



## An Exploratory Literature Analysis of Technostress Research in Information Systems Science

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**ABSTRACT:** Technostress is often characterized in information systems (IS) research as empirical research examined to understand the underlying causes of stress and strain among information and communication technologies (ICTs) users. However, most literature on technostress has emphasized on quantitative and qualitative analysis techniques to conceptualize their ideas. The objective of this study is to explore the technostress literature in IS using a critical literature analysis to help classify theoretical and analytical themes in the previous literature. While most technostress IS research explicitly employs a theory to substantially support the conceptual model under examination in their study, hardly any work has been done till date to understand the theoretical classification of psychological theory applications in technostress IS research. Based on the findings from our literature analysis we conclude by classifying Technostress IS theories into four psychological theories. We also examine and infer the effects analysis methods and theories on outcomes.

**KEYWORDS:** Technostress, ICT, Psychological Theory, Information Systems

Received 26 Dec., 2022; Revised 04 Jan., 2023; Accepted 06 Jan., 2023 © The author(s) 2023.  
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### I. INTRODUCTION

In today's world advanced and innovative information technology (IT) has digitized and automatized most events of our personal and professional lives. The advent of new information and communication technologies (ICTs) have revolutionized the way in which organizations carry out their day-to-day operations and business processes [46],[64]. ICTs have dramatically impacted organizational effectiveness in terms of productivity and employee performance [1]. Though, ICTs have helped organization perform better in their productivity, scholars have discovered the negative aspects and unintended consequences of ICTs [11]. With the rise of outsourcing and the current pandemic threat, remote work has become a prevalent style of work life. With technology becoming a part of everyday life, technostress has emerged as an inevitable consequence of ICT among users. It has come to our attention now that studying technostress from the relevance of IS literature is a dire need of time.

Information and communication technologies (ICTs) today permeate all aspects of work across the different domains of the industry. With the motive of better productivity organizations prefer to leverage the great advantages of such technologies by implementing and assimilating them at workplaces [29],[43],[47]. Although organizations do benefit from such moves and employees do exhibit better efficiency at work, ICTs may also have a "dark side" [31],[49]. Stress at the workplace is a result of ICTs and it has long-term health and quality of life consequences further leading to strain [22][40]. The use of ICTs at the workplace has shown to have higher levels of stress among employees [3],[18]. Though increased workloads are seen as the primary contributor to stress, it is the most likely combination of effects of ICTs at work [1]

Although the theory of stress is generalized in most literature available today, technostress has been studied through the lens of the psychological stress phenomenon in information systems (IS). Technostress was

first mentioned by clinical psychologist Craig Brod, who defined it as a modern disease caused by one's inability to deal with ICTs in a healthy manner [3],[7]. In information systems (IS) research technostress consists of five dimensions. Each dimension stands out for an individual technostress creator. These creators are considered as harmful stressors that lead to strain among individuals [36],[38] Information systems literature has also explored technology characteristics that are important to technostress research. The characteristics are of three types: usability characteristics, dynamic characteristics, and intrusive characteristics [3].

While the literature on technostress has been prevalent in IS research, there is a need for qualitative literature analysis to understand the depth of technostress literature in IS research. It is important from an academic perspective to shed more light on the themes prevalent in technostress research, the underlying domain application, and users. From a theoretical point of view, it is essential to deep dive into IS and psychology theories applied in technostress research. This paper aims to contribute to this area. We strive to do so by applying a literature analysis framework [40],[58] on available literature on technostress. We explore theoretical themes and further classify them into IS and psychological theories based on their origins.

This study contributes to the application of the theory of technostress in information systems research by exploring and examining the literature on technostress in information systems journals. This paper offers insights on theoretical applications of the technostress theory on different users, outcomes, and IS and psychological theories in IS research. It also offers a unique perspective of identifying underlying themes as classifiers of IS and psychological theories used in technostress research in IS. We also deep dive into understanding the categories of ICT users and methods used in technostress literature. This study contributes in four major ways. First, we review the theories applied in technostress research in IS and classify them into two major genres of IS and psychological science. We use literature analysis as a method for this classification. Second, we focus on exploring and categorizing the ICT users in technostress research. Most technostress literature published in IS genre journals have had empirical research design and have focused on samples of ICT users. We believe that by categorizing them we can unlock new domain potential for future research. Third, we categorize the methods used in technostress IS research. As technostress has evolved over the last decade, we believe categorizing methods will help new researchers to demonstrate diverse analytical methods in the future. Lastly, we explore different outcome variables in technostress literature and classify them into different scientific genres. Causal research has evolved over time on different theories and behavioral outcomes, it would be of great importance to future researchers to understand the past work on outcomes.

The remainder of this study is organized in the following way: Section 2 discusses the theoretical background of the study, which includes technostress theory and trends in technostress empirical research. Section 3 takes into account the research methodology. We believe as this paper is the first study to explore theoretical themes in technostress, Trauth's literature analysis framework [40] would help us classify themes. Section 4 outlines the study results and section 5 present a discussion of research findings and concludes with a summary of research findings and implications for future research and practice.

## II. BACKGROUND

For the past three decades there has been dedicated research on stress in IS literature. Numerous empirical researches have taken quantitative approach to explore the adverse effects of stress. IS literature has been focused on understanding the role of stress in organizations and further examining the effects of occupational stress at workplace. ICTs commonly pervade workplaces mainly because of their ability to produce efficiency and effectiveness at work and help support workers in their work [25],[44],[43],[61]. The implementation and assimilation of ICTs have benefitted organizations though these gains have had their dark side to address. Stress in the workplace is known to cause physical and psychological issues to workers with long term consequences [4],[6],[7]. Ayyagri [3] stated that organizational response to contain health risks at the workplace involved mitigating physical risks through training and support. Though physical risks occupied a large share of mitigation efforts, psychological stress was undermined in those circumstances [3].

As the past literature has dealt with stress generated from human and technology interaction, technostress has been a prevalent theme throughout IS literature. Technostress is composed of five dimensions and they are collectively known as technostressors or technostress creators [35],[24],[42]. In IS technostressors are defined as "IS stress creators appraised by the individual as threatening" [36]. The five technostress creators are techno-overload, techno-invasion, techno-complexity, techno-insecurity, and techno-uncertainty [44],[62]. Techno-overload happens when ICT users assess stressful events that contribute to them having longer work times that require more efforts. Techno-invasion occurs when users are constantly connected to technology outside of their workplace context. Techno-complexity relates with use of technology that is deemed complex, where the users feel inadequate about their technology skills, resulting in them spending more time and effort to understand the technology [39],[57]. Techno-insecurity makes users feel threatened about their job security, feeling stressed towards losing their job to other users who are more proficient in technologies [38]. Techno

uncertainty occurs when software, hardware, and computer systems update very frequently making the situation stressful for users to adopt to the frequent changes.

Although the stress research is very widely explored in organizational behavioral research, in IS literature it is confined to technostress and its application in organizational and institutional research [37],[55]. Most literature on technostress is focused on examining the influence of ICTs on users working in IT services organizations, who deal with technologies as a primary source of communication [35],[53]. This has led to many researchers focusing their research on outcomes related job performance and satisfaction. Further the research on this topic has evolved into theoretical contributions focused on antecedents and implications of technostress in ICT enabled IT organizations. The second stream of literature is focused on social media and social networking sites (SNS) stressors. Research on SNS stressors has mainly focused on SNS characteristics and social media related addictions caused by those characteristics. Most theoretical contributions in this stream are related to coping theories and mitigating mechanism developed to subdue stress.

The third stream of literature is focused on ICT users (old vs young). It takes into account the user's age as a substantive variable responsible for stress developed from proliferation of increasingly modern ICTs [23][41][59]. Graying workforce and rapidly evolving ICTs have caused age-related impacts on the job performance of the users [15]. The fourth and the last stream of literature is focused on application of technostress in healthcare and information security domain. Both these field of sciences are known for rapid transformation when it comes to technology assimilated and implemented by organizations [8]. Current research in technostress is focused on these two fields as radically transforming technology and the accelerated pace of adoption has led to elevated levels of stress among users [9]. Researchers are attracted towards the mitigating mechanism and coping techniques in high paced adoption [7].

One thing we found as an underlying foundation for the research on technostress in IS literature is the use of theories to manifest the relevance of relationship between human-technology interaction and stress. In this study we take the initiative to explore the role these theories take to underpin the empirically supported outcomes. We further classify these theories into IS and psychology theories helping future researchers to better understand the narrative behind their use in technostress research.

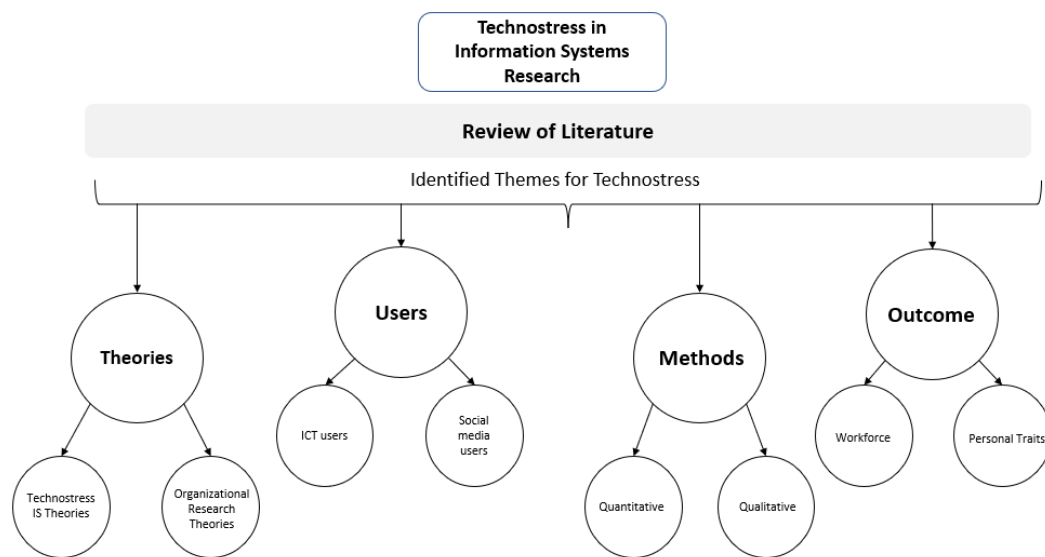


Figure 1. Technostress Literature Analysis Framework

### III. METHODS

This study is first of its kind to employ a 15-year retrospective literature analysis of research papers on the topic of technostress and IS that appeared in 12 information systems journals between 2006 and 2021. Articles were selected from Senior Scholars Basket of 8 journals from the Association for Information Systems which include European Journal of Information Systems, Information Systems Journal, Information Systems Research, Journal of the Association for Information Systems, Journal of Information Technology, Journal of MIS, Journal of Strategic Information Systems and MIS Quarterly [42],[60]. The other journals that were considered included The Database for Advances in Information Systems, Information & Management, Information & Organization, Information Technology & People, Computer and Education and Computer

Networks. The criteria for selecting articles were the appearance of the word “technostress” in the title, abstract or keywords.

The search yielded in 46 journal articles that were then read, coded, and classified according to the following themes and categories in Table 1 and 2. While most of the research about technostress in IS explicitly employs empirical contribution to organizational psychology [19], their empirical model is well backed by a theoretical framework [9]. Theoretical frameworks are exclusively based on theories adopted from psychological and information systems science [17]. We did classify the domains in which technostress is applied vs. categories of theories that were used in those domains in Table 1. The domains were broad classified into IT service organization, ICT users (general vs old), social networking sites, information security, and health information technology. These domains are related to use of ICTs and fall in the category of information systems domain [27],[45]. Most theories applied in these domains are classified as psychology theories and few are classified as information technology theories. Table 1 shows the relationship between these IS domains and theories. It helps us to define and distinguish the theories used in the IS domain, helping future researchers to better understand the implications of use of these theories in behavioral information systems. Table 2 gives us an overview of how theories are used to support IS research outcomes. This further escalates to the fact that theories irrespective of their origins have had been popular in the IS research stream. Technostress stands out to be one of scientific genres of IS research where there has been an exclusive use of theories.

Theme (Applied domain)	Categories (Theories)
IT service organization	Five personality traits (Five factor model), Transactional model, Coping theory, Person environment (technology) fit theory, Social support theory, and Affective response model theory
ICT users (General)	Transaction-Based Model of stress, Information acquisition, Socio-technical theory, and role theory
ICT users (Old)	Theories on stress and cognitive aging
Social networking sites	Theory of technology frames, Coping theory, Affordance theory, Theory of reasoned action, Social support theory, Person environment (technology) fit theory, and Theory of planned behavior
Information security	Coping theory and Moral disengagement theory
Health information technology	Techno-eustress and distress theory

**Table 1:** Coding themes (Applied domain) and categories (Theories)

Theme (Theories)	Categories (Outcomes)
<b><i>Technostress Psychology theories</i></b>	
Coping theory	Security compliance and coping mechanism, SNS addicts
Transactional model of stress	Job satisfaction and commitment to the organization
Theories on stress and cognitive aging	Physical stress and mental workload in older ICT users
Person environment (technology) fit theory	Work home conflicts and social relationships
Literature on anthropomorphism	Work home conflicts and social relationships
Big five personality traits	Job outcome and personality traits
Moral disengagement theory	ICT based negative outcomes mitigating mechanism
Social cognitive theory	ICT enabled performance and interpersonal skills
Role theory	User role stress and individual productivity
<b><i>Technostress Information systems theories</i></b>	
Techno eustress/ distress theory	Health information technology (HIT) adoption
NeuroIS	Psychometrics measurement development
Theory of technology frames	SNS* stressors and coping mechanism
Technostress trifecta	ICT users and technostress effects
Socio-technical theory	User role stress and individual productivity

\* Social networking sites

**Table 2:** Coding themes (Theories) and categories (Outcomes)

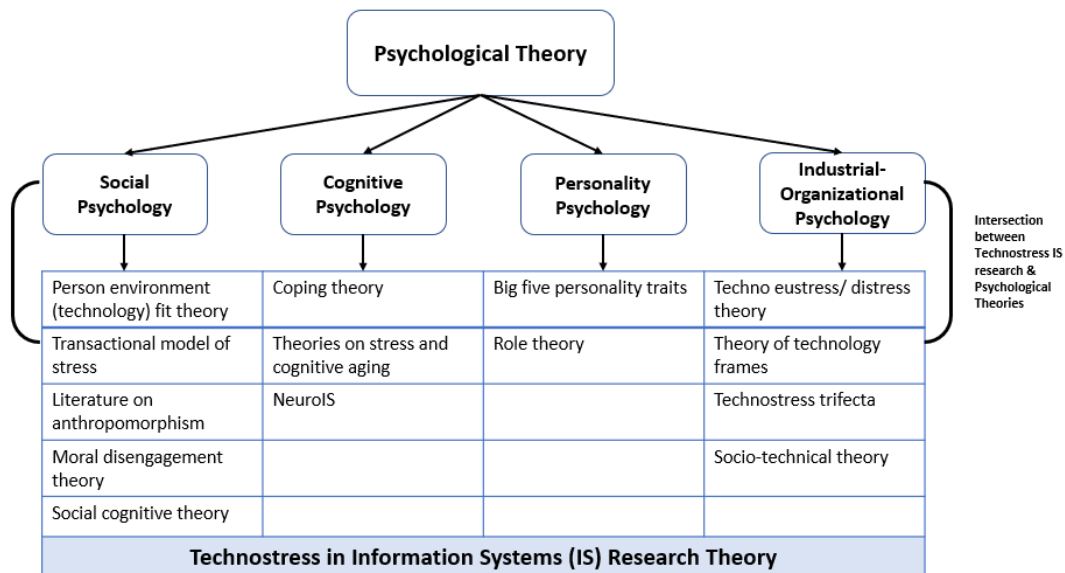
**IV. RESULTS**

Assume that masses of rods can be neglected but their moment of inertia should be included to better reflect the physical system they represent. Table 3 shows the results of the analysis of the technostress papers from the selected journals reviewed in this study for methods used from different theories in those papers.

Method	Theories
<b>Quantitative</b>	
SEM	Coping theory, Socio-technical theory, Role theory, Transaction-Based model, Techno-eustress and distress theory, Stress paradox theory, Social support theory
PLS SEM	Techno-eustress and distress theory, Coping theory, Moral disengagement theory, Technology continuance theory
PLS	Coping theory, Moral disengagement theory, Affordance theory, Personality traits theory, Transaction-Based model, Social support theory, Person-technology fit model
Polynomial quadratic regression	Information acquisition, Person environment (technology) fit theory
HLM	NeuroIS theory, Big five personality traits, Five-factor model, Transaction-Based model, Coping theory
ANCOVA	Transaction-Based Model
MANOVA	Theories on stress and cognitive aging, Affective response model theory
<b>Qualitative</b>	
Literature analysis	NeuroIS theory of reasoned action theory of planned behavior person-technology fit model

**Table 3:** Coding themes (Methods) and theories

The theories that are in evidence in these papers are classified into two broad categories: psychological and information systems theories. The underlying principle of the psychological theories is understanding and comprehending the human behavior towards technology taken into consideration the negative aspect of technological use on humans. On the contrary, IS theories deal with the general systems theory’s formalism in the use ICTs by humans [26],[44]. Psychological theories further yield 8 theories in IS literature in technostress.



**Figure 2.** Psychological Theories & Technostress IS Research Theories Intersection

**Psychological Theories in Technostress IS Literature**

D’Arcy et.al [11] defined coping theory as constantly changing cognitive and behavioral efforts to manage specific external and internal demands that are appraised as taxing or exceeding the resources of the person. In technostress literature in IS, coping theory has been common interpreter of human behavior in different domains and for different users [28],[46]. In a study by Stich [46] coping theory is seen to shape the



behavior of employees when complying to security policies and social networking addictions. Transactional model of stress, role theory, and theories on stress and cognitive aging in technostress IS literature deal with job satisfaction and employee's commitment to the organization. It has been thoroughly studied in IS and organizational behavior (OB) literature on how employee turnover is an implicit outcome of workplace stress [32],[50]. Theories on stress and cognitive aging in technostress IS literature is a niche genre of research focused on understanding the implications of ICTs on grayed workforce [34],[52]. It takes into consideration how grayed workforce differs from younger employees when new ICTs are put into effect at workplace [45][63]. Such research has been evident in showing the behavioral changes in old ICT users and their intentions to resign or retire early during their work tenure [21][39].

Person environment fit theory also known as person technology fit theory [16] in technostress literature is used to explore work home conflicts and social relationships of ICT users and IT workers [20],[38],[56]. Person technology fit theory expands the importance of techno literacy and techno insecurity in IS research exploring the effects of new technology on nuance users. Different levels of job insecurities have been studied in IS literature to understand the attitudinal mortification of technophobic users. Technostress IS research has also explored literature of anthropomorphism as a theory to understand work home conflicts and social relationships [5]. Moral disengagement theory states that individuals tend to cognitively separate themselves from moral component from an unprincipled act in order to rationalize engaging in it [12]. This theory in IS literature have paved path to understand the role of mitigating mechanisms to cope up with negative outcomes of stress due to ICTs [14]. Social cognitive theory of personalities emphasizes on learning and cognitive thinking as a source of individual differences in personalities [42]. In technostress IS research this theory takes into account.

Califf [8] in his dissertation on technostress examined the effects of Techno eustress/ distress theory in health information technology (HIT) understanding technology adoption by nurses [8]. Techno eustress/ distress theory is an integral part of technostress literature expanding on the importance of the consequences of technostress creators and benefits of technology characteristics [10][47]. NeuroIS theory deals with prediction of IS-related behaviors and the design of information systems that positively affect the economic and non-economic factors of an organization [33],[51]. NeuroIS theory in technostress literature expands on the use of technology in organization to enhance the efficiency of employees by understanding their behavioral traits [42]. Theory of technology frames takes into account social networking stressors (SNS) and social networking addiction [36],[54]. It examines the behavioral changes to occur in users when they spend prolonged amount of time on social networking sites [42][13].

## V. DISCUSSION

The results of the literature analysis reveal new themes of psychological and information systems theories that are not explicitly informed by previous literature in technostress information systems research. Technostress widely describes the stress issues endured by technology on ICT users and the application of theories contribute to support the studies. So why is it that theoretical themes haven't been explored in technostress IS research? One possibility is that the science of technostress is assumed to be of empirical nature, one that is easy to be measured in a survey, and easy to interpret using a quantitative method. This guides the focus of research more towards quantitative empirical science to study and analyze conceptual based models based on those theories. The further implication of this leads to researchers developing a series of empirical studies on technostress and theoretically contributing to the field of IS, giving the least importance to qualitative literature analysis on application of theories.

The backdrop of this literature analysis is to answer two questions: Why is psychological and IS theories relevant to studies on technostress in IS literature? and how are the theories supported by the type of users and methods? The answer to the first question is that theories help to build the conceptual models that support the research question the researchers aim to explore in their study. Theories themselves have been found on a series of literature based on quantitative and qualitative empirical analysis. Theories help to support the theoretical framework the study aims to explore. These theories help to develop the relationships between entities (variables/factors) in a conceptual model. Theories in psychology and IS play a substantial role in developing and contributing to the current literature in technostress IS research.

Theories on their own can't support research goals, they need vital assistance for analysis to support the conceptual models. This leads us to answer the second question, technology users (data) and quantitative and qualitative methods support theories to create foundations for conceptual models. Data and methods help the researchers to collect and interpret data about technostress thus helping the theories to prove the relationships in the conceptual models. One implication from this literature analysis is how do we build upon, explore, and extend the use of theories in technostress IS research? How does our understanding about theories grow and develop? Even when analysis of data and examination of phenomenon reveals some unexpected findings in

technostress, it is important to supplicate theory to support the findings. Therefore, in order to address issues uncovered in this literature analysis, some recommendations for technostress IS research are offered here.

## VI. CONCLUSION AND FUTURE

There is sufficient body of literature available in technostress IS to justify the need of moving beyond purely empirical research to that which is more analytical and interdisciplinary. Most present research is either implicit theoretical or atheoretical. Even empirical, research is supported by interdisciplinary theories, data, and method. In the context of technostress, psychological theories support the literature and empirical foundation to the conceptual model. The literature analysis synthesized the results of 46 journal articles that employed theories, surveys, qualitative interviews, and quantitative statistical methods to investigate the effects of technostress in organizational setting.

In context of technostress IS research, research goal and development of a conceptual model is driven by adoption of psychological or IS theory. Thus, instigating the role of theories in contribution to the IS literature, further supporting the notion of interdisciplinary research between the science of psychology, IS, and organizational behavior. Similarly, ICT users and methods support the theories to contemplate and infer conclusion from the data. Our results demonstrate that theories play a vital role in shaping the empirical research and offer a more theoretical perspective to findings.

We recommend future empirical research should take into consideration the role of theory of computation further leading to developing an IT artifact. This could be the first-time design science research could be applied to technostress designing an artifact which can help understand the role of ICTs in developing the stress further leading to strain among the users. Second, we recommend the use of task-technology fit theory (TTF) to examine the role of technology effectiveness to develop a coping mechanism adopted by users to overcome stress while performing a task. Third, technostress in last decade has been widely examined in the science of higher education. It would be interesting to explore the role of five educational learning theories on technology users. Cognitive learning theory, Behaviorism learning theory, Constructivism learning theory Humanism learning theory, and Connectivism learning theory are the educational learning theories which examine the classroom experience for better learning environment. With the current pandemic situation remote learning has become inescapable bringing in great deal of skepticism among learners and instructors.

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