intense at the time of data collection, suggesting the value of investigating how smaller, more subtle technostress experiences accumulate and affect digital gamers over time. Given that technostress is a temporal process that evolves through different stages (Salo et al., 2022), diary studies and other longitudinal research methods would be particularly useful for examining these gradual effects. This approach could provide deeper insights into how technostress unfolds and affects users across various IT environments.

Finally, I would like to encourage more IS scholars to investigate digital gaming, a context that has received limited attention in the field, despite offering rich opportunities to study phenomena highly relevant to IS research. For instance, IS scholars could incorporate our findings on gaming ambivalences and game design paradoxes explicitly from the technostress perspective. This could yield new conceptual understanding of how technostress unfolds, while also contributing to understanding on ambivalences and paradoxes. Here, different types of players could be studied, as they may handle ambivalences in distinct ways, with traits like competitiveness shaping their responses. Additionally, the dissertation revealed concerns among gamers about monetization strategies in digital games, which encourage spending beyond the initial purchase. Future

research could explore whether these strategies contribute to technostress, and if so, investigate the aspects that make them stressful. This could provide valuable insights into how business models in gaming (and other types of IT) affect technostress, contributing not only to technostress literature but also to a deeper understanding of the dynamics of monetary exchange in digital services; an area of great interest for IS scholars.

YHTEENVETO (SUMMARY IN FINNISH)

Informaatioteknologia (IT) on muovannut ihmisten elämää syvällisesti juurtuen päivittäisiin rutiineihimme ja muuttaen perusteellisesti tapojamme kommunikoida, työskennellä ja viettää vapaa-aikaa. Vaikka IT on tuonut mukanaan merkittäviä positiivisia muutoksia, se on myös synnyttänyt ja voimistanut ilmiötä nimeltä teknostressi, joka tarkoittaa yksilön kokemaa stressiä IT:n käytön seurauksena. Alun perin työelämään liitetty teknostressin käsite on sittemmin tunnistettu merkittäväksi myös IT:n käytössä vapaa-ajan kontekstissa. Vaikka tutkimus näissä yhteyksissä on lisääntynyt, on vielä paljon asioita, joita emme täysin ymmärrä. Koska aikaisemmat tutkimukset ovat osoittaneet, että teknostressi voi aiheuttaa merkittäviä ongelmia niin yksilöille kuin organisaatioillekin sekä työssä että sen ulkopuolella, teknostressin syntymisen ja siihen liittyvien hallintakeinojen selittäminen on erityisen tärkeää.

Tämä väitöskirja laajentaa teknostressin ja siihen liittyvien hallintakeinojen ymmärrystä vastaamalla kuuteen tutkimuskysymykseen kuuden artikkelin kautta hyödyntäen laadullisia tutkimusmenetelmiä. Tutkimus keskittyy erityisesti vapaa-ajan ja henkilökohtaisen IT:n käytön konteksteihin, kuten älypuhelimien käyttöön, sosiaalisen median käyttöön ja digitaaliseen pelaamiseen. Väitöskirjaa varten haastateltiin älypuhelimen ja sosiaalisen median käyttäjiä (n = 30) sekä digitaalisten pelien pelaajia (n = 22). Tämän lisäksi digitaalisten pelaajien kokemuksiin liittyen kerättiin keskusteluaineistoa pelaajayhteisöstä sosiaalisen median palvelussa.

Artikkelissa I käsittelen teknostressiä käyttötarkoitusteorian (eng. *uses and gratifications theory)* näkökulmasta. Tarkastelemalla sekä haettuja että saavutettuja palkintoja (eng. *gratifications),* selitän artikkelissa, kuinka teknostressin kokemukset voivat vaihdella haettujen palkintojen tyypin ja niiden saavuttamisen perusteella. Tämän lisäksi olennaisena osana artikkelissa nostetaan esille myös erilaisia käytön ominaisuuksia osana teknostressiprosessia, kuten personoitu käyttö. Huomioiden sekä nämä käytön ominaisuudet että käyttöön liittyvät palkinnot, tutkimus osoittaa, että käyttäjien saavuttaessa heille erityisen tärkeitä palkintoja, teknostressin kokemukset vähenevät (esim. sosiaalisten palkintojen havaittiin olevan erityisen tärkeitä käyttäjille). Toisaalta, palkintojen saavuttamattomuus voi lisätä teknostressiä.

Artikkelissa II selitän, miten käyttäjien hallitsemattomat kognitiot ja käyttäytyminen voivat myötävaikuttaa teknostressiin halun (eng. *craving*) näkökulmasta. Artikkelissa käsittelen kolmea eri tapaa, joilla halu voi laukaista teknostressiä. Ensimmäisessä tavassa älypuhelimen aktiivinen käyttö ei aina ole tarpeen teknostressin synnylle, vaan pelkkä älypuhelimen läsnäolo (esim. pöydällä) voi herättää halun, joka johtaa teknostressiin. Toisessa tavassa halu voi ajaa yksilön pakonomaiseen käyttöön, josta seuraa lopulta teknostressiä. Tämä tapahtuu usein tilanteissa, joissa älypuhelinta ei olisi soveliasta tai järkevää käyttää. Esimerkkejä tästä ovat käyttö ennen nukkumaanmenoa tai käyttö sosiaalisissa tilanteissa. Kolmannessa tavassa halu voi johtaa liialliseen älypuhelimen käyttöön. Tällöin yksilöt usein viettävät aikaa sisällön ja toiminnan parissa, joka ei ole heille

välttämätöntä tai edes erityisen nautinnollista. Tämä voi lisätä teknostressiä erityisesti ristiriitaisten tunteiden vuoksi. Tätä kautta voimme myös paremmin ymmärtää tilanteita, joissa ihmiset jatkavat teknologian käyttöä sen aiheuttamasta teknostressistä huolimatta.

Artikkelissa III käsittelen teknostressiä verkkopohjaisissa moninpeleissä. Tarkastelemalla digitaalisia pelejä, joissa kilpailu ja yhteistyö ovat keskeisiä, selitän myös teknostressiin liittyviä sosiaalisia dynamiikkoja. Esimerkiksi pelitilanne, joka itsessään ei aiheuta stressiä, voi synnyttää sosiaalisen tilanteen, joka ilmenee teknostressikokemuksena. Tutkimuksen tulokset osoittivat myös, että verkkopohjaisten moninpelien pelaaminen voi tuottaa uudenlaisia teknostressitekijöitä, kuten tilanteita, joissa kokeneet pelaajat luovat käyttäjätilejä pelatakseen itseään huomattavasti heikkotasoisempia pelaajia vastaan (nk. *smurffaus*). Keskeisenä havaintona tutkimuksessa myös todettiin, että pelaajien kokemukset teknostressistä olivat usein monimuotoisia ja dynaamisia. Joskus oli epäselvää, olivatko pelaajien teknostressikokemukset positiivisia vai negatiivisia. Esimerkiksi osallistuminen uuteen, erittäin haastavaan pelitilanteeseen voi aluksi tuntua negatiivisella tavalla stressaavalta, mutta pelaajan oppiessa hallitsemaan tilannetta siitä voi lopulta seurata positiivisia teknostressikokemuksia esimerkiksi liittyen kasvaneeseen motivaatioon ja itsensä ylittämiseen.

Artikkelissa IV keskityn teknostressiin liittyviin hallintakeinoihin (eng. *coping*). Artikkelissa tarkastellaan stressin ja saavuttamatta jääneiden tavoitteiden välistä yhteyttä korostamalla teknostressin ilmenemistä tavoitteiden estymisenä sekä teknostressin hallintaa tavoitteiden suojaamisena. Tulokset osoittavat, että yksilöt hallitsevat tilanteita paremmin, kun heidän tavoitteensa ovat eksplisiittisiä (esim. opintotehtävien suorittaminen määräaikaan mennessä), jolloin heidän hallintakeinonsa ovat usein ennakoivia. Sen sijaan implisiittisten tavoitteiden (esim. onnellisuuden tavoittelu) kohdalla yksilöt toimivat reaktiivisesti ja hetkeen mukautuen. Instrumentaalisten tavoitteiden kohdalla, jotka havaittiin pääosin eksplisiittisiksi, ennakoivat hallintakeinot olivat yleisiä, kun taas humanististen tavoitteiden, jotka voivat olla sekä eksplisiittisiä että implisiittisiä, kohdalla strategiat vaihtelivat tilanteen mukaan. Tämän lisäksi yksi keskeinen havainto oli, että yksilöt kohtaavat usein ristiriitoja käyttäessään hallintakeinoja tiettyjen tavoitteiden suojaamiseksi. Esimerkiksi ihmisten vähentäessä väliaikaisesti älypuhelimen ja sosiaalisen median käyttöä keskittyäkseen akateemisiin tavoitteisiin, tämä voi heikentää heidän kykyään ylläpitää sosiaalisia suhteita, jotka olivat riippuvaisia näistä teknologioista.

Artikkeli V laajentaa teknostressin ja siihen liittyvien hallintakeinojen tutkimusta sosiaalisesta näkökulmasta. Esittelen artikkelissa kolme sosiaalisten hallintakeinojen päätyyppiä:

1. neuvotteluun keskittyvät hallintakeinot, jotka korostavat vuorovaikutusta muiden kanssa sisältäen viestinnän, sosiaalisen tuen ja kollektiivisen ongelmanratkaisun;
2. pohdintaan keskittyvät hallintakeinot, jotka liittyvät sosiaaliseen itsetutkiskeluun ja painottavat itsetietoisuutta ja itsereflektiota sosiaalisesta näkökulmasta;

3. mukautumiseen keskittyvät hallintakeinot, jotka tarkoittavat sosiaalisten olosuhteiden muuttamista käyttäytymistä ja IT-asetuksia mukauttamalla/säätämällä.

Artikkelissa todetaan, että jotkin hallintakeinot ilmensivät lisääntynyttä sosiaalisen median käyttöä tai uskoa korkean aktiivisuuden tarpeellisuuteen, kun taas toiset keinot painottuivat vähentyneeseen käyttöön tai ymmärrykseen siitä, että aktiivisuus ei ole välttämätöntä. Esimerkiksi strategiat, kuten varmistelu, ettei sosiaalisen median sisältöä jää huomaamatta, ja luottamus siihen, että tarvittava tieto saavuttaa käyttäjän, vaikka tietoa ei itse aktiivisesti seuraisikaan, tähtäävät samaan perustavoitteeseen, mutta lähestyvät ongelmaa täysin eri suunnista.

Artikkelissa VI tarkastelen IT:n käytön laajempia ajureita ja seurauksia digitaalisen pelaamisen kontekstissa. Artikkelissa selitän, miten samanaikaiset negatiiviset ja positiiviset tuntemukset (nk. *ambivalenssit*) ilmenevät sekä yksilöllisellä että kollektiivisella tasolla ja kuinka ne voivat syntyä pelisuunnittelun toisiinsa kytkeytyvien paradoksien seurauksena. Tutkimuksessa pelisuunnittelun paradoksit määritellään tilanteiksi, joissa pelisuunnittelun eri osa-alueet ovat jatkuvassa konfliktissa, mikä johtaa pelaajien ristiriitaisiin kokemuksiin. Pelisuunnittelun paradoksit voivat johtaa ambivalentteihin lopputuloksiin, kuten samanaikaisiin ulkopuolisuuden ja osallisuuden tunteisiin tai vihamielisyyden ja harmonian kokemuksiin. Artikkelissa todetaan, että pelisuunnittelijoiden on löydettävä tasapaino luomalla vakaa pelikokemus, joka tarjoaa riittävästi vaihtelua pelaajien kiinnostuksen säilyttämiseksi ilman, että se kuormittaa heitä liikaa. Tästä näkökulmasta pelaamista joskus verrataan työhön. Tämä on erityisesti läsnä peleissä, joissa palkintojen saaminen ja edistyminen edellyttää toistuvien, usein pitkäveteisten tehtävien suorittamista (nk. *grindaus*). Nämä toistuvat pelisilmukat pitivät pelaajat sitoutuneina mutta eivät aina tyytyväisinä, mikä osoittaa, kuinka pelisuunnittelun paradoksit voivat laukaista ambivalenssia.

Yhteenvetona voidaan todeta, että kuudesta tutkimusartikkelista koostuvan synteesin kautta tämä väitöskirja esittää neljä keskeistä tietojärjestelmätieteen tutkimukseen liittyvää kontribuutiota:

1. teknostressin ennakkotekijöiden ymmärtämisen laajentaminen;
2. teknostressiin ja sen hallintakeinoihin liittyvän sosiaalisen dynamiikan selittäminen;
3. tavoitteiden saavuttamisen eston tunnistaminen teknostressin seurauksena ja tavoitteiden suojaamisen tunnistaminen hallintakeinona;
4. teknostressin, ambivalenssien ja paradoksien tarkastelun laajentaminen digitaalisen pelaamisen kontekstissa.

Tämän väitöskirjan keskeiset kontribuutiot sijoittuvat tietojärjestelmätieteen ytimeen korostaen tutkittujen ilmiöiden sekä sosiaalisia että teknisiä ulottuvuuksia. Kokonaisuutena väitöskirja selittää teknostressin syntytapoja ja siltä suojautumista monimutkaisissa sosioteknisissä ympäristöissä liittäen työn osaksi tietojärjestelmätieteen tutkimusta. Väitöskirja edistää keskustelua IT:n ”pimeästä puolesta”, mutta tuo myös esiin IT:n mahdollisuuksia, tarjoten näkemyksiä, jotka voivat edistää IT:n tasapainoista integrointia yhteiskuntaamme.

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APPENDIX – THE INTERVIEW SCHEMES

Interviews with smartphone and social media users (Dataset A)

(Background information was asked in a separate form, consisting of age, gender, educational background, and occupation)

(Prior to the interview formally starting, casual conversation was used to create a more comfortable atmosphere)

(Introduction of the research and the researcher; brief explanation of how the interview practically takes place; a mention of the confidentiality aspects of the interview; a permission question to record the interview)

(Supporting questions were asked throughout the interviews, such as: Could you elaborate on what you just said? How did you feel at that time? What did you do when that happened?)

Smartphone and social media use during leisure time

Example questions:

- How much do you use your smartphone during your leisure time daily?
- What kind of content do you browse on your smartphone? Social media? News? Something else, what? Describe your use in detail with examples.
- Why do you browse these specific types of content? What motivates you to browse them?
- What kinds of feelings does smartphone and social media browsing evoke? How do the feelings conveyed by different types of content differ from each other?
- What role does entertainment and enjoyment play in your use? How could these feelings be described?
- How do different social elements influence your use of the smartphone and social media? How do you use your phone for social purposes? How significant is this aspect in your use?
- What is your biggest/most important reason for using your smartphone during your free time? Where does most of your time go? How important do you consider your smartphone?

Stressful and other negative experiences in smartphone and social media use

Example questions:

- What kinds of stressful/negative/burdensome things or feelings have emerged while browsing certain content or related to the smartphone itself?

- How or where did you notice that you were feeling something stressful/negative/burdensome? In what situations did you realize that you were feeling this?

- What kind of symptoms or effects did you experience?

- What content/service/apps/website is associated with the most stressful or negative feelings? Why? What exactly causes these feelings?

- What aspects or features of the use or the content contribute to these feelings? How and why do you think these negative feelings arise?

- What has resulted from the stressful and negative feelings you may have experienced? How have these negative experiences affected you and your life?

- Feel free to share any additional thoughts about stressful or other negative feelings.

The evolution of smartphone and social media use, and the associated stressful aspects

Example questions:

- When did you get your smartphone? How did your use begin? How has your consumption of certain content evolved over time? How and when did you realize you were experiencing stress or other negative feelings?

- Has your smartphone use (in terms of amount or otherwise) changed over time? Why and how?

- Do you feel that a certain app you used "was better" in the past? Why? Which app? When? Can you describe why you think this way?

- Do you feel that you spend too much time on your smartphone or on social media? When and how did you notice that you were spending too much time?

Responding to stressful or otherwise negative aspects of smartphone and social media use

Example questions:

- How have you responded to the stressful or otherwise negative aspects caused by your smartphone and social media use? How?

- How efficient have these responses been for dealing with the issue? How do you feel about your success in making these changes? Has the effect been temporary or permanent? Why?

- How do you feel about your possibilities for personally influencing the stressful or negative aspects of your use? Is it easy or difficult? Why?

- Think a year into the future – how do you see or want to see your smartphone and social media use?

Relevant questions to ask if not already asked

Example questions:

- Do you sometimes feel that it would be nicer to live without a smartphone? Why?

- Do you use your smartphone simultaneously with other technologies? How? Why?

- Have you noticed that you sometimes use or pick up your smartphone automatically or without thinking? What thoughts does this bring up?

- Do you fear missing out on something if you don't use your smartphone or social media enough? Why, why not?

- Have you ever browsed your smartphone or social media to counteract negative feelings? How has it worked?

- Do you browse while in the presence of others? What are your thoughts on this? What do you think if others browse in your company?

- What do you think about personalized content and algorithms in social media?

Interviews with digital gamers (Dataset B)

(Background information was asked in a separate form, consisting of age, gender, educational background, and occupation)

(Prior to the interview formally starting, casual conversation was used to create a more comfortable atmosphere)

(Introduction of the research and the researcher; brief explanation of how the interview practically takes place; a mention of the confidentiality aspects of the interview; a permission question to record the interview)

(Supporting questions were asked throughout the interviews, such as: Could you elaborate on what you just said? How did you feel at that time? What did you do when that happened?)

Gaming background

Example questions:

- How much do you play on average per day/per week? What do you think about the amount of time you spend playing?

- Could you describe the significance of games and gaming in your life?
- What games do you play? Which genre of games do you play the most? What is your favorite game – currently and all-time?

- What kind of game modes do you play the most within a game? How do you see the significance of different types of gaming modes (e.g., PvE vs. PvP – ranked vs. casual – solo vs. co-op) in your gaming? How do the gaming experiences vary between different types of gaming?

- Who do you play with? How does playing alone differ from playing with others?

Broader experiences/emotions/thoughts in and about gaming

Example questions:

- What kind of experiences/emotions/thoughts does gaming (in general or a specific game) evoke in you? Could you describe in detail and provide concrete examples?

- What do you think of your own gaming skills in the games you play? How important your gaming skills are to you?

- Do you find gaming challenging? How do you feel the challenge of gaming affects your experiences? How important is it for you that gaming challenges you?

- Do you strive to improve in the games you play? How does this manifest in your gaming?

- Do you have any examples of completing a challenging task or achieving a difficult goal in a game? What kind of feelings are associated with this?

- Do you experience any feelings of tension while playing? Describe. What kind of gaming experiences are associated with these feelings?

- Please describe a gaming session – what do you do in the game? What elements? What activities? What functionalities?

- What kind of feelings do you usually have during and after a gaming session? What makes a good gaming session, and what does it involve? What about a bad gaming session?

- What is your most important reason for gaming? What do you think is the best thing about gaming? Why?

- What is the worst thing about gaming? Why?

Stressful and other negative experiences in digital gaming

Example questions:

- What prompted you to participate in this interview? What aspects made you interested in discussing this topic? [the call for participants mentioned that different stressful or negative aspects of gaming will be discussed]

- What stressful/negative/burdensome/irritating/experiences or feelings have emerged while gaming? What makes the experience stressful or otherwise negative? How often it happens? How long do the feelings last? Could you describe the situations and experiences in more detail?

- If you don't experience (strong) stress (often) while gaming, what helps you keep it that way?

- What aspects of games (features/elements/activities) have caused something stressful or negative? Why these in particular?

- How do you notice in yourself that you are stressed or experiencing something negative while gaming?

- What has resulted from the stressful or negative experiences while gaming? How has this affected your life (e.g., your well-being, mood, etc.)? How do stressful or negative gaming experiences impact your life?

- Do you ever get "tilted" while gaming? How do you notice that you're getting tilted? What do you do? What happens? What causes this?

- Do you feel that a game you play was "better" in the past? Why? When? Which game? Why do you think this?

- How have you responded to different stressful or negative aspects of gaming? How do you feel about your success in this?

- How has your gaming evolved as a result of your responses? How have your feelings or thoughts about gaming or particular games changed?

- Have you ever completely stopped gaming or stopped playing a specific game because of stressful or negative experiences? Why?

- Feel free to share any additional thoughts about negative feelings.

Social and cultural aspects of digital gaming

Example questions:

- Have you ever received or given negative feedback to other players/from other players? What kind? How? Why? How did it feel?

- How do you feel about the gaming communities or gaming culture associated with the games you play?

- How others' gaming influences or own gaming habits?

- What do you think of the general discussion in the media (and elsewhere) about gaming?

Relevant questions to ask if not already asked

Example questions:

- What is your general opinion on how modern games are monetized (e.g., microtransactions and pay-to-win elements)?

- What do you think about game developers' role in countering the stressful or otherwise negative feelings players might experience?

ORIGINAL PAPERS

I

SURFING, SCROLLING AND STRESSING: TECHNOSTRESS IN BROWSING DIGITAL CONTENT FEEDS ON SMARTPHONES FROM THE GRATIFICATIONS AND DIMENSIONS OF USE PERSPECTIVE

by

Hämäläinen, A., Salo, M., & Pirkkalainen, H., 2024

Human Technology, 20(3), 640-675

https://doi.org/10.14254/1795-6889.2024.20-3.11

HUMAN TECHNOLOGY

ISSN: 1795-6889

https://ht.csr-pub.eu Volume 20(3), December 2024, 640–675

SURFING, SCROLLING AND STRESSING: TECHNOSTRESS IN BROWSING DIGITAL CONTENT FEEDS ON SMARTPHONES FROM THE GRATIFICATIONS AND DIMENSIONS OF USE PERSPECTIVE

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Abstract: *In this study, we investigate how the nature of activities users perform to interact with information delivered via smartphones (i.e., dimensions of smartphone use), along with gratifications sought and obtained, contribute to technostress in the context of digital content feeds. By applying qualitative research methods and analyzing data gathered through 30 semi-structured interviews, we identify five dimensions of smartphone use: instant, repeated, continuous, personalized, and versatile. Introducing the concept of smartphone use loop, we reveal the dynamic relationships between these dimensions, gratifications, and technostress, illustrating how different dimensions of use and underlying gratifications can lead to diverse technostress experiences (e.g., depending on whether the gratifications sought are obtained). Furthermore, we identify previously unexplored technostressors and strains, such as gratification mismatch and worsened boredom tolerance. By integrating uses and gratifications theory with technostress research, this study offers a novel framework for understanding the dual nature of smartphone use.*

Keywords: *technostress, uses and gratifications theory, dimension of use, smartphone, qualitative research*

DOI: https://doi.org/10.14254/1795-6889.2024.20-3.11

INTRODUCTION

While smartphones have undeniably contributed to positive change in our society by facilitating access to information technology (IT) anywhere and anytime, such has not come without drawbacks. Prior studies have characterized mobile technology as a double-edged sword (Dén-Nagy, 2014; Qi, 2019), with smartphone use at bedtime described as "sleeping with the frenemy" (Hughes & Burke, 2018, p. 236). Additionally, research has linked various forms of IT, including smartphones (e.g., Lee, Chang, Lin & Chen, 2014; Malik, Dhir, Kaur & Johri, 2021) and social media (e.g., Maier, Laumer, Eckhardt & Weitzel, 2015; Maier, Laumer, Weinert & Weitzel, 2015; Salo, Pirkkalainen & Koskelainen, 2019), to technostress, that is, stress caused by IT use (Tarafdar, Cooper & Stich, 2019). It has been shown that technostress can harm users' well-being (Fischer & Riedl, 2017; Salo et al., 2019), underscoring the importance of studying the phenomenon further.

In the present study, we focus on technostress associated with digital content feeds viewed on smartphones. This focus is motivated by the widespread adoption and ubiquity of smartphones, used by billions globally, and the significant influence digital content feeds have on the information consumed through these devices. These types of feeds have even been associated with a type of flow state in which the users "are so engrossed in an activity that little else seems to matter to them and they will often continue the activity despite its negative consequences" (Roberts & David, 2023, p. 80), making them an interesting context for investigating technostress. Moreover, Gerlach and Cenfetelli (2020) propose that factors like the need to stay up-to-date motivate constant device checking, highlighting the necessity for further research to examine "the costs and benefits" of these behaviors (Gerlach & Cenfetelli, 2020, p. 1722). Therefore, understanding why users engage with digital content feeds on smartphones despite experiencing technostress is a critical area of inquiry.

We define digital content feeds as constantly and dynamically updating information streams from various services, applications, and websites. Notable examples of such feeds are present on social media (e.g., Instagram), instant messaging services (e.g., WhatsApp), and news sites and applications, which all have been associated with technostress (Ardèvol-Abreu, Delponti, Bonache & Rodríguez-Wangüemert, 2023; Salo, Pirkkalainen, Chua & Koskelainen, 2022; Whelan, Islam & Brooks, 2020). Consequently, when we mention smartphone use in our study, we refer to use centered around digital content feeds. Examining the technostress caused by browsing digital content feeds on smartphones and understanding why individuals continue this behavior despite its contribution to technostress is critical from multiple perspectives. It raises important questions: Who finds themselves in technostress-inducing situations, why do they engage in these behaviors, and how do such situations arise? Understanding this is essential for designing services that prioritize users' well-being and for educating users about the diverse and often problematic consequences of their smartphone-related behaviors.

There is a growing body of knowledge regarding technostress within the personal and leisure contexts. For instance, overdependence (Salo et al., 2019), fear of missing out (FOMO) (Malik et al., 2021; Dhir, Yossatorn, Kaur & Chen, 2019), overload (Cao & Sun, 2018; Fu, Li, Liu, Pirkkalainen & alo, 2020), invasion (Maier, Laumer, Weinert at al., 2015; Salo et al., 2022), and social comparison (Fox & Moreland, 2015; Salo et al., 2019) have all been identified as *technostressors* (i.e., stress-creating stimuli caused by different situations and events) in

personal IT use. Moreover, prior studies have revealed how IT use for personal purposes may lead to *strains/outcomes* (i.e., psychological, physical, and behavioral reactions to technostressors) such as exhaustion (Cao, Masood, Luqman & Ali, 2018; Cheikh-Ammar, 2020), concentration and sleep problems (Salo et al., 2019), reduced happiness (Brooks, 2015), and use discontinuation (Maier, Laumer, Weinert at al., 2015). Thus, the emergence of technostress through various technostressors and resulting strains/outcomes is well-documented in the literature. However, this process is shaped by numerous factors, including individual characteristics (Lee et al., 2014; Hsiao, 2017), the features of the IT itself (Ayyagari, Grover & Purvis, 2011; Salo et al., 2019; Tugtekin, Barut Tugtekin, Kurt & Demir, 2020), and patterns of usage (Maier, Laumer, Weinert et al., 2015). These influences underscore the dynamic and complex nature of technostress.

Despite existing research, there is limited understanding regarding the positive gratifications users seek (gratifications sought; tightly linked to needs or motives) and obtain (gratifications obtained; satisfying the needs by receiving gratifications) (Quan-Haase & Young, 2010; Palmgreen & Rayburn, 1979) through smartphone use and the impact of technostress as an associated negative outcome. Furthermore, previous studies have not addressed the nature and characteristics of smartphone use in relation to technostress. The uses and gratifications theory posits that individuals actively select media based on the gratifications they seek and obtain (Bae, 2018). Applying this perspective to the study of technostress offers a valuable lens for understanding the active role users play in engaging in behaviors that contribute to technostress. Understanding *why* and *how* individuals use smartphones in situations they experience technostress is crucial for providing answers and solutions for reducing the adverse consequences, such as negative well-being outcomes.

Our exploration of different dimensions of smartphone use (which reflect how individuals use smartphones; what is characteristic of the use) and gratifications (which reflect why individuals use smartphones; what individuals seek and obtain from the use) sheds light on the complex dynamic of the positive and negative facets of smartphone use in the personal context. The concept "dimension of smartphone use", which we define as *the nature of activities performed by users to interact with information delivered via smartphones,* helps us discern the associations between gratifications sought and obtained, and technostress. Building on these insights, we address two key research gaps: (1) the lack of exploration into what users seek and obtain from smartphone use in the context of technostress, and (2) the absence of explicit discussion on the dimensions of smartphone use and their relationship to technostress. Here, we answer the following research question: *How do the dimensions of smartphone use, the gratifications sought and obtained, and technostress interplay in the personal use context focusing on digital content feeds?* We address this question by applying a qualitative research approach and analyzing data from in-depth interviews with 30 smartphone users.

We contribute to the research in three ways. First, we adopt a dual perspective on gratifications for technostress research following Palmgreen and Rayburn (1979), which involves both the gratifications sought and obtained. We illuminate the complex interplay between users' underlying motives, cognitions, behavior, and their actual experiences associated with technostress. By integrating insights from uses and gratifications theory and technostress research, we provide a comprehensive exploration of how personal engagement with digital content feeds on smartphones can contribute to technostress. In doing so, we expand the discourse on balancing IT use in personal contexts (Steelman & Soror, 2017).

Second, we treat uses and gratifications as separate constructs and introduce the concept of smartphone use loop, which illustrates the dynamic interplay between gratifications sought, dimensions of smartphone use, and gratifications obtained in relation to technostress. We propose an explicit categorization for the dimensions of smartphone use comprising five dimensions: instant, repeated, continuous, personalized, and versatile. This classification extends beyond previous research grounded in uses and gratifications theory, offering a more nuanced understanding of smartphone use and its relationship with technostress. Third, we identify unexplored technostressors (techno-procrastination, online information bubbles, gratification mismatch) and strains/outcomes (worsened boredom tolerance) arising from the interplay of dimensions of smartphone use and gratifications sought and obtained.

The remainder of the paper is structured as follows. In the next section, we introduce the theoretical background of our study. Subsequently, we discuss the applied research methods and present our results. We then discuss how our findings extend the understanding of the research topic as well as how practitioners could benefit from the results. We also address the limitations of the study and offer directions for future research.

THEORETICAL BACKGROUND

Technostress

Stress occurs when individuals encounter stressors, which are stress-creating stimuli caused by different situations and events that result in strains and other outcomes, which are psychological, physical, and behavioral reactions to stressors (Cooper, Dewe & O'Driscoll, 2001; Lazarus & Folkman, 1984). Overall, stress can be viewed as a dynamic transactional process, where stress represents an interaction between the individual and the environment that the individual appraises as potentially harmful (Lazarus, 1966; Lazarus & Folkman, 1984). While stress is often associated with highly uncomfortable situations and events, even smaller daily stressors—especially when encountered perpetually—can prove detrimental (Charles, Piazza, Mogle, Sliwinski & Almeida, 2013). In the present study, we focus on stress caused by IT use, known as technostress (Tarafdar et al., 2019). Although stress is typically viewed negatively (distress), we emphasize that it can also have positive manifestations (eustress) (Cavanaugh, Boswell, Roehling & Boudreau, 2000). For instance, the holistic technostress model incorporates sub-processes for both techno-distress and techno-eustress, explaining their emergence through distinct types of technostressors: hindrance-stressors and challenge-stressors, respectively (Califf, Sarker & Sarker, 2020). Moreover, Tarafdar, Stich, Maier, and Laumer (2024) further outline four techno-eustress creators: techno-mastery, techno-autonomy, techno-relatedness, and techno-enrichment.

The term technostress was coined in the 1980s in organizational context (Brod, 1982), and the phenomenon has established itself as a central concept for understanding "the dark side of IT" (Tarafdar, Tu, Ragu-Nathan & Ragu-Nathan, 2011). Technostress emergence can be explained through use practices, IT environmental conditions, and the above-mentioned technostressors and strains/outcomes (Ayyagari et al., 2011; Nastjuk, Trang, Grummeck-Braamt, Adam & Tarafdar, 2024; Salo et al., 2022; Tarafdar et al., 2019). Fundamentally, technostress arises when individuals interact with IT and perceive certain IT environmental

conditions (i.e., IT characteristics such as ubiquity) as demands or threats (technostressors) that exceed their abilities to cope, resulting in different kinds of (negative) outcomes or strains (Tarafdar et al., 2019). Especially technostressors and strains have received scrutiny in previous research. In the organizational context, well-established technostressors include techno-overload, techno-invasion, techno-complexity, techno-insecurity, and techno-uncertainty (Fischer & Riedl, 2017; Ragu-Nathan, Tarafdar, Ragu-Nathan & Tu, 2008; Tarafdar, Tu, Ragu-Nathan & Ragu-Nathan, 2007). Previous studies have demonstrated that such stressors may negatively impact the benefits organizations can derive from IT due to reduced productivity and efficiency (Hung, Chen & Lin, 2015; Pirkkalainen, Salo, Tarafdar & Makkonen, 2019; Tarafdar et al., 2007). Moreover, such experiences of technostress can provoke deviant behaviors among employees, which may result in significant costs for organizations (Chiu, Tan, Hsu, & Cheng, 2023). Despite the above-mentioned five technostressors having roots in organizational research, studies concerning personal IT use have adapted them as well (Tarafdar, Maier, Laumer & Weitzel, 2020).

As IT use differs in organizational and personal/leisure contexts due to the voluntariness of use, studies have identified technostressors especially characteristic in personal IT use context. There does not exist a similar, widely accepted inventory of technostressors for the personal contexts as for the organizational. However, Nastjuk et al. (2024) proposed a list of six such technostressors based on prior research (Maier, Laumer, Weinert at al., 2015; Tarafdar et al., 2020): pattern, disclosure, complexity, invasion, uncertainty, and social overload. Other prevalent technostressors identified for personal contexts include overdependence (Salo et al., 2019), FOMO (Dhir et al., 2018; Malik et al., 2021), and social comparison (Fox & Moreland, 2015; Salo et al., 2019). Studies also have associated phenomena such as compulsive use (Dhir et al., 2018), excessive use (Luqman, Cao, Ali & Masood, 2017), and addiction (Tarafdar et al., 2020) with technostress in the context. The strains/outcomes identified in the personal technostress research include exhaustion (Cao et al., 2018; Cheikh-Ammar, 2020), concentration, social relation, and sleep problems (Salo et al., 2019), and reduced happiness (Brooks, 2015). In addition to technostressors and strains/outcomes, elements such as IT (e.g., push notification and self-disclose features) (Salo et al., 2019) and usage characteristics (extent of social media usage, number of social media friends) (Maier, Laumer, Eckhardt et al., 2015), and use practices (Salo et al., 2022) have been discussed in the personal use context of technostress. Especially social media as a specific use context has received attention in previous personal IT use technostress research (e.g., Maier, Laumer, Eckhardt et al., 2015; Salo et al., 2019). In such a context, it has been shown that, for instance, not obtaining the gratifications sought may contribute to fatigue from using social media, which could be stressful (Ravindran, Yeow Kuan & Hoe Lian, 2014). However, previous studies have yet to explore various gratifications sought and obtained and their interplay with technostress in detail, which we do in the context of personal smartphone use in the present study.

Focusing on personal smartphone use, especially compulsive (Hsiao, Shu & Huang, 2017; Lee et al., 2014) and excessive use (Cao et al., 2018; Luqman, Masood, Shahzad, Shahbaz & Feng, 2021) have been associated with technostress. The prevailing approach has been that technostressors (such as overload) lead to strains (such as fatigue) or other outcomes (such as discontinued use) (e.g., Sun & Lee, 2022). Some studies have also examined the impact of personality traits (e.g., Hsiao, 2017; Lee et al., 2014) or IT characteristics (Tugtekin et al., 2020) on the process. Beyond these examples, however, studies on smartphones remain limited

in addressing other factors that influence the emergence of technostress. Given that (techno)stress is a dynamic and transactional process, it is essential to investigate individuals' behavior and underlying cognitions to better understand how technostress arises. To this end, we expand the current knowledge by examining the "hows" and "whys" of personal smartphone use in relation to the dynamics of technostress. This approach broadens the focus beyond technostressors and strains/outcomes to encompass individuals' interactions with IT environments. In the following section, we discuss why and how individuals use IT, establishing the uses and gratifications theory as our theoretical lens to understand user cognitions and behaviors associated with technostress.

Uses and Gratifications

The uses and gratifications theory, originating from communication research during the 1940s, explains why and how people consume media (Ruggiero, 2000). The theory posits that users have needs they wish to satisfy and, therefore, make active media-related choices to receive gratifications (Katz, Blumler & Gurevitch, 1974). More recently, the theory has been applied to explain the use of modern media and IT (Sundar & Limperos, 2013), including the Internet (LaRose & Eastin, 2004; Stafford, Stafford & Schkade, 2004), social media (Bae, 2018; Ku, Chen & Zhang, 2013; Yang, Xu, Land, Yang & Chesney, 2024), and smartphones (Gentina & Rowe, 2020; Joo & Sang, 2013). The choice of uses and gratifications theory as a lens for observing the phenomena of interest in this study was driven by one of the strengths of the theory, its flexibility, since it does not rely on fixed variables (Lin, 1996; Mäntymäki & Riemer, 2014). Moreover, existing research has demonstrated the applicability of uses and gratifications theory in exploring the nuances of technostress, particularly from the perspective of user cognitions underlying IT use and their relationship to experienced technostress (e.g., Ardèvol-Abreu et al., 2023; Baabdullah et al., 2022). These studies provide valuable insights into the underlying factors of the phenomenon. Interestingly, despite experiencing stress, individuals may persist in using stress-inducing technologies in their personal lives (Cheikh-Ammar, 2020), potentially driven by the gratifications they derive from such use (Chaouali, 2016). Consequently, we find that this theoretical framework aligns well with our research objectives.

The issue of why media or IT is used can be discussed by dividing the gratifications into gratifications sought and gratifications obtained. More specifically, gratifications sought can be seen as the driving forces (closely related to needs or motives) behind media use, while gratifications obtained can be seen as the desired outcomes of the use (Palmgreen & Rayburn, 1979; Quan-Haase & Young, 2010). If the gratifications sought and obtained are aligned, individuals are likely to continuously engage with the source of those gratifications (Krasnova, Veltri, Eling & Buxmann, 2017; Rokito, Choi, Taylor & Bazarova, 2019). By contrast, if a discrepancy exists between the gratifications sought and obtained, people may be unsatisfied, reducing their use (Bae, 2018). Even though some studies have shown the importance of both the gratifications sought and obtained, such an approach has received less attention (Bae, 2018; Palmgreen & Rayburn, 1979).

In addition to gratifications sought and obtained, gratifications can be categorized according to what people specifically seek and obtain from media and IT use. An example of such categorization is a three-way categorization of hedonic (related to enjoyment or pleasure), utilitarian (related to usefulness), and social (related to social interaction) gratifications (e.g.,

Li, Liu, Xu & Heikkilä, 2015; Mäntymäki & Riemer, 2014). Focusing on smartphones, prior studies have shown how their use is associated with, for instance, entertainment (hedonic) (Ha, Kim, Libaque-Saenz, Chang & Park, 2015), communication (social) (Gentina & Rowe, 2020), and information-seeking (utilitarian) (Joo & Sang, 2013) gratifications.

In previous uses and gratifications studies, use has been discussed with different terms and emphases in various contexts. Traditionally, use has been characterized as either ritualistic or instrumental (Rubin, 1984). Furthermore, drawing on gratifications, different types of use, such as information-seeking and entertainment use (van Deursen & van Dijk, 2014), have been established. As we discuss dimensions of use in the present study, we note that the term has been used in previous research. The term has been used to describe specific types of uses, namely the information dimension (e.g., to learn about events), friendship dimension (e.g., to keep in touch with friends), and connection dimension (e.g., for dating purposes) (Bonds-Raacke & Raacke, 2010). In the context of smartphones, process and social dimensions of smartphone use have been identified (Elhai, Levine, Dvorak & Hall, 2017). Beyond uses and gratifications research, the term "dimensions of use" has been applied to describe various aspects of Internet use, including the amount (how much users engage), variety (how many different activities users undertake), and types (the kinds of activities users participate in) (Blank & Groselj, 2014). Similar approaches have employed the term "usage characteristics" to capture factors such as relationship length and usage experience (Kim, Wong, Chang & Park, 2016), as well as the extent of social media use and the number of social media connections (Maier, Laumer, Eckhardt et al., 2015).

We address use and gratifications as separate yet interconnected concepts and, therefore, consider that the types of uses (van Deursen & van Dijk, 2014) and dimensions of use that focus on specific types of uses (Bonds-Raacke & Raacke, 2010) are not adequate typologies for the study. We approach use from a different level of abstraction, focusing on what characterizes the use, examining its underlying nature. Approaching use this way, previous studies have mentioned, for example, constant use (Duke & Montag, 2017; Gerlach & Cenfetelli, 2020; Salo et al., 2022), although there does not appear to exist a holistic categorization for such dimensions of smartphone use. Also, although the uses and gratifications theory has been previously applied in studies discussing the negative consequences of IT use (Baabdullah et al, 2022; Chaouali, 2016; Gentina & Rowe, 2020; Sun, Liu & Zhang, 2020), exploring both the gratifications sought and obtained in relation to technostress is scarce. Furthermore, prior studies have not explained the nature of IT use in relation to gratifications and technostress. Our concept of dimensions of smartphone use gives insight into the interplay of gratifications sought and obtained and their relation to technostress. By drawing on the established technostress and uses and gratifications literature, we identify different dimensions of smartphone use and link them to gratifications and technostress with our empirical study as follows.

RESEARCH METHODS

Data Collection

We adopted a qualitative research approach in this study, given its suitability for examining how individuals engage with their technological environments (Myers, 1997). To collect data,

the first author interviewed (semi-structured interviews) 30 individuals (11 men and 19 women). Ten interviews (nine face-to-face and one remote) were done in 2019, while 20 remote interviews were conducted in 2021. The interview durations ranged from 34 to 77 minutes (average: 54 minutes). To identify interviewees, we applied a purposeful sampling method by seeking "information-rich cases for in-depth study" (Patton, 2002, p. 230), with the help of snowballing. In essence, the goal was to identify interviewees who were active smartphone users and had experienced technostress. This was accomplished by explicitly outlining these criteria in our research call. While the initial goal was to recruit young adults, who are traditionally active users of smartphones, we ultimately prioritized identifying individuals who used smartphones and had experienced technostress, irrespective of things such as their smartphone use patterns or age. By doing this, we were able to recruit a sample that represented "a variety of voices" (Myers & Newman, 2007, p. 22). Such an approach was deemed important for our goal of providing deep insights into the phenomena of interest, rather than providing results that could be generalized.

The interviewees were between 22 and 41 years old (average: 27 years), and they were all native Finnish speakers living in Finland. All interviewees were students, employed, or a combination of the two. The professions of the employed interviewees were diverse (e.g., pharmacist, human resources specialist, firefighter, masseuse, and early childhood educator). Regarding their smartphone use, the most used applications were Instagram (a social media platform) and WhatsApp (an instant messaging service). In addition, interviewees mentioned using other social media, including Facebook, Snapchat, TikTok, and Reddit. Moreover, many interviewees reported using their smartphones to access various news sources, including tabloid news, local media, and news related to specific topics like the economy. The time the interviewees spent using a smartphone ranged from under an hour up to nine hours a day, with the average time being around five hours. The individuals in our sample exhibited both similarities and differences in their psychosocial development, history of IT use, and current smartphone-related behaviors, allowing us to gather data that was both rich and consistent.

The interview method offers both strengths, such as the potential to gather rich, detailed data, and weaknesses, including the artificial nature of the interview setting (Myers & Newman, 2007). This artificiality may have led participants to provide socially desirable responses rather than fully authentic accounts of their experiences. Such responses might also stem from a lack of trust between the interviewer and the interviewee (Myers & Newman, 2007). To address these challenges, the interviewer adopted a neutral and natural demeanor, allowing the interaction to unfold organically and giving participants space to articulate their experiences and emotions in their own words (Myers & Newman, 2007). Techniques such as mirroring were employed to facilitate deeper discussions and encourage participants to elaborate on their experiences (Myers & Newman, 2007). Additionally, the interviewer demonstrated familiarity with the specialized jargon related to the IT context under study—specifically, various types of digital content feeds used on smartphones—helping to minimize social dissonance and foster a more open dialogue.

All the interviews focused on two main themes, namely why and how the interviewees used their smartphones (gratifications sought and obtained; dimensions of use) and what kinds of stressful or negative consequences they had experienced as a result (technostressors and the ensuing outcomes). Thus, the interview framework was partly based on existing research. In terms of their smartphone use, the interviewees were asked, for example, what digital content

feeds they browsed on their smartphones, why and how they browsed the content, and what they thought they received from the use. Regarding the stressful or negative consequences of smartphone use, the interviewees were asked, for example, what kinds of stressful or negative experiences they had had while using smartphones, what types of use they engaged in during experiencing such, and what consequences such experiences had caused for them. Despite us following a framework during our interviews, we were "prepared to explore interesting lines of research, and look for surprises", as is the nature of semi-structured interviews (Myers & Newman, 2007, p. 17). After conducting 30 deep and narrative-rich interviews, we determined that sufficient saturation had been reached as our preliminary analysis of the data indicated that the emergence of new insights from additional interviews regarding our research problem had significantly diminished at this stage. This meant that similar patterns of technostress experiences and their underlying conditions were highly repetitive in the participants stories. Figure 1 describes the different steps conducted during our data collection and analysis phases.

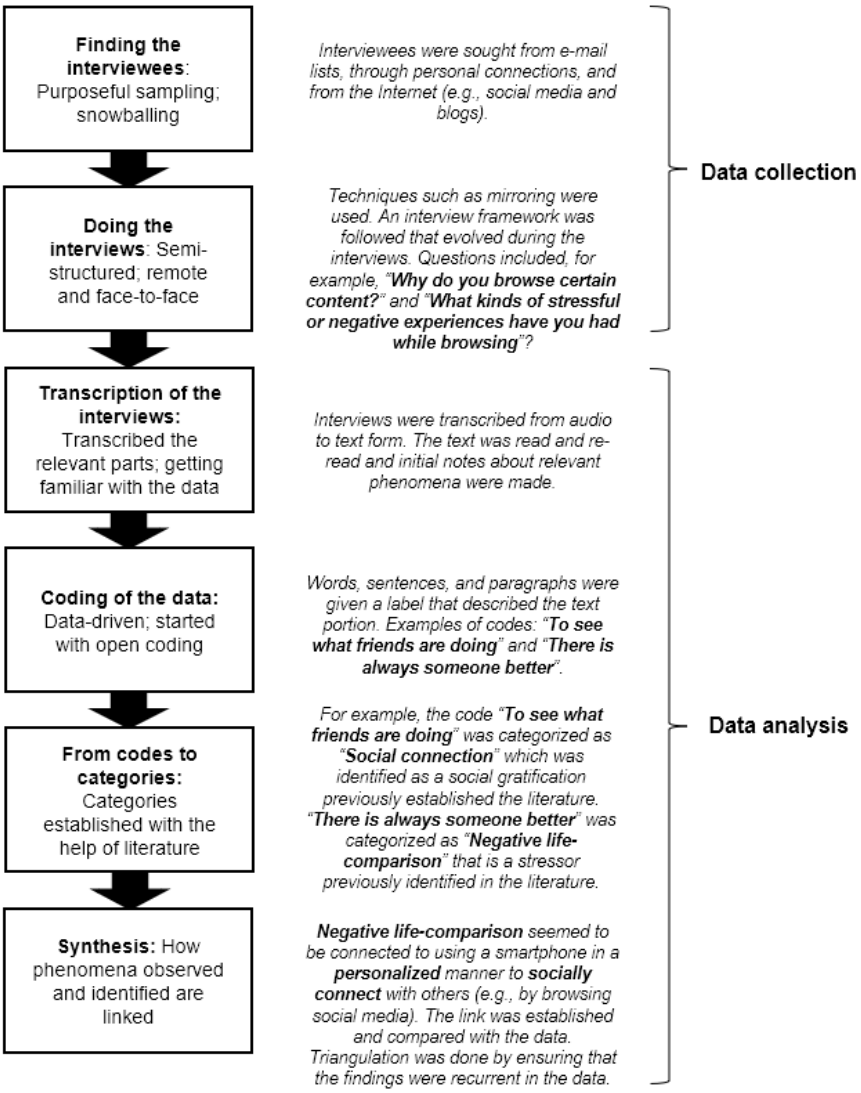

Figure 1. Data Collection and Data Analysis.

Data Analysis

As a first step, the interviews were transcribed, during which the first author made initial notes concerning the data. Subsequently, the first author read and re-read the transcriptions and made further notes about relevant observations. After the first author had become sufficiently familiar with the data, they began to code it following established guidelines (Lune & Berg, 2017; Saldaña, 2013). Although the first author conducted the primary analysis, they collaborated with the co-authors to discuss aspects such as the codes, emerging categories, and their relationships. The data was analyzed iteratively, beginning with open coding using NVivo software. During this process, we could dive deep into the data and become more familiar with them (Saldaña, 2013). This phase "allows researchers to identify and even extract themes, topics or issues in a systematic manner" (Lune & Berg, 2017, p. 125). Reflecting on the research question, all relevant pieces of data were labeled. Subsequently, the codes were initially assigned to three groups: 1) why the interviewees used their smartphones, 2) what kinds of stressful or negative events and situations they had encountered due to the use, and 3) what kinds of (negative) consequences had stemmed from the use. During this phase, we observed that in addition to understanding why people used smartphones, how they used them emerged as essential for understanding their behavior and experiences. Thus, we also assigned the codes to a fourth group: 4) how the interviewees used their smartphones. As the final task during this phase, irrelevant initial codes were removed.

While our analysis was heavily data-driven, during the coding process we harnessed theoretical insights from technostress and uses and gratifications literature to guide our coding. This meant looking for content in the participants' words that resonated with concepts central to the literature streams (e.g., specific types of technostressors such as *overload* and gratifications such as *entertainment*). Such central concepts were used for categorizing the codes when we started combining the codes, creating categories based on them (Saldaña, 2013). For example, the codes *too much content to browse* and *an overflow of information* were categorized under *information overload* (later re-named as *online information overload*). In line with prior studies, we identified online information overload as a technostressor (this is an example; other technostressors were also identified). Therefore, we harnessed existing research to deepen our understanding of the data (Saldaña, 2013). Based on our data, we observed three technostressors that previous studies had not identified: techno-procrastination, online information bubbles, and gratification mismatch. Moreover, as we wanted to understand how individuals used their smartphones, we examined the codes relating to that, which resulted in, for example, the codes *immediately reads messages* and *instantly grabs the phone during downtime*, which were categorized under the *instant dimension of use*. This approach was applied to other concepts as well. For example, the codes *one can shut off the brain* and *one can take a breather* were consolidated under the category *relaxation*, which was identified as a hedonic gratification. Similar actions were performed for the other dimensions of use, gratifications sought and obtained, and strains/other outcomes. We categorized the codes iteratively and compared the new categories with the original codes and the data to ensure that the categories were loyal to the data (Lune & Berg, 2017; Saldaña, 2013).

Next, the first author re-read the whole data set, reflecting the created codes and categories with the data, ensuring that the codes and categories created could capture the essence of what the interviewees said. During this phase, the data, codes, and categories were constantly

compared, and if needed, the codes and categories were reorganized or removed (Saldaña, 2013). As our goal was to explain how different concepts are linked, we searched for patterns within the data (Lune & Berg, 2017). We analyzed how specific ways (dimensions of use) and reasons (gratifications) associated with smartphone use were present in certain negative situations (technostress) and vice versa. For example, the interviewees could tell that they were seeking entertainment and, therefore, browsed their smartphones continuously, due to which they neglected other tasks. This was also done in the other direction. The interviewees could tell that they experienced exhaustion due to the constant flow of messages (information overload) from different services. By examining the data, such situations could be pinned down to, for example, versatile use performed to obtain social gratifications. To understand the phenomenon holistically, the authors together analyzed the relationships between the different categories and based on the resultant observations and discussions, created a model to explain the emergence of technostress in the context. The findings identified as central were those corroborated by multiple participants, thereby enhancing the validity and reliability of the conclusions through triangulation (Lune & Berg, 2017). Additionally, the robustness of these findings was further reinforced by employing constant comparison, which involved iterative analysis of the data, codes, and categories. This process allowed for the refinement, reorganization, or elimination of codes as necessary to ensure they accurately reflected the essence of the participants' responses (Saldaña, 2013). Moreover, this enhanced the concisteny of our coding and analysis, further increasing the validity and reliability.

Next, we will present our observations on smartphone use and the associated gratifications. Following this, we will explore the interplay between the dimensions of smartphone use, the gratifications sought and obtained, and the experience of technostress. We provide brief information about the frequency of observations where relevant (e.g., how many participants mentioned a particular technostressor). However, we emphasize that these numbers are presented solely as background information and should not be used to draw generalized conclusions.

RESULTS

Smartphone Use Loop

As we were analyzing different dimensions of smartphone use and gratifications sought and obtained in our data, we observed them forming a cycle: *the smartphone use loop*. This loop illustrates how gratifications sought, dimensions of smartphone use, and gratifications obtained are associated, with the gratifications sought serving as the trigger that initiates smartphone use, followed by the dimensions of use, leading to the gratifications (not) obtained (visualized in Figure 2). In the following sections, we discuss the smartphone use loop in more detail. We will begin by discussing gratifications sought and obtained, as gratifications sought act as the trigger that initiates smartphone use. Subsequently, we elaborate on the different dimensions of smartphone use. Finally, we will illustrate how the smartphone use loop can be employed to explain the emergence of technostress, extending existing research on the antecedents of technostress.

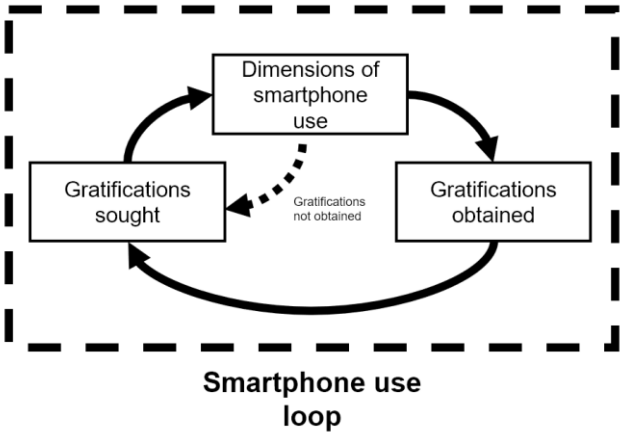

Figure 2. Smartphone Use Loop.

Gratifications Sought and Obtained

Previous studies have suggested that media users may not always obtain the gratifications they seek (Palmgreen, Wenner & Rayburn, 1980; Rokito et al., 2019). Therefore, we provide insights from both scenarios. We divide gratifications into three main categories: hedonic, social, and utilitarian. While all 30 interviewees sought and obtained gratifications across these main categories, differences were observed in terms of more specific gratifications.

Hedonic gratifications. The most prevalent hedonic gratifications sought and obtained among the interviewees concerned entertainment. Moreover, they pursued gratifications like escapism, relaxation, novelty, humor, passing time, comfort, and inspiration. Entertainment was especially sought in situations the interviewees considered boring, and social media platforms like Instagram and TikTok were frequently used for this purpose. Many highlighted that visual content, such as pictures and videos, were the primary sources of hedonic gratifications, and such gratifications were often sought by continuously browsing different kinds of feeds. In cases where escapism was sought, users tended to access their smartphones repeatedly, checking various social media feeds for novel content. Many interviewees thought smartphone use could initially bring hedonic gratification, although after continuous sessions or repeated browsing, the gratifications were no longer perceived as obtained. Overall, we found that hedonic gratifications were the most frequent types of gratifications associated with situations leading to technostress. Nevertheless, hedonic gratifications were frequently pursued through browsing various digital content feeds. As one participant described their experience of reading comments on a social media platform:

> *And it's fun, and you find those highlights there, like everyone's always trying to be so funny, but you also come across things that are genuinely funny. So, it's nice and entertaining. [...] It's like entertainment, and specifically in a fun way.*

Social gratifications. The most prevalent social gratifications sought and obtained among the interviewees concerned social connection. Moreover, they pursued gratifications like affection, staying up to date with their friends and relatives (by instant messaging or through following them on social media), and other elements of sociality, including peer support. In our interviews, different aspects of sociality were the most common reasons for smartphone

use. Many interviewees mentioned that their close ones lived elsewhere, and staying in touch with them was a primary motivation for smartphone use. Some highlighted active communication, while others emphasized the ability to observe what people were doing. Instant messaging (mainly WhatsApp) was primarily used for social gratifications, although some interviewees used social media like Instagram and Facebook for this purpose. Overall, the ability to send and receive messages instantly was highly valued, often leading to instant and repeated checking of smartphones. Additionally, smartphones offer a versatile means of managing different social environments, and many interviewees used various social media and instant messaging services for different people or social situations, allowing them to tailor their interactions accordingly. In general, the interviewees reported that they were successful in obtaining the social gratifications they sought. However, there were instances where the gratifications sought were not obtained, such as when they were waiting for a message but not receiving it. For the majority of participants, social gratifications emerged as the most significant drivers of their smartphone use:

> *Yeah, the social aspect, like staying in touch with people, that's definitely the most important thing. It's really the only reason why I even pick it up. It's the social side... Okay, sometimes it's for a Google search or something like that, or listening to music or something else, but like, 90 percent of the time, it's about that social connection. Or seeking it there. I'm quite a people-oriented person, so even though I spend a lot of time alone in my daily life, in a way I'm not, because through the phone, I'm still connected to people.*

Utilitarian gratifications. The most prevalent utilitarian gratifications sought and obtained among the interviewees concerned staying up to date. Additionally, other information-related gratifications were mentioned. Often, the interviewees actively pursued information on specific topics, but they also passively absorbed information while browsing news and social media feeds for various purposes. Many interviewees turned to different news sources to enhance their understanding of global and national events, reflecting their desire to stay up to date. Moreover, social media was commonly used to gather information on various topics, often accomplished through personalized browsing. In general, the interviewees reported that they were usually successful in obtaining the utilitarian gratifications they sought, although personalized use sometimes hindered this by limiting exposure to a broader range of information. Even though the utilitarian gratifications sometimes played a role in prompting the browsing of digital content feeds, their role was not as influential as that of the hedonic and social gratifications in our data. Still, especially utilitarian gratifications linked to staying up to date were often mentioned, as one participant explained on browsing news sites:

> *Mainly, I still want to browse them because I know they provide at least some good information. And then again, even for my work, it's important to stay updated on things like economic events. So, in a way, I don't see it as negative or a waste of time; for me, it's just a given that I stay informed about those things every day.*

It is important to note that all the main gratifications discussed can be sought or obtained simultaneously. For instance, some social media platforms are used for entertainment, communication, and information-seeking purposes, making them relevant to all the gratifications discussed. Indeed, by communicating with others (seeking social gratifications), users might simultaneously obtain both hedonic (enjoyable conversation) and utilitarian (useful

information exchange) gratifications. Next, we discuss the different dimensions of smartphone use that were prevalent in our data in more detail.

Dimensions of Smartphone Use

From our data, we identified five dimensions of smartphone use. The dimensions of use provide insights into how smartphones are used; what is characteristic of the use, addressing both temporal (instant, repeated, and continuous) and content (personalized and versatile) characteristics. Thus, the dimensions do not focus on specific activities or tasks performed on the device.

Instant. This dimension refers to situations in which users instantaneously initiate smartphone use by reacting to various stimuli, such as receiving a smartphone notification, or situational cues, like watching TV and encountering commercials. Therefore, instant use can be triggered by either smartphone-related events or real-life occurrences. Within the instant dimension of use, only a single use instance takes place. For example, users might read a message they receive on their smartphones immediately after receiving it or instantly engage with their smartphones when the current activity lacks stimuli. The gratifications sought are especially relevant in explaining the initiation of instant use. One interviewee provided an example of using their smartphone while eating or waiting in queues:

> *Like when you're eating, you feel like you need your phone there, or standing in a queue at the store. I mean really brief moments, it doesn't have to be very long, that moment of boredom or pause, for you to take up the phone.*

Repeated. This dimension refers to situations in which users repeatedly use their smartphones, such as frequently checking their devices to browse social media or to see if they have received any messages. Within the repeated dimension of use, multiple instances of use take place, and repeated use can reflect multiple instances of instant use. Both the gratifications sought and obtained play a central role in repeated use. Gratifications sought initiate the use, and when the gratifications are obtained, users may seek to experience them again, leading to repetitive actions. The same can occur if users do not obtain the desired gratifications because they may repeat their efforts to attain the gratifications they originally sought. The interviewees often engaged in repeated smartphone use in situations they found otherwise uncomfortable. For instance, interviewees mentioned their tendency to repeatedly access smartphones while trying to study:

> *But sometimes, you kind of wake up to the fact that you repeatedly pick up your phone and open, say, a messaging app or Reddit several times, and you're like scrolling through it for, say, five minutes, then you put it down and then pick it up again, put it down, pick it up again.*

***Continuous*.** This dimension refers to situations in which users browse their smartphones continuously over an extended period. In continuous use, a single or multiple use instances can occur, meaning that both the instant and repeated dimensions can eventually transition into continuous use. This may happen, for example, when a user receives a message, immediately reads it, and then continues using the phone. Continuous use is particularly characteristic when browsing social media, as these platforms typically feature feeds containing an endless stream of content (such as TikTok), allowing users to browse without reaching a natural stopping

point. In continuous use, the gratifications obtained are crucial in maintaining engagement. As one interviewee mentioned about TikTok and the novel content it constantly displays:

> *Like, if I sit down on the couch and decide, "okay, I'll open TikTok and watch a couple of videos, just for a moment." But because it's so easy to use, and there's always new videos coming up, then suddenly I realize how easily I can get stuck there for half an hour.*

Personalized. This dimension refers to situations in which users engage with digital content feeds that are personalized by the service to appeal to individual users. Differing from instant, repeated, and continuous dimensions, the personalized dimension does not address the temporality of use. An example of personalized use is when users browse social media feeds that feature content personalized by the service to align with the presumed interests of the user. In personalized use, the gratifications sought and obtained are often aligned, at least initially, as such use is supposed to be consistent with what the users are interested in. However, due to personalization, users may not always see everything they truly want. Nonetheless, personalized use in services such as TikTok was often found to be entertaining, as one interviewee noted:

> *I initially thought, "this isn't for me" [TikTok]. But for some reason, I wanted to explore it further, and I started responding to those videos, by clicking "I don't like this, and I don't like that" on some, so it started customizing the front page based on that. And then I realized, "Okay, there are actually some funny videos here," and I realized I was using it every day.*

Versatile. This dimension refers to situations in which users engage with more than one digital content feed. Differing from instant, repeated, and continuous dimensions, the versatile dimension does not address the temporality of use. In versatile use, the gratifications sought are particularly important. Given that individual feeds or functionalities within feeds may not be capable of fulfilling all the gratifications users seek, versatile use becomes necessary. One interviewee elaborated on this in the context of reading news:

> *If I read, for example, [a magazine focused on the economy], I expect to get relevant information and news from there. And then with [a tabloid magazine], it's more like general, light news about what's happening in Finland, but it's not always purely informative; it has more entertainment value. But then, for example, I follow [a local newspaper] because it's a media outlet from [a county], and I live in [a city], so I still kind of keep up with news from my hometown.*

It is important to note that different dimensions of smartphone use can coexist and interact with each other. An example of this interaction occurs when users continuously browse personalized social media feeds, and this continuous use can lead to even more personalized information, reinforcing the personalized use dimension. Nevertheless, specific dimensions tend to be more prevalent in some situations. Even more importantly, depending on the situation, specific dimensions of use, associated with different gratifications sought and obtained, play a crucial role in the emergence of technostress, which we will elaborate on in the following sections.

Interplay Among Technostress, Gratifications Sought and Obtained, and Dimensions of Use

In this section, we explain the interplay between technostress, gratifications sought and obtained, and the dimensions of smartphone use (as illustrated in Figure 3). Our observations reveal that the gratifications sought initiate the process, followed by engagement within a specific dimension of smartphone use. Depending on various situational factors, smartphone use may lead to the gratifications obtained or not obtained. However, it is crucial to note that technostress can emerge in both scenarios. Following Figure 3, we explore the two distinct routes that illustrate the associations between technostress and the smartphone use loop. In Table 1, we have summarized central situations that follow the model. Moreover, Table 2 presents an example chain of evidence of our results.

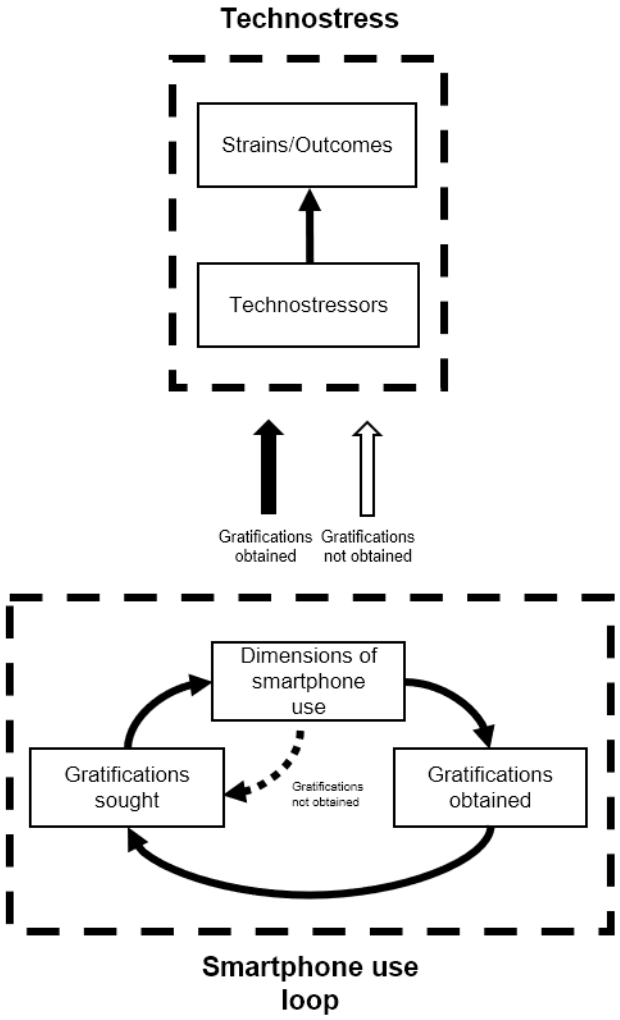

Figure 3. Smartphone Use Loop and Technostress.
Note. The gratifications sought, dimensions of smartphone use, and the gratifications obtained may interact without leading to technostress—the figure illustrates how the smartphone use loop can underlie situations in which technostress emerges.

Table 1. Central Situations of the Interplay Among Technostress, Gratifications Sought and Obtained, and Dimensions of Use.

	Situation 1	**Situation 2**	**Situation 3**	**Situation 4**	**Situation 5**
Dimensions of Smartphone Use	Instant	Repeated	Continuous	Personalized	Versatile
Central Gratifications	Hedonic gratifications sought **and** obtained	Hedonic gratifications sought **and** obtained	Hedonic gratifications sought (**but not**) obtained	Utilitarian/ social gratifications sought **but not** obtained	Social gratifications sought **but not** obtained
Central Technostressors	Interruptions; techno-invasion	*Techno-procrastination*; online information overload	*Gratification mismatch*; techno-dependency	*Online information bubbles*; negative life comparison	Online information overload; fear of missing out
Central Strains/Outcomes	*Worsened boredom tolerance*; frustration; annoyance; fatigue	Anxiety; exhaustion	Guilt; sleep problems	Fear; inadequacy	Exhaustion; anxiety
Situation Description	Despite obtaining gratifications related to, for example, passing time, instant smartphone use leads to interruptions and eventually, worsened boredom tolerance (e.g., due to being so used to instant gratification).	Despite obtaining gratifications related to, for example, escapism, the individual's repeated smartphone use leads to techno-procrastination and anxiety (e.g., due to not progressing important tasks).	Despite initially obtaining gratifications related to, for example, entertainment, continuous smartphone use eventually is not gratifying, leading to gratification mismatch and guilt (e.g., due to spending time on something that is not gratifying or important).	Due to personalized use, one encounters online information bubbles and is unable to see different perspectives for information, which can increase fear (e.g., of polarization).	Due to versatile use, one encounters online information overload, which can lead to exhaustion (e.g., due to too much information coming in from different social media platforms and instant messaging services).

Note. Technostressors and strains in italics are new findings.

Table 2. An Example Chain of Evidence: Situation 1.

Interviewee	Dimension of Smartphone Use	Central Gratifications	Central Technostressors	Central Strains/Outcomes
A woman in her 30s, holding a Master's degree, and working full-time. She perceives her smartphone proficiency as good and uses her smartphone for 3-4 hours daily. She primarily uses various types of social media, like Instagram and Pinterest, as well as instant messaging services such as WhatsApp. She frequently browses news sites on her smartphone and occasionally uses an online dating application.	"I do notice that if the phone is right there next to me, I'll pick it up without even really realizing it. Before I know it, I've grabbed it, opened it, and started scrolling through something." **(instant)** "But somehow it feels like everything has become short and fast, like… Communication has changed to be like that." **(instant)**	"It's so easy to check it during a commercial break or even in the middle of a show, and without even thinking about it, you might just grab the phone and start using it." **(hedonic gratification sought and obtained – passing time)** "And it's exactly that thing with those services, where there's always something new. So, it's always like, 'Oh, let me refresh one more time, maybe there's something else here.'" **(hedonic gratification sought and obtained – novelty)**	"And actually, just this spring I realized that I was getting every possible news notification on my screen, and then with a smartwatch on top of that, those notifications would vibrate on the watch too. I noticed how much attention it took—like, even if the news wasn't particularly interesting, I still ended up looking at it." **(interruptions)** "I usually love reading books while on vacation, but I realized that I couldn't focus on them at all. Before, I would easily get immersed and read for hours, but now it was so fragmented [due to smartphone use]. I even started wondering if my brain had completely deteriorated." **(techno-invasion)**	"And also, noticing that the ability to tolerate boredom is really poor. That's probably the most concerning thing, that you constantly feel the need for stimulation. That's probably not such a good thing..." **(worsened boredom tolerance)** "I also notice that it's quite overwhelming if I'm constantly following the day's news events in real time throughout the day. It definitely adds to the mental load." **(fatigue)**

Technostress and Smartphone Use Loop - Gratifications Sought and Obtained

First, we showcase situations in which users actively sought and successfully obtained gratifications but also encountered technostress. As a key aspect of our study was to gain insight into the driving forces of smartphone use that ultimately contribute to technostress, we inquired about the reasons for smartphone use with all our interviewees. Many promptly offered explanations that encompassed the purpose of their use (gratifications sought), how they engaged with their devices (dimensions of use), the resulting benefits (gratifications obtained), and concurrent experiences of technostress. To illustrate, one interviewee described her smartphone use, including the ensuing frustration and annoyance:

> *Primarily, it's about seeing what friends are up to, how they're doing. Also, it's for inspiration and sometimes also for seeking information. On the surface, it sparks curiosity and brings a good mood, but sometimes it also leads to* ***frustration*** *and* ***annoyance.***

Among our interviewees, the most frequently sought-after gratifications centered around various social aspects. For instance, when individuals pursued social connection (social gratification sought), they often engaged with their devices instantly or repeatedly (dimension of smartphone use). In cases of instant use, technostressors related to interruptions and invasion (and the associated constant availability) were particularly prevalent. Constant availability was a recurring topic, with many describing it as exhausting, frustrating, or annyoing (15

interviewees). Yet the associated instant and repeated use were seen as something that is expected of them, serving a crucial purpose in obtaining social gratifications:

> *It's really important [social gratifications] in a way that you feel like if you're not on your phone or if you don't see people's events and also don't report on your own life, then somehow you might be forgotten. [...] It's like it's a natural way to stay connected, and there's a lot of commenting through private messages, so it's not just passive scrolling, but also active discussions taking place there. [...] Yeah, I feel it's quite* ***exhausting****, having to be present all the time. It's maybe also, I'll add to the negative aspects, um, negative aspects somehow, this* ***need to be present all the time****. It's like this constant thought that you have to respond quickly, and even if you've seen a message and you're online, you don't respond, so it creates this strange, um,* ***pressure to act in a certain way****.*
>
> *But now there's this expectation for real-time communication [on an online dating service]. And I feel like it's really* ***exhausting****, like you're supposed to always be available. And if you're not, then it's like, onto the next one [laughs]. Like, they expect... That constant real-time connection, always having the phone in your hand. It's kind of* ***distressing****... There are so many factors that made me decide it's better to just let it go, because it's...* ***It takes more than it gives.***

In addition to social use, passing time with smartphones was highly prevalent in our data. This often occurred during brief moments when no other engaging activities were available. Associated with instant use, many interviewees (seven of them) reflected how their ability to tolerate boredom had decreased, which we see as an outcome of technostress. Even when users were able to pass the time using their devices, involving both gratifications sought and obtained, such behavior could still lead to technostress. Although this could emerge from a single instance of instant use, it was particularly common when use was repeated. This could create a vicious cycle: smartphones were used to alleviate boredom, but smartphone use might worsen the ability to tolerate boredom, leading to increased use. Overall, many interviewees expressed extreme annoyance with their decreased tolerance for boredom. Furthermore, in situations where hedonic gratifications were sought (as opposed to social gratifications), the interviewees did not seem to place as much value on obtaining them despite the momentary entertainment provided. As these two examples show about passing time using a smartphone and the associated issues with boredom tolerance:

> *I even felt like not watching TV shows. Somehow, it felt like even when watching series, or at least during the commercials if you watch TV, or if you're watching Netflix there might be a boring part. So,* ***I might pick up my phone and start looking at it, it was really hard…***
>
> *Like, whenever there's a moment where there's nothing to do, the phone is always in your hand, and you feel the need to send a message to someone or constantly be in contact with someone. It's kind of* ***overwhelming****, at least for me. And I've noticed that nowadays, my* ***lack of focus is really concerning****. For example, I can't even watch a full Netflix episode, not even a 20-minute one. At some point, I realize I've picked up my phone again.* ***I just can't maintain focus.***

More specifically, many interviewees resorted to using their smartphones repeatedly and continuously to escape uncomfortable or even stressful situations. Such behavior could lead to something we call "techno-procrastination", where individuals delay engaging in other activities by using their smartphones, reported explicitly by ten interviewees as a stress-creating condition. In these scenarios, users are typically able to obtain various hedonic gratifications, such as entertainment or simply escapism. Trying to escape uncomfortable situations by using a smartphone might provide momentary gratification but could be detrimental in the long run by prolonging the stressful situation:

> *And you know, that's actually* ***one problem;*** *if there's a situation that becomes too* ***stressful****, I'd rather escape to my phone than try to face the problem, and then* ***confronting the problem gets delayed.*** *[...] Yeah, I get that momentary feeling of relief, but then I feel terrible again when I return to real life, and I immediately want to escape back. [...] So, I just* ***prolong being stressed...***

Also, many interviewees highlighted how smartphone use often led to the postponement of their sleep patterns, where continuous use was central. In fact, 16 participants mentioned that smartphone use could contribute to issues with sleeping. Thus, while not everyone who used their smartphones continuously during the night considered it problematic, it had caused issues for the majority. The gratifications sought during such situations were often hedonic, and they were obtained by browsing content that was considered entertaining, amusing, and interesting. In such cases, the gratifications obtained were enough to keep them engaged with the devices, contributing to continuous use. However, despite obtaining the gratifications, less sleep was considered a problem:

> ***It has disturbed [my sleep].*** *[…] It's probably the evening-oriented [use]. I'm already a night owl, so then I notice that, if it's the last thing before going to sleep, I open some social media and start looking at it. Or well, the last mistake is to start watching a YouTube video and then realize three hours later that I'm still staring at a YouTube video. So, it's definitely [laughs]* ***a problem for me*** *that I'm maybe a bit easily swayed by interesting content.*

In addition to social and hedonic gratifications, the interviewees used smartphones to stay up to date with news and current events. While this behavior was not as typical in our data, most interviewees did browse news concerning topical issues nationally and worldwide. Such was often done repeatedly because they wanted to stay informed about what was happening in real time. Additionally, versatile use was often engaged in due to different news sources providing different types of news. Even when the gratifications sought were obtained, browsing news could contribute to stress and anxiety due to the vast amounts of often negative information. While stress can be caused by news from various sources like TV or newspapers, it is emphasized in the context of versatile smartphone use because users have instant access to sources reporting on events worldwide. Nine interviewees discussed the stressful experiences they had had in relation to reading news on their smartphones. As one interviewee explained, she had experienced high levels of stress from following news online, despite wanting and being able to stay up to date:

> *Well... I easily get* ***stressed*** *about the state of the world, and often, the news doesn't really focus on the positive things, so... I get this* ***anxiety*** *from all the bad news*

> *happening around the world or in Finland. So, that's why I don't actively read the news. [...] I mean, I would like to stay up to date with what's happening in the world, but then when you force yourself to go through all the pages [of different Finnish news outlets], it just* ***becomes stressful... It's just stressful. And it makes you feel bad.*** *So then I've realized that, well, I don't have to read them.*

To summarize, obtaining gratifications does not inhibit experiencing technostress in smartphone use. While gratifications can sometimes alleviate negative feelings, this depends on the specific gratifications. The interviewees appeared to assign different values to various gratifications, which in turn influenced the technostress experienced (for example, social gratifications were seen as more important than hedonic ones). We emphasize that both the "whys" (gratifications sought and obtained) and the "hows" (dimensions of use) are important in understanding the emergence of technostress in this context. Next, we will discuss situations where gratifications are sought but not obtained, associated with technostress.

Technostress and Smartphone Use Loop - Gratifications Sought but not Obtained

Situations in which individuals seek but do not receive gratifications can happen in two ways. First, users may immediately realize they are not obtaining gratifications. For instance, this can happen when users wait for a message and check their device but find no new messages. Second, users might initially obtain the gratifications they seek, but over time (during a single session or over multiple sessions), these gratifications are no longer obtained. Such a mismatch of gratifications sought and obtained can be stressful because it creates a conflict within users regarding their behavior. Many interviewees said that continuously and repeatedly browsing social media feeds caused this, and they eventually stopped experiencing gratification, which elicited emotions like guilt, which was reported by seven interviewees. As one of them described:

> ***You start feeling a bit guilty****, like maybe you could have used this time for something more productive. [...] You occasionally think that, "Okay, it's actually good [browsing the smartphone]," that it's sort of like, for example, sometimes when it's in the evening before going to bed, it's kind of like a reset time. Even if you watch videos on YouTube or just browse something, it's like a way to reset yourself, especially if you've had something on your mind during the day, or you just need to unwind. That's okay.* ***But then, if you notice that you do it too often, you start feeling a bit guilty****, like, "Come on, you have resources to use for maybe something a little better, so use your time for something else sometimes."*

While gratification mismatch is a common factor contributing to technostress in the situations discussed in this section, it is not the sole cause. For example, many interviewees browsed their smartphones in personalized fashion to find content about their interests, which could lead to them encountering online information bubbles. These bubbles can inhibit people from seeing content from a different perspective, resulting in gratifications not being obtained. Many interviewees believed that only being exposed to information solely from one perspective is harmful, as it can contribute to, for example, increased polarization. As the

following quote illustrates, one interviewee expressed concern and even fear about online information bubbles while nine interviewees in total discussed similar issues:

> *When I started thinking about how much I've actually chosen myself, like where I join, and how much has come as a sort of feed, like "oh, that looks interesting, let's go there". And through that,* ***my own thinking has been reinforced and maybe even changed in some ways****. [...] So, if I hadn't been on these channels at all, how different a person would I be? Do these essentially shape or produce certain kinds of people? It's kind of a wild thought [...] So, it's kind of, even a bit* ***scary****.*

Personalized use can also contribute to technostress when individuals browse different digital content feeds to follow the lives of others. For instance, many experienced technostress when following the seemingly perfect lives of "influencers". While following such content can be inspiring, it can also have the opposite effect due to unfavourable comparisons. Algorithms often show users more of this type of content, which creates more opportunities for stress-inducing comparison behavior. In total, 16 interviewees discussed technostress relating to negative comparison behavior. The following quote provides an example of negative comparison and users' interests:

> *If you've been a bit down in general, maybe it doesn't really help* ***when everything is, like, fantastic, and everyone seems so productive****, and I'm just sitting here scrolling through social media. [...] When I do handicrafts, it always felt like* ***no matter how amazing I made something, someone had made something much more amazing, and someone took better photos, and everyone seemed to have a slightly better relationship****. Or at least it looked like it because, you know, that's how it is, it's not exactly pressure, well, maybe pressure is the wrong word. But maybe a feeling of* ***inadequacy****. So, it's been kind of, and then somehow like, "Well, why am I knitting when my socks never look like that other person's socks?" or, "Why am I running to work every day when that one person runs 250 kilometers?" Like I should somehow reach their level.*

On a different note, many interviewees reported using different communication applications. When multiple applications are used, the overall information load can become exhausting. While a single application or service can contribute to technostress, the interviews showed that the potential for negative consequences increases when users engage in versatile use. When users receive too much information from multiple sources, it can become challenging to obtain gratifications because not all information is relevant. This overload, reported by 18 interviewees, can make it too challenging to find the information that is genuinely valuable, resulting in a burdensome and exhausting experience:

> *In my free time too, it's like wondering if there are Snapchat messages or Instagram notifications, or maybe something on LinkedIn or elsewhere. [...]* ***So, yes, notifications come in a lot per day. In fact, I checked, and I've had 181 notifications on my phone screen today****. [...] Well, I think to some extent, now that there's an unlimited amount of information available, it does start to become* ***burdensome*** *at some point... After all, the amount of absorbable information is quite limited per day, what you can take in, and then it keeps adding more information every hour of the day, so it does start to become* ***exhausting*** *at some point.*

Furthermore, several interviewees mentioned using multiple services to avoid missing out on anything. Paradoxically, while versatile use is often done to mitigate FOMO (in total, 15 interviewees discussed FOMO), it can also increase this fear because there are so many different gratifications being sought. If an individual seeks to see everything across various social media platforms, instant messaging services, and news sites, it becomes easy to overlook something and, as a result, miss an opportunity to obtain gratifications, which can lead to technostress:

> *Some stories [Instagram], for example, are only there for 24 hours and then disappear. There is a feeling of **FOMO**, like, you want to stay on top of things and want to see the information when it is still available. [...] Unless there's something like "I would have asked you to eat [with me]", of course **it's annoying** when you've missed something just because you haven't been checking your phone [instant messaging]. [...] And I wanted Snapchat because all my friends were on Snapchat, it felt like **I was missing out on so much** because I wasn't there.*

Summary of the Results

To summarize, the situations discussed represent some of the possible interactions among gratifications sought and obtained, dimensions of smartphone use, and technostress. While they are not an exhaustive list, they were central in our data. Based on them, we developed a model that illustrates the various concepts and their relationships. We made two important distinctions: whether gratifications sought are obtained or not. In both scenarios, technostress can emerge, but the nature of these situations differs. Obtaining gratifications does not necessarily eliminate technostress; however, it can help mitigate negative thoughts and emotions associated with it. Gratifications, both sought and obtained, provide insights into users' cognitions in relation to technostress in smartphone use. For example, the experienced strains and other outcomes of stress seemed to differ when comparing situations where gratifications were obtained (e.g., when gratifications are not obtained, guilt is often present in continuous use). Additionally, the dimensions of use can play a role in whether gratifications are obtained, thus affecting the experienced technostress (e.g., personalized or versatile use can actually inhibit obtaining gratifications, contributing to technostress), highlighting the holistic effect of the smartphone use loop in the emergence of technostress. In Table 3 below, we have compiled our new findings for the context of technostress.

Table 3. Summary of New Findings in the Context of Technostress.

Finding	Description
1) Gratifications sought, gratifications obtained, and the dimensions of smartphone use form a smartphone use loop that is crucial for understanding behavior underlying technostress experiences in smartphone use	The concept of smartphone use loop integrates both the whys and hows of smartphone use in technostress situations/experiences. For example, when a user seeks social gratifications and instantly engages with their smartphone disrupting the task currently at hand, such can lead to technostress (e.g., due to techno-invasion). If gratifications are not obtained, the positive feelings are not present to alleviate the stress. Furthermore, by seeking the gratifications again, the user can engage in repeated use that can lead to "more" technostress (e.g., due to techno-procrastination).
2) Gratifications sought and obtained provide insight into users' motivations for smartphone use in technostress situations/experiences	Hedonic, social, and utilitarian gratifications sought and obtained provide insight into why smartphones are used when users experience technostress. When users obtain gratifications they value highly, technostress experiences are not as prevalent (e.g., social gratifications emerged as most valued in our study). Furthermore, not obtaining gratifications can contribute to (increased) technostress. Thus, technostress experiences can differ based on the gratifications sought/obtained and whether the gratifications sought are obtained.
3) Dimensions of smartphone use provide insight into users' nature of activities performed to interact with information delivered via smartphones in technostress situations/experiences	We identified five dimensions of smartphone use (instant, repeated, continuous, personalized, and versatile) that provide insight into how smartphones are used when users experience technostress. The dimensions do not directly reflect technostress situations/experiences, but they provide insights into behavior that can contribute to technostress (e.g., personalized use can be stressful when users encounter online information bubbles).
4) Delineating technostressors and strains/other outcomes previously unidentified	Gratification mismatch, online information bubbles, and techno-procrastination emerged as technostressors previously unidentified in research. Furthermore, worsened boredom tolerance emerged as a negative outcome of technostress.

DISCUSSION

Research Contributions

This study makes three key research contributions. First, we combine theoretical insights from two distinct research streams, namely, uses and gratifications theory and technostress. Our approach enables a comprehensive examination of why and how personal use of digital content feeds on smartphones can lead to technostress. Previously, studies have examined the impact of personality traits (e.g., Hsiao, 2017; Lee et al., 2014) or IT characteristics (Ayyagari et al., 2011; Salo et al., 2019) on the emergence of technostress. However, technostress research has primarily focused on technostressors (e.g., overload) and their resulting strains (e.g., fatigue) or other outcomes (e.g., discontinued use) (Sun & Lee, 2022). We expand this perspective by investigating gratifications, which can be understood as underlying cognitions associated with technostress experiences. While the uses and gratifications theory has been previously applied in studies discussing the negative consequences of IT use (e.g., Baabdullah et al., 2022; Chaouali, 2016; Gentina & Rowe, 2020; Sun et al., 2020), we explain gratifications and technostress from a dual perspective following Palmgreen and Rayburn (1979): gratifications sought (closely tied to needs or motives) and gratifications obtained (satisfying needs by

receiving gratifications). Extant research has shown, for example, that users may not want to stop using IT due to the possibilities for obtaining hedonic gratifications, even though overall use may be harmful (Salo et al., 2022). We add to these findings by explaining how gratifications beyond the hedonic type may have similar effects. For example, when individuals engage instantly, repeatedly, or continuously with their smartphones and feel overloaded and exhausted due to the messages they send and receive, they nevertheless obtain social gratifications and wish to continue their use as the gratifications are highly valued.

We relate our findings to existing literature on technostress and smartphone use by building on prior discussions of types of smartphone use, such as using instant messaging for social, work, and study purposes, and their connections to technostress (Ardèvol-Abreu et al., 2023). Expanding on this, we explicitly examine the roles of dimensions of use and gratifications sought and obtained in the emergence of technostress, providing a more nuanced understanding of these relationships across a broader range of personal use contexts. Moreover, previous research has shown that using social media can be simultaneously stressful and enjoyable, and the users need to evaluate the balance of stress and various positive consequences (Ardèvol-Abreu et al., 2023; Cheikh-Ammar, 2020; Steelman & Soror, 2017). Regarding such a balance, we observed that smartphone use associated with social gratifications might align better with users' values than hedonic-oriented browsing which affected the technostress emergence. However, even more prevalent was that technostress was experienced when no gratifications were obtained, meaning that gratifications could alleviate technostress. Thus, we extend on the previous findings that not obtaining gratifications sought can, for example, contribute to fatigue when using social media (Ravindran et al., 2014) by offering more detailed explanations from the perspective of technostress and by discussing the effect of dimensions of smartphone use in the relationship between gratifications sought and obtained. Such findings contribute to existing technostress literature by providing new ideas into how the technostress process unfolds through cognitive antecedents.

Moreover, although the objective of this study was not to explicitly categorize technostress experiences based on demographic factors, some nuanced observations emerged in this regard. For example, participants who reported living with a partner frequently noted that their own or their partner's smartphone use had contributed to tension within their relationship. While previous studies have shown that technostress can manifest as issues to social relations (Salo et al., 2019), understanding the role of gratifications sought and obtained for technostress in such situations provides us with deeper insights into the situation. If smartphone users receive gratification from their use but simultaneously harm their relationships, such could call for a more explicit prioritization of one's cognitive patterns.

Second, we treat uses and gratifications as separate constructs and introduce the concept of smartphone use loop. We emphasize the importance of this distinction because the dimensions of use and gratifications are separate yet interconnected concepts, which can help us in discerning the "whys" and "hows" of smartphone use contributing to technostress. To address the "hows," we develop an explicit categorization for the dimensions of smartphone use, defined as the nature of activities users perform to interact with information delivered via smartphones. This categorization comprises five dimensions: instant, repeated, continuous, personalized, and versatile. Although some of the dimensions are present in IT on a broader scale (e.g., the Internet), we find that our dimensions together reflect what is characteristic of browsing digital content feeds on smartphones. The dimensions extend the existing body of

research on uses and gratifications theory by offering new insights for approaching use, which has typically been characterized at a more general level (e.g., ritualistic and instrumental use) (Rubin, 1984), or focused on different types of use derived directly from gratifications (e.g., entertainment use, social interaction, and information-seeking) (Ardèvol-Abreu et al., 2023; van Deursen & van Dijk, 2014). Furthermore, we add to previous studies that have focused on usage types (Bonds-Raacke & Raacke, 2010; Elhai et al., 2017) or user types (e.g., Brandtzæg, 2010). In related research, we notice some similarities between our dimensions and earlier findings. For instance, the amount of use (Blank & Groselj, 2014) aligns with the repeated dimension, and the extent of use (Maier, Laumer, Eckhardt, et al., 2015) corresponds to the continuous dimension. Moreover, constant use (Duke & Montag, 2017; Gerlach & Cenfetelli, 2020; Salo et al., 2022) could reflect both the repeated and continuous dimensions. However, for example, we see that repeated and continuous use are distinct from each other, which the term "constant" is unable to capture. Furthermore, we add to extant research by introducing dimensions not previously addressed. Overall, the dimensions do not directly reflect stressful experiences; instead, they can be seen as a part of the smartphone use loop which together with gratifications sought and obtained provide insights into cognitions and behavior that can eventually lead to technostress. This resonates with existing research stating that, for example, constant use is not inherently negative (Gerlach & Cenfetelli, 2020).

Since browsing dynamic digital content feeds on platforms such as TikTok can lead to time distortion and subsequent negative consequences (Roberts & David, 2023), it is crucial to understand how these negative outcomes unfold. Thus, we expand on existing research by explaining the processes through which such consequences emerge through the lens of technostress. With our dimensions of use, we also extend previous findings associated with compulsive and excessive use and technostress, which has been a common perspective especially centered around smartphone and social media use (e.g., Cao et al., 2018; Hsiao et al., 2017; Lee et al., 2014; Luqman et al., 2021). Repeated use may become compulsive, and continuous use may become excessive, but this requires users to perceive their behavior as uncontrollable or excessive, as per the definitions of compulsive and excessive use (Caplan, 2010; Luqman et al., 2017). As a part of the smartphone use loop, we observed the identified dimensions of use preceding a variety of different technostressors. With the instant dimension, interruptions, and invasion (e.g., Ayyagari et al., 2011) were central. In repeated and versatile use, especially online information overload (e.g., Fu et al., 2020) was highlighted. Furthermore, continuous use often contributed to or reflected techno-dependency (e.g., Salo et al., 2022). Personalized use was highlighted when the interviewees discussed negative life comparison (e.g., Fox & Moreland, 2015; Salo et al., 2019). Thus, although some of the observed technostressors are not novel, we contribute to research by delineating users' underlying behavior associated with them. Through the concept of the smartphone use loop, our findings contribute to existing technostress research by explicitly highlighting both cognitive and behavioral antecedents of technostress, as well as their varying associations with different types of technostress experiences. This approach provides insights into why distinct types of technostress emerge from specific smartphone-related activities.

Third, although many of the technostressors we discuss have been previously established in various studies, we recognize that previous research has not fully explored all potential technostressors. By shedding light on the interplay between dimensions of smartphone use, sought and obtained gratifications, and technostress, we observed that a mismatch between

sought and obtained gratifications can manifest as a technostressor. When individuals seek specific gratifications from their smartphone use, for example, by continuously browsing social media feeds and do not obtain them, this can be stressful (e.g., leading to feelings of guilt). Furthermore, we introduce two additional technostressors, techno-procrastination and online information bubbles, that have not been addressed in previous technostress research. Techno-procrastination shares similarities with the concept of cyberslacking, which has been discussed before (e.g., Güğerçin, 2020; Lavoie & Pychyl, 2001). For instance, technostress could lead to cyberslacking in workplaces. However, we view techno-procrastination as a distinct stressor that can contribute to technostress emergence (e.g., procrastinating important tasks by repeatedly browsing a smartphone). Additionally, while previously identified technostressor techno-invasion (Maier, Laumer, Eckhardt et al., 2015; Tarafdar et al., 2007) may overlap to some extent with techno-procrastination, the key distinction lies in the specificity of techno-procrastination, which addresses situations where smartphone use not only invades one's life but also leads the individual to neglect important tasks. Thus, the invasive nature of IT by itself is not the trigger for technostress. This can be especially evident when individuals repeatedly access their smartphones in search for hedonic gratifications. Furthermore, although online information bubbles (or filter bubbles) (Savolainen, Oksa, Savela, Celuch & Oksanen, 2021) have previously been associated with negative consequences related to IT use, to the best of our knowledge, they have not been conceptualized as a part of the technostress process before.

Regarding strains/other outcomes, we discuss "worsened boredom tolerance" as a strain/outcome of technostress. When individuals are so used to instantly and repeatedly accessing their smartphones (e.g., to check for messages), it might lead to them being unable to tolerate situations in which they are not receiving stimuli from their smartphones. Additionally, if individuals rely on smartphones to alleviate boredom while simultaneously perceiving that their smartphone use has diminished their capacity to tolerate boredom, this dynamic may perpetuate a cycle of increased smartphone use. This increase could manifest through shorter intervals tolerated without smartphone stimulation, more frequent instances of smartphone access, prolonged periods of continuous use, greater personalization in browsing behavior, and engagement with a wider variety of content types, thereby encompassing linkages to all the dimensions of use identified in our study. Moreover, boredom proneness has been linked to overload and fatigue in social media use (Whelan et al., 2020). Thus, the experiences of boredom and technostress may vary among individuals, as some people may be more prone to boredom. In summary, identifying new technostressors and strains is valuable for a more comprehensive understanding of stress that can arise when using different technologies in various contexts and ways. It underscores that technostressors and strains are not universally applicable and should not be viewed as "one size fits all".

Practical Implications

Different stakeholders could use our findings to understand and combat the negative effects of technostress in personal smartphone use. First, users themselves could learn from our results. With the help of our findings, users can, for example, reflect if the situations we discuss are relevant to them, and accordingly, assess the levels of technostress they might be experiencing due to certain dimensions of smartphone use. Moreover, users can examine the relationships between the gratifications they seek and those they obtain in relation to technostress to evaluate

if the use they are engaging in is actually rewarding. Thus, evaluating one's behavior based on the smartphone use loop could provide users with insight into their technostress experiences and the possibilities for mitigating them. Focusing on specific user groups, such as individuals whose studies or work are adversely affected by technostress, this study could provide valuable insights into the particular situations where technostress interferes with critical academic or professional tasks. These users might also explore alternative behavioral strategies to address and mitigate such challenges effectively.

Second, service providers could use our findings to design applications that take technostress into consideration since previous studies have shown that technostress may contribute to users' discontinued service use (e.g., Luqman et al., 2017; Maier, Laumer, Weinert et al., 2015). Many of our interviewees emphasized that they believed the services they use were purposefully designed to deliver stimuli that they find gratifying, which is why it can prove difficult to resist browsing, leading to issues. Even though service providers aim to ensure user engagement and profits, we believe that technostress is a phenomenon that could eventually prove harmful to providers, too. Thus, for example, social media providers should implement functionalities that make it easier and more transparent for users to manage their personalized use.

Third, although we studied the personal use of smartphones and technostress, our findings can also be helpful for employers. If users feel drained due to their personal smartphone use, such may also affect their performance at work. Our findings could help employers understand what kind of personal smartphone use, especially within working hours, is harmful and what kind could prove beneficial (e.g., small breaks to release tension). In addition, due to the increased working from home due to the COVID-19 pandemic, the possibilities for cyberslacking have increased. In the long run, such behavior could prove harmful to both workers and employers, and employers should educate their workers about the possible consequences of using smartphones during working hours from different perspectives. Such could be done, for instance, by creating guidelines informed by the central situations we present in our results.

Limitations and Future Research

It must be acknowledged that our study has several limitations. First, we focused solely on techno-distress, omitting the positive manifestation of technostress. As techno-eustress is a part of the holistic technostress process, this could be something to study in the future, as research exploring positive stress in personal IT use is scarce. Second, we relied on self-reported data, meaning the interviewees had to recall past experiences concerning their smartphone use. Due to this, memory bias may be present. Although we took precautions to mitigate such challenges, there are always possible inaccuracies when self-reporting and recalling past events. Moreover, the self-reported nature of the data introduces the potential for social desirability bias, where participants may provide responses they perceive as more acceptable or favorable. To mitigate the limitations associated with self-reporting, participants were given ample time to reflect on their responses, and they were explicitly informed that there were no right or wrong answers, as the primary focus was on understanding their personal experiences and stories. Third, although qualitative methods were deemed valid for the research context and objectives, they inherently limit the generalizability of the findings. Nonetheless, the primary aim was to offer

a deep and nuanced understanding of the phenomena under study by exploring detailed narratives of the study participants' experiences. Future research could expand on these insights by employing alternative methods to generate more generalizable results. Fourth, the assessed demographic factors also reflect limitations, as our interviewees were mainly young adults from similar cultural and educational backgrounds. Fifth, as the second data collection phase of the study (20 interviews) was conducted during the COVID-19 pandemic, other limitations may have arisen. For example, some interviewees thought the pandemic had increased their smartphone use (e.g., due to spending more time at home). Sixth, the services, applications, and sites used by our interviewees represent a limiting factor. Due to our focus on digital content feeds, our study only included some types of personal smartphone use (e.g., playing games or using online banking were omitted). We may have missed exciting and important narratives regarding smartphone use that could have been relevant to our research goals. This, however, could be an exciting avenue for future research.

Our study presents multiple possibilities for future research. First, future research could explore the positive aspects of technostress within contexts similar to those examined in this study. While the concept of techno-eustress has gained increasing attention, there remains limited research on its occurrence in personal and voluntary IT use settings (Tarafdar et al., 2024). Future studies could build upon our approach to examining gratifications and technostress by investigating how the gratifications sought and obtained through IT use are linked to positive manifestations of technostress. For example, prior research has shown that technostress spilling over from work to home can influence partnership satisfaction, either positively or negatively (Benlian, 2020). Expanding on this, future studies could examine whether technostress arising from activities such as social media use might also have positive effects and how such outcomes influence partnership satisfaction. Second, it is important to highlight how the smartphone use loop and its interplay with technostress is unique to each user, since stress is a subjective phenomenon (Lazarus & Folkman, 1984). This indicates that more research must be conducted to understand the relations between 1) different personalities and technostress and 2) different situational factors and technostress. It may also prove interesting to extensively address how technostress can affect the smartphone use loop. Third, with regard to the uses and gratifications theory, one of the leading suggestions is that people are active when choosing media to consume (Katz et al., 1974). However, since many of the feeds are personalized by algorithms, it could be claimed that the active aspect of the uses and gratifications theory is something to reconsider in the future. Previously, it has been suggested that how algorithmic recommendation is perceived varies between individuals, which could affect how services utilizing such are used (Min, 2019). In accordance with this, it could be argued that people's attitudes toward personalized services and their use could be the active aspect of media consumption in this context, even if algorithms guide the consumption event itself to some degree, which could be an interesting future research avenue. In a similar vein, habits could be studied as a part of the equation. Fourth, further research is needed to clarify how specific dimensions of smartphone use are explicitly linked to particular gratifications and technostressors. We propose that this exploration could benefit from a quantitative approach, investigating these associations in greater depth. In this study, we presented examples of potential relationships between dimensions of smartphone use, gratifications sought and obtained, and technostress. These relationships could serve as a basis for developing theoretical models that can be tested quantitatively to confirm their existence and, if validated, to assess

the strength of the associations between dimensions of use, gratifications, stressors, and strains. Fifth, gratifications and technostress could be examined by distinguishing between process gratifications and content gratifications, which refer to the gratifications derived from engaging with the media itself and those obtained from the content delivered by the media, respectively (Cutler & Danowski, 1980). This approach could offer deeper insights into the role of various types of content and activities in the technostress process.

CONCLUSION

In this paper, we explore technostress caused by browsing digital content feeds on smartphones. We identify five dimensions of smartphone use (instant, repeated, continuous, personalized, and versatile), which reflect how smartphones are used in the context. Subsequently, we discuss the gratifications sought and obtained (hedonic, social, and utilitarian), which reflect why smartphones are used. We introduce the concept of smartphone use loop, bringing forth new knowledge by integrating both what is sought and obtained from the use (gratifications) and how the smartphone is used (dimensions of smartphone use). We assess the interplay between the smartphone use loop and technostress, contributing to the technostress literature by linking the different dimensions of use and the gratifications with technostressors and strains/outcomes. As a practical implication, service providers could use our findings when designing digital content feeds to minimize the likelihood of user behavior that could result in technostress manifesting as, for instance, discontinued use.

IMPLICATIONS FOR RESEARCH

We contribute to research especially in the area of technostress by delineating the hows and whys of browsing digital content on smartphones, and their associations with emerging technostressors and the associated strains/outcomes. Thus, we underline how the technostress process is influenced by users' underlying motivations, their potential fulfillment, and the nature of their actions, thus highlighting both cognitive and behavioral antecedents for technostress. By incorporating the concepts of gratifications, dimensions of use, technostress, smartphones, and digital content feeds, we offer a multidisciplinary approach for holistically explaining technostress emergence. The conceptualization of the smartphone use loop and the dimensions of use presents an opportunity for researchers to develop refined frameworks for analyzing user behavior associated with technostress. We find it crucial to further understand why individuals, especially while engaging in voluntary and leisure-oriented IT use, end up in situations that elicit technostress. Furthermore, investigating how different dimensions contribute to various technostressors can provide insights into nuanced aspects of user experiences and inform the studies aimed at mitigating technostress.

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Authors' Note

This research has been supported by the Research Council of Finland (341359, 346479), the Foundation for Economic Education, and the Emil Aaltonen Foundation.

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"ONE MORE, ONE MORE... YOU GET STUCK" – THE ROLE OF CRAVING IN SMARTPHONE-RELATED TECHNOSTRESS

by

Hämäläinen, A., Salo, M., & Pirkkalainen, H., 2022

Proceedings of the 30th European Conference on Information Systems, 27

https://aisel.aisnet.org/ecis2022_rp/27

6-18-2022

"One More, One More... You Get Stuck" – The Role of Craving in Smartphone-Related Technostress

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"ONE MORE, ONE MORE… YOU GET STUCK" – THE ROLE OF CRAVING IN SMARTPHONE-RELATED TECHNOSTRESS

Research Paper

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Abstract

Smartphones have been integrated into nearly every aspect of human life. Because of them, being entertained, communicating with others, and finding information has never been easier. Even though such possibilities are positive on the surface, the versatile nature of smartphones has also created issues, such as people using them compulsively or excessively. By collecting and analyzing data from 30 semi-structured interviews, we explored how users may experience craving (unstoppable/uncontrollable desire to use, despite the negative consequences) that make them use smartphones compulsively or excessively. Such use may eventually lead to technostress, which is stress caused by technology use. We present three levels of craving (stimuli, sensation, and content) and discuss how they affect smartphone use and technostress. We contribute to research by discussing craving in the context of technostress. As a practical implication, different stakeholders could use our results to address the issues relating to stress caused by smartphone use.

Keywords: Technostress, Craving, Smartphone, Compulsive use, Excessive use.

1 Introduction

In the modern world, smartphones are everywhere. It is virtually impossible not to encounter individuals browsing their smartphones in a whole host of everyday situations, such as strolling in the streets, waiting for somebody or something, or even more radically, while driving a car (see, e.g., Maier et al., 2020). Even though there are many positive effects of smartphone use, numerous problems have emerged from it. Individuals may, for example, use technology compulsively, meaning that they are unable to control their use (Caplan, 2002). In addition, it has been demonstrated that smartphone use can be excessive (Zheng and Lee, 2016). Excessive use is usually defined as using too much (e.g., using more than planned, using more than is desirable, or using more than others) (Caplan, 2002; Luqman et al., 2017). Both compulsive and excessive use have been previously linked to a phenomenon known as technostress, which is stress caused by technology use (Tarafdar et al., 2019). In such a context, both compulsive and excessive use have been discussed as stressors (e.g., Cao and Yu, 2019; Cao et al., 2018; Dhir et al., 2018; Hsiao et al., 2017; Lee et al., 2014). Studies have shown that such stressors may lead to a number of negative outcomes, or strains, such as fatigue, anxiety, emotional and physical ill-being, conflicts, cognitive distraction, and discontinuance of use (Dhir et al., 2018; Masood et al., 2020; Panda and Jain, 2018; Zheng and Lee, 2016). Focusing on smartphones, previous studies have shown that problematic use can lead to users' reduced well-being (Horwood and Anglim, 2019; Hughes and Burke, 2018), thus highlighting the importance of studying the subject even further.

Although different technostressors and strains in particular are well-reported in the literature, many issues remain unsolved. While prior research has studied how technostress may contribute to a sufferer

discontinuing their use of a service (Maier et al., 2015b), reasons for behavior leading to continued use despite experiencing technostress have not been extensively studied. In addition, pre-stressor behavior (i.e., what happens before stressors emerge) remains understudied. To explore the issues further, we have employed the concept of craving to technostress research. In this study, craving is defined as "an unstoppable and uncontrollable desire that can lead to use (a drug, a technology), despite its negative and detrimental effects" (De-Sola et al., 2017, p. 2). Even though craving is usually associated with addiction, it has been argued that individuals can experience craving without being addicted (Franken, 2003; Kavanagh et al., 2005). In addition, we discuss compulsive use and excessive use, which support us in understanding the relationship between craving and technostress, since both compulsive (Abrams, 2000; Clements and Boyle, 2018) and excessive behavior (Hormes et al., 2014) have been linked to craving. Two research questions have been set for the study:

RQ1: How is craving present in personal smartphone use?

RQ2: How are craving, compulsive and excessive use, and technostress linked in the context of personal smartphone use?

We answered our research questions through a qualitative approach by collecting and analyzing interview data from 30 participants. Our research contributions are threefold. First, we contribute to the literature by developing a three-level categorization of smartphone-related craving. Second, we extend technostress research by explaining how craving affects technostress. Third, we discuss how compulsive and excessive use can be antecedents to stressors triggered by craving. Thus, we offer new insights to pre-stressor behavior in relation to technostress. Our results should offer practitioners (e.g., service providers) valuable information about individuals' smartphone behavior, focusing especially on the issues that emerge from using these devices compulsively and excessively.

In the next section, we present the theoretical background of our study. We then discuss how the empirical part of our research was conducted. Then, we move on to presenting the results of our study. After that is the discussion, in which we present the research contributions, practical implications, limitations and possible future directions of our research.

2 Theoretical Background

In this section, we present the theoretical background of our study. First, we discuss the concept of craving. Second, we focus on compulsive and excessive use. Finally, we introduce the background of technostress.

2.1 Craving

Previously, in both substance-related (Franken, 2003; Sayette et al., 2000) and behavior-related literature (De-Sola et al., 2017), it has been pointed out that the concept of craving has not been established or defined unanimously. Generally speaking, craving can be seen as a desire to use (Sayette et al., 2000). In this article, we follow the definition of De-Sola et al. (2017, p. 2) that "craving can be defined as an unstoppable and uncontrollable desire that can lead to use (a drug, a technology), despite its negative and detrimental effects". Previously, some research (e.g., Kozlowski and Wilkinson, 1987) has restricted craving to extreme desire or longing. Others, however, dispute this by saying that individuals do not need to be addicted for them to experience craving (Kavanagh et al., 2005; Franken, 2003). Thus, experiencing craving does not implicitly mean that one is addicted.

Craving can be explained from two perspectives. First, it may be focused on withdrawals and their avoidance, and second, it may be focused on the rewards associated with the target of craving (Tiffany and Conklin, 2000). Much of the previous discussion and research on craving has been in the context of addiction, primarily focusing on substances such as alcohol (e.g., Addolorato et al., 2005) and drugs (e.g., Robinson and Berridge, 1993). Even though the majority of craving research has been centered on substance-related craving, the term has been used in other contexts, such as social networking services (SNSs) (Savci and Griffiths, 2021), the Internet (Niu et al., 2016), and smartphones (De-Sola et al., 2017). Also, Savci and Griffiths (2021) stated after their review of existing research that even though

craving has been studied primarily in terms of substance-related research, it should not be limited to such context.

Some concepts are similar to craving. For example, Wang and Lee (2020) studied compulsive use of smartphones by utilizing the concept of "urge," which they defined, referencing Beatty and Ferrel (1998), as "a state of a sudden, strong, and irresistible desire to use" (Wang and Lee, 2020, p. 179). Grant et al. (2006) used the words "urge" and "craving" in the same context, highlighting the link between the two. Sayette et al. (2000) discussed the two concepts in their article, reporting that individuals had answered almost identically in many different studies to measurements of cravings and urges. In the end, we found that the concept of craving was suitable for our research topic, which we elaborate next.

Following the literature presented in this chapter, we approach the concept of craving as follows. First, the concept can be used in contexts that are not substance-related. Second, experiencing craving or having a craving does not necessarily refer to extreme feelings or addiction. Third, in terms of the twofold meaning of craving (Tiffany and Conklin, 2000), we discuss craving as being associated with rewards rather than withdrawal avoidance. Also, craving has been linked to compulsive (Abrams, 2000; Clements and Boyle, 2018) and excessive behavior (Hormes et al., 2014). Both types of use are of interest for our study. Thus, next we discuss the background of compulsive and excessive use.

2.2 Compulsive and Excessive Use

Both compulsive and excessive use have been associated with technologies such as the Internet (e.g., Van den Eijnden et al., 2008; Weinstein and Lejoyeux, 2010), SNSs (e.g., Cao and Yu, 2019; Dhir et al., 2018), and smartphones (e.g., Wang and Lee, 2020; Wolniewicz et al., 2018). Even though compulsive use and excessive use have similarities and are sometimes used interchangeably, there are differences between them.

Compulsion can be defined as a "response to an uncontrollable drive or desire to obtain, use, or experience a feeling, substance, or activity that leads an individual to repetitively engage in a behavior that will ultimately cause harm to the individual and/or to others" (O'Guinn and Faber, 1989, p. 148). In his research on problematic Internet use, Caplan (2010) discussed compulsive use in terms of uncontrollability, time spent online, and urges related to using. As can be seen from these definitions, compulsive use is characterized by its uncontrollability, similar to craving. In the context of smartphones, compulsive use has been associated with increased stress (Lee et al., 2014), which can lead to negative consequences such as exhaustion and reduced productivity (Lee et al., 2016).

On the other hand, excessive use of technologies is associated with the amount of time that is spent using them. In general, excessive use can be characterized as use that exceeds the amount of normal use (Luqman et al., 2017). The amount of normal use is, however, subjective. Thus, excessive use can be defined by individuals' own perception of their time spent, meaning that users themselves believe that their use is too much compared to what they believe is normal, to that of others, or the use that was planned (Caplan, 2002; Caplan and High, 2006). In the context of smartphones, excessive use has been associated with negative consequences such as conflicts and worsened academic performance (Cao et al., 2018; Zheng and Lee, 2016). To conclude, compulsive use is associated with uncontrollability, and excessive use is characterized by using too much. Both have been linked to a phenomenon known as technostress, which we discuss next.

2.3 Technostress

Stress has been described as a transaction between individuals and their environments (Lazarus, 1966). If individuals appraise their environments as too taxing, and their resources are insufficient for handling the demands, stress may form (Lazarus and Folkman, 1984). By interacting with their environments, individuals may encounter stress-inducing stimuli (stressors), which can affect them physically, psychologically, or behaviorally, causing them to feel strain (Cooper et al., 2001; Lazarus and Folkman,

1984). Stress is a complex and dynamic process whereby individuals, their resources, as well as environmental factors are in constant interaction (Lazarus, 1984, 1990).

The development of technological environments has presented people with new possibilities for encountering stress. The term technostress, defined as the negative result of users not being able to handle the demands of emerging technologies, had already been established in the 1980s (Brod, 1982). Technostress can be seen as forming via technostress-creating stimuli (technostressors) such as techno-overload (Ragu-Nathan et al., 2008; Tarafdar et al., 2007) and technology dependency (Shu et al., 2011). In a similar way to non-technology-related stress, by encountering stressors users may experience strain or other outcomes (Ayyagari et al., 2011) such as decreased job satisfaction (Califf et al., 2020) or even job burnout (Srivastava et al., 2015). As in the examples mentioned earlier, much of the previous technostress research has been conducted on organizations that usually mandate their members to use specific items of information technology, and the technology is used mainly for utilitarian purposes such as increasing productivity (e.g., Tarafdar et al., 2015; Tu et al., 2005).

Organizational technostress research has been extended to personal and voluntary contexts in recent years (e.g., Benlian et al., 2020; Maier et al., 2015a; Salo et al., 2022). With new technologies such as smartphones and SNSs becoming widespread, opportunities for encountering technostress have increased substantially, leading to a number of issues. For example, as mentioned earlier, compulsive and excessive use have been discussed as stressors that may lead to strains (and other outcomes) such as worsened academic performance, reduced productivity, emotional ill-being, invasion, and conflicts (Cao et al., 2018; Hsiao, 2017; Lee et al., 2016; Panda and Jain, 2018; Zheng and Lee, 2016). Focusing especially on personal smartphone use, previous research has shown how users can experience stressors such as overload and fear of missing out along with strains such as fatigue and reduced psychological well-being (Chen et al., 2017; Dhir et al., 2019; Horwood and Anglim, 2019; Malik et al., 2020).

Even though some previous studies have explored compulsive use, excessive use, and even addiction (Brooks et al., 2017; Tarafdar et al., 2020) in the context of technostress, we find that the research is lacking in the area of explaining why individuals engage in such use despite the negative consequences. To address this, we employ the concept of craving to the context. We believe that craving could explain technology use that has compulsive and excessive characteristics and that causes stress. We explore the connections between the concepts empirically as follows.

3 Research Method

To answer our research questions, we needed to understand in detail how individuals interact with their smartphones. To do that, we took a qualitative research approach by collecting and analyzing data from 30 participants. We sought to collect rich data representing the participants' experiences in detail, helping us understand their behavior (Schultze and Avital, 2011). Since stress is a subjective phenomenon, we had to explore the nuances of the negative encounters our participants had while using smartphones in depth. For this, qualitative interviews were considered suitable.

3.1 Data Collection

We collected empirical data by conducting 30 semi-structured interviews. To find interviewees, purposeful sampling was utilized by selecting "information-rich cases for in-depth study" (Patton, 2002, p. 230). Thus, we sought out participants who had used smartphones actively and encountered negative experiences while using them. The interviewees had to be over 18 years old and native Finnish speakers. Initially, we looked for participants from an age group traditionally seen to be active smartphone users (young adults). However, in the end, we did not set age criteria for the interviewees, as we found it more important that the interviewees used their smartphones actively and had encountered stress while doing so. After suitable participants were found, we used snowballing to source more interviewees (Patton, 2002). The interviews were done in two separate phases: 10 interviews (one remote via video chat, nine face-to-face) were conducted between June and August 2019, and 20 interviews (all remote using video chat) were conducted between February and April 2021. More information is presented in Table 1.

Interviews
30 semi-structured interviews: 10 interviews in 2019; 20 interviews in 2021
9 face-to-face interviews; 21 interviews conducted remotely using video chat
Interview duration: 34–77 minutes (average 54 minutes)
Interviewees
30 in total (11 men, 19 women); age: 22–41 years (average 27 years)
Diverse professions, e.g., student, entrepreneur, software developer, firefighter, masseuse, HR specialist …
Average daily personal smartphone use: 1–9 hours (average 5 hours)
Applications/services/sites used (mentioned by at least two participants): **SNSs** (Instagram, Facebook, Snapchat, YouTube, Twitter, Reddit, TikTok, Pinterest, LinkedIn); **IMs** (WhatsApp, Discord, Telegram, Messenger); **other** (e-mail, news sites/applications, browser, Spotify, online marketplaces, Netflix)

Table 1. Information about the interviews and interviewees.

During the interviews, it was essential for the interviewees to explain their experiences and emotions in their own words. The role of the interviewer was to act neutrally and allow the interaction to develop on its own (Myers and Newman, 2007). The first author, who was responsible for interviewing the participants, aimed to act naturally to create a comfortable atmosphere during the interviews. Methods such as mirroring (Myers and Newman, 2007) were used to advance the discussion and encourage the interviewees to talk more deeply about their experiences.

Since we conducted semi-structured interviews, an interview framework formed the basis for them. All interviews had similar overarching themes (e.g., general smartphone use and negative incidents/consequences/thoughts regarding smartphone use) but the precise course of the interviews differed between each other. The interviewees were asked questions such as "Why do you use a smartphone?", "How did you realize that your smartphone use was causing issues?" and "Do you think you spend too much time using your smartphone?" Finally, it was deemed that sufficient saturation had been reached during the interviews, and the data gathered were rich and able to satisfy our research goals, and we proceeded with our study.

3.2 Data Analysis

The analysis part of our research began during the data collection phase. Each interview was transcribed as soon as possible after it was conducted. Initial notes were also made about the data. After all the interviews were conducted and transcribed, the first author read and re-read the collected data and made notes about the observations that could be of interest for the research topic. After sufficient familiarity was reached, the first author systematically coded the data. We wish to highlight that even though the first author was mainly responsible for the analysis process, the process was also discussed with the co-authors. These discussions were necessary for the quality of the analytical process, and they helped us answer our research questions in more detail. We discussed, for example, the different paths of craving and technostress that are presented in more detail in Section 4.2.

Next, open coding was utilized using NVivo analysis software. Through open coding, we were able to systematically establish interesting observations from our data (Lune and Berg, 2017). We partially followed the methods used in grounded theory, which has been common in information systems research (Wiesche et al., 2017). During this phase, all relevant data were labeled (words, sentences, and even whole paragraphs). For example, the sentence "I definitely feel like I use it too much" was coded under "Uses too much." After open coding, we used our theoretical background for categorizing the codes. We assigned relevant codes to categories representing craving, compulsive and excessive use,

technostressors, and strains. For example, the code "Uses too much" was categorized under "Excessive use" following the definition discussed in the theoretical background.

When we assigned the open codes to the category of craving, we carefully followed the definition used in our article, meaning that codes that had to reflect "uncontrollable or unstoppable desire to use despite the negative effects" to be considered craving. For example, if the codes reflected sentences in which the interviewees had discussed "using despite wanting to do something else" or "having to do something on the phone" (both of which could be seen as uncontrollable or unstoppable), in relation to smartphone use and its negative effects, such codes were categorized as craving. After the formation of the craving category, we took a step backwards and explored possibilities for categorizing craving into subcategories by further evaluating the different types of craving that we could see in our data. Accordingly, we deemed that craving can be present on three levels: craving stimuli (general), craving certain sensations (e.g., relaxation), and craving specific content (e.g., messages), and we assigned codes from the craving category to such subcategories. For example, the sentence "You feel like your hands are itching and you want to open, read and answer [a message], but you have to wait" was originally coded under "Itching to read" which was subsequently categorized under craving. After going through the category of craving again, the original code was eventually categorized under "Craving messages," which, in the end, became part of the "Content craving" category.

After this, we engaged in synthesizing our data. Our goal was to describe the phenomena we observed in detail (Wiesche et al., 2017). We looked for relationships between craving, compulsive and excessive use, and technostress. We first identified the stressors and strains that users had experienced. We traced back from the strains to cravings and were able to find different paths of how technostress and craving were linked. We confirmed these paths by also following them from craving to technostress. We compared the paths with our data, and we deemed that our thoughts concerning the different paths were consistent and loyal to the data. We also used constant comparison to find similarities and differences between the participants (Glaser and Strauss, 1967). Finally, the entire data set was read through one more time by the first author, and it was deemed that the codes, categories, and their relationships were able to capture the essence of what the interviewees had said.

Next, we move on to the results, where we discuss first the three levels of craving identified in our study. We then explain how craving, compulsive and excessive smartphone use, and technostress can be linked. Direct quotes from the interviews are presented as evidence (translated from Finnish to English).

4 Results

In this section, we present the results of our study. We first discuss the three levels of craving (stimuli, sensation, content) that we observed from the interview data. Subsequently, we demonstrate how craving can lead to compulsive and excessive use of smartphones and, eventually, technostress.

4.1 Craving

Based on the definition and our data, we saw craving affecting smartphone use in three different ways. First, craving can trigger unpleasant thoughts related to smartphones. Second, craving can make individuals initiate smartphone use even when they know they should not or even when they do not necessarily want to. Third, craving can keep individuals tethered to their smartphones for too long. In Section 4.2, we discuss this in more detail from the perspective of compulsive and excessive use as well as of technostress.

Craving can occur in the personal use of smartphones because, for example, smartphones deliver stimuli that give users (short-term) pleasure. Most interviewees claimed that their smartphone use was "unnecessary" at times. We think that the concept of craving is well suited for explaining such behavior because of the uncontrollable nature of craving. People do not necessarily want to or need to do something, but craving guides their behavior, which might be frustrating, leading to stressful situations. As one of the interviewees described browsing content on smartphones:

And you are like, one more, one more… You get stuck. (Interviewee 26)

We found in our data that craving can occur on three different levels. On the bottom level, users crave stimuli. In such cases, craving is not associated with any particular sensations or content. Rather, individuals simply crave the stimuli that smartphones deliver. On the middle level, users crave sensations (e.g., relaxation). In such cases, they crave the specific sensations that smartphones are able to elicit. On the top level, users crave specific content (e.g., videos). The levels are described in Figure 1, and discussed in more detail below.

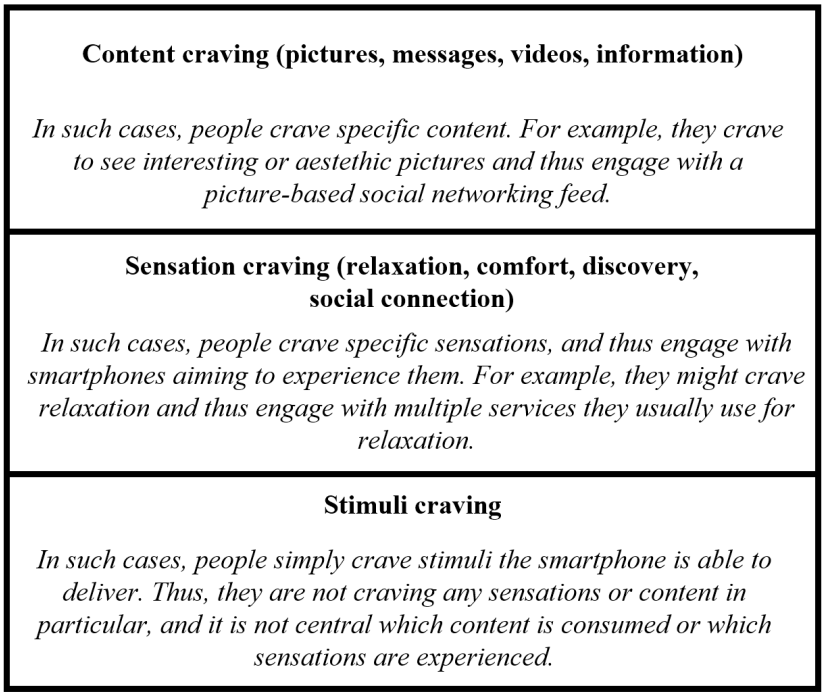

Figure 1. Three levels of craving related to smartphone use.

Stimuli craving. Many interviewees pointed out that smartphones deliver stimuli that make it easy to start or difficult to stop using the device. People may not want to engage specifically with the content they are browsing, but they crave some stimuli which cause them to initiate use or keeps them attached. The participants described such behavior as unnecessary. In such cases, it is not important which kind of sensations are experienced or content is browsed but the stimuli, generally speaking, are craved.

> *They are just unnecessary feeds, and then you just want the stimuli and the new information, even though they are not even interesting or useful in a way that it would bring real joy, as it is for the short-term.* (Interviewee 6)

Some also thought that they had become accustomed to the stimuli they received via their phones, making them browse, sometimes even automatically. In situations such as this, the users might not have specific goals for their behavior, they just wanted the stimuli.

> *The more used to it you get, the more automatic the browsing becomes. You realize that your brain is used to receiving smartphone stimuli all the time.* (Interviewee 7)

Many interviewees craved stimuli especially in situations that they considered boring. They craved the dopamine that smartphone-delivered stimuli were able to provide. Even though use of the devices brought them something positive, in most cases the interviewees were not happy with themselves for alleviating their boredom by browsing the phone.

> *Pretty often it is like boredom or something, like you have to get some stimuli to receive dopamine or… something. Yeah, probably the different stimuli; you kind of have to get it when nothing is happening.* (Interviewee 22)

Sensation craving (relaxation, comfort, discovery, social connection). Many interviewees craved the different sensations that smartphones are able to deliver. In such cases, it does not central which kind of content is browsed; the craving is for the sensation. For example, people can crave the relaxation effect of smartphones. Such use is quite conflicting, since many interviewees thought that when they used their devices to relax, they were more exhausted afterwards. It was typical that even though this had happened multiple times, people still engaged in such use.

> *It is not very recovering, browsing the phone. You always think that it will help you relax, but in the end, it is as tiring as the thing you were doing before you started browsing the phone.* (Interviewee 12)

Many craved a wide range of positive sensations from their smartphones, among them comfort. Sometimes this happened in situations during which another task, usually something stressful, was in progress. In moments like this, people felt the need to escape from stressful situations and thus craved positive sensations.

> *When you end up in an uncomfortable situation, you have to take out the phone to receive something good.* (Interviewee 27)

Some interviewees also highlighted how one might crave new content that would keep them attached to the devices. Such craving might be so powerful that individuals would engage uncontrollably with their smartphones.

> *You say, "Okay, I have seen this, but … is there more? Where will it lead?" It's probably because of the ease with which you can quickly move from one thing to something new, and you sort of don't know when to stop.* (Interviewee 2)

Craving the social connection that smartphones can offer was also prevalent. People were very used to constantly checking their devices to see if someone had tried to contact them.

> *When you have nothing to do, you always take out the phone, and then you end up in constant contact with someone.* (Interviewee 22)

Content craving (pictures, messages, videos, information). Many interviewees had craved content that smartphones are able to deliver. In such cases, the kinds of sensations that result from the content are not central, but the craving is for the content itself. For example, many applications such as Instagram were used to look at pictures. A number of the interviewees revealed that they would sometimes spend hours each day browsing pictures on different applications even though they simultaneously thought they should be doing something else.

> *Imgur doesn't feel that important, and it really isn't. It just shows nice pictures, and the same is also the case for Twitter and Instagram. All you find are pictures and hashtags, and they actually aren't very interesting or even meaningful.* (Interviewee 6)

All interviewees used their smartphones for communication. There were situations where the participants had been both in a real-life social situation and at the same time they checked their devices for any messages they might have received. Everyone who behaved in such a way told that they knew they should be focusing on the real-life situation, but they nevertheless simultaneously shifted their attention to their device.

> *I had the phone in my hand all the time. Especially when I was younger and in a relationship, I constantly had to see if the other person had sent me messages.* (Interviewee 26)

Many interviewees also used different services to look at videos on their devices. In particular, services that rapidly presented the user with short videos (e.g., TikTok) were discussed as negative during the interviews. The participants thought it was easy to become tethered to the content even though this use was not considered beneficial.

> *I would just watch TikTok videos, but then I realized that this made no sense, and I started wondering if I got anything from this. I realized I got nothing apart from the wasted time.* (Interviewee 30)

Finally, smartphones were used to access a wide range of information. In some situations, such behavior was due to information craving. For example, many interviewees said they "had to" immediately check their smartphones in the morning because they "needed to" know what had happened during the night. Some found this disturbing.

> *Especially in the mornings, when you wake up, your immediate thought is that you have to know what's going on. You feel like your morning hasn't started if you're not allowed to look at the phone. I am being honest, it's horrible to say this out loud [laughs]*. (Interviewee 7)

4.2 Craving, compulsive and excessive use, and technostress

In this section, we discuss the negative effects of craving and smartphone use in more detail by demonstrating how craving may contribute to technostress in three different ways. First, craving can occur, and even though it does not necessarily lead to active use, it can be disturbing and may, for example, harm concentration (**craving contributes to technostress**). Second, craving can trigger use that the individual is unable to control and that can harm other activities such as sleeping (**craving contributes to technostress via compulsive use**). Third, craving can contribute to the individual using the device too much, which can, for example, create conflicts (**craving contributes to technostress via excessive use)**. All of these paths can be problematic and lead to different technostressors (e.g., invasion, interruptions, conflicts, overdependence, overload) and strains (e.g., anxiety, frustration, concentration issues, sleep issues, annoyance, exhaustion). The three different paths are depicted in Figure 2, with examples.

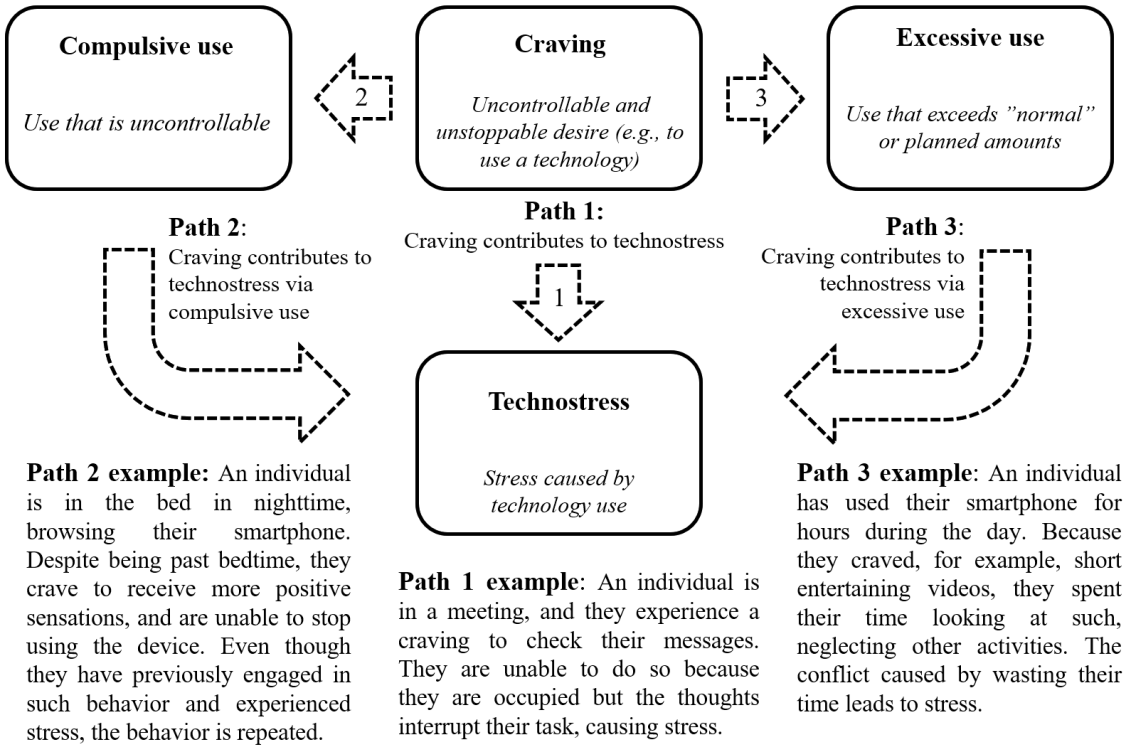

Figure 2. Three paths of craving and technostress.

Craving contributes to technostress (no active use) – Path 1. Craving is a desire that *can* lead to use. In some cases, craving does not lead to active use, but it still causes stress. For example, individuals may be craving something that smartphones are able to deliver, and this can interrupt ongoing tasks. This can happen without them even seeing the phone, but it was more typical among our interviewees

that they would see notifications and be in a situation where they could not or should not check their phone. In such situations, individuals experienced craving (e.g., for messages) that created stressors such as interruptions, leading to strains such as anxiety.

> *If I find that I am receiving messages all the time [on the smartphone], it is very difficult for me not to take out [the smartphone], look at it, and answer. I feel like I have to, like… I get anxiety because there are messages or notifications*. (Interviewee 10)

Also, because of craving, people may feel conflicted about their smartphone use. Simultaneously, they may feel like they want to use their device but also feel like they do not want to. Many interviewees knew that certain types of use caused negativity and they were conflicted when thinking about such use, causing them to feel frustration. This can happen, for example, when craving social connection through messages or SNSs.

> *When I am away from my phone for a longer period, I feel like, "yuck, I don't want it back." But I still end up in the same situation… Yeah, I mean, kind of, I don't know, you can't resist it. You feel like you have to, and then you kind of have a conflicting feeling all the time that you want to look at it—messages and Insta [Instagram]—but you kind of don't want to. I don't know.* (Interviewee 27)

Craving contributes to technostress via compulsive use – Path 2. The link between craving and compulsive use is evident from the definitions, since both highlight uncontrollability. Thus, compulsive use can be seen as a response to craving. Even though most participants had identified situations in which they were unable to control their smartphone use despite the negative consequences, many emphasized that they were perplexed why they behaved in such a way repeatedly. This highlights uncontrollability, and can thus be explained through craving and compulsive use. Even though people believe they should do something else, they are unable to, which causes stress.

> *All the unnecessary browsing—that's the worst in my opinion. I try to be efficient in everything, and it annoys me. Why am I doing something unnecessary when I could be using the time for something more useful?* (Interviewee 20)

One interviewee even described that his smartphone sometimes made him feel "zombie-like," which highlights uncontrollability. He knew that using a service was negatively affecting him, but nevertheless, he kept using the device. He was experiencing technostress through conflicts and frustration.

> *I don't know what I should call it, something like compulsive browsing… It's annoying that you still go there [SNS] and you feel like a zombie. You don't actually get any content from there.* (Interviewee 19)

Several interviewees pointed out that because there was always something new to see on a smartphone, it was difficult for them to detach from the device. People can simply crave seeing new things. Such behavior can eventually cause, for example, being too dependent on the phone in certain situations, which may lead to concentration issues.

> *It is difficult to detach from it because there is always something new, and then you are like, "I'll just watch a couple more." Then you can't concentrate on anything else. All of your concentration is on the phone.* (Interviewee 14)

Similarly, craving-triggered compulsive use can also happen before nighttime, which may harm sleep. Individuals can crave positive sensations such as relaxation and comfort after a hard day, making them engage in compulsive use, which harms their ability to sleep. Many of the interviewees had become too dependent on their bedtime smartphone use even though they knew it was harmful. We found that this happened because they were craving sensations, leading to compulsive use which invaded their sleeping schedules.

> *At some point, I was unable to get away from the phone [laughs], even during the night. I would browse Pinterest, I would browse Facebook, I would browse… I just browsed and browsed, and I felt like it [smartphone] had grown attached to my hand. I wasn't able to stop at all. I was always like, "I'll just watch this" and "I'll just watch this" and…* (Interviewee 15)

Sometimes interviewees engaged in compulsive use because they experienced impulses. Impulses can be external (e.g., they receive a notification) or internal (e.g., they get an impulse wanting to see/experience something). In such situations, people encounter craving (e.g., for messages or relaxation) and thus compulsively use the device, which can be stressful because of the interruptions.

> *Especially when I need to be doing something else, very often there is a nice post and I must see it, and so I get interrupted. Or someone sends me a message… It's annoying, but I still do it again and again.* (Interviewee 6)

Craving contributes to technostress via excessive use – Path 3. As discussed in Section 2.1, excessive use is something that individuals believe surpasses the amount that they consider to be normal. Hence, we asked the interviewees whether they thought they used their smartphones too much. Most (23 out of 30) thought that they did. Interestingly, some who used their devices two hours a day thought it was too much, while others used theirs for eight hours and did not consider that to be too much.

Even though excessive use has similarities with compulsive use, it is central to excessive use that the amount of time is problematic. Many interviewees criticized the amount of time they spent on their devices. They questioned their use but still continued it to the extent they believed was too much. This happened because users craved, for example, the videos delivered by certain services. For some, such behavior invaded other aspects of their life, such as doing school work, causing stress.

> *Probably when I had school work due and I wondered where all my time had gone—I realized that I had actually been browsing TikTok for an hour. All my time had been spent doing that. At that moment, I realized, "damn, where did I spend all my time? This is not what I want." I was, contrary to my values, watching unnecessary videos when I should have been doing many other things.* (Interviewee 30)

Because SNSs host an infinite amount of content, it is easy to use smartphones excessively when viewing them. Many used their smartphones to relax, but in many cases they eventually attained the opposite. Thus, people craved positive sensations even though their use eventually caused stress. Most of the interviewees revealed that they felt like they were wasting their time using smartphones, yet still, every day, they used them for hours, which was conflicting and stressful.

> *First of all, the time I spend on it [smartphone] is too much. I should not spend so much time on it. For some reason, at least on Instagram, you get so easily hooked on it. You kind of start believing that some things that are useless are actually important in life.* (Interviewee 27)

Because of their excessive use, many interviewees thought that they felt like they were in a rush all the time. For example, services that delivered an endless number of pictures were considered harmful for such situations. Many browsed smartphones to spend time, craved seeing more pictures, which kept them attached, and they spend more time on the device than they had planned to. Such behavior can contribute to the users feeling like they are constantly in a hurry, which many highlighted as stressful.

> *Sometimes I realize that I have checked the time, and I think, "Well, I will stop in five minutes and go eat or something." Then I realize that oops, thirty minutes have gone by while I was aimlessly browsing.* (Interviewee 4)

In general, many of the interviewees thought they used their devices too much and could not control their use. They experienced an unstoppable craving that can lead to compulsive use, excessive use, and eventually, may contribute to technostress.

> *It is pretty shocking if you think about everything that you could do for eight hours every single day; you could gain something much more meaningful. Yeah, it is quite horrible [laughs].* (Interviewee 27)

5 Discussion

In this section, we first discuss the research contributions of our research. We highlight how we have been able to contribute to the existing literature. Second, we discuss the practical implications of the study. Finally, we acknowledge the limitations of our research and offer suggestions for future research.

5.1 Research Contributions

Our study has three research contributions. First, we employ the concept of craving to explore smartphone use and technostress. To our knowledge, craving has not been discussed before in the context of technostress. Previous research has shown that technostress can lead to discontinued use (Maier et al., 2015b). However, detailed explorations are scarce on the behavioral mechanisms underlying the continued use of technology despite experiencing technostress. It has previously been shown that certain enabling factors, such as receiving gratification (Chaouali, 2016; Cheikh-Ammar, 2020), may contribute to continued use despite experiencing stress. We extend this by approaching it from a different perspective, harnessing the concept of craving to explain such behavior. We argue that craving contributes to users being unable to stop their use because of the concept's uncontrollable nature (i.e, the desire to use is uncontrollable). Even though we employ such an approach to craving that focuses on rewards (Tiffany and Conklin, 2000), this focus differs from gratification-seeking, since craving is characterized by uncontrollability while gratification-seeking is more controlled and active. Thus, by answering our RQ2, we can link technostress with craving. To do that, we have also discussed compulsive and excessive use, the contributions of which we address next.

Second, we shed light on the complex nature of compulsive and excessive behavior in relation to smartphone use and technostress. In the technostress literature, compulsive and excessive use have both been previously discussed as stressors (e.g., Hsiao et al., 2017; Lee et al., 2016), and we agree with such observations. However, we see them as complex reflections of human behavior that are not necessarily solely stressors, and chose a different approach and explained how they can be types of use triggered by craving that can lead to stressors (e.g., invasion and conflicts), and eventually, strains (e.g., exhaustion and anxiety). The concept of craving is especially evident in compulsive use, since both are characterized by uncontrollability (Caplan, 2010; De Sola et al., 2017). However, when feelings are uncontrollable, they can also contribute to excessive use (Igarashi et al., 2008). We demonstrate that craving is an uncontrollable trigger that can cause compulsive or excessive use that could lead to the draining of users' resources via technostress.

Third, by answering our RQ1, we elicit three levels of craving (stimuli, sensation, content) from our data. Such levels of smartphone-related craving have not been discussed before. By identifying such levels, we showcase how individuals can experience craving for different things in relation to smartphones. We would like to emphasize that even though craving has been mostly associated with substances such as alcohol (e.g., Tiffany and Conklin, 2000), more recent studies have addressed it in behavioral contexts (e.g., De-Sola et al., 2017). Also, craving is traditionally associated with addiction. However, following Franken (2003), we see craving as something that can be present in non-addicted individuals. Even though one can be addicted to smartphones (Salehan and Negahban, 2013), that is not always the case, even when individuals display behavior that has some similarities to that of addicts. For example, Gerlach and Cenfetelli (2020) posited that individuals who constantly check their devices should not be called addicts. We see craving as something that could trigger compulsive and excessive smartphone use that leads to stressful situations without the users being addicted to their devices. Thus, we offer new insights to problematic smartphone behavior that is uncontrollable and stressful without being addiction.

5.2 Implications for Practice

We discuss here the implications for practice from two perspectives that we believe are most relevant: the user's perspective and that of the service/application/platform/device provider/manufacturer.

From the individual's perspective, our three-level categorization of smartphone-related craving is helpful for all smartphone users that believe they may be too attached to their devices. Individuals can evaluate whether they think all stimuli, certain types of sensations, or certain types of content are the ones that they are too drawn to. If users could identify the source of their craving, they could modify their behavior and mitigate the negative consequences emerging from their use. Since technostress caused by voluntary technology use can negatively affect important aspects of life, such as sleeping and social relations (e.g., Salo et al., 2019), individuals need to be careful with such issues to tackle the

possible negative well-being consequences of technology use. From our interviews, it could be seen that individuals believe that the negative consequences of smartphone use are partially their own fault, although some responsibility is with the developers of the devices, services, and applications.

Even though more use means more revenue for the providers, we believe that more attention should be given to the fact that some applications, and certain features, are too engaging. It is very easy to receive different stimuli by using different services on smartphones, and service providers should evaluate why individuals develop craving towards their services. Such could be approached, for example, by using the three levels of craving established in this article. It would be beneficial for users to use different services because they want to use them, not because they crave using them. For example, different SNSs could scale back on the amount of endless information they present to users to create a healthier environment in which users' well-being is not endangered. Since technostress can lead to discontinued use (Maier et al., 2015b), different service providers should take more concrete action to limit such issues, which would benefit different stakeholders.

5.3 Limitations and Future Research

There are some limitations to our research that we need to address. First, the concept of craving and its relationship with addiction is a limiting factor. Even though some scholars have addressed how craving can exist without addiction, most previous studies regarding craving have been in the context of addiction. We took the stance that experiencing craving does not inherently mean that one is addicted, but we acknowledge that some could disagree. Second, the research methods that we used have some limitations. Since we used qualitative research methods, our results cannot be generalized. We also collected data that the subjects had to recall and report themselves. Also, since the participants had to recall past experiences and discuss them in an artificial situation, issues such as memory bias could be present. Third, demographic factors such as cultural background and age were relatively homogenous among our participants, meaning that in other contexts the results could be different. Fourth, the second data collection phase took place during the COVID-19 pandemic. Some interviewees thought that the pandemic had affected their smartphone use (they used devices more because they spent more time at home), which could have affected their experiences and answers.

Future research could focus on how, why, and when cravings emerge in the context of our study. We focused more on situations in which craving was already present. It could be fruitful to dive deeper into the process of developing cravings towards smartphone-delivered content. Another interesting future research avenue could be discussing craving associated with different kinds of applications, such as mobile games. Also, it could be interesting to quantitatively approach the interplay of craving, compulsive and excessive use, and technostress in the context of smartphone use. We believe that our research could be extended to a number of different scenarios that could help us to understand the complex nature of stress caused by technology use in even more detail.

6 Conclusion

In this article, we explored the relationship between craving, compulsive and excessive use of smartphones, and technostress. By employing the concept of craving in technostress research, we offer a new perspective for exploring smartphone use and the negative consequences of it. We demonstrate how the uncontrollable desire (i.e., craving) to use smartphones can contribute to technostress directly or via compulsive and excessive use. We also establish three levels of craving related to smartphone use (stimuli, sensation, content). Our results should give new insights into the complex nature of technostress caused by voluntary smartphone use. Our results could offer both researchers and practitioners tools to address the consequences of technostress.

7 Acknowledgements

This study was partially supported by the Academy of Finland (341359).

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III

THE ROLE OF GAME ELEMENTS IN SHAPING THREE DIMENSIONS OF TECHNO-DISTRESS AND TECHNO-EUSTRESS IN ONLINE MULTIPLAYER GAMES

by

Hämäläinen, A., Salo, M., & Lampi, A., 2024

Proceedings of the 15th Scandinavian Conference on Information Systems, 24

https://aisel.aisnet.org/scis2024/24

2024

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Research paper

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Abstract

Playing digital games is an immensely popular leisure activity, offering players numerous benefits. Despite this, research, practitioner reports, and mainstream media discussions have highlighted various issues associated with gaming. In the information systems (IS) discipline, research on the phenomenon of technostress, referring to stress caused by information technology (IT) use, has been instrumental in understanding the negative consequences of IT use. Nevertheless, while technostress has received attention in various IT use contexts, digital games have received minimal scrutiny. To address this gap, we studied technostress in the context of playing online multiplayer games. By employing qualitative data collection and analysis methods, we investigated gamers' experiences of technostress and the game elements underlying them via 19 semi-structured interviews. We highlight how technostress can manifest both negative and positive aspects and explain how the same game elements and gaming situations can lead to both types of outcomes. Through our three-dimensional view of technostress, we emphasize the direct role of gameplay, in addition to the indirect roles of social interactions and self-perception, in shaping technostress when playing online multiplayer games. By delineating specific associations between game elements and technostressors, we provide practical insights for game developers and organizations implementing gamification in various activities.

Keywords: Technostress, Techno-distress, Techno-eustress, Digital games, Online multiplayer games, Game elements.

1 Introduction

Playing digital games is an exceedingly popular activity, with the number of gamers being in the billions (Clement, 2023). While this form of entertainment has been linked to various positive outcomes, such as stress relief (Barr and Copeland-Stewart, 2022), research and media have both highlighted different adverse phenomena, such as problematic gaming and gaming addiction (Kuss and Griffiths, 2012; McCaffrey, 2023). In this study, we explore the consequences of gaming from the perspective of technostress, which refers to stress emerging because of information technology (IT) use (Tarafdar et al., 2019). Addressing the adverse consequences of gaming from a technostress perspective could help reduce the stigma associated with gaming, which often arises when gaming is discussed as problematic or disordered (Galanis et al., 2023). Furthermore, because technostress can contribute to reduced well-being (Whelan et al., 2022) and use discontinuance (Chen et al., 2019) among users, it is important to understand the issues associated with the phenomenon in such a popular IT use context.

While technostress has been studied in various personal IT use contexts, such as social media (Tarafdar et al., 2020), mobile shopping (Chen et al., 2019), and wearable technology use (Rieder et al., 2020), digital gaming has received minimal attention. In this study, we focus on online multiplayer games. Because of the intricate integration of technical, competitive, and cooperative elements in these games,

the inclusion of elements that incentivize consistent playing, the rapid pace of updates in servitized online games, extensive time and money investments made by the players, and digital gamers' identities being intertwined with the games they play, we see such games as forming a crucial use context for furthering the understanding of technostress. Online multiplayer games can be seen as constantly evolving, complex IT artifacts (Orlikowski and Iacono, 2001), and engagement with them may introduce novel technostressors.

Moreover, it is essential to recognize that stress manifests not only negatively, as distress, but also positively, as eustress (Selye, 1974). Positive stress is an integral part of gaming, especially because competitive elements and challenge are central in playing digital games (Denisova et al., 2020). Answering the call for further research into techno-eustress (Tarafdar et al., 2019; 2024), we study the role of the IT artifact in shaping the positive stress process in playing digital games, thereby providing a foundation for contributing to the broader body of knowledge in IS. Despite techno-eustress having been recognized as an essential aspect of the holistic technostress process (Califf et al., 2020), the topic has received limited attention especially in the context of leisure IT use. We approach the research problem qualitatively by interviewing digital gamers, providing us with deep insight into the players' experiences and giving concrete examples of how specific aspects of digital gaming can be appraised as stressful. Our focus is on online multiplayer games, which also provide a context for studying the social aspects of gaming (e.g., competition and cooperation). We address the following research question: *How do game elements shape the emergence of technostress in playing online multiplayer games?*

Our study makes three main research contributions. First, we identify technostressors specific to online multiplayer games (e.g., poor matchmaking, smurfing, and game meta issues) and identify the underlying game elements (e.g., player-versus-player competition, matchmaking, and game characters and their abilities). Second, we contribute to research on techno-eustress, emphasizing the dynamic and sometimes overlapping nature of techno-distress and techno-eustress in online multiplayer games. Third, we delineate three dimensions of technostress in the context (gameplay-dimension, social-dimension, self-dimension) and discuss how they are connected. Overall, by identifying how game elements shape IT environmental conditions that users appraise as stressful (Tarafdar et al., 2019), we provide insight into this topic that could help game designers and developers understand and improve player well-being.

2 Theoretical Background

2.1 (Techno)stress

Technostress is often discussed within the transactional model of stress, which states that stress forms through the interaction between individuals and their environment when individuals appraise the environmental demands as exceeding their resources (Lazarus and Folkman, 1984). Based on this, technostress is viewed as forming through technostressors, which are "IS stress creators appraised by the individual as threatening," and strains or other outcomes, which are "non-beneficial or adverse consequences emanating from a direct relationship with the various technostressors" (Tarafdar et al., 2019, p. 10). In essence, when individuals interact with different dimensions of their environment (e.g., social or technology dimensions), they encounter situations, events, and stimuli that they appraise as a threat to their well-being, leading to the emergence of technostress (Fischer and Riedl, 2017). Furthermore, technology characteristics, referring to different attributes or features of IT, such as pace of change, affect this emergence (Ayyagari et al., 2011). In social media use, characteristics of social media, such as push notifications, have been identified as features that contribute to the emergence of technostress (Salo et al., 2019). Although IT always plays a role in technostress, its role can be indirect (Fischer and Riedl, 2017).

When discussing stress, it is important to note that stress is not solely a negative phenomenon. In addition to negative stress, known as distress, stress also has a positive variant, known as eustress (Selye, 1974). However, more research has been devoted to negative than positive forms of technostress. In their seminal conceptual paper, Tarafdar et al. (2019) call for more research on positive manifestations of technostress. Furthermore, more research on techno-eustress in voluntary IT use settings has been

called for (Tarafdar et al., 2024). In the holistic technostress model, both negative and positive technostress sub-processes are identified, where techno-distress forms via hindrance-stressors and techno-eustress emerges via challenge-stressors (Califf et al., 2020). Hindrance-stressors are associated with such things as poorly working IT and uncertainty about one's IT skills; challenge-stressors are associated with such things as being efficient, learning, and solving problems with IT (Benlian, 2020). The key determinant is how individuals appraise the situations they encounter.

Originating from organizational research in the 1980s, the term "technostress" was defined as "a condition resulting from the inability of an individual or an organization to adapt to the introduction and operation of new technology" (Brod, 1982, p. 754). While the world has changed drastically since the term was coined, especially in terms of various technological environments, the overarching ideas remain relevant. However, IT is embedded everywhere today, and this has provided grounds for new types of stressful experiences that are associated with IT use. In research, technostress gained momentum with the identification of the "big five" technostressors: techno-overload, techno-invasion, techno-complexity, techno-insecurity, and techno-uncertainty (Ragu-Nathan et al., 2008; Tarafdar et al., 2007). Still, it took some time for research to expand from the organizational context into personal IT use. Research in the latter context has been predominantly done on social media, in which the stressors identified include social overload, fear of missing out, and overdependence, while strains/other outcomes encompass use discontinuance, concentration issues, and worsened academic performance (Maier et al., 2015; Malik et al., 2021; Salo et al., 2019; Whelan et al., 2022).

In relation to games, game elements in contexts outside gaming (i.e., gamification) have been studied alongside technostress. For instance, research has shown how gamification characteristics (visibility of achievement, competition, interactivity) can contribute to stressors (privacy invasion, social overload) and strain (exhaustion) (Yang and Li, 2021). Focusing on a specific game, game features and activities, such as time limits and combat, have been associated with negative and positive technostress experiences (e.g., overload and exhaustion; challenge and sense of accomplishment) (Hämäläinen et al., 2023). In addition, it has been shown that mismatches between the players' skills and the requirements of the game can contribute to technostress experiences (Mehtälä et al., 2023). However, various game elements that contribute to the emergence of technostress, especially in the context of online multiplayer games, have yet to be extensively explored.

2.2 Digital games and gaming

When players play digital games, they engage with the games via an interactive, multifaceted, and complex process which results in diverse experiences that are shaped by both the game artifact and the players involved (Hartanto et al., 2021; Ralph and Monu, 2015). In the present research, we broadly consider games to consist of game elements, defined as "elements that are found in most (but not necessarily all) games, readily associated with games, and found to play a significant role in gameplay" (Deterding et al., 2011, p. 12). These elements can be diverse, including game characters, rewards, and competition (Ralph and Monu, 2015). Drawing from widely established work on technostress, we explore how game elements shape the IT environmental conditions, which are appraised as a demand or an opportunity, resulting in the manifestation of techno-distress or techno-eustress, respectively (Tarafdar et al., 2019). Thus, we conceptualize game elements as IT characteristics contributing to technostress emergence (Ayyagari et al., 2011; Salo et al., 2019).

Extant research on negative experiences with gaming has primarily centered on problematic gaming (McCaffrey, 2023) and addiction (Kuss and Griffiths, 2012). However, these aspects represent only a small subset of the diverse negative phenomena linked to playing digital games. For example, the concept of toxicity encompasses disruptive and hostile gaming behaviors such as harassment and cheating (Gandolfi et al., 2023; Kordyaka et al., 2020). Toxicity has been identified as highly prevalent in gaming, especially in competitive online multiplayer settings (Kwak et al., 2015). Moreover, various stressors, such as communication issues, criticism from others, and problems with one's own or teammates' performances, have been identified in competitive gaming (Poulus et al., 2022; Smith et al., 2019).

Furthermore, it is worth noting that stressful reactions among players can be considered necessary for playing to feel meaningful (Lobel et al., 2014; Porter and Goolkasian, 2019). As challenge is often associated with techno-eustress (Califf et al., 2020) and digital gaming (Denisova et al., 2020), we consider it relevant to study the concept of eustress in such an IT context. Moreover, especially in challenging team-oriented gaming situations, distress and eustress are often intertwined (Snodgrass et al., 2016). Exploring this further can provide grounds for understanding technostress as a holistic process, as studies have called for (Tarafdar et al., 2019; 2024). Overall, extant research has not delineated different game elements' roles in technostress emergence, which we address with our study.

3 Research Methods

3.1 Data collection

We collected and analyzed qualitative interview data from 19 active digital gamers to gain a detailed understanding of how participants perceived technostress when playing online multiplayer games. We based our approach on qualitative research methods that are especially suitable for studying emerging IS phenomena (Monteiro et al., 2022). Moreover, the ability to obtain rich data has been recognized as a key strength of qualitative research (Brekhus et al., 2005).

We chose interviews as our data collection method because they enabled us to gain deep insights "by engaging participants directly in a conversation with the researcher in order to generate deeply contextual, nuanced and authentic accounts of participants' outer and inner worlds, that is, their experiences and how they interpret them." (Schultze and Avital, 2011, p. 1). All interviews were conducted in 2023 via video or voice chat. We employed purposeful sampling to select participants, meaning that we had predefined criteria during the search process (Patton, 2002). Thus, we sought active digital gamers who had had stressful experiences while playing. Because we sought to develop a comprehensive understanding of the possible technostress experiences in gaming, we did not limit our sample to specific types of gamers (e.g., playing time or specific games). The participants were recruited from diverse networks, including email lists, gaming communities, and the authors' own networks. All interviewees were from Finland, 12 of them were men, seven were women, and their average age was 26.2 years. The gender ratio closely mirrors the actual gender distribution among gamers overall. Furthermore, we interviewed gamers in the selected age group because this demographic represents the most active segment of gamers. The participants' average weekly gaming time was approximately 30 hours, ranging from one hour to 100 hours. Commonly played games included first-person shooter (FPS) games (e.g., Counter-Strike), multiplayer online battle arena (MOBA) games (e.g., Dota 2), and massively multiplayer online role-playing games (MMORPGs; e.g., World of Warcraft). In addition, participants mentioned playing such games as Rocket League ("soccer with cars"), strategy games, gacha games, card games, and vehicular combat games.

During our interviews, we explored neutral, positive, and negative experiences related to playing digital games. First, the participants were asked about general emotions elicited by playing digital games and the significance of gaming in their lives. Since our goal was to understand the technostress the participants had experienced, we followed an interview framework that was designed to gain insights into this phenomenon. For example, we asked the following questions: "*What kinds of negative or stressful situations have you encountered while playing digital games?*" and "*What aspects of the game/gaming situations contributed to different negative or stressful experiences?*" The interviews yielded data about both negative and positive technostress. The interview framework was developed incrementally, with relevant questions added based on insights from the completed interviews. Established methods, such as mirroring (using participants' words to ask follow-up questions) and minimizing social dissonance (e.g., using appropriate jargon), were employed during the interviews (Myers and Newman, 2007). The author responsible for the interviews had extensive knowledge of different areas of games and gaming culture, and this proved helpful in minimizing social dissonance.

3.2 Data analysis

In our analysis, we followed Lune and Berg's (2017, p. 184) established guidelines for analyzing qualitative data: The collected data were transformed into readable format (i.e., the interviews were transcribed), the data were systematically coded (i.e., labels were added to relevant words, sentences, or paragraphs), the codes were categorized (i.e., codes with similar characteristics were placed in groups), the data underlying the categories were scrutinized to seek emerging patterns and processes (i.e., the data were read to understand the aspects the identified codes and categories reflected), and eventually, the identified patterns were reflected in terms of existing literature. We complemented this method by employing simultaneous coding, in which complex text portions were given multiple codes. Such an approach can be suitable when "the richness or complexity of an event or participant's story makes it difficult for a researcher to assign only one major code to the datum," and it can be useful when the goal is to seek relationships between codes (Saldaña, 2013, p. 82). Although the first author mainly did the coding and analysis, they discussed the emerging codes and categories, as well as the interconnectedness of different codes and categories, with the author team. For instance, two authors reviewed the identified codes, categories, and underlying data together to find consensus regarding the emerging patterns.

After the interviews were transcribed, the first author read the transcriptions and made notes about observations of interest. Subsequently, the first author systematically coded the data using NVivo software, assigning descriptive labels to words, sentences, or paragraphs that represented the phenomena under study. Since our aim was to understand game elements, (negative) technostressors, and strains/other outcomes, the created codes were initially distributed among these three main categories. Here, the simultaneous coding method was utilized to provide initial insights into how different concepts could be related, and this was further examined by reviewing the actual data represented by the codes. To illustrate, the sentence "*Because others are jerks to me, I then become a jerk to everyone*" was coded as "toxicity," which we categorized as a technostressor. Furthermore, the code "game chat" was categorized as a game element, while "frustration" was categorized as a strain/other outcome. In addition, to understand positive technostress experiences, we created a fourth category: techno-eustress. This included, for instance, the code "accomplishment." Initially, our analysis of techno-eustress was separated from techno-distress, but later, we integrated these observations into our holistic analysis process, distinguishing between negative and positive technostress and the associated game elements. In the beginning, Ayyagari et al.'s (2011) framework guided our data analysis. However, as we progressed, we conceptualized IT characteristics as "game elements," aligning our analysis with game research (e.g., Deterding et al., 2011) to understand the data further. We engaged our data and the existing theoretical foundations iteratively (Lune and Berg, 2017), which helped us seek meaning in our results and position the findings alongside the existing literature.

Our analysis was inherently iterative, as we continually refined our codes and categories. After we initially coded text portions into different categories, we conducted a comprehensive review and made necessary changes. Following the guidelines presented in this section (Lune and Berg, 2017), we sought patterns between different game elements and technostress experiences. By reviewing the data behind our codes in detail, we could pinpoint the underlying game elements that triggered technostressors. For example, we observed that "player-versus-player competition" and "game chat" could underlie "toxicity," eventually discussed as "gameplay toxicity" and "communication toxicity." In addition, we examined the data more closely to understand the outcomes of these experiences, distinguishing between different negative and positive outcomes. During our analysis, we did not identify specific patterns of strains or outcomes associated with particular game elements or technostressors. Instead, we observed how similar strains or outcomes recurred in our data, including negative outcomes, such as annoyance, frustration, anger, exhaustion, and use discontinuance, as well as positive outcomes, such as accomplishment, progress, and development.

By identifying different game element–technostressor patterns, we observed three emerging dimensions for the technostress experiences: the gameplay-dimension, the social-dimension, and the self-dimension. For instance, "poor matchmaking" was categorized in the gameplay-dimension, "communication toxicity" was categorized in the social-dimension, and "substandard gaming performance" was categorized

in the self-dimension. To some extent, player–game interaction was observed in all these dimensions, indicating interconnectedness. However, the role of the game elements (i.e., direct or indirect) differed. Some game elements were recurrent in all dimensions (e.g., player-versus-player competition), whereas others were present in only one (e.g., game chat in the social-dimension). Throughout our analysis, we employed constant comparison and triangulation (Lune and Berg, 2017) to ensure that the findings we report were recurrent in our data and that we accurately represented our participants' stories, as we discuss in the next section.

4 Results

In the results, we outline three dimensions of technostress in online multiplayer games (the gameplay-dimension, the social-dimension, and the self-dimension). For all dimensions, we present recurrent technostressors and the underlying game elements. In presenting examples of technostress in our participants' stories, we sought to ensure that their descriptions would be consistent with the definitions of (techno)stress used in the research (e.g., Ayyagari et al., 2011; Fischer and Riedl, 2017; Lazarus and Folkman, 1984; Tarafdar et al., 2019). This means that we present narratives in which participants appraised their interaction as exceeding their resources (techno-distress) or driving them toward development (techno-eustress). We observed that the same technostressors can manifest as techno-distress or techno-eustress (game-challenge, poor matchmaking, gameplay toxicity, and substandard gaming performance). The results are summarized in Table 1.

Gameplay-dimension of technostress		
Technostress emerges ***directly*** from player–game element interaction. This means that players specifically appraise the stimuli and events associated with gameplay as stressful.		
Techno-distress	**Techno-eustress**	**Game elements**
Technostressors grinding overload, unfair gameplay, game meta issues, poor matchmaking, game-challenge	***Technostressors*** poor matchmaking, game-challenge	***Game elements*** grinding, rewards, (daily/weekly) missions, random number generation, player-versus-player competition, game characters and their abilities, matchmaking, time constraints
Social-dimension of technostress		
Technostress emerges ***indirectly*** from the player–game element interaction. This means that, for technostress to emerge, the player–game element interaction must be emphasized by other players interacting with the game elements (e.g., by abusing them in cases of toxicity or smurfing).		
Techno-distress	**Techno-eustress**	**Game elements**
Technostressors communication toxicity, gameplay toxicity, smurfing, social pressure	***Technostressors*** gameplay toxicity, smurfing, game-challenge	***Game elements*** game chat (text/voice), player-versus-player competition, game characters and their abilities, time constraints
Self-dimension of technostress		
Technostress emerges ***indirectly*** from the player–game element interaction. This means that, for technostress to emerge, the player–game element interaction must be emphasized by the player's own expectations and perceptions of their interaction with the game elements (e.g., performance in competitive settings compared with self-standards).		
Techno-distress	**Techno-eustress**	**Game elements**
Technostressors overdependence, grinding overload, self-pressure, substandard gaming performance	***Technostressors*** substandard gaming performance, game-challenge	***Game elements*** (daily/weekly) missions, player-versus-player competition, game characters and their abilities

NOTE: As stated in the data analysis, we did not delineate specific outcomes/strains associated with certain technostressors, game elements, or dimensions of technostress; similar group of outcomes/strains were seen throughout the participants' experiences (**negative**: annoyance, frustration, anger, exhaustion, use discontinuance; **positive**: accomplishment, progress, development)

Table 1. Key results.

4.1 The gameplay-dimension of technostress

In the first dimension, gameplay is perceived as the direct cause of players' experience of technostress. Thus, the game elements have a direct role in shaping technostress. We emphasize that specific game elements are not inherently harmful or stress inducing. Rather, they create IT environmental conditions that players appraise as stressful. For instance, in the interviews, many participants discussed how the games they played had elements necessary for gameplay progression or rewards that were dull and repetitive (i.e., grinding). While such elements may themselves be neutral, the extensive time required for grinding and the perceived importance of rewards compelled many to engage in activities they did not enjoy, resulting in stress because of **grinding overload**. Some games were simply described as having grinding as a central activity, which can be exhausting:

> ***I don't like [grinding] at all**. […] But in [an MMORPG], it has been a significant theme in the last two expansion packs at least, **so it has been quite burdensome**, especially now that I'm working. Considering that, the fact that you must remember to log in every week and bash some dungeons—**it indeed becomes a bit taxing**.*

From a different perspective, several interviewees mentioned feeling that the gameplay they engaged in was **unfair** at times, sometimes because of random number generation (RNG) elements (i.e., probability-based elements of random outcomes in gameplay). Failing at something because of RNG can elicit stress or even anger:

> *Yeah, **I often lose my temper when I have bad luck.** […] **Honestly, I feel like throwing the mouse at the wall** or something like that. […] It's probably some confirmation bias, but it feels like it always happens, and at that point, **it's like, oh hell no. I just can't. I can't deal with this anymore.***

The game meta (i.e., the optimal way of playing) was discussed extensively in our interviews. In our data, this was mostly discussed as associated with different game characters and their abilities, although the game meta overall could be seen as a structure comprising many other game elements. Some players were indifferent to the game meta, preferring to play according to their personal preferences. However, those who closely followed the game meta noted that it could sometimes lead to undesirable and stressful experiences (i.e., **game meta issues**), particularly when certain game characters possessed disproportionately strong abilities. These undesirable game metas could result in players discontinuing playing the game, an outcome that can be viewed as a manifestation of technostress:

> *I've actually also played [a vehicular combat game] a lot. **But then I kind of quit playing it** because, well, **I don't really like what they're doing to the game**. And then I feel like it's sometimes a bit too fast-paced or the game's **meta is just weird.** […] **So those things kind of ruin my game, and then I'm immediately like, "Ugh, I'm not really interested in playing this game again."** I haven't played it much since [the game meta changed].*

Furthermore, matchmaking (i.e., how the game decides which teams/individuals play against each other) is an integral part of online multiplayer games. Although different games have implemented various systems to ensure fair matchmaking, many participants discussed how the matchmaking in the games they played was perceived as inadequate (i.e., **poor matchmaking**), leading to uneven teams, lopsided games, and ultimately, technostress. While some pondered whether matchmaking was genuinely poor or whether this was just their perception, the finding nevertheless underscores the role of the element of matchmaking in shaping technostress, which could again lead to discontinued playing:

> *Matchmaking is broken in every game I play. **It really annoys me a lot, perhaps the most [of anything]. I've basically quit playing** [an FPS game] because of it, as the skill level differences are just insane.*

As another point associated uneven games, multiple participants discussed a phenomenon called **smurfing** as contributing to technostress. Smurfing refers to highly skilled and experienced players playing

on accounts that are ranked much lower than their actual playing skills, meaning that they will be playing against opponents who are much less skilled than they are. In such instances, players sometimes intentionally abuse the games' technical limitations. However, smurfing can also occur if highly skilled players want to play with their lower-ranked friends, making smurfing a necessity. This highlights the interconnectedness of different dimensions (here, gameplay and social). Nevertheless, playing against players with a skill level much above one's own can be frustrating and feel like a waste of time:

> *[Playing against smurfs]* ***doesn't feel nice*** *when you know that probably the next half an hour to an hour will be spent trying your best, but then you will lose.* ***So, it's not a very positive setup to get into that game.*** *[...] Then you just do everything you can,* ***but it pisses you off [said with a curse word] right away if you realize that this will probably be a waste of time.***

In contrast, some found motivation in playing against players better than themselves, highlighting techno-eustress because of **game-challenge**. Players can appraise situations in which the game presents them with opponents above their skill level as an opportunity rather than a threat, and this can lead to positive outcomes, such as development and accomplishment. Thus, the same game elements and technostressors can lead to techno-distress or techno-eustress outcomes, depending on the players' appraisal:

> ***When I know that the opponents are at a higher level, and especially when I succeed, it gives me that feeling of accomplishment.*** *And you can't improve if you don't play against opponents who are better than you or at the same level.*

Sometimes, when the participants described situations in which they experienced stress associated with game-challenge, there was ambiguity as to whether the experiences were negative or positive. We note that, when individuals appraise and re-appraise the situations they are in, the eventual outcomes of stressful situations can be fluid and change quickly:

> *It's fun when you reach a new level,* ***but then it's incredibly stressful*** *when you really have to learn everything again. It doesn't work the same way anymore. [...]* ***It's that kind of [positive] stress, where you know, okay, now I'm progressing here****, but it doesn't feel like a burden afterward. So it's the stress of that moment, but when it's over, it doesn't linger, and I don't have trouble sleeping or anything, so it's okay.*

4.2 The social-dimension of technostress

In the second dimension, the social nature of online multiplayer games contributes to the emergence of technostress. Here, the role of game elements is indirect, meaning that social conditions are central in shaping technostress. The player–game interaction can precede the social trigger that eventually contributes to technostress. For instance, one participant described how they engaged in a cooperative gaming situation in which others gave negative feedback about their playing. Eventually, the feedback made the participant feel so bad that they started crying. Here, the initial issue was gameplay-related, but technostress really emerged when the **social pressure** was too much for the player to handle:

> ***I found it too stressful*** *[raiding]. I tried it once [...]* ***It was horrible. It ended with me starting to cry.*** *[...] I don't really know; maybe I just didn't know how to do it. And then* ***there is this terrible stress when others are shouting in the chat.*** *[...]* ***I didn't try it again because it was pretty awful.***

In general, receiving negative feedback while playing can be stressful, especially if the criticism is personal. This could be seen as a form of **communication toxicity**, which was the most mentioned negative aspect of playing online multiplayer games in the interviews. In digital games, communication often occurs anonymously, without much moderation, and this enables toxic behavior. Although toxicity is not solely present in specific games, many participants emphasized that some games had a toxic reputation (e.g., certain MOBA games). Participants highlighted toxicity as ingrained in the culture of the games, seeing it as something that players simply have to put up with. Overall, toxicity was most often

manifested by a general increase in unpleasant exchanges in the game chat. It could also involve targeting certain players based on their playing abilities or even personal characteristics, such as gender or race. While the presence of chat in the game does not directly mean that technostress could emerge, it provides a platform for communication that contributes to technostress. We observed this phenomenon to occur mostly in competitive settings. Although receiving direct feedback about oneself could be stressful, witnessing others being toxic toward each other also contributed to highly negative experiences:

> *I've had a lot of those friends over the years who might **start fighting with opponents or teammates in the chat**, […] **saying "you're bad, uninstall the game**," and so on. And then you're just there like, "yeah…" At that point, **the feelings are not the best; there's so much negativity**. And competitive games especially bring out that negativity because people's egos are partly involved in the game, **so those emotions really start bubbling up.***

In addition to communication, toxicity was also more directly associated with gameplay (i.e., **gameplay toxicity**), highlighting the interaction between the social and gameplay dimensions. For instance, if players focus on arguing over chat instead of playing, it negatively affects gameplay. An even clearer instance of toxicity showcased via gameplay is when someone becomes upset and abuses the elements of the game, doing something that ruins the experience for others. For example, in many games, an issue arises when players either leave the game or stay in the game without contributing. In many of the games discussed, the matches are long (over 30 minutes), and many participants described how players leaving often resulted in frustration. Hence, both the social-dimension and the gameplay-dimension are necessary:

> ***It is frustrating**, especially if the game could still be won. Like, for example, you have spent half an hour of your time on it, and in [a MOBA game], it often happens that two people start arguing, and one of them decides, "I'm not playing this game anymore." […] Situations like that, where you are winning and someone gets upset over something trivial, and they just decide to throw the game, **are probably the most toxic situations I have ever experienced.***

As mentioned above, the appraisal of a potentially stressful situation is critical in determining whether the outcome will be negative or positive. For instance, someone leaving the game or not contributing could be seen as a challenge one wishes to overcome. If such a challenge is met, meaning that one wins despite teammates leaving the game, it can be highly rewarding. Thus, a similar potentially stressful situation can eventually lead to positive outcomes:

> ***There have been a few situations where it's just been me and another player. And those have probably all been situations where the rest of the team has just bailed; they have left.** And then we've been left alone to handle it. One amazing experience was with [another player]. We won that one. [...] **And it was like a heavenly gaming performance. I can say that I can't remember the last time I played so brilliantly—not a single mistake.***

4.3 The self-dimension of technostress

In the third dimension, the players' expectations and perceptions of self (e.g., of their gaming abilities) are central to the emergence of technostress. Here, the role of game elements is indirect, meaning that conditions associated with the players are more central to shaping technostress. For instance, some felt they were **overdependent** on games due to their own expectations. This could also be associated with grinding overload, highlighting the interconnectedness of the different dimensions through manifesting similar technostressors. While different aspects of gameplay enable such an interaction between the game and the player, here the emerging technostress is ultimately rooted in the individual:

> *I realized that **I just can't take this anymore**. […] Playing [an MMORPG] **started to feel like work. Then I quit.** [...] I didn't feel like it anymore. I would be like, oh, I have a raid tonight. **Do I have to go?** [...] I was like, I want to play [something else]. No, I have to play [the*

MMORPG], ***because I have to get this and this thing. I have to get those to max level or something like that.*** *[...]* ***I set too many goals. It's self-imposed pressure.***

From a different perspective, many participants explained how they sometimes experienced stress when playing if they did not perform as well as they hoped to (i.e., **substandard gaming performance**). This could be, for example, because they did not have enough time to practice. This was a highly interesting finding, since the negative aspects of gaming have often been associated with playing too much. Substandard gaming performance could be associated with either one's mechanical skills or knowledge of the current game meta, which is crucial in games that are constantly updating:

And as soon as you stop playing, then the skills decrease, and you don't stay current in the meta, and so on*. So if you take a break, then* ***it's not as fun to play when you're not winning, and it gets worse.*** *[...]* ***It feels frustrating*** *because, in a way, you know that those skills have been at a point where you've won a large part of the games. [...]* ***It's frustrating.***

Especially for the participants who considered themselves highly competitive gamers, losing and underperforming were stressful experiences. Although such experiences were often negative, they could also be seen as possibilities for growth, emphasizing the difficulty in conclusively delineating techno-eustress and techno-distress:

It creates higher highs and lower lows in emotional states. That's why losing *in [a MOBA] or* ***personally playing poorly annoys me a lot.*** *I am quite harsh with my performance in games. Usually, if we lose, I don't blame or point fingers at others.* ***Instead, I tend to direct it more toward myself, thinking about what I could have done better.***

Overall, the stressful experiences for the participants were most prevalent in the games they took seriously. Thus, the meaningfulness of the competition to the player is an essential factor. Quite radically, some interviewees had physical stress reactions, such as heart palpitations and sweating, stemming from highly intense and competitive gaming situations. For some, in the stressful situations that led to physical reactions, positive and negative stress were highly mixed:

With [a strategy game], there was this concept of ***ladder [i.e., competitive play] anxiety****, where you press that "find match" button, and then the clock starts ticking […]. It somehow starts to make* ***you feel even a bit uneasy, and your heart immediately starts pounding.*** *[...]* ***It's not directly bad, or not only bad,*** *but sometimes you just freeze like that. The mouse is on the "find match" button, but then you think, do I really want to go play, or why would I press that button?*

Overall, gaming can be stressful for a number of reasons, sometimes manifesting negatively and sometimes positively. This could be seen as a fundamental point of life itself, manifesting in online multiplayer games through different game elements and technostress experiences:

Life already has enough stressful things, so a good kind of stress is okay, *and that comes with gaming because you constantly have to improve yourself.* ***The main feeling should be like, "Yes, I played for an hour, and I feel really good about it."***

5 Discussion

5.1 Research contributions

In this study, we make three key research contributions. First, we argue that identifying context-specific technostressors is crucial for advancing research and practical applications in a way that complements previous work on general technostressors, such as techno-unreliability (Fischer et al., 2019) and online discussion conflict (Salo et al., 2019). Building on research on stress and technostress (e.g., Lazarus and Folkman, 1984; Tarafdar et al., 2019), we identify technostressors specific to the online multiplayer

context, including poor matchmaking, game meta issues, smurfing, communication toxicity, and gameplay toxicity. Although poor matchmaking could be viewed as a form of techno-unreliability, many interviewees highlighted that the matchmaking often works as intended, and appraising it as working poorly does not necessarily reflect the element being unreliable or broken. Furthermore, our data highlight the role of players' egos in toxicity, echoing issues relating to users' identities in the contexts of technostress and social media use (Salo et al., 2019). However, the explicit element of competition, which is more prevalent in gaming, distinguishes toxicity from online conflicts on social media. Toxicity has been linked to competitive gameplay in extant research (Kwak et al., 2015), indicating that the game element of player-versus-player competition underlies specific technostress experiences. Although the game chat element is often used as the medium for toxicity, it can also manifest via gameplay.

Furthermore, we add to extant research in which some technostressors have been identified in digital gaming (Hämäläinen et al., 2023), as well as research that has explored stress and digital games, for example, in association with violence in games (Hasan et al., 2013) or stress in competitive gaming (Poulus et al., 2022; Smith et al., 2019). By delineating specific game elements shaping IT environmental conditions that are appraised as stressful, we add to the research by identifying specific aspects of the IT artifact in the technostress process, extending previous studies that have explored technostress and the associated IT characteristics in organizational contexts (Ayyagari et al., 2011) and social media use (Salo et al., 2019). Our investigation explicitly focused on how game elements contribute to various negative stress outcomes in players, and these findings can inform further research into the adverse consequences of gamification (Riar et al., 2022).

As a second contribution, we extend the research by exploring techno-eustress, which has received limited attention, especially in the context of personal IT use. Digital gaming provides a rich context for understanding techno-eustress, especially because challenge is a central element in both (Califf et al., 2020; Denisova et al., 2020). Many of our participants were competitive gamers and saw the challenges presented to them in online multiplayer games as possibilities for learning and improving, as has been found for techno-eustress discussed in the organizational context (Benlian, 2020; Califf et al., 2020). However, especially in cases where player-versus-player competition is present, the use contexts are inherently different. Previous studies have shown that situations in competitive games can be appraised simultaneously as threats and challenges (Poulus et al., 2020), making it challenging to differentiate between negative and positive technostress.

Thus, we showcase that techno-distress and techno-eustress can be seen as dynamic, often overlapping phenomena, illustrating how similar player–game interactions can be appraised negatively or positively, leading to distinct outcomes. For instance, when players encounter smurfing and have to play against players who have much better skills than they do, for some, this feels like a waste of time. However, those who are eager to improve their gameplay might view this as a challenge to beat, highlighting positive challenge associated with IT use (Tarafdar et al., 2024). Furthermore, different sociocultural aspects might affect the processes of eustress and distress in online multiplayer gaming, and for instance, social pressure from team play might contribute to eustress transforming into distress (Snodgrass et al., 2016), which highlights all the dimensions we discuss.

As a third contribution, we draw on the ideas of the indirect role of IT in shaping technostress (Fischer and Riedl, 2017), discussing three interconnected dimensions of technostress (gameplay-dimension, social-dimension, self-dimension). We highlight the role of IT, showing that the gameplay-dimension is always present, although the social-dimension or the self-dimension can be dominant, manifesting as different types of technostress experiences. For instance, in communication toxicity, social conditions are necessary and dominant, whereas substandard gaming performance stems from players' expectations of their own performance. Thus, we explain how the role of game elements can be more direct or indirect. For instance, in the social-dimension, our participants experienced technostress because of exposure to toxic behavior, even when they were not the direct targets of the toxicity.

With the discussion of the social-dimension of technostress, we contribute to the less-explored social perspective of technostress, emphasizing the role of competition, cooperation, and game developers' actions in shaping the process. This view highlights online multiplayer games as evolving systems in a

complex and dynamic social context (Orlikowski and Iacono, 2001, p. 126). Not only are modern online multiplayer games services evolving through constant patches and updates, but the ways in which players engage with the games is also changing constantly. This was highlighted in our interviews in terms of issues associated with the game meta. In this framework, the social-dimension is shaped through complex interactions of the IT itself, its users, developers, and other stakeholders (Orlikowski and Iacono, 2001). Such findings provide insight into understanding both the social and the technical aspects of user–IT interaction, which is a core perspective in the field of IS.

To conclude, IT is always necessary in shaping technostress (Tarafdar et al., 2019), but we suggest that the phenomenon could be viewed predominantly from different perspectives on (e.g., personal factors or social environments) (Fischer and Riedl, 2017). Thus, technostress manifests through various game elements in online multiplayer games, either directly or indirectly, as delineated by the three dimensions illustrated in Figure 1 below.

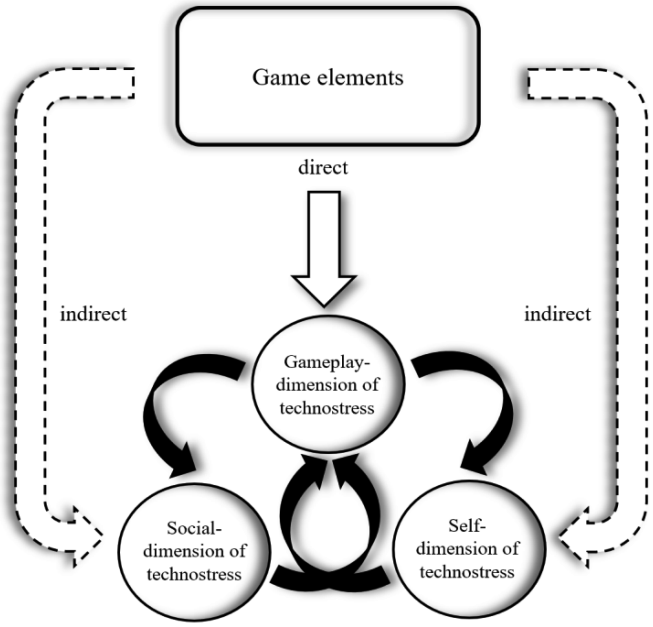

Figure 1. Role of game elements in shaping the three dimensions of technostress.

5.2 Practical implications, limitations, and future research

We see numerous practical implications that are relevant to our study. Since we delineated different game elements that contribute to players' specific technostress experiences, game developers could use our findings to guide the design of games. Although game companies and studios, especially large ones, have vast amounts of data about their players, harnessing established theoretical knowledge and constructs alongside users' concrete experiences can provide useful information for game developers. Our results could help developers find a balance between aiming for revenue and aiming for the satisfaction and well-being of players. Furthermore, we see that organizations implementing gamification in their different functions could learn from our results. The key aspect of gamification is eliciting the positive emotions that gaming can bring forward. Studies have advocated elaborating on gamification's possible adverse effects, such as negative competition and increased monitoring and measurement of performance (Koivisto and Hamari, 2019). Although we focused on digital games rather than gamified systems, the line is exceedingly blurred, as game elements are incorporated into more and more systems. Since we identified specific gaming situations, game elements, and the associated positive and negative stress reactions, such findings could be used to guide the design of gamified systems that elicit positive feelings in users. Based on our results, not only are the elements that are designed essential, but so too

are the role of the social environment and the users' perceptions and preferences. For instance, gamified systems are often based on points and leaderboards. As we explained, the optimal way of playing a game can be undesirable and stressful; thus, gamified systems should be designed and implemented to establish a desirable game meta for the users.

Our study has several limitations. First, although we see studying the problem as an important contribution, not focusing on the solution is a limitation. Thus, future research could build on our study to elucidate different ways for digital gamers to cope with technostress. Second, we focused on online multiplayer games; thus, we missed out on possibilities for understanding how technostress could emerge in offline single-player games. Third, some participants did not experience very high levels of stress. These players may have valued their time spent playing a lot, marking a way in which technostress in game playing differs from, for example, that in social media use. Fourth, while some of the stressful experiences discussed may also occur in non-digital games or other competitive contexts, the involvement of an IT artifact introduces an additional layer of complexity to how stress can manifest. For example, frequent updates in digital games can significantly alter gameplay dynamics, potentially increasing stress levels.

Future research could build on our results by, for instance, using longitudinal research methods to understand how experiencing technostress perpetually because of playing digital games affects players over time. As many of our participants' experiences were not extremely strong when the data were collected, it would be interesting to utilize different research methods, such as diary studies, to understand how smaller technostress experiences affect digital gamers over time. In addition, in our interviews, we observed that avid players worried about how digital games are monetized nowadays, encouraging players to spend more money on the games even after they have been purchased. This topic could be studied further alongside technostress.

Acknowledgments

This research has been partly funded by the Research Council of Finland (341359), the Emil Aaltonen Foundation, and The Foundation for Economic Education.

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IV

COPING WITH TECHNOSTRESS-RELATED GOAL HINDRANCES: MULTIDIMENSIONAL AND HIERARCHICAL NATURE OF GOALS

by

Hämäläinen, A., Salo, M., & Pirkkalainen, H., 2024

Under review for a journal (2nd round; major revision)

Request the article from the author.

V

TOWARD A SOCIAL COPING PERSPECTIVE FOR TECHNOSTRESS

by

Hämäläinen, A., Salo, M., & Pirkkalainen, H., 2024

Under review for a journal

Request the article from the author.

VI

UNCOVERING INDIVIDUAL AND COLLECTIVE AMBIVALENCES IN DIGITAL GAMING: THE TRIGGERING ROLE OF GAME DESIGN PARADOXES

by

Hämäläinen, A., Salo, M., & Pirkkalainen, H., 2024

Proceedings of the 16th Mediterranean Conference on Information Systems, 6

https://aisel.aisnet.org/mcis2024/6

10-3-2024

Uncovering Individual and Collective Ambivalences in Digital Gaming: The Triggering Role of Game Design Paradoxes

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UNCOVERING INDIVIDUAL AND COLLECTIVE AMBIVALENCES IN DIGITAL GAMING: THE TRIGGERING ROLE OF GAME DESIGN PARADOXES

Research full-length paper

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Abstract

In this paper, we investigate ambivalences—simultaneous positive and negative evaluations of an object—triggered by paradoxes—contradictory yet interrelated elements that persist over time and appear logical in isolation but irrational and inconsistent when juxtaposed—in digital gaming and game de-sign. By analyzing qualitative data from 22 semi-structured interviews, 30 social media posts, and over 5,000 comments in these posts, we identify six core digital gaming ambivalences manifesting through individual (obligation/volition, distress induction/distress reduction, experiencing distress/eustress, and overplaying/underplaying) and collective (exclusion/inclusion and hostility/harmony) dimensions. We explain how the ambivalences are triggered by game design paradoxes, namely constant change versus status quo, shallow gameplay loop/monetization versus sustained player satisfaction, and catering to hardcore gamers versus casual gamers. We present a framework that explains the interrelatedness of the game design paradoxes and their role in triggering the digital gaming ambivalences. We provide insights for designing games and gamified information technologies to balance user well-being and benefits, emphasizing the importance of considering the paradoxical aspects of game design.

Keywords: Ambivalence, Paradox, Digital Game, Game Design.

1 Introduction

Ambivalence, defined as "*the simultaneous existence of positive and negative evaluations of an attitude object*" (Conner and Sparks, 2002, p. 39), has been a subject of discussion within information technology (IT) use for decades. As early as the 1990s, it was claimed that while the Internet was designed to foster social interaction, it could simultaneously diminish it (Kraut et al., 1998). Similar ambivalence has been found to affect the use of newer IT, such as social media (Nguyen et al., 2022). While ambivalences can emerge for several reasons, paradoxes have been discussed as potential triggers for them (Ashforth et al., 2014). Here, paradox is defined as "*contradictory yet interrelated elements (dualities) that exist simultaneously and persist over time; such elements seem logical when considered in isolation, but irrational, inconsistent, and absurd when juxtaposed*" (Smith and Lewis, 2011, p. 387). A key distinction between ambivalences and paradoxes is that paradoxes could be seen as reflecting external conditions, whereas ambivalences are individuals' or collectives' internal emotional or cognitive conflicts (Ashforth et al., 2014). Although both ambivalences and paradoxes have been studied particularly in organizational contexts (e.g., Ashforth et al., 2014; Schad et al., 2016) and in areas like personal social media use (e.g., Qahri-Saremi and Turel, 2020), numerous issues remain to be investigated.

For instance, the emergence of ambivalences triggered by paradoxes has yet to be studied alongside digital gaming. The omission of studying both concepts and their associations in digital gaming is significant because *(1)* while neither of the concepts inherently reflects problems, extant research has shown that both ambivalences (Van Harreveld et al., 2009) and paradoxes (Lewis, 2000) can contribute to detrimental consequences; *(2)* gaming reflects multifaceted outcomes, both positive and negative, such as distress alleviation (Barr and Copeland-Stewart, 2022) and distress increase (Porter and Goolkasian, 2019), underlining the importance of investigating such dynamics and their emergence; and *(3)* billions of people globally engage in digital gaming (Clement, 2024a), and the value of the digital game market is in the hundreds of billions (Clement, 2024b), highlighting the massive popularity and economic significance of this type of IT.

It has been shown that individuals might attempt to avoid ambivalence due to its representation of inconsistencies (Schneider and Schwarz, 2017). Thus, it is crucial to understand game design that could lead to ambivalent outcomes, as that could harm both the players (e.g., detriments to well-being) and game companies (e.g., reduced player retention). To fully understand this complexity, we frame digital games as artifacts that emphasize the dynamic interactions among designers, users, and IT (Orlikowski and Iacono, 2001). This approach aligns with the core focus of the information systems (IS) discipline: the social and the technical dimensions (Sarker et al., 2019). The technical dimension in the study is reflected in the investigation of various aspects of game development, while the social dimension is reflected in how players, alone and as collectives, engage with the games. This dual perspective helps illustrate the intricate relationship between individual players, social dynamics, and game design.

Despite the recognized ambivalences of IT use, their possible detrimental outcomes, and the potential of paradoxes acting as triggers for ambivalences, research has not investigated how ambivalences emerge due to the paradoxes of (game) design. To address this, we answer the following research questions: *What types of ambivalences and paradoxes are present in digital gaming and game design? How are the digital gaming ambivalences and the game design paradoxes associated with each other?*

Our research contributions are threefold. *First*, we extend research on ambivalence triggers (Ashforth et al., 2014) by explaining how digital game design paradoxes can trigger individual and collective ambivalences. *Second*, while research shows ambivalences often result in harm (Van Harreveld et al., 2009), they can also manifest positively, playing a constructive role in complex activities like digital gaming. *Third*, we contribute to research on informal norms in IT use by highlighting how paradox-triggered ambivalences affect behavior on a collective level in digital gaming (Chen et al., 2022).

2 Theoretical Foundation and Related Work

2.1 Ambivalences

While ambivalence has been defined and discussed in various ways and from various perspectives in the past, the common factor is that ambivalence refers to "*the simultaneous existence of positive and negative evaluations of an attitude object*" (Conner and Sparks, 2002, p. 39). For instance, ambivalence can include simultaneous positive and negative cognitions or emotions towards a person, goal, task, or technology (Ashforth et al., 2014). As an example, time can be viewed ambivalently, reflecting conflicting perceptions of how much time has passed and how much is left (Fisher et al., 2024). This resonates with the core aspects of gaming, as the activity can be so engaging that players' perception of time becomes blurred. Overall, ambivalence is characterized by conflicting emotions and cognitions, making it a complex and often uncomfortable state (Rothman et al., 2017; Van Harreveld et al., 2009). Ambivalence, while not directly reflecting individuals' behavior, can manifest through specific actions or trigger certain types of behavior.

Following the definition, we focus on how ambivalences reflect players' cognitions and emotions, manifesting through individual and collective dimensions (Ashforth et al., 2014; Conner and Sparks,

2002). While ambivalence could be triggered by many different factors, various paradoxes have been highlighted as eliciting ambivalence (Ashforth et al., 2014). For instance, in organizations, the paradoxical nature of IT-mediated real-time connectivity (i.e., IT facilitating rapid communication yet diminishing autonomy due to constant pressure for immediate responses) can trigger emotional ambivalence, manifesting as both anxiety and pride (Sui et al., 2024). Furthermore, ambivalences can affect users' behavior regarding whether to use an IT or not, and it is influenced by social norms (Chen et al., 2022). This refers to others' opinions and behavior affecting how or if one uses IT (Maity et al., 2019).

Many different types of IT, such as social media (Turel and Qahri-Saremi, 2022) and digital games (Snodgrass et al., 2016), have been studied alongside ambivalence. For instance, research has shown that users can simultaneously engage in positive interactions and unfavorable social comparisons in social media use (Krasnova et al., 2015). Still, the outcomes of ambivalence in IT use are poorly understood (Qahri-Saremi and Turel, 2020). We chose to investigate ambivalence in digital gaming due to the inherent conflicts reported in the literature, such as the tension between experiencing satisfaction and frustration in gaming (Kosa and Uysal, 2022). Moreover, gaming can elicit positive experiences through negative emotions (Triberti, 2016), underlining the complexities surrounding gaming outcomes. As such, a relevant concept to discuss further is paradox.

2.2 Paradoxes

The term paradox has been discussed diversely across historical contexts, from everyday life to practical applications and scholarly discourse. In simplistic terms, a paradox is "*a situation, act, or behavior that seems to have contradictory or inconsistent qualities*" (Jarvenpaa and Lang, 2005, p. 7). For instance, a common paradox in everyday life is the paradox of choice, which posits that more options can make a choice feel less fulfilling (Schwartz, 2004). A more comprehensive definition states that paradoxes are "*contradictory yet interrelated elements (dualities) that exist simultaneously and persist over time; such elements seem logical when considered in isolation, but irrational, inconsistent, and absurd when juxtaposed*" (Smith and Lewis, 2011, p. 387). These elements can include conflicting demands, opposing perspectives, or seemingly illogical patterns within organizational and technological settings (Lewis and Smith, 2014). Thus, paradoxes reflect complex, dynamic situations that evolve through the interrelationships between various actors and events.

In organizational research, the concept of paradox has been used to study various tensions (Lewis, 2000). Paradoxes in organizational settings reflect central activities and aspects: learning, belonging, organizing, and performing (Smith and Lewis, 2011). For instance, digital transformation can create paradoxical tensions such as efficiency versus innovation, control versus flexibility, and stability versus change (Farjoun, 2010; Smith and Lewis, 2011). Furthermore, the paradoxical nature of IT use, which includes aspects such as empowerment versus enslavement, refers to how mobile technology enables numerous possibilities while creating new mandates, such as constant availability (Jarvenpaa and Lang, 2005). It is important to note that paradoxes can be managed through various design choices. For instance, implementing message filtering functions and status availability indicators can help address issues related to constant availability (Jarvenpaa and Lang, 2005). Additionally, it is crucial to recognize that paradoxes are influenced by various social and cultural conditions, such as power distribution, which play a role in how they can be managed (Hargrave et al., 2017).

Moreover, a well-documented paradox in IT use is the privacy paradox, which highlights the discrepancy between individuals' privacy concerns and their actual behavior (Alashoor et al., 2023). This paradox illustrates users' conflicting desires for personal data privacy versus the benefits of personalized services, leading to ambivalent attitudes toward data-sharing policies (Gerber et al., 2017). Also, research has highlighted the paradoxical nature of IT use in relation to stress (Cheikh-Ammar, 2020; Cheng et al., 2023). This paradox emerges as IT can reduce stress while increasing it, presenting a "*double-edged sword.*" Furthermore, some studies have explored paradoxes in digital gaming. For example, digital game violence has been discussed as paradoxical, where players enjoy in-game violence

but do not condone it in real life (Daneels et al., 2018). Tying the concept of paradox to a specific gaming scenario, it has been shown that kill cams (i.e., replays of how a player dies in a game) can increase players' enthusiasm to play despite losing as they analyze their deaths, illustrating the paradox of failure (Obreja, 2023). This underlines the importance of game challenges, which can emerge from the fear or anticipation of failure (Juul, 2013). Thus, digital gaming elicits complex experiences and outcomes in players, making both the ambivalence and paradox suitable lenses for investigating our research problems.

2.3 Digital games as a research context in IS

Games are generally characterized as systems where players engage in an artificial conflict governed by rules, leading to quantifiable outcomes (Salen and Zimmerman, 2004). Integrating multiple approaches for framing digital games, Ralph and Monu (2015) discuss digital games as consisting of players, experiences, and artifacts, which resonates with how IT has been viewed in IS research. Thus, games can be viewed as artifacts that emphasize the dynamic interactions among designers, users, and the IT itself (Orlikowski and Iacono, 2001). Furthermore, it is important to note that the influence of digital games extends beyond entertainment, as evidenced by the integration of game-like elements into non-gaming activities, known as gamification (Riar et al., 2022), underlining the widespread diffusion of game-like aspects in modern life. While game research is a vast field, the concepts central to IS have significant contributions to offer for this IT use context.

In the work that has been done in IS, different motivational and monetary aspects have been focal in studying digital gaming (e.g., Liu et al., 2013; Meng et al., 2021). For instance, while digital game definitions do not necessitate competition, it is a central aspect of many games and has been shown to enhance player motivation (Sepehr and Head, 2018). Furthermore, IS research has investigated loot boxes (i.e., randomized in-game rewards purchasable with real money), uncovering their potentially detrimental effects on players (McCaffrey, 2023). However, the monetary aspects of loot boxes might be crucial for the game's economic viability (Carvalho, 2021). This is conflicting as the economic viability is also dependent on gamer retention (Strååt and Verhagen, 2018), and loot boxes could negatively affect this: an example of a paradox associated with digital game design. Still, existing studies have not delineated various individual and collective digital gaming ambivalences that could be triggered by game design paradoxes despite this interaction potentially contributing to adverse outcomes for different stakeholders. Our approach highlights the importance of studying digital games as prevalent forms of IT, bridging the gap in existing research by linking digital gaming to theoretical insights within the IS field using the concepts of ambivalence and paradox as lenses.

3 Research Methods

3.1 Data collection

We employed qualitative research methods recognized for their robustness in capturing emergent IS phenomena (Monteiro et al., 2022). The generation of rich data, a noted strength of qualitative approaches (Brekhus et al., 2005), influenced our choice of research method. We collected qualitative data through semi-structured interviews (primary data collection) and from social media discussions (secondary data collection). By collecting interview data, we were able to elicit deep stories of digital gamers' experiences. By complementing this with additional qualitative data from social media discussions, we gained broader support for our findings. Overall, social media data helped us gather data that was not as heavily influenced by the researcher as is the case with interviews (Chenail, 2011). Thus, the different data collection methods mitigated the weaknesses of each individual method and improved validity and credibility through triangulation. Here, triangulation was achieved by collecting data from different individuals and locations (Miles and Huberman, 1994).

As our primary data collection method, we conducted interviews with 22 gamers (19 in 2023 and three in 2024) to explore their digital gaming experiences. We detailed both the positive and negative aspects of their activities, investigating the factors within the games that contributed to these experiences. The interview framework included questions such as: "*What is your main reason for gaming?*", "*How do you feel during/after gaming sessions?*", and "*What aspects of games (features/elements) have elicited positive/negative feelings?*" This approach enabled us to investigate the ambivalences and paradoxes in the participants' stories, as well as understand their root causes. General guidelines for conducting interviews were followed, including employing mirroring (i.e., using participants' words to ask follow-up questions) and using appropriate jargon (Myers and Newman, 2007).

We did not limit interviewees based on their playing time or the specific games they played, enabling us to capture a wide range of potential experiences within the gaming context. Employing purposeful sampling (Patton, 2002), we sought participants who were not only avid gamers but had also experienced something negative while playing, aligning with our research objectives. Participants were recruited through email lists, gaming communities, and the personal networks of the authors. The demographic consisted of 13 males and nine females, averaging 27.0 years of age, mirroring the general gender distribution within the gaming community. This age group was targeted as it comprises the most active segment of gamers. All interviewees were from Finland. Most participants played digital games daily, primarily on personal computers, often in online multiplayer settings. Commonly played online multiplayer games included different multiplayer online battle arena (MOBA) games and first-person shooter (FPS) games. Single-player games spanned genres such as adventure, action, and puzzles, among others. The participants varied in their competitive approach to gaming; while some viewed competition as a crucial motivator, others did not prioritize it.

As a secondary data collection method, we gathered data from social media discussions to seek broader support for our findings. The interviews guided our social media data collection and helped us choose keywords for finding relevant discussions. Between 2023 and 2024, we collected data from a popular social media platform, which is not specified to protect user anonymity. Although we deviated from the informed consent process here, we obtained permission from the university's ethics committee to do so. Also, we implemented strategies to ensure user anonymity, including avoiding the collection of usernames and extensively paraphrasing quotes presented as evidence. When managed correctly, collecting data from social media can be ethical and beneficial (Proferes et al., 2021).

We focused on a discussion group for a popular MOBA game frequently mentioned in our interviews, chosen for its evolving nature and active competitive scene. Initially, we used the platform's search function with the keywords "*negative*," "*positive*," "*stress*," and "*fun*" to find relevant posts. The search function displayed the 250 most relevant posts based on these keywords, which we analyzed preliminarily. However, many results were outdated (some over ten years old), so we manually searched for posts from the years 2022-2024 using a third-party search application. Based on the preliminary analysis, we refined our search terms to include "*frustrating*" and "*enjoy*." We sorted the search results from 2022-2024 by the number of comments to identify popular discussions. This was crucial, as we wanted to analyze comments to observe discussions between users in addition to the original posts. We selected the ten most-commented posts from each year that reflected ambivalences or paradoxes related to gameplay or game design. From these posts, we chose the five most popular comments and their subcomments for deeper analysis. Given that a single comment could have hundreds of subcomments, this resulted in over 5,000 comments for analysis. In total, the social media data amounted to around 250,000 words.

3.2 Data analysis

We analyzed our data using the concepts of ambivalence and paradox as lenses for interpreting the participants' words. Following the guidelines of Lune and Berg (2017), we undertook the following steps: *(1)* transcribing the interviews; *(2)* labeling relevant words, sentences, and paragraphs (i.e., cod-

ing); *(3)* grouping similar codes (i.e., categorizing); *(4)* examining the data underlying the codes and categories in detail to find patterns; and *(5)* analyzing and discussing the identified patterns in relation to existing literature. The analysis was iterative, allowing movement back and forth between the steps. During the coding process, we employed simultaneous coding (i.e., one text segment receiving multiple codes) and in-vivo coding (i.e., codes named after the participants' words) (Saldaña, 2013). This helped manage the complex content of the participants' stories. Furthermore, simultaneous coding can help identify patterns and processes in the data (Saldaña, 2013).

We began by analyzing our primary data: the interviews. First, we sought paradoxes in the data. Using NVivo 14 software, we systematically coded all instances of paradoxes. For example, codes like "*leisure time feels like work*" and "*designing for casuals versus hardcore players*" were created. These codes were then grouped into three categories: individual paradoxes, collective paradoxes, and game design paradoxes. However, after reviewing the codes, the categories, and the underlying data, we determined that some coded paradoxes better reflected ambivalences, as ambivalences are internal emotions and cognitions, whereas paradoxes reflect external conditions. We thoroughly reviewed all the coded paradoxes and regrouped them as ambivalences if needed, exemplifying the iterative nature of our analysis. For instance, "*leisure time feels like work*" was renamed "*obligation/volition*" to better reflect the underlying data and was categorized as ambivalence.

Ultimately, we had two main ambivalence categories (individual and collective) and one paradox category (game design paradoxes), comprising six and three sub-categories, respectively. By scrutinizing the data underlying the sub-categories of game design paradoxes in detail, we observed how they were interconnected. Furthermore, as studies have shown that paradoxes can trigger ambivalence (Ashforth et al., 2014), we next sought patterns between them in our data. This involved re-reading the data to understand the nuances reflected in the categories and codes (Lune and Berg, 2017). For example, we found patterns of how the paradox of designing for casual versus hardcore players could elicit the ambivalence of experiencing distress/eustress. Both too easy and too difficult a challenge could create such experiences, highlighting the complexity of balancing the challenge in digital games.

Subsequently, we analyzed our secondary data: the social media discussions. We sought support for the types of ambivalences and paradoxes identified in the interviews while remaining open to discovering new types and connections. We aimed to find support for the patterns and processes we had identified (i.e., interconnected game design paradoxes triggering ambivalences). The social media data especially highlighted ambivalences of "*hostility/harmony*" and "*overplaying/underplaying*." The design paradox of "*shallow gameplay loop/monetization versus sustained player satisfaction*" was particularly significant in triggering these ambivalences. Finally, by reflecting and comparing our findings with existing literature, we deepened our investigation and fortified our contributions to the existing body of knowledge (Dey, 2003). Quotes from both the interviews and social media data are presented in the results. Interview quotes are marked with **(I)**, and social media quotes with **(SM)**. The quotes from the social media data have been paraphrased to prevent the possibility of finding the original discussions, thus protecting users' anonymity. While all collected social media data is freely and unrestrictedly available online, we exercised caution in presenting the results and evidence based on them.

4 Results

In the results, we outline six core ambivalences of digital gaming, categorized into two main types: individual and collective. Furthermore, we discuss three types of digital game design paradoxes and explain how these interconnected paradoxes can act as triggers for the ambivalences. Table 1 below presents the identified ambivalences. Table 2 summarizes the identified types of game design paradoxes.

Individual ambivalences	**Definition**
Obligation/volition	This ambivalence occurs when players experience an obligation to play even when the activity is supposedly voluntary and enjoyable.
Distress induction/ distress reduction	This ambivalence highlights how gaming can simultaneously induce and reduce distress in players.
Experiencing distress/eustress	This ambivalence reflects how gaming can simultaneously elicit both negative stress (distress) and positive stress (eustress) in players.
Overplaying/ underplaying	This ambivalence addresses the conflict between the perception of one's gaming time, overplaying or underplaying, which affects whether they are pulled towards or away from the game.
Collective ambivalences	**Definition**
Exclusion/inclusion	This ambivalence arises when a game offers varied ways of playing, but the community simultaneously exhibits exclusion and inclusion for different ways of playing, often abiding by enforcing unwritten rules leading to gatekeeping.
Hostility/harmony	This ambivalence occurs when, in multiplayer games requiring teamwork, the players approach situations with hostility despite harmony being essential for success.

Table 1. Core ambivalences of playing digital games.

Paradox	**Definition**
Constant change versus *status quo*	This paradox arises especially in servitized online games that frequently update, where constant changes can be detrimental if players prefer the stability of previous versions, despite the changes also being needed for games' success.
Shallow gameplay loop/monetization versus *sustained player satisfaction*	This paradox involves the balance between designing a game with the sole goal of increasing revenue and player engagement, which carries the risk of decreasing player satisfaction and can eventually lead to reduced player retention and revenue loss.
Catering to hardcore gamers versus *casual gamers*	This paradox highlights the challenge of designing games based on feedback from a vocal minority, such as professional players and content creators, which may not reflect the preferences of the more extensive, quieter player base.

Table 2. Central paradoxes of digital game design.

4.1 Individual ambivalences of digital gaming

Obligation/volition. A key aspect of playing digital games in one's leisure time is that it is a voluntary activity meant to bring benefits, such as enjoyment. However, our data showed that gaming can simultaneously feel like an obligation. This is especially true when games have a constant gameplay loop that requires players to perform specific activities for progress. For instance, if players feel overwhelmed by too many tasks, gaming can feel like an obligation. When gaming is driven by such feelings, it can be problematic:

"*I haven't played much during the event, say it's a two-week event and I've only played a little, then it might be like on the last two days, for example, 'Okay, I need to play this gacha for five hours today and six hours tomorrow, if I want to 100% this event'. [...] If it is happening only once ever, then it's kind of like, I have to play it, or I'll never play this.*" **(I)**

Distress induction/distress reduction. Although distress relief is a common goal of playing digital games, the actual experiences can simultaneously reflect increased distress. For instance, despite people often playing games as a fun leisure activity, gaming can be a source of distress due to the amount of content they are engaging with. This means that stress emerges from feeling overloaded:

"*It's quite a relaxing activity for me, mainly because it lets me escape from all the work worries, stress, and all that, so it's more of an [chuckle] escape from reality, let's put it that way. [...] And then many games these days have a battle pass or something like that, and there's this constant need to grind. [...] It's really exhausting.*" **(I)**

Experiencing distress/eustress. In addition to inducing and reducing distress, gaming can reflect ambivalent outcomes due to the dynamics between distress and eustress. Gaming as a source of distress can manifest as frustration, anxiety, and exhaustion. Such experiences can arise, for instance, due to toxic social interactions in games or the pressure to progress. Conversely, overcoming challenges and experiencing accomplishment and mastery are integral to many gaming experiences, reflecting eustress. This can also be a dynamic experience, where the type of stress experienced, whether negative or positive, might be ambiguous. Such ambiguity is often present in competitive gaming, as one participant explained:

"*I'm the kind of player who easily gets nervous, so if I find myself in, for example, in a situation where it's one against three. I have this watch on my wrist that measures my heart rate, so it might have, I mean, my heart rate has actually been 150 in such a situation. [...] It's an unpleasant feeling when the heart rate rises and all that, but it's also the release of adrenaline that comes from it, so it's the situation that I may partly seek from games.*" **(I)**

Overplaying/underplaying. While both overplaying and underplaying could reflect negativity, we view them as ambivalent because overplaying could drive the player away from the game, while underplaying pulls the player towards the game. In both datasets, we observed instances of players simultaneously feeling like they were playing too much and too little. Many reported extensive playing hours but simultaneously felt deprived of sufficient gaming time. Additionally, many highlighted how playing for hours on end is often counterproductive and does not yield the sought-after benefits, thus necessitating extended breaks. As discussed on social media:

"*Just because you're unaware of it doesn't mean it's not affecting you. Stress from gaming leads to worse performance and can impact your real life. Taking an extended break after prolonged playing sessions can be very beneficial.*" **(SM)**

4.2 Collective ambivalences of digital gaming

Exclusion/inclusion. While hard rules are central to how digital games are shaped (i.e., the rules coded in the game artifact), players often create informal rules of their own. These can include etiquette for player interaction, legitimate strategies, or gameplay conventions. Such informal rules can foster a sense of belonging and community. However, they can also become restrictive, policing how individuals play the game and sometimes excluding those who do not conform to community standards. The game meta (i.e., the optimal way of playing a game) was especially discussed here. Although most were perplexed by why the community is so concerned with how others play the game, some found understanding in games where a competitive edge can be gained or lost by making certain choices. Especially from this perspective, it was highlighted that following the game meta might be necessary to succeed:

"*For instance, if a teammate picks, let's say [a character]. […] Then immediately, it's like, 'Oh no, please don't pick that. We're going to lose [laughter], we are going to lose'.*" (I)

However, the same participant described how they were not a "meta player," further representing conflicting thinking. Managing the freedom to choose while also being bound by unwritten rules often associated with gaining a competitive edge can be tricky:

"*I'm not, you know, I'm not a meta player at all. I'm not interested in what's meta and what's not. Of course, you notice it there that many people are like, 'Yeah, you can't choose that character because it's not meta', but then I'm just like, whatever [laughter]. I don't care, I'll pick it anyway.*" (I)

Hostility/harmony. Such ambivalence emerges due to players engaging in counterproductive behavior, particularly in competitive settings. While cooperation is necessitated and worked towards in multiplayer settings, participants in our interviews discussed that many players simultaneously seek conflict within teams, which can diminish teamwork, result in the loss of games, and eventually worsen the gaming experience:

"*When I was younger, I might have yelled at the team, like what the hell, why is it going like this, and why aren't you doing anything, and damn it [insert expletive], I'm going home, or that now this is over. And a couple of friends actually said to me back then, 'Hey, it's not necessarily fun to play with you if you get worked up like that'.*" **(I)**

In both datasets, there was significant discussion on toxicity in digital gaming, which tends to stem from competitive aspects, also reflecting the paradox of for whom the games are designed. To address this, many suggested disabling or muting chat in the game. However, this approach is problematic because the games are cooperative, and turning off cooperative elements is counterintuitive:

"*Why choose to be destructive instead of being kind to others? Why not channel that energy into improving your gameplay? When someone isn't performing well, insulting or wishing harm because they're 'ruining your game' is disheartening. It doesn't benefit the game or its players. All you achieve is mental exhaustion, extreme stress, self-hatred, a probable loss, and the risk of chat restrictions, suspensions, or even a permanent ban.*" **(SM)**

4.3 The role of game design paradoxes in triggering ambivalences

As we sought to understand how ambivalences in digital gaming manifested in both individual and collective dimensions, we observed that these often emerged due to different, interconnected paradoxes of game design. Thus, the paradoxes act as triggers for the ambivalences. We define game design paradoxes as situations in which various aspects of game design are in constant conflict and tension, leading to outcomes that elicit ambivalent responses in players. These paradoxes can manifest in various aspects of game development, including gameplay mechanics, reward systems, and player interactions.

Paradox of constant change versus status quo. Although modern games are characterized by change, and their success may depend on such, these changes can also lead players to reduce their engagement with the game or even abandon it. Significant changes or deviations from a game's core mechanics can contribute to this. This may stem from a sense of loss over the original game experience, frustration with having to learn new systems, or simply a disconnect between player expectations and the game's new direction. This can elicit ambivalence of distress/eustress. As one interviewee discussed regarding a game-changing update in a MOBA game:

"*Nobody liked it [an update that significantly changed the game] [laughter]. [A role in the game] players got mad about it because they get to play less against [the opponent of a similar role], and when others come to interfere right at the start, it takes away their control of their environment right from the beginning of the game. […] So the gaming experience worsened from that your own experience is so dependent on other players right from the start, that your own actions don't have as much impact, but rather what others do.*" **(I)**

Although playing digital games is often purposefully challenging, players can be overwhelmed by complex game mechanics. This is especially prevalent in constantly updating games, which also means that the meta changes frequently. Staying up to date with the meta takes time and falling behind can lead to frustration. Additionally, learning the new optimal ways to play can contribute to feelings of overload. However, some found it a valuable part of the gaming experience that could also bring enjoyment. This also highlights the difficulties in catering to all player types, showcasing the interconnectedness of the game design paradoxes:

"*Who is the game being developed for? Is it the 2% who understand the game, or is it more important to just have changes within the gameplay experience and the meta just for the sake of change? […] [Casual players] might not understand [the changes], but they still get the refreshing experience due to the game updating.*" **(I)**

Shallow gameplay loop/monetization versus sustained player satisfaction. This paradox emerges from the gameplay design and monetization strategies implemented in games aiming to increase engagement and revenue without considering player satisfaction. This can negatively affect player retention and paradoxically decrease revenue. In both our datasets, monetization strategies such as loot boxes and other types of microtransactions were discussed in this context, especially if they provided progress for gameplay: a concept called "pay-to-win." Furthermore, the social media discussions highlighted that players' enjoyment does not seem to be a priority for game companies – revenue is everything:

"*There's no sense in those pay-to-win features [in a car game]. It's like, no one benefits from those except the devs, and I don't even know if they benefit in the long run when people get fed up with it. […] It's not necessarily the devs who decide what gets put in-to the game, but rather the 'suits' in the company's office who think about what will end up on the bottom line.*" **(I)**

"*It's crucial to be aware of these issues on your own, as the game company profits from players being stressed and making impulsive purchases. It's disappointing that a leading company places such a high priority on profit.*" **(SM)**

Interestingly, multiple interviewees discussed a popular MMORPG and how the gameplay loop had become unsatisfactory, mainly aimed at player retention. One interviewee explained how the game's player base decreased due to the design choices made. However, eventually, the changes were reversed, highlighting how managing these paradoxes is essential for the survival of the games:

"*And then there are all the time-gating parts and such, meaning practically there's a fear of missing out because it's weekly, and if you don't do it that week, you can't get it the next week, meaning you're literally behind in power due to game design […] Maybe at the time when you were doing it, you were in a sort of hamster wheel, like, 'okay, let's do this'. And then sometimes you stop to think, 'why am I spending my time on this? What sense does this make? Is this fun?' […] And at that point, it comes to, 'okay, our player base is leaving, we get less revenue. Well, we have either the option to continue this and lose players or then try the other model and listen to the players'.*" **(I)**

"*When you recognize that you're playing out of a sense of duty rather than enjoyment, it discourages you from continuing. This is what ruined playing [the MMORPG] for me.*" **(SM)**

Thus, rapid and repetitive rewards in digital gaming can be highly ambivalent. On one hand, they can initially bring a sense of enjoyment, motivating players to continue playing, as the anticipation and achievement of rewards provide positive reinforcement and a sense of progression. While this can initially drive player retention, over time, it may diminish player satisfaction as the novelty wears off and the effort required to obtain rewards becomes tiresome. This highlights how such a design paradox influences the ambivalence of obligation/volition. Furthermore, the obligation to continually achieve these rewards can transform a pleasurable activity into something burdensome, contributing to the paradox of overplaying/underplaying and the tension between intrinsic desire and extrinsic obligation to play.

Paradox of catering to hardcore gamers versus casual gamers. Hardcore gamers often seek challenges and complexity, desiring games that offer opportunities for mastery and competition. In contrast, casual players typically engage with games for leisure, relaxation, and social interaction, favoring experiences that are enjoyable and not overly demanding in terms of time or skill. Thus, designing games for different types of players can be difficult. In both datasets, it was discussed how games are often designed from the perspective of hardcore gamers, despite casual gamers comprising the majority of the player base. Especially professional players and content creators often become a vocal minor-

ity for whom the games are designed. Emphasizing these players in game development can potentially alienate the broader audience that forms the backbone of the gaming community. Therefore, developers need to understand that the majority of the gamer base consists of players who are playing casually:

"*So, the majority of players are casual players, and then there comes the problem, like, are we designing this for professionals, or are we designing it for the larger percentage, which is the casual players? […] Of course, now that the new season has come out, it seems, at least from what I've heard, it has become apparent that the devs have kind of realized that we can't [laughs] design this game for professionals, because the larger number of players are casual gamers.*" **(I)**

"*It's baffling that some are okay with their gaming experience being compromised due to the game studio catering to professional players. I couldn't care less [insert expletive] about professional gaming.*" **(SM)**

Such a paradox could elicit ambivalent outcomes primarily associated with exclusion/inclusion and hostility/harmony. If the game is specifically designed from a competitive perspective, this can create an atmosphere where gamers seek optimal gameplay, leading to conflicts within teams, even in cooperative situations. Below, Figure 1 summarizes our findings and highlights the interconnectedness of the different types of paradoxes, in addition to showing how the game design paradoxes trigger ambivalences.

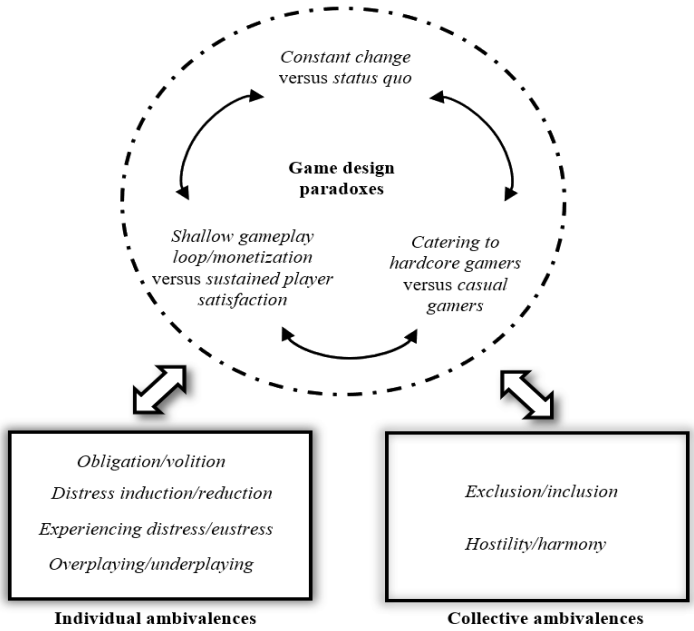

Figure 1. Game design paradoxes triggering individual and collective ambivalences.

5 Discussion

5.1 Research contributions

First, we contribute to existing research by identifying core digital gaming ambivalences and delineating central, interconnected game design paradoxes. Moreover, we explain how the design paradoxes can trigger both individual and collective ambivalences, extending the research on triggers of ambivalence (Ashforth et al., 2014). By identifying interrelated design paradoxes in digital gaming, we provide a framework that clarifies how these paradoxes evoke ambivalence. While existing research has

highlighted organizational triggers of ambivalence, such as continuity and change (collective level) and role conflict (individual level) (Ashforth et al., 2014), we specifically address these triggers from the perspective of game design paradoxes. By doing so, we show how ambivalences are triggered through paradoxes in IT that are constantly evolving with new features, new standards, and new ways of use (Orlikowski and Iacono, 2001). This is particularly relevant for IT characterized by change, as seen in all the game design paradoxes we discussed. In existing research, paradoxical tensions between stability and change have been extensively explored in organizational contexts but have received little attention in the context of voluntary and leisure IT use. This oversight is problematic, as we have shown that the tension in game design between constant change and maintaining the status quo can evoke ambivalence between obligation and volition in players, leading to significant issues such as diminished player well-being and reduced player retention. These insights provide new perspectives on understanding the paradoxes associated with stability and change (Farjoun, 2010). Specifically, they could offer guidance on balancing the need for consistent, reliable mechanics with the desire for novel, exciting updates, achieving a harmonious coexistence of both elements. Also, as design features can help manage paradoxes (Jarvenpaa and Lang, 2005), it is important to understand such dynamics in various IT use contexts, especially when the design features themselves might reflect paradoxes.

Second, while existing research often shows that ambivalences result in harm (Van Harreveld et al., 2009), this is not always the case. Ambivalences can manifest positively, enabling adaptation (Rothman et al., 2017). This perspective encourages a re-evaluation of traditional views on ambivalence, suggesting it may play a constructive role in complex leisure activities like digital gaming. The ambivalent nature of gaming can also make games more appealing, particularly in the dynamics between distress and eustress (Snodgrass et al., 2016). Our findings indicate that such ambivalence primarily arises from the game design paradox involving constant change versus the status quo. Games that do not evolve can become dull, but constant updates can provoke both distress and eustress reactions, such as feeling overloaded while also striving for mastery. Designers must create a stable core gameplay loop that offers a reliable structure while introducing enough variability and novelty to keep the experience engaging. This balance is crucial for maintaining long-term player interest and satisfaction. Understanding this balance between different game design choices, or managing the paradox, is essential for eliciting beneficial rather than detrimental ambivalent reactions. This could help address the economic challenges faced by gaming companies, often associated with player retention (Stråat and Verhagen, 2018). A common theme in our interviews was that digital games have deteriorated due to new monetization strategies (e.g., microtransactions) originating from mobile gaming. Associated with these are loot boxes, which have many negative issues from the player perspective (McCaffrey, 2023). However, removing them might prove detrimental from a monetary perspective (Carvalho, 2021). Striking the right balance between providing enough incentive to keep players engaged and avoiding player fatigue is essential. By examining these dynamics, we offer insights into creating more sustainable and enjoyable gaming experiences that maintain player well-being and satisfaction over time.

Third, we contribute to research regarding the informal norms in IT use (Chen et al., 2022). Research has shown that what others feel and say, and how they use IT, influences how users engage with IT (Maity et al., 2019). This highlights the collective and social dimensions of IT use. Resonating with this, we underline the role of collectives in ambivalent outcomes of digital gaming, triggered by design paradoxes. By doing so, we add to less-studied social dynamics of paradoxes (Hargrave et al., 2017). For instance, the paradox of control and freedom can affect organizational innovation (Smith and Lewis, 2011). We approached this from the perspective of how changes in digital games can emerge as ambivalences due to the simultaneous existence of exclusion and inclusion of different types of gaming behavior, highlighting norms and optimal ways of playing. Although some participants were highly annoyed with unwritten rules on how to play the game, they also had their own ideas of how a game should be played, reflecting ambivalence stemming from design paradoxes. The critical point is that the community has rules for the "right" and "wrong" way to play the game, despite players being completely free to choose how they wish to play. This emerged as central in our interviews, as partici-

pants discussed how such community-enforced rules did not align with what they wanted to experience. These findings enrich IS literature by illustrating how insights from digital game dynamics can inform broader practices, such as change management. Specifically, we explained how changes in IT use can be optimized and influenced by design factors and varying social conditions, such as norms.

5.2 Practical implications, limitations, and future research

Our results provide insights for organizations at large due to the use of gamification. Such organizations could include those oriented toward education, where gamified systems have been shown to be efficient for learning. With gamified systems, extrinsic and intrinsic aspects of motivation could elicit ambivalent emotions in users, for which understanding the various paradoxical design aspects could be helpful. Furthermore, game developers could implement design choices that highlight the positive aspects of ambivalences and paradoxes. Our findings could help gamers and game providers adopt a "paradox mindset" (Miron-Spektor et al., 2018) that harnesses paradoxes for positive outcomes rather than harm. This could involve explicitly acknowledging and transparently communicating paradoxical tensions with players. For instance, as we have stated, monetary aspects are instrumental in the gaming business, as they are in all businesses. However, players' satisfaction and well-being need to be prioritized, and gaming companies could transparently explain how they are managing such a paradox. Understanding how players perceive and value their time in games can guide the design of experiences that are fulfilling, ultimately enhancing player well-being and satisfaction.

As with all research, our study has some limitations. *First*, the core concepts of our study, ambivalence and paradox, have been defined in various ways over the years. While there is some consensus on these terms, there are varied perspectives. We managed this by being explicit and transparent with our definitions, especially tying our background to relevant research fields. *Second*, the idea of paradox as a meta-theory originates from organizational research, which required adaptation to the personal and voluntary context of IT use. *Third*, we combined data from two different types of sources, which could pose issues as the research subjects were not a homogeneous group due to the inclusion of social media data. *Fourth*, associated with social media data, due to anonymity reasons, we had to paraphrase user quotes presented as evidence, which can affect credibility. However, we were diligent in how the paraphrases were formed and gave great attention to ensuring that the paraphrases captured the same story told by the original quote by reading and re-reading the texts side by side.

For future research, a more detailed investigation of how specific game design paradoxes elicit specific ambivalent outcomes could be conducted. Furthermore, we encourage scholars to examine the role of individual characteristics of players in how these paradoxes and their triggering ambivalences are appraised. For instance, different types of players might handle ambivalence differently, with characteristics such as competitiveness potentially influencing their responses. Future research should continue to explore these concepts across diverse technologies and cultural contexts to build a more detailed and robust framework that can inform both theory and practice in IT design and use.

6 Conclusion

By investigating the triggers of ambivalence through design paradoxes, we shed light on the complex dynamics between game design, player behavior, and various gaming outcomes. Our findings show that paradoxes in game design can lead to ambivalences in players, affecting both their emotional experiences and eventual behavior. Moreover, our research highlights that ambivalences, often perceived as detrimental, can also have positive implications in digital gaming by contributing to a richer, more engaging gaming environment. Furthermore, by examining the collective impact of paradox-triggered ambivalences, we contribute to the broader discourse on informal norms in IT use. Overall, our study offers a framework for future research and practical applications in digital game design, emphasizing the intricate balance between competing elements to optimize player experiences and outcomes.

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