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# MITIGATING TECHNOSTRESS IN NEW KNOWLEDGE WORKERS THROUGH PERCEIVED SELF-EFFICACY

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# ABSTRACT

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The aim of this Master's Thesis is to examine the relationship between technostress and perceived self-efficacy in new knowledge workers and how it is manifested in the beginning of the employment. Technostress is the darker outcome of the widespread of technology. Since the rapid advancement of technology and its implementation in today's workplaces, technology has become a vital tool in everyday work. This increase of technology exposes new knowledge workers under a lot of stress and pressure to learn and use technologies effectively. New knowledge workers may have to learn technologies rapidly upon employment. Perceived self-efficacy has shown promising signs in estimating one's ability cope with stress in prior research. Therefore, perceived self-efficacy provides a lucrative base to research further. This research will provide new and valuable information for new knowledge worker introduction to technology. The research was conducted by first forming a literature review. After this, an empirical qualitative research was conducted using semi-structured interviews. The interviews were conducted with employees working in an international technology organization based in Finland, working in the health and wellness industry with customers in more than 40 countries. According to study, perceived self-efficacy does not have a self-explanatory relationship with technostress in new knowledge workers, but generally higher levels of perceived self-efficacy can effectively mitigate technostress in new knowledge workers. The research proposes a new model for new knowledge worker introduction to technology.

Keywords: Technostress, Perceived Self-Efficacy, New Knowledge Worker, Introduction

# TIIVISTELMÄ

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Tämän pro gradu -tutkielman tarkoitus on tarkastella teknostressin ja minäpystyvyyden suhdetta uusissa tietotyöntekijöissä, sekä kuinka tämä suhde näyttäytyy uuden työpestin aloitusvaiheessa. Teknologian nopea leviäminen on aiheuttanut haittoja, joista yksi on teknostressi. Teknologian yhä suurempi implementoiminen moderneihin työpaikkoihin on tehnyt teknologiasta yhä tärkeämmän työkalun työntekijöille. Teknologian lisääminen työpaikoissa altistaa etenkin uudet tietotyöntekijät stressille ja paineelle oppia ja käyttää näitä teknologioita tehokkaasti. Uudet tietotyöntekijät saattavat joutua opettelemaan uusien teknologioiden käyttöä hyvinkin nopealla aikataululla. Aikaisempi tutkimus on osoittanut, että minäpystyvyys pystyy mahdollisesti ennustamaan yksilön kykyä käsitellä stressiä. Tästä syystä teknostressin ja minäpystyvyyden suhdetta uusissa tietotyöntekijöissä on mielenkiintoista tutkia. Tämä tutkimus tuo uutta ja arvokasta tietoa uuden tietotyöntekijän perehdyttämisestä teknologioihin. Tutkimus toteutettiin koostamalla kirjallisuuskatsaus, jonka pohjalta toteutettiin empiirinen kvalitatiivinen tutkimus puolistrukturoituja teemahaastatteluja käyttäen. Haastattelut toteutettiin työntekijöille, jotka työskentelevät Suomesta lähtöisin olevassa kansainvälisessä teknologiaorganisaatiossa, jolla on asiakkaita yli 40:ssä maassa. Organisaatio työskentelee terveyden ja hyvinvoinnin toimialalla. Tutkimusten tulosten mukaan minäpystyvyydellä ei ole itsestään selvä suhde teknostressin vähentämiseen uusissa tietotyöntekijöissä, mutta yleisesti ottaen korkeampi minäpystyvyys pystyy tehokkaasti vähentämään teknostressiä uusissa työntekijöissä. Tutkimus esittää uutta mallia uusien tietotyöntekijöiden perehdyttämiseen teknologioihin.

Asiasanat: Teknostressi, minäpystyvyys, uudet tietotyöntekijät, perehdyttäminen

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# 1 INTRODUCTION

Technology is increasingly being implemented in people's lives. Technology has rapidly advanced and it has had presumably numerous benefits to people and organizations by raising productivity and effectiveness levels (Ayyagari et al., 2011), and allowing people to connect with each other despite time and place. However, the rapid advancement of technology and its widespread across different industries have brought perhaps unexpected new challenges to the everyday life of people and to the operations of organizations.

The nature of how people nowadays work has changed and the advancement of technology has made things such as information overload, multitasking, interruptions, constant connectivity, complex IT systems, continuous upgrades to new systems, and continuous adaptation to new workflows and applications much more frequent and part of employees' everyday life (Ragu-Nathan et al., Ayyagari et al., 2011; 2008; Tarafdar et al., 2011; Tarafdar et al., 2015; Srivastava, Chandra & Shirish, 2015; Ioannou & Papazafeiropoulou, 2017). In the current organizational environment, the nature of work is increasingly characterized as knowledge-intensive and collaborative, which requires employees to work increasingly via the use of technology (Ragu-Nathan et al., 2008). Furthermore, many employees are fearful of new technologies because they may lead to the loss of jobs either by technology replacing the job, or another person with a higher understanding of new technologies replacing the employee (Ragu-Nathan et al., 2008; Shu et al., 2011; Tarafdar et al., 2011; Tarafdar et al., 2015; Srivastava et al., 2015; Ioannou & Papazafeiropoulou, 2017). Simultaneously, these outcomes of technology advancements and their implementations to the workplace and personal lives have brought forth and increased technology-related stress in individuals (Ayyagari et al., 2011).

Technology-related stress, or technostress, describes a situation where stress is experienced by an individual because of an inability to adapt to the introduction of technology in a healthy manner (Brod, 1984; Tarafdar, Tu, Ragu-Nathan & Ragu-Nathan, 2007; Ragu-Nathan et al., 2008; Ayyagari et al. 2011; Shu et al., 2011; Tarafdar et al., 2011; Tarafdar et al., 2015; Pirkkalainen et al., 2017). Symptoms and negative consequences of technostress, such as fatigue, loss of motivation, inability to concentrate, job dissatisfaction, and employee resignations have a huge economic outcome (Ioannou & Papazafeiropoulou,

2017; Sarabadani, Carter & Compeau, 2018). They do not only affect negatively on an employee's well-being, but also impact greatly on an organization's overall performance (Ayyagari et al., 2011; Tarafdar et al., 2015). It has been estimated that workplace stress costs more than 300 billion dollars annually to businesses across the United States due to the decrease of employee productivity, absenteeism, turnover and insurance costs (American Psychological Association, 2010). The ability of humans to handle increasing amounts of information is limited, and according to Moore's law the development of computers and technology will increase, meaning that the frequency and intensity of technostress in people might just be increasing (Ragu-Nathan et al., 2008; Shu et al., 2011).

The 'context' of technostress refers to a specific type of situation in which technologies are developed or used (Tarafdar et al., 2015). 'Contextualization' of technostress includes linking the variables and relationships to specifics, such as tasks or roles (Tarafdar et al., 2015). Context-specific theoretical development focuses on the relationships between technology usage and users in different situations and thus, helps to determine how context modifies the understanding of a specific technology-related phenomenon (Tarafdar et al., 2015). Stress can be held as a context-specific phenomenon (Lazarus & Folkman 1984). This means, that different conditions, strains and situational variables are highlighted depending on the stress-creating situation under study (Tarafdar et al., 2015). Research suggests, that in order to theoretically advance our understanding of technostress, studies should focus on particular contexts and reveal insights from the use of specific technologies and applications, or from the perspective of certain roles or tasks (Ayyagari et al., 2011; Tarafdar et al., 2015). Thus, more context-specific studies are called for. Therefore, in this research, technostress is examined from the perspective of new knowledge workers. The research question is the following: (1) How does perceived self-efficacy relate to technostress in new knowledge workers, and (2) how does this relationship manifest in the beginning of the new employment?

This study will be utilizing implications from the well-known theory in the field of psychology, the Social Cognitive Theory (SCT) (Bandura, 1986, 1991), and particularly the concept of perceived self-efficacy (Bandura, 1977, 1982, 1984, 1989; Bandura & Wessels, 1997). SCT is a widely accepted theoretical framework that helps to predict individual behavior and identify various models in which behavior can be changed (Bandura, 1986, 1991; Shu et al., 2011). Self-efficacy is a highly important part of the SCT, and acts as a major predictor of an individual's task performance and has been found to have various psychological and behavioral effects in the human psychological functioning (Bandura, 1986; Bandura & Wessels 1997; Shu et al. 2011). SCT, particularly self-efficacy, is considered suitable for this study because of its proven track record in predicting individual task performance and functioning. Shortly put, self-efficacy is defined as a belief of one's capability to organize or execute certain actions (Bandura 1977, 1982, 1984, 1989; Bandura & Wessels 1997; Shu et al., 2011). Bandura (1977, 1984, 1986) can be held as the father of the concept of 'self-efficacy' and 'perceived self-efficacy', as well as a major contributor to the 'Social Cognitive Theory'. That is why this study will be referencing mostly Bandura's multiple studies on these concepts. This study is particularly looking

into technology self-efficacy (Tarafdar et al., 2015) or computer self-efficacy (Shu et al., 2011), that relates to examining one's perceived self-efficacy in performing tasks involving technology or technological difficulties.

The research will also be focusing on a specific context, new knowledge workers, which will be providing a whole new perspective to the technostress mitigation research. New knowledge workers are a subject of information overload but, to the author's best knowledge, have yet to be researched in the context of technostress. The objectives include to research what type of technostress new knowledge workers experience, and can it be mitigated with perceived self-efficacy. New knowledge workers were chosen as the study subject because in the beginning of a new job, new knowledge workers will be put through a number of different trainings and introductions to learn and adapt new technologies and applications to adapt to the organizational culture and the new job position. Many times, new knowledge workers are presented with new technological applications and ways of using technology. These new technological applications should presumably help the new employee to perform in the new job, and introducing new technological applications is associated with technostress (Ragu-Nathan, Tarafdar, Ragu-Nathan & Tu, 2008; Shu et al., 2011; Tarafdar, Tu, Ragu-Nathan & Ragu-Nathan, 2011; Tarafdar et al., 2015). This introduction of new technologies for the knowledge worker is interesting to research further. Particularly, if the worker learns how to use the technologies in a healthy manner and not become a subject the negative effects of technostress.

The study consists of a literature review, an empirical research and a discussion and conclusion. The literature review was conducted by adapting Okoli & Schabram's (2010) methodology for conducting a literature review. Two online libraries were used to seek for information: Google Scholar and AIS Electronic Library. These online libraries were chosen for three reasons: they are reliable, broad and relevant to the research. The following words and their combinations were used to find relevant references: technostress, negative effects, creators, perceived self-efficacy, self-efficacy, social cognitive theory, new knowledge workers, employees, recruits, stress, mitigating technostress, perceived control, and technology.

The empirical research was conducted by using qualitative methods, more specifically, the semi-structured interview (Hirsjärvi & Hurme, 2000). The target organization of the empirical research included a medium-sized rapidly growing international technology company based in Finland working in the health and wellness industry. The interviews were transcribed into written text and analyzed using qualitative methods. The analysis of the results was conducted by using the MAXQDA2018 software. The methods of analysis included grouping and coding.

Next the study will go through the literature review, which will form a base to the empirical research. Then the study will continue to the empirical research. This part of the study will further examine the research methodology used and go through the results. Then the study will interpret the results with a discussion part. Finally, the study will be concluded with a conclusion, including stating contributions of the study and suggestions for future research.

# 2 TECHNOSTRESS

Because of the increasing implementation of technology, it is important to understand technostress more. Existing research has relatively well established the definition of technostress, what creates it and what negative effects it causes on individuals and organizations. This chapter will go through the definition of technostress and stress, the creators and negative effects of technostress, certain attributes effecting perceived technostress defined by literature, and technostress experienced by new knowledge workers.

## 2.1 Definition

Technostress relates to technology-related stress. The term "technostress" was first used in 1984 and was defined as describing a situation of stress experienced by an individual because of an inability to adapt to the introduction of new technology in a healthy manner (Brod, 1984; Tarafdar, Tu, Ragu-Nathan & Ragu-Nathan, 2007; Ragu-Nathan et al., 2008; Ayyagari et al. 2011; Shu et al., 2011; Tarafdar et al., 2011; Tarafdar et al., 2015; Pirkkalainen et al., 2017). It relates to the inability to cope with the demands of IT use by an individual, resulting in perceived stress (Brod, 1982; Ayyagari et al. 2011; Pirkkalainen et al., 2017). Another definition highlights the negative aspects referring to the "negative impact on attitudes, thoughts, behaviors, or body physiology that is caused either directly or indirectly by technology" (Weil & Rosen, 1997, p. 30). In an organizational context, technostress is defined as stress employees experience resulting from their use of IT (Brod, 1982; Ayyagari et al., 2011; Tarafdar et al., 2015). Arnetz and Wilholm (1997) defined technostress slightly differently adding a strong dependency on technology from the organizational perspective: "state of mental and physiological arousal observed in certain employees who are heavily dependent on computers in their work" (Arnetz & Wilholm, 1997, p. 36). Technostress can be attributed to characteristics of modern IT, for example constant change and presence (Ayyagari et al., 2011; Tarafdar et al., 2015). Summarizing from the definitions presented by existing literature, there is a

clear causal IT artefact in technostress that contributes to the psychologic phenomenon of perceived stress by an individual. In this research the firstly described definition of technostress will be used (Brod, 1984; Tarafdar, Tu, Ragu-Nathan & Ragu-Nathan, 2007; Ragu-Nathan et al., 2008; Ayyagari et al. 2011; Shu et al., 2011; Tarafdar et al., 2011; Tarafdar et al., 2015; Pirkkalainen et al., 2017) as well as the definition concentrating in the organizational context (Brod, 1982; Ayyagari et al., 2011; Tarafdar et al., 2015).

It is important to distinguish the difference between technostress and other similar terms, like computer anxiety and technophobia. Computer anxiety is a concept that refers to the fear of computers when using or interacting with one (Ragu-Nathan et al., 2008; Shu et al., 2011). Technophobia or computer phobia refers to the individual being scared to use or the possibility to use technology (Ragu-Nathan et al., 2008). Technophobia is a combination of computer anxiety and negative attitudes towards computer-related interactions and technology (Ragu-Nathan et al., 2008). In contrast, technostress refers to the inability of an individual to deal with the constantly evolving IT and the changing requirements related to using them (Tarafdar et al., 2007; Shu et al., 2011). Computer anxiety and technophobia can be associated with workplace stress (Ragu-Nathan et al., 2008), but refer more to an extreme negative outcome of technostress.

## 2.2 Stress

The phenomenon of stress has been researched quite extensively, for example in the fields of psychology, sociology and medicine, and can be considered as a hypernym for technostress. Existing literature brings forth a few theories to define stress, for example, stress is defined as a state experienced by a person when there is an "environmental situation that is perceived as presenting a demand which threatens to exceed the person's capabilities and resources for meeting it, under conditions where he or she expects a substantial differential in the rewards and costs from meeting the demand versus not meeting it" (McGrath, 1976, p. 1351).

There are also additional definitions that highlight stress to stem from the relationship between person and environment. According to the cognitive theory of psychological stress, individual stress is formed from the relationship between the person and their environment, which is perceived by the person as exceeding their resources and resulting in endangering their well-being (Lazarus & Folkman, 1984; Ayyagari et al., 2011; Shu et al., 2011). Stress is comprised of stressors, that are the stimuli encountered by the individual as factors that create stress, and strain, which is the individual's psychological response to the particular stressor (Lazarus, 1966; McGrath, 1976; Cartwright & Cooper, 1997; Cooper, Dewe and O'Driscoll, 2001; Ragu-Nathan et al., 2008; Ayyagari et al., 2011; Tarafdar et al., 2015; Pirkkalainen et al., 2017). This relationship is comprehensively characterized as stress.

Two widely used and partly overlapping theories about how stress is formed are the Person-Environment Fit Model (P-E Fit) (Ayyagari et al. 2011) and Transaction-Based approach (Lazarus, 1966; McGrath 1976, Lazarus & Folkman, 1984; Cooper et al., 2001; Ragu-Nathan et al., 2008; Tarafdar et al., 2015). The P-E Fit bases itself on a premise, that people and their environment have an equilibrium relationship, and when this equilibrium is out of balance, it results in strain (Ayyagari et al. 2011). Similar to the cognitive theory of psychological stress, P-E Fit encapsulates stress as a phenomenological process concentrating on the relationship between person and environment, rather than stress emerging solely from one or the other (Ayyagari et al., 2011). More specifically, the lack of fit between the person's characteristics and the environment could lead to unmet needs or demands, that result in strain (Ayyagari et al., 2011). The theory emphasizes the subjective evaluation of the individual, i.e. how the individual perceives the situation (Ayyagari et al., 2011).

The Transaction-Based approach (figure 1) sees stress as "a combination of a stimulating condition and the individual's response to it" (Ragu-Nathan et al., 2008, p. 419). It has provided a foundation for numerous researches on stress, especially relating to stress happening at the workplace (e.g. Lazarus, 1966; Ragu-Nathan et al., 2008; Tarafdar et al., 2015). The Transaction-Based approach includes stressors and strain as stress comprising components, but additionally adds two more components to the concept of stress: stress mitigating conditions, or situational factors, and other organizational outcomes (Lazarus, 1966; McGrath 1976, Lazarus & Folkman, 1984; Cooper et al., 2001; Ragu-Nathan et al., 2008). These four components (stressors, strain, situational factors and other organizational outcomes) comprise stress from the organizational perspective according to the theory. Examples of stressors include role overload and role conflict, and strain such as disruptive behavior and dissatisfaction at work (Ragu-Nathan et al., 2008; Tarafdar et al., 2015). Situational factors include organizational mechanisms that can reduce the impact of stressors and essentially act like a buffer between stressors and strain. They include job redesign, social support and stress management training (Ragu-Nathan et al., 2008; Tarafdar et al., 2015). Other organizational outcomes explain outcomes that can be caused by strain at work (Ragu-Nathan et al., 2008). For example, job dissatisfaction is a strain variable which can cause absenteeism in the workplace, which is an organizational outcome.

Typically, stressors create and increase strain, and situational factors, or inhibiting factors, decrease strain. Strain can ultimately lead to other organizational outcomes. Furthermore, situational factors can influence and decrease other organizational outcomes. Situational factors, such as technical support and literacy facilitation (Ragu-Nathan et al., 2008), also have a moderating influence on the relationship between stressors and strain.

According to Ragu-Nathan et al. (2008), technostress can be analyzed and considered as a conceptual enhancement to the existing theoretical frameworks of stress literature when it comes to the organizational context. Typical stressors in the concept of stress are similar to the stressors in the concept of technostress. Stressors in the concept of stress from the organizational perspective include, for example, role ambiguity, role overload and task difficulty. Typical stressors

of technostress in the organizational context include, for example, techno-uncertainty, techno-overload and techno-complexity. Role ambiguity is similar to techno-uncertainty, because both involve situations which include ambiguity about expectations and outcomes associated with the particular stress creating condition. Role overload is similar to techno-overload, because both include changed or increased demands on an individual as a result of stress creating condition. Task difficulty is similar to techno-complexity, because both involve a change in conditions that an individual has difficulty to understand. (Ragu-Nathan et al., 2008).

Thus, the concept of technostress can be analyzed in the terms of stress. Therefore, this research will apply the Transaction-Based approach to the concept of stress, because of its validated references in technostress research and its contributions to the research conducted from the organizational perspective (e.g. Lazarus, 1966; Ragu-Nathan et al., 2008; Tarafdar et al., 2015). This research will be also focusing on the psychological perception of stress in individuals, rather than, for example, physiological stress. Additionally, the research will focus on the negative sides of stress, or distress, rather than positive stress, or eustress. Eustress refers to the positive appraisal of stress and is associated with rising up to a challenge or opportunity that has the potential to benefit the individual by offering personal growth or gain (Cooper et al., 2001; Crawford, LePine & Rich; 2010; Tarafdar, Cooper & Stich, 2019).

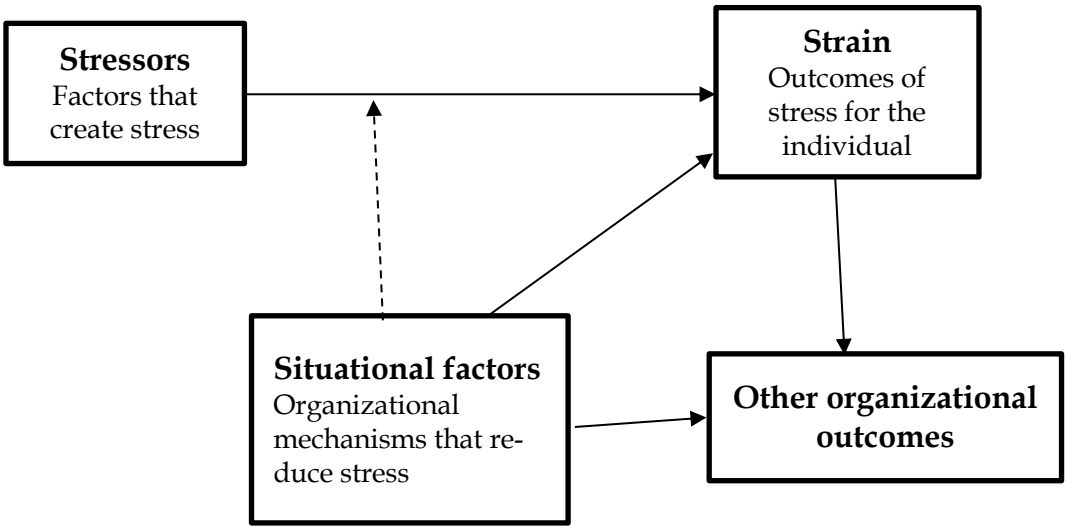


FIGURE 1. Transaction-Based approach to stress (adapted from Ragu-Nathan et al., 2008)

## 2.3 Technostress Creators

Rapidly advancing IT has its negative effects. Constantly introducing new technological applications to the workplace are the source of technostress within employees (Rahu-Nathan et al., 2008; Shu et al., 2011; Ioannou &

Papazafeiropoulou, 2017). Additionally, globalization and the intensive competition between businesses has resulted in lean organization cultures, which praise people who work hard, spend long hours at the office, and are constantly connected to IT (Ayyagari et al., 2011). Technostress creators, or stressors, can be categorized into five different categories. They are techno-overload, techno-invasion, techno-complexity, techno-insecurity and techno-uncertainty (Ragu-Nathan et al., 2008; Tarafdar et al., 2011; Tarafdar et al., 2015; Srivastava et al., 2015; Ioannou & Papazafeiropoulou, 2017). These five categories try to comprehensively describe the different the situations which can create technostress.

Techno-overload is a result of the increasing use of IS that forces employees to work more and faster. Certain technologies, like mobile devices and social and collaborative applications, allow individuals to process information constantly and in real-time. This ultimately results in information overload, interruptions and multitasking. Information overload describes the situation when individuals are exposed to more information than they are capable of handling, which results in information fatigue. Individuals may be devouring information from multiple sources resulting to information fatigue, which disrupts deep thinking, and thus diminishes innovation and creativeness. Interruptions, such as email notifications, may disturb and pressure the individual to attend to the information as soon as it arrives. This creates anxiety and disconnection of workflow resulting in difficulties in sustaining mental attention. Multitasking refers to employees simultaneously working on multiple applications and tasks, trying to be more efficient by doing more in less time, creating experienced tension. (Ragu-Nathan et al., 2008; Tarafdar et al., 2011; Tarafdar et al., 2015).

Techno-invasion refers to situations where individuals feel the need to be constantly reachable and connected. Individuals can be reached anywhere and at any time. Being constantly connected intrudes into personal time and space extending to after work hours, including vacations, blurring the lines between work and home. (Ragu-Nathan et al., 2008; Tarafdar et al., 2011; Tarafdar et al., 2015). This results to a work-home conflict, which significantly increases stress and frustration, thus resulting in strain on individuals (Ayyagari et al., 2011; Tarafdar et al., 2015).

Techno-complexity is associated with individuals being forced to learn and understand new technologies and applications. The complexity and steep learning curves associated with technology requires professionals to invest time and effort to fully learn the new technology. Technology has become more complex and might take months to learn. Additionally, the system problems and errors associated with technology increase perceived stress by individuals. (Ragu-Nathan et al., 2008; Tarafdar et al., 2011; Tarafdar et al., 2015).

Techno-insecurity is a result of employees feeling insecure about their job positions because of their limited understanding of constantly evolving technologies. The insecurity is felt due to the fear of losing their jobs to people with better understanding of the new IT. As the knowledge-requirements in technology increase, it is common to find new recruits equipped with a higher technological cognizance to enter the workplace. Thus, existing employees may be

cynical towards technology. (Ragu-Nathan et al., 2008; Tarafdar et al., 2011; Tarafdar et al., 2015).

Techno-uncertainty refers to the situations where continuous changes and upgrades in technology at the workplace creates frustration and anxiety among employees. Employees may feel that they do not have the chance to learn and develop experience towards the particular systems. Continuous changes eventually lead to employees' knowledge becoming obsolete. Even though learning new applications may at first be exciting, constant changing knowledge-requirements eventually lead to frustration and anxiety. (Ragu-Nathan et al., 2008; Tarafdar et al., 2011; Tarafdar et al., 2015).

All of the technostress creating conditions are summarized in table 1.

| Technostress creating condition | Refers to |
|---|---|
| **Techno-overload** | Inability to handle the flood of information resulting in an overwhelmed state. |
| **Techno-invasion** | Urge of being constantly connected and reachable through technology resulting in intrusion of personal time and space. |
| **Techno-complexity** | Investment of time and resources to learn and master the complexity and steep learning curves associated with technology. |
| **Techno-insecurity** | Fear or threat of losing job due to other individuals' better understanding of technology resulting in cynicism towards technology. |
| **Techno-uncertainty** | Unsettling feeling brought by constant changes and upgrades of technology resulting in feeling of frustration and anxiety. |

TABLE 1. Technostress creating conditions (Ragu-Nathan et al., 2008; Tarafdar et al., 2011; Tarafdar et al., 2015)

Additionally, Ayyagari et al. (2011) defines the most dominant creators of technostress to be work-overload and role ambiguity. Ayyagari's et al. (2011) definition of work-overload, the perception that assigned work exceeds the capability or skill level of an employee, overlaps with the concepts of techno-overload and techno-complexity (Ragu-Nathan et al., 2008; Tarafdar et al., 2011; Tarafdar et al., 2015). Work-overload includes peoples' perception of their capabilities to be limited towards new technology, relating to techno-complexity, and that con-

stant connectivity increases workflow speed leading to individuals being unable to process all the information provided by technology (Ayyagari et al., 2011), relating to techno-overload. Furthermore, Ayyagari's et al. (2011) definition of role ambiguity, the unpredictability of one's role performance and the consequences related to that and the lack of information needed to perform the role, overlaps with techno-overload as well and techno-invasion (Ragu-Nathan et al., 2008; Tarafdar et al., 2011; Tarafdar et al., 2015). Role ambiguity includes individuals to be constantly connected and being disturbed by interruptions that result in a level of ambiguity to what information to respond to and in what order (Ayyagari et al., 2011), relating to both techno-overload and techno-invasion.

Literature also defines other stress creators, such as work-home conflict and job insecurity, which follow work-overload and role ambiguity but did not turn out to be as dominant (Ayyagari et al., 2011; Tarafdar et al., 2015). As referred to before, work-home conflict describes the situation when the boundaries between work and family are blurred resulting in increased stress (Ayyagari et al., 2011; Tarafdar et al., 2015). This refers to constant connectivity, which can be related to techno-overload and techno-invasion. Job insecurity describes the situation where technological change generates concern over job security in employees (Ayyagari et al., 2011; Tarafdar et al., 2015), which relates to techno-insecurity.

Thus, it can be stated that, as work overload and role ambiguity are the most dominant stressors related to work, techno-overload, techno-invasion and techno-complexity can be held as dominant stressors related to technology as well. Constant connectivity proved to be a major contributor to the different concepts of technostress creators, contributing to techno-overload, techno-invasion, work overload, role ambiguity and presenteeism. Constant connectivity has been associated with high dependency of technology, and when dependence on technology is high, perceived technostress may increase (Shu et al., 2011). High dependency is again associated with the constant introduction of new technology (Shu et al., 2011). Constant introduction of new technologies requires individuals to develop new skills for work, resulting in techno-complexity and techno-uncertainty. Additionally, failures and trouble are related to the introduction of new technologies, which results in technology overload in employees (Shu et al., 2011).

Overall, technostress creators are the result of rapidly evolving IT, and implementing these new technologies in the workplace, which forces employees to constantly adapt to changing requirements and may cause high dependency in technology (Shu et al., 2011; Ioannou & Papazafeiropoulou, 2017).

## 2.4 Technostress Negative Effects on Individuals

Technostress causes numerous negative effects on individuals. Negative effects include psychological, cognitive and physical reactions, and negative attitudes towards technologies (Ragu-Nathan et al., 2008). The psychological factors as-

sociated with stress include fear, anxiety, resistance, reduced concentration-span, increased irritability and the feeling of loss of control. (Shu et al., 2011; Tarafdar et al., 2011). Physical impacts include fatigue, headache, restlessness, irritability (Arnetz & Wilholm, 1997; Tarafdar et al., 2015) and increase of stress hormones, such as alpha amylase (Tarafdar et al., 2019). Some studies have linked high amounts of stress to poor physical and mental health (Keller et al., 2012), as well as depression (Sprigg & Jackson, 2006). Additionally, individuals who perceive that they experience a lot of stress suffer from an increased risk of premature death (Keller et al., 2012).

Some negative effects that an individual may experience in the workplace-context include disruptive behavior, dissatisfaction at work, lack of job involvement, poor job performance, ambiguity about job demands, reduced well-being, absenteeism, increased strain, burnout and exhaustion, reduced innovation ability (Ragu-Nathan et al., 2008; Ayyagari et al., 2011; Tarafdar et al., 2011; Galluch, Grover & Thatcher, 2015; Tarafdar et al., 2015; Pirkkalainen et al., 2017; Tarafdar et al., 2019), and unwilling compliance (Barber & Santuzzi, 2015) or noncompliance (D'Arcy, Herath & Shoss, 2014) of technology use requirements set by organization, such as quick e-mail response.

Summarizing the most common negative effects that occur in the work-place-context, the negative effects can be categorized into seven different outcomes: role overload, role conflict, reduced job satisfaction, decreased innovation in tasks involving IS (Information Systems), reduced productivity while using IS in tasks, dissatisfaction with the used IS, and reduced commitment of individuals to their organizations' goals and values (Ragu-Nathan et al., 2008; Tarafdar et al., 2011; Ioannou & Papazafeiropoulou, 2017; Sarabadani et al., 2018). These effects lead to lower performance and a higher likeliness of resignation from current job (Ioannou & Papazafeiropoulou, 2017; Sarabadani et al., 2018). Additionally, technostress may inhibit further learning or use of IT (Shu et al., 2011).

### 2.4.1 Categorization of Negative Effects

Role overload refers to employees experiencing a role-related overload, which describes employees perceiving their work to be too much or too difficult (Tarafdar et al., 2011). When comparing to the light of earlier defined technostress creating stressors, techno-complexity, techno-uncertainty and techno-overload are the main creators of role overload (Ragu-Nathan et al., 2008; Tarafdar et al., 2011; Ioannou & Papazafeiropoulou, 2017; Sarabadani et al., 2018). For example, putting forth a greater effort to understand and use the technology due to techno-complexity, repeatedly implying this effort because of the technology-related changes due to techno-uncertainty, and the feel of being forced to process more information and do more in less time due to techno-overload, all enhance the feeling of role overload.

Role conflict refers to the contradictions that technology may increase, relating to ambiguity of a specific role. Technostress creators enhance the contradictions. For example, techno-invasion enhances role conflict by potentially ex-

tending office hours to after work as well, creating a conflict with work and home roles. When it comes to techno-uncertainty, it may create role conflict when technologies are frequently changed and the employee may not agree with the new applications. Techno-insecurity may create role conflict when employees may feel that they have to learn new skills in order to feel secure about their jobs, even though these new skills may conflict with existing ones. (Tarafdar et al., 2011).

Reduced job satisfaction among employees is a common outcome of technostress (Ragu-Nathan et al., 2008; Tarafdar et al., 2011; Ioannou & Papazafeiropoulou, 2017; Sarabadani et al., 2018). For example, the complexity and constant upgrades in IT may make the employee feel anxiety, leading to job dissatisfaction. Employees who are trying to cope with technostress creators are more likely to hold negative attitudes of their jobs (Tarafdar et al., 2011).

Decreased innovation within job tasks while using IS relates highly to techno-overload and techno-complexity. The overload of information and the hurried information processing resulting from it, leaves less time and space for imaginative and innovative thinking, and come up with ways to accomplish work using technology. The swamping and constant devouring of information available ignores the deep thinking necessary for innovative and creative thinking. Also, the unwillingness or inability to learn technology due to techno-complexity cripples innovation to perform technology-mediated tasks. (Tarafdar et al., 2011).

Reduced productivity while using IS in work relates to techno-complexity, techno-uncertainty and techno-overload. Complex technology forces employees to keep updating their knowledge, which relates to mistakes been done, thus lowering productivity. The ever-changing technology results in uncertainty among employees when using new systems, and due to this, they might require technical support. Time taking to learn the new system is time taken away from technology-mediated work tasks. The overload of information inevitably includes also unimportant information, which an employee will go through, which again results to wasted time to unnecessary things. (Tarafdar et al., 2011).

Dissatisfaction with the IS used relates to techno-overload, since useful information is increasingly harder to recognize. It also relates to techno-invasion, since many users may experience the technology as privacy depriving. Techno-complexity may relate to users feeling overwhelmed and intimated towards the technology. Techno-uncertainty may result in system crashes and loss of data, which ultimately creates dissatisfaction with systems and applications among employees. Technostress can reduce the likeliness of the success in new technology implementation, because the success is highly dependent on user satisfaction. (Tarafdar et al., 2011).

Reduced commitment of employees' organizations' goals and values is a more radical outcome of technostress. It is indirectly created by all of the technostress creating conditions. Both job dissatisfaction and the lack of organizational commitment may lead to resignation and thus, to substantial costs to an organization (Ragu-Nathan et al., 2008; Tarafdar et al., 2011; Ioannou & Papazafeiropoulou, 2017; Sarabadani et al., 2018).

The negative effects of technostress and by what technostress creating conditions they are created by are summarized in table 2 below.

| Negative effects of technostress | Created by |
|---|---|
| **Role overload**<br><br>(Tarafdar et al., 2011) | Techno-complexity, techno-uncertainty, techno-overload<br><br>(Ragu-Nathan et al., 2008; Tarafdar et al., 2011; Ioannou & Papazafeiro-poulou, 2017; Sarabadani et al., 2018) |
| **Role conflict**<br><br>(Tarafdar et al., 2011) | Techno-invasion, techno-uncertainty, techno-insecurity<br><br>(Tarafdar et al., 2011) |
| **Reduced job satisfaction**<br><br>(Tarafdar et al., 2011) | Techno-complexity, techno-uncertainty<br><br>(Tarafdar et al., 2011) |
| **Decreased innovation in job tasks involving IS**<br>(Tarafdar et al., 2011) | Techno-overload, techno-complexity<br><br>(Tarafdar et al., 2011) |
| **Reduced productivity while using IS**<br><br>(Tarafdar et al., 2011) | Techno-complexity, techno-uncertainty, techno-overload<br><br>(Tarafdar et al., 2011) |
| **Dissatisfaction with the IS used**<br><br>(Tarafdar et al., 2011) | Techno-overload, techno-invasion, techno-complexity, techno-uncertainty<br><br>(Tarafdar et al., 2011) |
| **Reduced commitment to goals and values**<br><br>(Tarafdar et al., 2011) | Techno-overload, techno-invasion, techno-complexity, techno-insecurity, techno-uncertainty<br><br>(Ragu-Nathan et al., 2008; Tarafdar et al., 2011; Ioannou & Papazafeiro-poulou, 2017; Sarabadani et al., 2018) |

TABLE 2. Negative effects of technostress

### 2.4.2 Influence of Individual Characteristics and Personality Traits

The intensity and frequency of which an individual experiences technostress depends on certain individual characteristics and personality traits. Especially the individual characteristics of gender and computer confidence have shown to play a major influence (Ragu-Nathan et al., 2008; Tarafdar et al., 2011; Tams, Thatcher & Grover, 2018). Studies have shown that men experience more

technostress than women (Tarafdar et al., 2011). Generally, women find technology harder to use than men, but women tend to use technology when it is absolutely needed (Tarafdar et al., 2011). Men, on the other hand, are more prompt to use technology voluntarily, exposing them to more frequent technostress creating opportunities (Tarafdar et al., 2011). Computer confidence describes the level of confidence, or self-efficacy, an individual has towards using technology. Individuals with greater computer confidence experience less technostress than individuals with low computer confidence, because they tend to have a stronger belief in their personal ability to use technology and handle stressful tasks or situations related to technology (Ragu-Nathan et al., 2008; Tarafdar et al., 2011; Tams et al., 2018).

Other individual characteristics, such as age, education and experience, have a minor influence. Older people tend to experience less technostress, because of their better ability to handle stress in general and their experience with technology-related changes (Tarafdar et al., 2011). This is especially interesting, because one might think that younger individuals would experience less technostress due to their characteristic of generally having better ability to use new technologies. Also, older employees might have greater power at the workplace, resulting to having more freedom to choose the amount of using IT in their work tasks, resulting to perceiving less technostress (Tarafdar et al., 2011). However, another study has brought forth the contrary, implying that older people experience more technostress because of their increased dependence on attentional amplification when using technology, which potentially increases mental workload and consumes resources (Tams et al., 2018). The study presented that older people experience more technostress because of mainly three reasons: their inhibitory effectiveness against technostress is not as strong as younger people's, they have lower levels of computer experience, and they have lower levels of computer self-efficacy (Tams et al., 2018). Thus, age is a controversial matter and can influence in one way or another. One possible explanation for the different results regarding age is the possible different research context in the studies. Age's relation to technostress is thus dependent on the context.

Individuals with higher education tend to experience less technostress because of their higher likeliness of being exposed to computers and technology in general (Tarafdar et al., 2011). They are more likely to have used technology in obtaining their higher education. Also, individuals with more experience with computers and technology experience less technostress, because they are more familiar with them and have more likely experienced different changes, upgrades, and evolution of technology (Tarafdar et al., 2011; Tams et al., 2018). Individuals with higher computer experience tend to cope better with technology-mediated interruptions by not perceiving interruptions as stressful on mental workload (Tams et al., 2018). They are also more likely to have more experience on how organizations react and implement new technology (Tarafdar et al., 2011). Thus, they are better at handling technostress as well.

There has been a study also presenting that different human personality traits in individuals have an effect on how strongly individuals experience technostress. Srivastava et al. (2015) presents that personality traits effect how

organizational stress is experienced and different coping mechanisms are adopted. Difference in experienced stress and coping mechanisms help explain the different negative effects people experience (Srivastava et al., 2015). This may have a significant impact from a recruiting point-of-view, when considering high stress jobs, and the influence of an applicant's personality traits (Srivastava et al., 2015).

The study found that there are four different personality traits that have a relationship on how technostress is experienced and mitigated: openness to experience, neuroticism, agreeableness, and extraversion. Openness to experience includes curiosity, imaginativeness, adaptability and a general more acceptive attitude towards peculiar experiences. Openness to experience has a positive effect on technostress mitigation and increases job engagement in technostress creating conditions. Neuroticism refers to high anxiousness, insecurity and hostility. Individuals with high neuroticism tend to be embarrassed, depressed and anxious, as well as feel negative emotions when faced with change. Agreeableness implies increased empathy, friendliness and helpfulness. Additionally, people high in agreeableness perceive sustaining human relationships as more important. Agreeableness negatively effects technostress mitigation and increases the risk of job burnout in technostress creating conditions. Extraversion is associated with increased sociability, energy, spontaneity, and higher tendency to confidence and happiness. Extraversion positively effects technostress mitigation and increases the risk of job burnout in technostress creating conditions. (Srivastava et al., 2015).

Individual characteristics and personality traits have an effect on how technostress is experienced in organizations. Individual differences matter and should be considered in organizations when reflecting on the effects of technostress on individuals. In the table below (table 3), the influence of individual characteristics and personality traits on technostress mitigation are summarized.

| Variable | Influence on technostress mitigation |
|---|---|
| **Individual characteristics:** | |
| - Gender | Men are more capable of mitigating technostress, but experience more technostress than women (Tarafdar et al., 2011). |
| - Computer confidence | Higher computer confidence positively influences technostress mitigation (Ragu-Nathan et al., 2008; Tarafdar et al., 2011; Tams et al., 2018). |
| - Education | Higher education positively influences technostress mitigation (Tarafdar et al., 2011). |
| - Age | Higher age can positively (Tarafdar et al., 2011) or negatively (Tams et al., 2018) influence technostress mitigation. |

| | |
|---|---|
| - Experience | Higher experience positively influences technostress mitigation (Tarafdar et al., 2011; Tams et al., 2018) |
| **Personality traits:** | |
| - Openness to experience | Positively influences technostress mitigation (Srivastava et al., 2015). |
| - Neuroticism | Negatively influences technostress mitigation (Srivastava et al., 2015). |
| - Agreeableness | Negatively influences technostress mitigation (Srivastava et al., 2015). |
| - Extraversion | Positively influences technostress mitigation (Srivastava et al., 2015). |

TABLE 3. Individual characteristics and personality traits influencing technostress mitigation

## 2.5 Technostress and New Knowledge Workers

New employees are crucial for organizations. They can be a source of growth or a way to increase competence in the organization. The importance of human capital in today's organizations cannot be undermined. However, the retention of a new employee is dependent on job performance and organizational commitment (Allen & Shanock, 2013), both which can be largely affected negatively by technostress (Ragu-Nathan et al., 2008; Ayyagari et al., 2011; Tarafdar et al., 2011; Galluch et al., 2015; Tarafdar et al., 2015; Pirkkalainen et al., 2017). Additionally, entering a new organization is associated with uncertainty, anxiety and reality shock (Allen & Shanock, 2013). A study has shown, that employee turnover is often the highest during the first year of a new (Allen & Shanock, 2013). Thus, making employee onboarding for new knowledge workers as effortless as possible is particularly important. Also, the cost of a new employee can be relatively high. For example, a study conducted in Germany found that a cost of hiring a new apprentice is about 600€ but can largely vary depending on the job position (Wenzelmann, Muehlemann & Pfeifer, 2017). Thus, employee retention can be regarded as important for the organization.

Knowledge work is intensive. It requires the processing of many different types of information, often simultaneously, to be able to adapt to constantly changing situations and technologies (Neiswander & Lind, 2012). While organization constantly introduce new technologies, people take time and effort to keep up with the latest software and hardware (Shu et al., 2011). Additionally, new technologies in general are associated with relatively long learning curves (Tarafdar et al., 2011). New recruits might have to learn multiple new techno-

logical applications, such as company internal communication system, a new CRM, and content creation software, in a relatively short period of time. This puts them into the risk of role overload, role conflict, reduced job satisfaction, decreased innovation in tasks involving IS, reduced productivity while using IS in tasks, dissatisfaction with the used IS, and reduced commitment to their organizations' goals and values. Given that employee turnover is the highest during the first year of work, the sheer number of new technological applications introduced, the long learning curves of technology, and the negative reactions associated with starting a new job position, anxiety, uncertainty and reality shock, it is increasingly important to learn how to mitigate technostress negative effects on new recruits. Especially the technostress negative effects of reduced commitment to organization and job dissatisfaction which can lead to job resignation (Ragu-Nathan et al., 2008; Tarafdar et al., 2011; Ioannou & Papazafeiropoulou, 2017; Sarabadani et al., 2018).

Perceived organizational support and job embeddedness are crucial for employee retention and increasing organizational commitment in employees (Allen & Shanock, 2013). A way of providing organizational support, is to alleviate technostress via organizational mechanisms. Providing literacy facilitation, technical support provision, technical involvement facilitation, and innovation support through mastery and vicarious experiences, social persuasion, and psychological arousal in order to provide organizational support, alleviate technostress and create perceived self-efficacy in new knowledge workers is lucrative to research, to say the least.

# 3 PERCEIVED SELF-EFFICACY

This chapter will go through the second key concept of this research, perceived self-efficacy. The chapter will start of by defining the concept of perceived self-efficacy, then going through the processes of which self-efficacy is portraited on individuals, and lastly defining the circumstances creating perceived self-efficacy.

## 3.1 Definition

The term self-efficacy was introduced in 1977 (Bandura, 1977) and has since been widely accepted. Perceived self-efficacy refers to "people's beliefs on their capabilities to exercise control over their own level of functioning and over events that affect their lives" (Bandura, 1991, p. 257) (Bandura, 1977, 1982, 1984, 1986, 1989; Bandura & Wessels, 1997; Stajkovic & Luthans, 1998; Ajzen, 2002; Shu et al., 2011; Campbell & Nolan, 2019; Latikka, Turja & Oksanen; 2019; Zhang & Ardasheva, 2019). Self-efficacy has an influence on how people act. It affects making choices, the effort people put forth, how long people persist when confronted with an obstacle, and how people feel (e.g. Bandura, 1977, 1984). The concept of self-efficacy has been used in various different fields and contexts, such as predicting language skills (Zhang & Ardasheva, 2019), robot use within welfare services (Latikka et al., 2019), and predicting the effect of yoga classes to creating self-efficacy in pregnancy (Campbell & Nolan, 2019).

Self-efficacy later became part of the Social Cognitive Theory (SCT) (Bandura, 1986, 1991), which can be considered as a hypernym for self-efficacy. SCT specifies different psychological factors, that determine human action, predict individual behavior and identify methods in which human behavior can be modified (Bandura, 1986, 1991; Stajkovic & Luthans, 1998; Shu et al., 2011). From an organizational perspective, SCT defines basic human capabilities through which humans operate to initiate, execute and maintain organizational behavior (Bandura, 1986; Stajkovic & Luthans, 1998). SCT can be considered as a "theoretical framework for analyzing human motivation, thought and action"

(Bandura, 1986, p.2001). Self-efficacy is one of the psychological factors and a major determinant in SCT. It predicts an individual's task performance and has many different psychological and behavioral effects in human psychological functioning (Bandura, 1977, 1982, 1984, 1989; Bandura & Wessels, 1997; Stajkovic & Luthans, 1998; Ajzen, 2002; Shu et al., 2011; Zhang & Ardasheva, 2019), also relating to perceived stress in individuals (Shu et al., 2011; Tarafdar et al., 2015).

Specifically, perceived self-efficacy involves people's beliefs in their capabilities to affect the environment and control their actions in ways that produce desired outcomes. People tend to evaluate, weigh and integrate information about their perceived capabilities, before making choices and initiating their effort. If, however a person believes that their ability, or perceived self-efficacy, is not sufficient to perform a certain task, they might initiate some kind of coping mechanism. (Bandura, 1977, 1982, 1984, 1989; Bandura & Wessels, 1997; Stajkovic & Luthans, 1998; Zhang & Ardasheva, 2019). For example, an employee stumbles upon a task that they perceive is out of their capability to perform. The employee might in this case initiate a coping mechanism, i.e. a way to cope with the fact that they believe they are not capable of performing the task, which can be for example, rejecting the task completely.

It is important to differentiate perceived self-efficacy from similar concepts, such as self-regulation and self-control. Self-regulation, similarly to self-efficacy, is also part of SCT (Bandura, 1986, 1991). While self-efficacy focuses on the individual's belief of their own capabilities to perform a certain task, self-regulation and self-control refer to different things. Self-regulation focuses on the individual's capability of exercising influence over their own motivation and behavior (Bandura, 1986, 1991). It forms a basis for purposeful action by implying that people possess self-reflective and self-reactive capabilities that enable individuals to exercise influence over their own feelings, thoughts, actions and motivation (Bandura, 1986, 1991). Self-control refers to the capability of altering one's own responses to match them with one's standards, such as values, social expectations, and morals, to support long-term goals (Baumeister, Vohs & Tice, 2007). It differs from self-regulation, for example, by being associated with deliberate and conscious efforts, such as being able to restrain and override one's response (Baumeister, et al., 2007).

This study will be focusing in the research area of technology, so it is relevant to define perceived self-efficacy in this context. The term 'technology self-efficacy' will be used to focus the concept of self-efficacy towards technology. Technology self-efficacy refers to the belief of one's capability to use technology (Compeau & Higgins, 1995; Shu et al., 2011; Tarafdar et al., 2015). Research has also used the term computer self-efficacy (Compeau & Higgins, 1995; Shu et al., 2011), but to be more consistent with the terminology used in this study, the term technology self-efficacy will be used.

## 3.2 Processes of Self-Efficacy

So far, it has been established that self-efficacy beliefs determine the ways people think, motivate, feel and behave themselves. Self-efficacy beliefs determine these effects on people through four major processes: cognitive, motivational, affective and selection processes. Cognitive processes are thinking processes that involve the acquisition, organization and use of information. People's belief in their self-efficacy shapes their thoughts and how they anticipate scenarios. People with higher self-efficacy beliefs visualize more positive scenarios where they are successful, which will support performance. Conversely, people with low self-efficacy beliefs visualize failures and are more doubtful about their performance in different scenarios. Therefore, the cognitive thinking process may have a substantial effect on people's lives. Such processes include processing information that contains many ambiguities and uncertainties, weighing different predictive factors and adjusting judgements on previous experiences. (Bandura, 1984, 1986, 1989; Bandura & Wessels, 1997).

Motivational processes act as activators to action. Motivation is mostly cognitively generated, and the amount of motivation generated is largely affected by the beliefs of what the individual perceives that they are capable of doing. The level of motivation is then reflected through the course of action the individual chooses, as well as the intensity, persistence of effort and how they react with to failures. People who perceive themselves with high self-efficacy, attribute their failures with insufficient effort and are more likely to try again with greater effort. People with low self-efficacy will attribute their failures with low ability, and will thus, be much less likely to master the challenge. (Bandura, 1984, 1986, 1989; Bandura & Wessels, 1997).

Affective processes regulate the emotional states and the level of emotional reactions. Affective processes play a central role on how people generate anxiety when facing stressors. People with high self-efficacy beliefs can perceive to have control over threats and challenges and will be less likely to generate anxiety. People with low self-efficacy beliefs can believe that they cannot manage these challenges and perceive high anxiety. This is because people with low self-efficacy concentrate and magnify the severity of threats and worry more about things that are unlikely to occur, which may result in distress and impaired level of functioning. The difference between people perceiving high and low self-efficacy is not the frequency of disturbing thoughts, but the ability to turn them off. Inability to do this can lead to stress and depression. (Bandura, 1984, 1986, 1989; Bandura & Wessels, 1997).

Selection processes include the general selections people make in their lives, for example, which types of activities and environments people get involved. People naturally avoid tasks and situations they perceive exceeding their coping capabilities, but gladly undertake activities they find challenging but not exceeding their coping abilities. This can ultimately have a significant effect on the course of life, what direction it may take, and what kind of interests, competencies and social networks people gather. People operating in selected environments have certain social influences in this environment that

promote certain competencies, values and interests, even after the self-efficacy determinant has rendered its effect. Therefore, selection processes have a great impact on personal development and course of life. (Bandura, 1984, 1986, 1989; Bandura & Wessels, 1997).

Cognitive, motivational, affective and selection processes are the four ways that self-efficacy beliefs are showcased on an individual. Self-efficacy beliefs can be described as the source, which are then transferred through these four processes as certain types of effects on an individual. Ultimately having an effect on a larger environment, such as an organization, and network where the individual is operating in.

## 3.3 Creators of Perceived Self-Efficacy

In order to further research perceived self-efficacy's effects, it is important to define how can perceived self-efficacy be created in individuals. Perceived self-efficacy springs from four main sources of influence: mastery experiences, vicarious experiences, social persuasion, and psychological arousal (Bandura, 1989; Bandura & Wessels, 1997; Stajkovic & Luthans, 1998; Campbell & Nolan, 2019; Zhang & Ardasheva, 2019). From these four sources mastery experiences are the most effective way of creating strong self-efficacy (Bandura, 1984, 1989; Bandura & Wessels, 1997; Stajkovic & Luthans, 1998).

Firstly, mastery experiences describe successes in challenging tasks. An individual will face certain challenges in their life and the better they succeed from these challenges, the stronger the mastery experience and more significant the effect on self-efficacy beliefs. Successes build on the individual's self-efficacy beliefs, and failures undermine it, especially if the individual has not yet established a firm sense of self-efficacy. However, if an individual experiences only easily accomplished successes, the effect of failures will be stronger. Therefore, it is important for the individual to overcome obstacles through perseverant effort, and some setbacks in the pursuit of success serve a useful purpose teaching that success usually requires a certain level of effort. After individuals have formed strong self-efficacy beliefs, they persevere when adversity is faced and are able to quickly rebound from difficulties. (Bandura, 1984, 1989; Bandura & Wessels 1997; Stajkovic & Luthans, 1998).

A change in self-efficacy beliefs will depend on previous experiences and how the individual processes the information from these experiences. An individual process' this information through two evaluation criteria: situational factors and conception of ability. Situational factors include, for example, resources available to perform the task, physical distractions, type of supervision, and the amount of external aid received. Conception of ability includes whether the individual evaluates the performance to require a certain ability that can be learned or that is a given entity. If the individual evaluates that the ability is acquirable, they tend to spend more time analyzing the task and are less prone to failures. The reason behind the effectiveness of mastery experiences is because of the direct performance information it provides for more stable and ac-

curate efficacy judgements. (Bandura, 1984, 1989; Bandura & Wessels, 1997; Stajkovic & Luthans, 1998). Mastery experiences, according to SCT, have been described as the principal means to personality change (Bandura, 1984, 1986; 1989, 1991).

Secondly, vicarious experiences, or vicarious learning, describe the process of creating self-efficacy through social models. Seeing people similar to oneself succeed in certain tasks strengthens the belief that one is also capable of mastering similar activities. Conversely, seeing other people fail despite perseverant effort will also undermine one's own self-efficacy beliefs and level of perseverance. Additionally, the higher the perceived similarity of the observed individual, the stronger the influence on one's perceived self-efficacy. People who are perceived as having a low perceived similarity to oneself will have little effect on one's self-efficacy beliefs. However, people who may not be too similar but possess the competencies that one aspires, transmit and teach the observer skills and strategies for managing challenges. Acquiring these skills taught by these models raises perceived self-efficacy. (Bandura, 1984, 1989; Bandura & Wessels, 1997; Stajkovic & Luthans, 1998). This mimicking of models can be utilized in the workplace, for example, through structured employee training programs to enhance self-efficacy in employees. In principle, the training program provides a mastery experience. (Stajkovic & Luthans, 1998).

Thirdly, social persuasion refers to a way of strengthening individuals' beliefs that they have what it takes to be successful. When people are socially persuaded that they possess the capabilities to perform certain tasks, they are more likely to persevere and sustain a greater effort. When this social persuasion has led the individual to give a greater effort, and the greater effort has led to a successful outcome, the level of perceived self-efficacy will rise. Social persuasion is a fine art, because if a person is socially persuaded unrealistically and this leads to a disappointing result, self-efficacy beliefs are in a risk to lower. An individual should already have a reason to believe that they have the ability to complete the task prior to the social persuasion. Also, negative social persuasion, the persuasion that an individual lacks the capabilities to perform a certain task, have a negative effect on perceived self-efficacy as the individual is more likely to avoid challenging tasks and not give a persistent effort when faced with difficulties. Successful self-efficacy building relies on situations where people are likely to succeed and avoids situations where people are put prematurely to perform tasks that they are likely to fail. (Bandura, 1984, 1989; Bandura & Wessels, 1997; Stajkovic & Luthans, 1998). Social persuasion works best in situations where an individual is having difficulties to perform a task and may be doubting their capabilities (Stajkovic & Luthans, 1998).

Fourth, psychological arousal refers to reducing stress reactions and altering the tendency to negative emotions and misinterpretations of an individual's psychological and physical state. Individuals tend to rely on their psychological and emotional states in judging their capabilities, which results in interpreting stress and tension as vulnerability to failure. Diminishing stress reactions and negative emotions will result in individuals to be more inclined to successful performances because they are not disturbed with emotional agitation. Positive mood leads to enhanced self-efficacy, while negative mood leads to lowered

self-efficacy. However, not only does the nature of the emotional and physical reaction to a certain task determine perceived self-efficacy, but also how they are interpreted. Individuals with already high self-efficacy are likely to view the psychological or physical arousal as energizing pushing to a higher perseverance, whereas individuals with already low self-efficacy will perceive the arousal as a debilitative factor. (Bandura, 1984, 1989; Bandura & Wessels, 1997; Stajkovic & Luthans, 1998; Campbell & Nolan, 2019; Zhang & Ardasheva, 2019). In activities involving physicality, such as strength and stamina, pain and aches act as a debilitative factor making physical indicators play a very influential role in perceived self-efficacy (Bandura, 1984, 1989; Bandura & Wessels, 1997). Therefore, medication or anesthesia to diminish physical debilitative factors are widely used in elite sports. The four creators of perceived self-efficacy are summarized in table 4 below.

| Creator | Definition |
|---|---|
| **Mastery experience** | Personally succeeding in a challenging task |
| **Vicarious experiences** | Observing others similar to oneself succeed in a challenging task |
| **Social persuasion** | One persuading another one that they are capable of performing a task |
| **Psychological arousal** | The state of one's psychological mindset at the time of one performing a task. |

TABLE 4. Creators of perceived self-efficacy (Bandura, 1984, 1989; Bandura & Wessels, 1997; Stajkovic & Luthans, 1998)

These four factors describe how self-efficacy beliefs are formed. Beliefs are then processed through cognitive, motivational, affective and selection processes to form intentions. The strength of these intentions is again influenced by the magnitude of perceived task difficulty, strength of belief of successful performance considering the task difficulty, and the generality of the task's characteristics (Bandura, 1977, 1982, 1984, 1989; Bandura & Wessels, 1997; Stajkovic & Luthans, 1998). Generality of the tasks characteristics refers to how specific the task is, for example, does it involve a specific skill such as computer programming, or is it more general such as being able to get things organized in different situations (Bandura, 1977, 1982, 1984, 1989; Bandura & Wessels, 1997; Stajkovic & Luthans, 1998). These three dimensions, magnitude, strength and generality are referred to as three dimensions of self-efficacy (Bandura, 1977, 1982, 1984, 1986, 1989; Bandura & Wessels, 1997; Stajkovic & Luthans, 1998).

These four creators of perceived self-efficacy have also been validated through a couple of recent previous studies. One research used the four creators of self-efficacy as measures in predicting good English public speaking skills among college students, and found that mastery experiences, vicarious experiences and social persuasion – but not psychological arousal – had a significant impact in predicting English public speaking self-efficacy (Zhang &

Ardasheva, 2019). Another previous study researched whether the four creators of self-efficacy helped in increasing perceived self-efficacy beliefs when being in labor by the use of yoga classes and found that all four creators of self-efficacy helped in creating perceived self-efficacy (Campbell & Nolan, 2019). Thus, there has been some previous research validating the effect of the four self-efficacy creators have on perceived self-efficacy towards a certain skill that produces certain benefits to an individual.

It is important to however distinguish the difference between intentions and behavior. High self-efficacy beliefs create intentions, but do not necessarily yet present as behavior. For intentions to ultimately transform into behavior, there are additional factors influencing that, for example, perceived behavioral control and controllability (Ajzen, 2002), and contingent reinforcement (Stajkovic & Luthans, 1998). Perceived behavioral control and self-efficacy are similar that both are concerned with the ability to perform a behavior or sequence of behaviors, but the difference is that perceived behavioral control refers to the subjective degree of control over the behavior itself (Ajzen, 2002). To better avoid misinterpretations with perceived self-efficacy, perceived behavioral control should read as "perceived control over performance of a behavior" (Ajzen, 2002). Controllability refers to the belief about the extent that a certain behavior is under the control of an actor (Ajzen, 2002). High self-efficacy beliefs may not be enough to create behavior without contingent reinforcement. Contingent reinforcement refers to the expectation of certain benefits of performing the intention, for example, money or recognition (Stajkovic & Luthans, 1998). Controllability, perceived behavioral control, and contingent reinforcement thus concentrate on the behavior, while perceived self-efficacy rather concentrates on revealing strong and significant paths to intentions which may ultimately lead to behavior (Stajkovic & Luthans, 1998; Ajzen, 2002).

# 4 MITIGATING TECHNOSTRESS

The negative effects of technostress are plentiful. Learning to mitigate technostress negative effects is becoming increasingly important (Ayyagari et al., 2011; Pirkkalainen et al., 2017). Especially since given the importance of human capital in today's workplaces, research should look into further on strategies on how to reduce the levels of technostress (Ayyagari et al., 2011). Interesting ideas of ways to mitigate technostress have been brought forth. Several organizational mechanisms of combating technostress, such as technical support supervision and literacy facilitation (Ragu-Nathan et al., 2008; Tarafdar et al., 2011), have been presented. Additionally, existing research has brought forth some psychological approaches from the individual perspective to technostress mitigation, such as IT mindfulness (Ioannou & Papazafeiropoulou, 2017) and perceived IT control (Pirkkalainen et al., 2017). Existing research, however, lacks an efficient mitigation technique from the individual perspective.

In this chapter, the research will go through some proven mitigation strategies to technostress presented by research. Mitigation strategies refer to the means of inhibiting stressors from emerging or lessening their effect on strain (Ragu-Nathan et al., 2008; Tarafdar et al., 2011; Ioannou & Papazafeiropoulou, 2017; Pirkkalainen et al., 2017). This chapter will further research how the psychological concept of perceived self-efficacy can be used to combat technostress. Ultimately, stress is a psychological phenomenon (Lazarus, 1966; McGrath, 1976; Cartwright & Cooper, 1997; Cooper, Dewe and O'Driscoll, 2001; Ragu-Nathan et al., 2008; Ayyagari et al., 2011; Tarafdar et al., 2015; Pirkkalainen et al., 2017) which makes researching a psychological mitigation technique reasonable and feasible. The chapter will go through the concept of perceived self-efficacy as a mitigation strategy, organizational mechanisms, the relationship between perceived self-efficacy and organizational mechanisms, and some individual mechanisms brought forth by literature.

## 4.1 Perceived Self-Efficacy and Technostress Mitigation

Technostress can lower human performance and well-being. Perceived self-efficacy enhances human performance, accomplishment and well-being. This makes self-efficacy a significant concept to consider when battling technostress in organizations. Especially, since individual behavior and differences are often difficult to understand in a work setting (Stajkovic & Luthans, 1998). A strong self-efficacy belief can help people with numerous different things. It helps people facing difficult tasks to view them as challenges to be overcome rather than threats to be avoided, to quickly recover their feeling of self-efficacy after setbacks, to associate setbacks as insufficient effort or skills which can be acquired, and to approach challenging tasks with assurance that they practice control over them (Bandura, 1982, 1984, 1989). Such attitude results in personal accomplishment, reduced stress levels and lowers vulnerability to depression. Conversely, individuals who suffer from low self-efficacy are more likely to avoid difficult tasks which they view as threats, have lower ambitions and weaker commitment to goals they have set for themselves, blame their personal deficiencies, lack effort and give up quickly when faced with challenges, recover slower from failures, and view deficient performance as a lack of competence which makes failures have a more significant negative effect which results in losing faith in their capabilities faster. All of these lead to experiencing stress and depression. (Bandura, 1982, 1984, 1989).

When comparing employees in organizations with high versus low self-efficacy, employees perceiving high self-efficacy will persist in their efforts when faced with difficulties which may lead to successful outcomes, while employees with low self-efficacy will likely discontinue any efforts prematurely in similar situations leading to failure (Stajkovic & Luthans, 1998). This includes also technology-related situations. High self-efficacy with technology could lead to the increased usage of technology and result in persisting greater effort when any challenges are faced with its use (Bandura, 1982; Shu et al., 2011). Also, high self-efficacy with technology is related to higher levels and greater comfort of technology use, less technology-related anxiety and technostress, and a more positive attitude in general towards technology (Compeau & Higgins, 1995; Shu et al., 2011). High technological self-efficacy also has been proven to have a significant negative relationship especially with techno-complexity and techno-insecurity, while the other three outcomes of technostress, techno-overload, techno-invasion, and techno-uncertainty, have not proven to have a significant relationship (Shu et al., 2011). Perceiving technology as complex and the fear of losing jobs can be thus mitigated with high self-efficacy towards technology.

Additionally, as mentioned earlier, higher levels of computer confidence, which is similarly defined as technological self-efficacy, are related to better handling of technostress creating conditions and less perceived technostress (Ragu-Nathan et al., 2008; Tarafdar et al., 2011; Tams et al., 2018). Computer confidence, or technology self-efficacy, has proven to lower the perceived mental workload on individual stress (Tams et al., 2018). Technological self-efficacy

reduces perceived stress by affecting the thinking processes and biases towards technology use, by regulating how people anticipate the use of technology (Tams et al., 2018). For example, a more positive anticipation of technology use will also more likely lead to less stress perceived by the individual (Tams et al. 2018). Additionally, perceived self-efficacy and positive thinking generate a loop of mutual reinforcement. Positive psychological arousal has proven to create perceived self-efficacy (Bandura, 1984, 1989; Bandura & Wessels, 1997; Stajkovic & Luthans, 1998; Campbell & Nolan, 2019; Zhang & Ardasheva, 2019) and higher self-efficacy has proven to reduce negative mindsets and enforce positive thinking (Tams, et al., 2018).

Self-efficacy has proven to have a significant positive relationship to work-related performance. Bandura and Wessels (1997) bring forth numerous studies which have proven it, including in areas of learning and task-related achievement, skill acquisition, adjustment to new organizational settings, and, most importantly, adaptability to advanced technology. Particularly, self-efficacy shapes an individual's response to demands associated with performing a certain task (Bandura, 1986; Tarafdar et al., 2015). Additionally, an individual's belief of being able to use technology mitigates the negative effects of technostress creators on performance (Tarafdar et al., 2015). This is significant because it shows that, even though an individual's level of ability to use technology has a great impact on the amount of technostress perceived, it might just be enough that an individual believes that they exercise control or are capable of using such technology to mitigate the negative effects of technostress. It is thus relevant to understand what creates individual belief of being capable. As perceived self-efficacy is defined as belief an individual has on their capabilities of exercising control over their functioning and events (Bandura, 1977, 1982, 1984, 1986, 1989; Bandura & Wessels 1997; Stajkovic & Luthans, 1998; Ajzen, 2002; Shu et al., 2011), it is feasible to look at the relationship between perceived self-efficacy creators and the mitigation techniques over negative effects of technostress.

## 4.2 Organizational Mechanisms

The existing successfully proven mitigation strategies to technostress are interesting, as they can be related to the sources of what creates self-efficacy. Proven organizational mechanisms to mitigate technostress include literacy facilitation, technical support provision, technology involvement facilitation, (Ragu-Nathan et al., 2008) and innovation support (Tarafdar et al., 2011). Further studies have proven especially technical support provision, literacy facilitation and technology involvement facilitation to be helpful (Sarabadani et al., 2018).

Literacy facilitation refers to the different mechanisms that help IS users to educate themselves to use applications and systems to increase their IS-related awareness (Ragu-Nathan et al., 2008; Tarafdar et al., 2011). These include encouraging to share IS-related knowledge as part of the organization culture and

educating through sharing IS-related knowledge (Ragu-Nathan et al., 2008; Tarafdar et al., 2011). The main goal of literacy facilitation is to educate employees to cope with the requirements of learning new technology, which has proven especially helpful with mitigating techno-complexity (Ragu-Nathan et al., 2008; Tarafdar et al., 2011).

Technical support provision describes the end-user support provided by the organization, or its IT department, to support employees in technical matters. It refers to the assistance given by the organization's help desk related to the employees use of IT in their work. An effective technical support department can especially reduce techno-complexity and techno-uncertainty by addressing different IT-related problems, increasing job satisfaction with employees. Technical support plays a key role in keeping productivity levels as high as possible by ensuring technical problems interrupting workflow are kept to the minimum and effectively erased. The main goal of technical support provision is to assist IS users and to reduce their feeling of anxiety about technology. (Ragu-Nathan et al., 2008; Tarafdar et al., 2011).

Technology involvement facilitation refers to involving IS users in the development and adoption of new technology in the organization. Such practices include, for example, informing IS users about the rationalization of the new technology, the technology's objective, how the technology will affect their workflow, and encouraging IS users to use the new technology. Users who are more involved in the development and implementation of new technologies, will be more familiar with its use and feel like having influence on the process, thus, alleviating techno-complexity and techno-uncertainty. Providing such inputs regarding the introduction of new technologies in the organization will also increase perceived usefulness and job satisfaction. The main goal of technology involvement facilitation is to keep users involved and familiar with new technologies introduced in the organization. (Ragu-Nathan et al., 2008; Tarafdar et al., 2011).

Innovation support describes different mechanisms encouraging technology users to learn and experiment with new technologies. This involves creating an organization culture, which is supportive, promotes open communications between employees, and encourages new ideas and risk-taking. The emboldened employees may be more experimental and innovative with technology and thus, decrease techno-insecurity and techno-complexity. The main goal of innovation support is to encourage learning and experimenting with new technologies, and help users understand and accept changes happening in their workflow due to new technologies implemented in the organization. (Tarafdar et al., 2011).

The organizational mechanisms and their effects on individuals are summarized in table 5 below.

| Organizational mechanism | Effect on individual |
|---|---|
| **Literacy Facilitation** | Educate individual with technology and increase technology-related knowledge |
| **Technical Support Provision** | Provide support and assistance to in- |

| | |
|---|---|
| | dividual to technology-related problems |
| **Technological Involvement Facilitation** | Familiarize and involve individuals with technology use |
| **Innovation Support** | Encourage learning and experimenting with technology |

TABLE 5. Effects of organizational mechanisms (Ragu-Nathan et al., 2008; Tarafdar et al., 2011)

These organizational mechanisms tackle technostress creating conditions by involving employees with the implementation process of new technologies, educating employees to increase their technological awareness, offering technical assistance when necessary, and generating an open atmosphere where employees are encouraged to learn and experiment with new technologies (Ragu-Nathan et al., 2008; Tarafdar et al., 2011).

## 4.3 Relationship Between Organizational Mechanisms and Perceived Self-Efficacy

Literacy facilitation is a technostress inhibitor, which is related to the perceived self-efficacy creating conditions of vicarious experiences. While literacy facilitation involves the sharing of knowledge related to technology to your peers, vicarious experiences rely on the same social aspect in observing other people similar to oneself succeed in different tasks via using technology. By observing others succeed in technology, it facilitates learning about technology and creates self-efficacy, which mitigates against technostress creators. Thus, vicarious experiences create literacy facilitation. If, however, literacy facilitation is fulfilled, for example, through a training program, it will principally involve mastery experiences as well which may increase self-efficacy beliefs as well.

Technical support provision relates to creating perceived self-efficacy through vicarious experiences and possibly social persuasion and mastery experiences depending on the methods used by technical support. Vicarious experiences can be created, when a person similar to oneself or a person possessing the competencies to which one aspires, is successful with certain tasks. Some employees, concerning the numerous negatives effects the lack of ability to use technology implies, may aspire the skill and knowledge levels technical support agents may have, thus experiencing vicarious experiences enhancing their self-efficacy when technical support resolves an issue. Additionally, if a technical support agent uses social persuasion to encourage the employee to resolve the technical issue through minimal instructions resulting in success, this will result in increased self-efficacy through social persuasion and mastery experience.

Technology involvement facilitation is partly created by perceived self-efficacy creator, mastery experiences. While technological involvement facilitation includes involving technology users to be part of and contribute to the im-

plementation of a technology, mastery experiences refer to the same first-hand experience in using and implementing a technology. Through directly contributing to the implementation of a new technology, the technology users will have gained first-hand mastery experiences with the technology, thus being more familiar with it and creating perceived self-efficacy. Additionally, while technological involvement facilitation increases perceived usefulness and satisfaction in employees, it will lead to psychological arousal, reducing negative mindsets about the implementation of the new technology which will further increase self-efficacy beliefs.

Innovation support supports perceived self-efficacy through mastery experiences, social persuasion and psychological arousal. While organizations implement means to support innovation by encouraging employees to learn and experiment by creating a supportive environment, they decrease people's negative emotions and states by encouraging them, creating a positive psychological arousal. This encouragement again is the result of social persuasion. Additionally, when people experiment themselves and learn, they create mastery experiences. These all create self-efficacy.

These organizational mechanisms originate, support or can be partly influenced by perceived self-efficacy creators in theory. This theory does not exclude other outcomes that may be created on individuals by the organizational mechanisms, in fact it is likely that something else is also created in individuals, but it can be rightly justified that the organizational mechanisms may create one or more of the self-efficacy creators. Therefore, it is relevant to research the relationship of organizational mechanisms and self-efficacy creators empirically. The relationships are summarized in figure 2 on the next page.

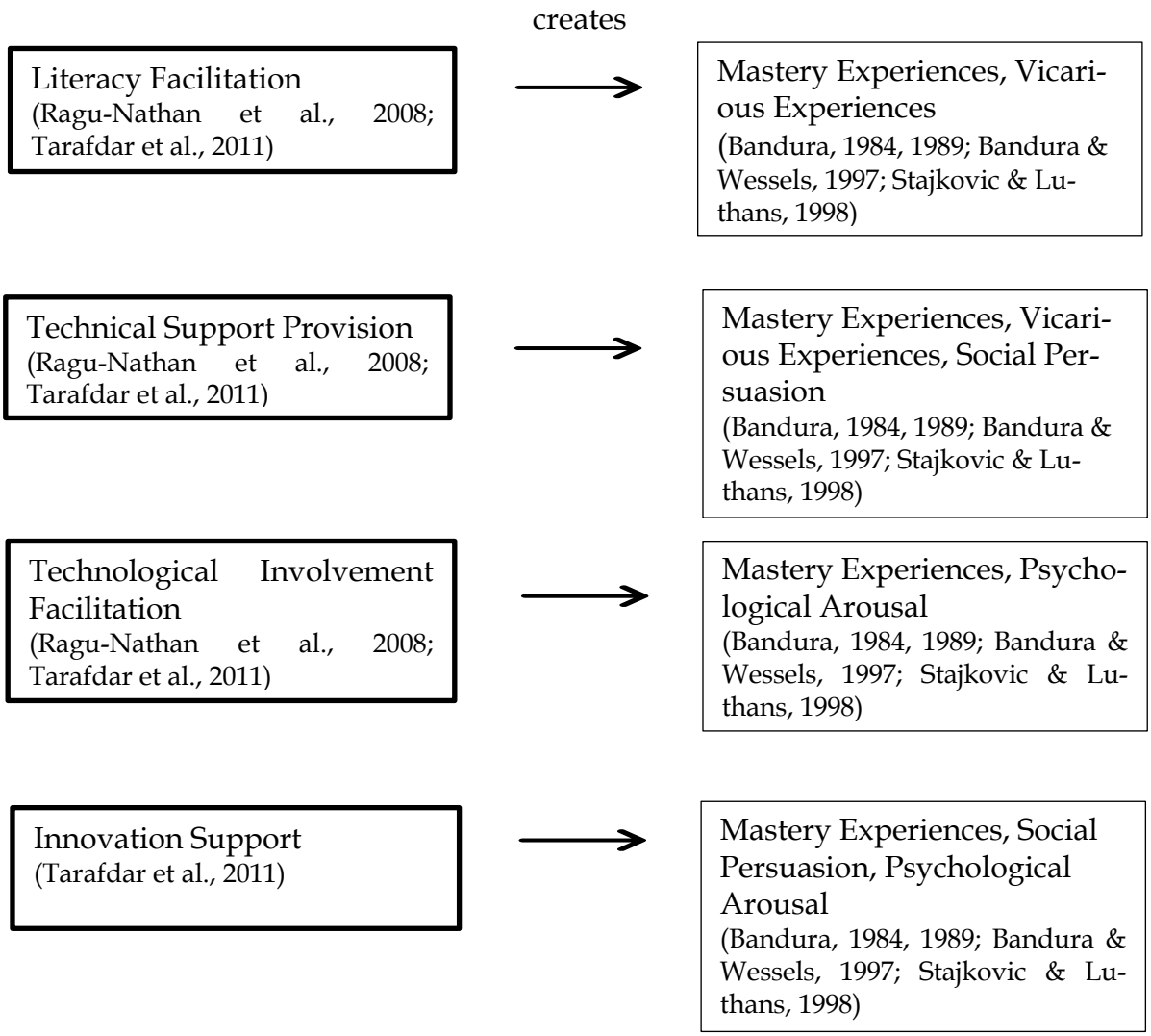


FIGURE 2. Relationship between Organizational Mechanisms and Perceived Self-efficacy Creators

## 4.4 Individual Mechanisms

Technostress has proven to have numerous negative effects. Research has identified some mitigation techniques for individuals to combat the negative effects caused by technostress. The most successful and therefore intriguing mitigation techniques that research has presented so far, in addition to perceived self-efficacy, include increasing the user's perceived control of IT (Pirkkalainen et al., 2017), IT mindfulness (Ioannou & Papazafeiropoulou, 2017; Thatcher, Wright, Sun, Zagenczyk & Klein, 2018), reappraising arousal (Jamieson, Nock & Mendes, 2012) and helping behavior (Poulin, Brown, Dillard & Smith, 2013).

Perceived control over IT refers to the perception of control an individual believes they have over their IT (Pirkkalainen et al., 2017). Perceived control over IT moderates the negative effects of technostress (Pirkkalainen et al., 2017).

Perceived control and perceived self-efficacy, when put in the field of IT, are interrelated. A higher level of perceived technology self-efficacy can be understood to mean greater perceived control over IT use, based on a stronger belief in one's ability to use IT (Tarafdar et al., 2015). Creating perceived control over a subject has also been associated with high self-efficacy beliefs (Bandura, 1984, 1986, 1989; Bandura & Wessels, 1997). Thus, the term perceived technology self-efficacy is largely interdependent with perceived IT control.

Research has however presented some other individual mechanisms to mitigate technostress that are worth having a look. One of these is the concept of IT mindfulness (Ioannou & Papazafeiropoulou, 2017; Thatcher et al., 2018). Mindfulness refers to a "state of conscious awareness in which the individual is implicitly aware of the context and content of information" (Langer, 1992, p. 289). It is a deep and dynamic state of awareness that focuses on the present rather than in the past or future (Ioannou & Papazafeiropoulou, 2017). However, literature has defined several different views over mindfulness. Mindfulness has been described as a state, a personality trait, an attitude, a cognitive process, a meditation practice and an intervention (Choi & Leroy, 2015; Ioannou & Papazafeiropoulou, 2017). It has been associated with many benefits, such as offering a way to mitigate work-related stress (MAPPG, 2015), lowering depression and anxiety, relieving pain, strengthening well-being, improving memory, and boosting emotional intelligence (Ioannou & Papazafeiropoulou, 2017).

IT mindfulness is a context-specific approach that literature has adapted to extend the concept of mindfulness to the use of technology (Ioannou & Papazafeiropoulou, 2017). IT mindfulness refers to "a dynamic IT-specific trait, evident when working with IT, whereby the user focuses on the present, pays attention to detail, exhibits a willingness to consider other uses, and expresses genuine interest in investigating IT features and failures" (Thatcher et al., 2018, p. 5). IT mindfulness has thus the same state of awareness incorporated into its meaning as the concept of mindfulness. It additionally includes four dimensions by which it can be aligned to IT: alertness to distinction, awareness of multiple perspectives, openness to novelty and orientation in the present (Ioannou & Papazafeiropoulou, 2017; Thatcher et al., 2018).

Alertness to distinction describes the ability of an individual to understand the capabilities and usefulness of technology. This results that when a conflict is confronted in the use of technology, the individual is capable of creating new ways of using the technology to complete the task, given that the limits of the technology allow it. Awareness of multiple perspectives describes the ability of an individual to use technology in multiple new beneficial ways. Additionally, the individual is capable of developing innovative solutions to problems using technology in the work environment. Openness to novelty describes the enthusiasm and curiosity of an individual to experiment with different technologies and applications deployed in the organization. Orientation in the present describes the ability of an individual to be involved and present in the moment and the current task they are accomplishing, as well as be capable to adapt to different technologies with other tasks as well (Ioannou & Papazafeiropoulou, 2017; Thatcher et al., 2018).

IT mindfulness within an individual makes them more capable to adapt to technostress creating conditions and mitigate possible technostress strain in the organization. Higher IT mindfulness mitigates technostress outcomes, such as anxiety, ambiguity, job dissatisfaction and decreased performance. (Ioannou & Papazafeiropoulou, 2017; Thatcher et al., 2018). Therefore, IT mindfulness can combat technostress that arises in the work environment.

In the context of stress, there is another individual stress mitigation mechanism that has been proven successful which has similar traits to mindfulness. That is the reappraising arousal during acute evaluative stress (Jamieson et al., 2012). Jamieson et al. (2012) found in their study, that the psychological reappraising of arousal when experiencing acute evaluative stress increased the perception of available personal resources, improved physical cardiovascular functioning, and decreased negative threat-related thinking. Reappraising arousal refers to the cognitive reappraisal or rethinking of the stress creating arousal (Jamieson et al., 2012). However, it differs from mindfulness because reappraisal arousal concentrates on reshaping how arousal is construed, while mindfulness aims more to decrease the arousal (Jamieson et al., 2012).

One more interesting individual stress mitigation mechanism relates to social connections. Social connections have proven to have numerous health and well-being benefits, but one study specifically studied the impact of helping behavior on stress mitigation (Poulin et al., 2013). The study found that help given to other people served as a significant stress buffer providing psychosocial benefits improving health (Poulin et al., 2013). Helping other people especially had an impact on decreasing premature mortality by 30% (Poulin et al., 2013).

Perceived control over IT, IT mindfulness, reappraising of arousal and helping behavior are all mitigation mechanisms against stress. Perceived control over IT and IT mindfulness specifically combat technostress, while reappraising of arousal and helping behavior are mitigation techniques taken from stress research. However, as stress is a hypernym for technostress, it is reasonable to consider stress mitigation strategies to technostress-context as well.

# 5 RESEARCH METHODOLOGY

The objective of this study is to examine the relationship between technostress and perceived self-efficacy in new knowledge workers. This chapter will examine the research methodology used in the study and will further argue its use. Additionally, the chapter will examine the research process, including the planning of the research and analysis of results.

## 5.1 Methods

The empirical research uses qualitative methods. More specifically, the research will be using the semi-structured interview method defined by Hirsjärvi and Hurme (2000). This subchapter will go through qualitative methods and the semi-structured interview more deeply.

### 5.1.1 Qualitative Methods

Qualitative methods have six characteristics (Hirsjärvi & Hurme, 2000): they research meanings and relationships, are subjective in nature, are built through the collaboration and communication of the researcher and the interviewee, are value-oriented, are usually presented in a descriptive way instead of using numbers and are based on accuracy rather than precision. Additionally, qualitative methods are inductive: they are interested in multiple factors that influence the outcome, follow a continuously changing state where it's themes may change during the research process, are contextual including theories and patterns, and the accuracy and reliability are achieved through verification. Qualitative methods also have the premise, that the factors measured are complicated, interrelated and difficult to measure. (Hirsjärvi & Hurme, 2000). These characteristics of qualitative methods are in line with the objective of this study of examining the relationship of technostress and perceived self-efficacy in a certain context.

Technostress can be generally measured in two ways, focusing on the objective measures or focusing on the subjective measures (Ayyagari, 2011). Ayyagari (2011) presents two theoretical paradigms on how to measure technostress: the epidemiological and the cognitive perspective (Fox, Dwyer & Ganster, 1993). The epidemiological perspective focuses on the objective measures for measuring stressors and their outcomes, while the cognitive perspective focuses on the use of subjective measures on how people appraise or interpret environmental demands (Fox et al., 1993). The cognitive perspective supports the view that technostress should be measured based on individual perception (Fox et al., 1993). Qualitative methods allow a deeper extraction of information using the cognitive perspective, when compared to quantitative methods. Additionally, 'perceived self-efficacy' refers to 'perception', making it a subjective phenomenon. Also, the objective of this research includes studying the relationships of two concepts, implying the study of mechanisms that constitute the relationship. Therefore, it is relevant to use qualitative methods from the cognitive perspective to measure technostress and perceived self-efficacy.

### 5.1.2 The Semi-Structured Interview

The most important characteristic of a semi-structured interview is that certain viewpoints of the interview have been settled before the actual interview, but there is space for some improvisation. For example, Eskola and Suoranta (1998) define that the questions in a semi-structured interview are the same to all interviewees, but the answers are not tied to predefined choices, like in a multiple-choice question layout. Similarly, Robson and McCartan (2016) define that the questions are the same to all interviewees, but the wording of the questions may vary.

Literature does not define any general definition for a semi-structured interview. The semi-structured interview method defined by Hirsjärvi and Hurme (2000) closely relates to the well-known Merton, Fiske and Kendall's (1990) approach to the focused interview. The two methodologies differ in a way that Hirsjärvi and Hurme's (2000) approach does not require the interviewees to have a common experience generated by an experimental test. The approach rather includes that all the interviewees' experiences, thoughts, beliefs and feelings can be studied using this method (Hirsjärvi & Hurme, 2000). The semi-structured interview can be categorized into three parts: (1) the researcher has comprehensive knowledge and has researched the most important parts and processes of the examined phenomenon, (2) based on this knowledge the researcher has makes certain conclusions and is able to compose a framework for the interview, and (3) the interview focuses on the subjective feelings of the interviewee relating to the phenomenon and the conclusions made by the researcher (Merton, Fiske & Kendall, 1990).

The semi-structured interview has multiple benefits regarding this study. It does not limit the number of interviews that can be conducted or the depth of the interview, which is suitable when researching technostress in a context it has not been researched before allowing more freedom in the interview. The

semi-structured interview rather focuses on certain predefined themes. This is suitable when using the perspective of perceived self-efficacy, because its creators can be applied as these themes. The themes shift the whole interview away from the viewpoint of the interviewer and allows the voice of the interviewee, the new knowledge worker, to be better heard. The semi-structured interview in this research takes in account how the new worker has interpreted different technological challenges or difficulties they have encountered in the first few weeks or months and what are meaningful in those situations. Through interaction with the interviewer, the meaningful things surface and can be discussed. (Hirsjärvi & Hurme, 2000).

## 5.2 Research Process

The following chapter will go through more thoroughly the three phases of the research: planning and conducting the research, and analysis of the results. They will go through the themes that were defined, how the interviews were conducted and how the results were analyzed.

### 5.2.1 Planning the Research

When planning the research, existing literature was held as a basis from which certain phenomena were derived. It was realized that the four factors that create perceived self-efficacy (e.g. Bandura, 1984) were suitable as themes of the interview. These were mastery experiences, vicarious experiences, social persuasion and psychological arousal. In order to understand the relationship between perceived self-efficacy and technostress the subjects, it is relevant to consider what creates perceived self-efficacy and use the creators of perceived self-efficacy as a lens in the interview to examine the relationships and meanings of a particular self-efficacy creator and technostress in the subject. Additionally, since new knowledge workers have not been previously researched as subjects of technostress, a theme was added to further examine what kind of technostress new knowledge workers experience and the possible reasons behind them. Ultimately, the interview included the following five themes:

1. Negative feelings, experiences or anxiety caused by technology
2. Effect of mastery experiences
3. Effect of vicarious experiences
4. Effect of social persuasion
5. Effect of psychological arousal

Each theme included sub-questions. The sub-questions were same to all interviewees, but the wording varied, as defined by Robson and McCartan (2016). The sub-questions started in each theme by a more general and open

question aiming to give the interviewee a chance to openly discuss, without any steering from the interviewer, what kind of experiences they have with the particular theme. For example, the first sub-question in the theme "Negative feelings, experiences or anxiety cause by technology" would go in the realms of "what kind of role did/does technology have in the starting phase of your job?". After this the interview was designed to proceed according to the answers of the interviewee aiming to find out relationships between the theme handled and technostress.

Prior to conducting the research, potential research interviewees were asked if they had experienced at least some degree of anxiety or negative feelings or experiences relating to technology when starting their new jobs. The word 'technostress' or 'stress' was knowingly avoided to be used with the research interviewees both prior and during the interview until the interviewee themselves possibly brought it up. This was a technique aimed not to steer the interviewee's answers towards certain outcomes. In this way, any misunderstandings or biases towards the word 'stress', which is a commonly used word in today's society and media, was eliminated.

Other requirements to research interviewees were made as well. The interviewee had to have started their new job within four months and worked for at least two weeks at the time of the interview itself took place. This requirement was made so that the interviewee would have a fresh memory of the starting phase of their new job and had already gained some experience. Also, a minimum of 15 research interviewees were applied in order to ensure sufficient research data. The interviewees had to also be completely new workers in the organization, and not, for example, been promoted or transferred to a new job within the same company. These requirements were applied to add to the reliability of the research.

Additionally, all of the interviewees were from the same organization. This particular target organization was chosen mainly for three reasons. Firstly, the organization working habits can be considered as modern knowledge work including the use of multiple technological equipment and services. Secondly, the organization is a rapidly growing company hiring tens of new employees every year, so they highly value them and their viewpoints. Thirdly, the researcher was granted access to the organization to conduct the research. The target organization is an international technology company based in Finland working in the health and wellness industry. The company consists of employees in four countries and customers in 40 countries. The number of employees the organization had at the time of the interviews was 149.

Summarizing the requirements:

- Interviewee had to have experience of some degree of technology related anxiety or negativity in the new job.
- Interviewee had to have experience in the new job for minimum of two weeks and maximum of four months at the time of the interview.
- Interviewee had to have not worked in the same organization previously.

- The minimum number of research interviewees was set to 15.

### 5.2.2 Executing the Research

Executing the research included four phases: listing all potential research candidates, asking them about experiences with anxiety or negative feelings related to technology in the new job, agreeing on a time and place for the interview, and executing the actual interview.

In the first phase, all potential research interviewees (i.e. new employees who had worked for a minimum of two weeks and maximum of four months) were gathered and listed in a document, concluding to a total list of 16 candidates for interviewees. This data was generated together with the subject organization's IT department.

In the second phase, all of the potential interviewees were asked either personally face-to-face or through the company internal communication platform Microsoft Teams about their experiences with technology in their new job and if they had experienced any degree of anxiety or negative feelings relating to it. All of the people asked agreed to participate in the research.

In the third phase, a time and place were agreed with the research interviewee. All of the interviews were completed within two weeks of the initial asking to participate in the research.

In the fourth phase, the actual interview was executed. The interview included first a five-minute introduction to the research. In the introduction the interviewee was told the following information: the approximate duration of the interview would be around 45 minutes, the research is about technology use in the workplace and negative feelings or experiences that may relate to it, the research methodology would be a semi-structured interview which includes certain themes (without revealing the actual themes), and that the interview would be recorded. Anonymity was also emphasized.

After the five-minute introduction, the basic demographics of the interviewee were asked, including age, gender and education. Also, additional background information was gathered, including previous work experience from information work, starting date in the new organization and a personal rating of their own technological competence. After this, the themes were addressed. During the interview, if the interviewee asked for more specific definition of 'starting phase' when asking about a job's starting phase, it was defined broadly as the first few weeks of the new job.

The first two interviews acted as pre-interviews helping to evaluate the appropriateness of the themes and sub-questions. Minor changes were made based on the pre-interviews that were applied to future interviews. The changes were made to the wordings of two of the sub-questions in two different themes. They initially caused some confusion with the interviewee and were restructured to a more understandable way.

All of the interviews were conducted in the period of one and a half weeks with two to three interviews per day. The interviews took place starting from Monday to Friday, and again Monday to Wednesday the following week. All of

the interviews were executed in Finnish language, as Finnish is the mother tongue of all of the interviewees as well as the interviewer. This allowed more deeper conversations. From the 16 interviews conducted, 15 were executed face-to-face and one through online call using the Microsoft Teams communications platform. All of the interviews were recorded with Apple's QuickTime -software.

### 5.2.3 Analysis of Results

The qualitative methods were chosen as a research method to this research because they were most suitable to answer the research question and measure the researched phenomena. The characteristic of the research was to find out subjective technostress experienced and not, for example, physiological stress, therefore the most suitable option for data collection was to use the semi-structured interview. This gave the researcher a chance to really dig into the subject and find the cause and effects but ensuring answers to the core themes. The analysis where conducted qualitatively, which included detailed transcribing of the interviews, reading the transcribed data thoroughly, then grouping and coding the data and finally interpreting the grouped and coded data (Hirsjärvi & Hurme, 2000).

Firstly, all of the 16 interviews were transcribed. The audio file, that was recorded by Apple's QuickTime -software, was also played with the same software. Then Microsoft Word -software was used to writing the transcriptions into text format. All of the interviews were saved on separate documents, which included the whole interview itself and the collection the interviewee's background information and demographics. In the transcription process, the audio was carefully listened to and their correspondence with the written text file was ensured. When all of the interviews were transcribed, each of the transcriptions were read thoroughly and the audio file listened to simultaneously to detect possible mistakes and correct them.

Next the transcriptions were read through thoroughly. The transcriptions were read with an open mind to further understand the data. The aim of this was to get familiarized with the data, possibly create meaningful observations and prepare for the analysis by raising questions and thoughts (Hirsjärvi & Hurme, 2000).

In the next phase of the analysis, the 16 documents of transcribed interviews were imported to and analyzed with a qualitative data analysis software MAXQDA2018. With the software, each document was grouped according to different codes, that were determined by the researcher. The software was able to create new separate documents from the codes, that included the coded sentences.

Grouping was done by identifying the most important themes related to the study from the research data and collecting the observations under each theme together to a separate document. The themes were determined by reflecting on the findings that existing literature had presented. The observations relating to a specific theme, where coded into the separate document under the

specific theme. Grouping allowed to find the most relevant themes relating to the study. Each theme was marked with a specific code which was found from the research data. The codes used in grouping where the following: the demographics and background information of the interviewee, mastery experiences, vicarious experiences, social persuasion, psychological arousal, negative effects experienced, technostress creating conditions and factors affecting the intensity of technostress experienced. According to these codes, the research data was grouped into new documents for the next phase of the analysis. For example, when scanning for observations relating to mastery experiences, sentences relating to that specific theme were detected:

> "I got to use the software myself, which helped in learning the software."

In the next phase of the analysis, the grouped data was further analyzed to observe further subgroups within the theme. These subgroups were determined according to findings in existing literature and the set research context in the study. These codes included text that were part of an existing group. For example, when looking for what processes creates vicarious experiences, the research data was scanned for sentences including things that describe the process of how a vicarious experience was created:

> "It [finding a function in a software] used to be a hard and ambiguous, but then my colleagues showed me by grabbing my mouse and clicking where I had to go to find it, and since then I learned how to do it."

When the analysis progressed, the coding and grouping was continued to a more accurate level. For example, when technostress creating conditions were determined, the more specific source of that condition was looked for, which was again coded as a new group. All codes from a specific group were again gathered on a separate document. For example, when looking for a more specific source of a technostress creating condition:

> "Well, the internet connection disconnecting has been a thing that has bothered quite a few people lately."

The research successfully managed to extract multiple elements that had not been defined by existing literature before. These were, for example, the types of technologies or technological difficulties that create a certain technostress creating condition in new knowledge workers. All themes were individually grouped into separate documents that included all the codes belonging to that group. These consisted the research data and based on this, observations and conclusions were made. These observations may include similarities, differences and new elements when compared to existing literature (Hirsjärvi & Hurme, 2000). The final phase of the analysis includes presenting the research results. The results were reported according to the extracted groups and codes. The next chapter will go through the results of the empirical research.

# 6 RESULTS

In this chapter, the study will go through the results of the interviews. It will firstly introduce the background information of the research interviewees, secondly reported technostress experienced, thirdly reported perceived self-efficacy creators identified and finally other notes and observations. All presented quotes from interviews have been translated from original Finnish language to English language by the researcher. The translations have been written to retain the original meaning of the text and have tried to use the same exact wording to the extent as it is possible.

## 6.1 Background Information of Interviewees

In this subchapter, the study will go through the detailed background information of the research interviewees. The research included 16 interviewees altogether from the same organization. The data collected from these 16 interviewees account for all of the research data. All of the background information was gathered right before the actual themes were addressed.

From the 16 interviewees, the average age was 26,75 years old. There were both eight male and eight female interviewees. Two had a high school education, six a bachelor's degree and eight a master's degree as their highest education completed. The average years of previous work experience was approximately 4,1 years. The average duration of employment in the current organization at the time of the interview was approximately 2,4 months. Two interviewees rated their computer confidence as 'below average', five as 'average', seven as 'above average' and two as 'excellent'. A more detailed summary can be seen in table 6.

In table 6 below age is displayed as years (y). Also, previous work experience (WE) is displayed as years (y) and was rounded up or down to the closest whole number. Duration of employment (DE) is displayed as months (m) and was also rounded up or down to the closest whole number, keeping in mind that the research interviewees must have not had over four months experience

unrounded in the target organization to be able to participate in the research. Personal evaluation of computer confidence (PE of CC) was rated by the interviewee in the following scale: bad, below average, average, above average, and excellent. 'Bad' was regarded as the worst and 'excellent' as the best value.

| Interviewee | Age (y) | Gender | Education | WE (y) | DE (m) | PE of CC |
|---|---|---|---|---|---|---|
| **A** | 24 | Male | High school | 1 | 3 | Above average |
| **B** | 29 | Female | Master | 10 | 2 | Average |
| **C** | 30 | Male | Bachelor | 7 | 2 | Excellent |
| **D** | 28 | Female | Master | 4 | 3 | Below average |
| **E** | 26 | Male | Bachelor | 0 | 1 | Above average |
| **F** | 28 | Male | Master | 7 | 4 | Above average |
| **G** | 27 | Male | Master | 6 | 4 | Average |
| **H** | 28 | Male | Bachelor | 9 | 1 | Above average |
| **I** | 25 | Female | Bachelor | 1 | 1 | Average |
| **J** | 26 | Female | Master | 4 | 3 | Above average |
| **K** | 20 | Male | High school | 0 | 3 | Average |
| **L** | 23 | Female | Bachelor | 2 | 1 | Average |
| **M** | 26 | Female | Master | 2 | 1 | Above average |
| **N** | 33 | Female | Master | 7 | 4 | Above average |
| **O** | 27 | Female | Master | 2 | 2 | Below average |
| **P** | 28 | Male | Bachelor | 3 | 3 | Excellent |

TABLE 6. Summary of background information of research interviewees

## 6.2 Technostress Experienced

This subchapter will go through the results regarding technostress experienced. All of the interviewees reported that they had experienced technostress of some sort. The following parts of the study will thoroughly go through the results relating to what were the identified technostress creators, what factors affected the strength of technostress experienced and what were the negative effects experienced by individuals.

### 6.2.1 Technostress Creators

In this section of the study, the study will go through all of the technostress creators that were identified as technostress creators among the research interviewees. The identified technostress creators can be categorized into techno-complexity, techno-insecurity, techno-invasion, techno-overload and techno-uncertainty.

The most dominant technostress creator among the research interviewees was related to the complex nature of technology. This was identified as falling under the category of techno-complexity. Of all 16 research interviewees, 15 reported to have experienced technostress because of the complex nature of a

certain technology where, either the usability was regarded as poor, or the technology itself had a steep learning curve and required a significant investment of time and resources. The exact technologies that caused these outcomes among the research interviewees can be categorized into three different categories: external software used as a tool, company own product software and computer operating system. External software used as a tool includes software provided by external providers used by the employees to perform a certain work-related task. Some examples include email provider and company CRM (Customer Relationship Management system). Company own product software includes software that the company itself has developed and is a product used by either employees to perform work-related tasks or by the customers. These technologies were reported by some interviewees as less user friendly. Computer operating system includes the use of different operating systems than the workers were used to, which caused technostress. The most frequent category that came up was the external software used as a tool, which came up 15 times. The second most frequent category that came up was company own product software with five times, and finally the computer operating system with one case.

> ”Well, one thing came to mind about CRM. It is incredibly hard to find the information that you are looking for. You need to do an immense amount of manual work and it requires a lot of time and effort and that is really frustrating. It is not designed as it should have been designed.” – Interviewee G.

The second most dominant stressor was related the uncertain feeling technology creates. This was identified as techno-uncertainty. From the 16 interviewees, 11 reported to have experienced some sort of uncertain feeling related to technology. The situations that caused the uncertain feeling can be categorized into five different categories: software crashes, insufficient introduction, multiple similar IS in use, unreliable internet connection and software updates or changes. Software crashes refer to a certain software crashing and causing an uncertain feeling towards the functionality of that particular software. Insufficient introduction refers to lack of information given in the employee introduction process that caused an uncertain feeling for the employee regarding on how a certain technology works or when should it be used. Multiple similar IS in use refers to the organization having multiple different information systems in use that serve the same or similar purpose and have only minor differences. This causes an employee to feel uncertain on which IS to use and problems in collaboration between employees. Unreliable internet connection refers to the internet connection being down randomly which creates an uncertain feeling towards the technology and interrupts workflow. Software updates or changes refer to expected or unexpected software updates or changes which interrupt with regular work tasks or create a totally new learning curve for the employee. This creates an uncertain feeling towards the technologies and frustration among the employees. The most frequent categories that came up were software crashes and insufficient introduction with six interviewees reporting each. Then came multiple similar IS in use and unreliable internet connection, which

both had four reported cases. Finally, came software updates or changes with three reported cases.

> "I would have needed some more instructions on how to use that system. They just told me to do it. How should I do it? Are there any instructions? It caused a lot of additional stress and frustration and uncertainty. Can I do it like this? Then at some point I just decided that, whatever, I will do it like this. If no better instructions are given." – Interviewee J.

The third most dominant stressor was the struggle of coping with the multiple new IS introduced. This stressor was identified as techno-overload. Techno-overload was experienced by seven of the 16 interviewees. All of the seven interviewees reported the cases of techno-overload to be related to the use or learning of multiple different new IS simultaneously. This was strongly affected by not having any previous experience with similar systems. Examples of such systems were the introduction of company CRM and company own product systems.

> "When you think about the employee introduction, it is mostly new information systems. Is the information system overload too large when you think that it [employee introduction] could be better built? If it would rather be just the most important things that you need to learn in order to do your job. Because the amount of information systems that were introduced in the beginning was too much, I do not even remember those systems anymore." – Interviewee F.

The fourth most dominant stressor was related to the work-home conflict, where three interviewees reported that they had the urge of being constantly connected to work even at home in their spare time. This relates to the category of techno-invasion. The reasons of why the three interviewees experienced techno-invasion was that all of them were very excited about their new job and felt that they wanted to learn as much as possible extending learning to outside of work as well. This caused additional stress on the interviewees. Additionally, one interviewee reported that keeping phone notifications turned on caused the urge to respond to them, even in spare time, adding to the experienced strain.

> "I had the experience in the very beginning that my free time and working time started to mix. Technology played a huge part because I always took my work laptop and work phone with me home, so I never experienced a 'switch off' thing. I was always connected and receiving messages and emails on my phone and then I had the laptop there when I thought that this would be good to do now. Then I started to do work at home even if I did not need to. I felt that caused a huge strain on me" – Interviewee A.

The fifth most dominant stressor was related to the feeling of insecurity related to the interviewee feeling that they should have already learned to use a certain technology. This relates to techno-insecurity. There was one interviewee whom reported this feeling. The feeling that others already knew how to use the technology which the interviewee had not learned yet made the strain harder.

> "Sometimes I maybe feel like I should already know these things and I should have already learned these things by now because others already know how to do these things. It brings a feeling of insecurity. Also, when I was applying here, I was a bit insecure about my technical skills. Because ultimately, this is a tech company and is based on these IT things. Do I have sufficient tech skills to be here?" – Interviewee D.

A summary of the reported technostress creating conditions (TSCC), the number of interviewees that reported that particular TSCC, the causes of a particular TSCC and the number of reported cases of each can be seen in table 7 below.

| TSCC (cases) | Interviewees (number) | Interviewees (%) | Causes of TSCC (number of reported cases) |
|---|---|---|---|
| **Techno-complexity (21)** | 15 | ~94% | - External software used as a tool (15)<br>- Company own product software (5)<br>- Computer operating system (1) |
| **Techno-uncertainty (23)** | 11 | ~69% | - Software crashes (6)<br>- Insufficient introduction (6)<br>- Multiple similar IS in use (4)<br>- Unreliable internet connection (4)<br>- Software updates or changes (3) |
| **Techno-overload (7)** | 7 | ~44% | - Multiple new different IS introduced simultaneously (10) |
| **Techno-invasion (3)** | 3 | ~19% | - Work-home conflict (3) |
| **Techno-insecurity (1)** | 1 | ~6% | - Insecure feeling towards own technical abilities (1) |

TABLE 7. Summary of technostress experienced by research interviewees and their causes

### 6.2.2 Factors Affecting the Intensity of Technostress Experienced

In this part of the study, the factors that were found to affect the intensity of technostress experienced by the research interviewees will be addressed. It was found that there are some strengthening and some weakening factors affecting the intensity experienced. Regarding the intensifying factors, two major factors were found: bothering others and investing time and resources. Bothering others came up with 10 interviewees and investing time and resources came up with six interviewees.

Bothering others was contributed by two things: the repetitive act of asking others how to solve a technical problem or use a certain technology and

having an effect on other people with your technical problem you are encountering. For example, some research interviewees felt that they did not want to bother others constantly if faced with a technical problem and because of that, did not have the courage to ask help and were left alone. This significantly intensified the experienced technostress. Another example is that if the technical problem came up at a time when it would affect other people and there was not much time left to fix the problem, like lost internet connection or system crash minutes before a scheduled online meeting, the experienced technostress was much higher.

> "You do not want to bother your colleague every time and be like 'hey just one more thing' constantly. Sometimes I would just be quiet when a problem arose and would let a bit more time pass before I would ask again. They can also do their own things." – Interviewee M.

The degree of how much time and resources needed to be invested also affected on the intensity of technostress experienced. For example, if the problem that was encountered was an issue where the interviewee would have to invest time and resources to solve it or learn how to solve, it would cause much more technostress compared to a fairly simple problem that could be fixed easier. Interestingly, there was also a difference in opinions among some interviewees in what kind of problems cause the most technostress. Two of the interviewees felt that if a technical problem was caused by a third party, like unreliable internet service provider, and could not be fixed by the interviewee themselves, it caused more technostress. In the contrary, two interviewees reported the opposite. If the technical problem was out of their realm to fix, it caused much less technostress.

> "If you can affect the problem, it is a smaller issue. If you cannot affect the problem, its again a smaller issue. But if you only sort-of know how to fix the problem, and it requires a lot of time and effort to fix, that is the most annoying thing. That usually involves googling the problem and really investigating it." – Interviewee A.

Also, other smaller things came up that intensified the technostress experienced. These were things that were only mentioned once. They included own preference differing from company's preference in the choice of technology, the assumption that technology should always work, the negative distress venting of others, and experiencing that other people are better at using a certain technology.

Additionally, a couple of things came up that lessen the feeling of technostress experienced. These included the acknowledgment of being a new worker and being very interested in technology in general. Acknowledgement of being a new worker was brought up by ten interviewees as a mitigating factor. They felt that being a new worker was more forgiving by having looser requirements and more time for learning. The interviewees felt, for example, that they did not necessarily need to know how to use a certain system yet fully because of their novelty in the organization. Being very interested in technology in general was brought up by three interviewees as a mitigating factor. They felt

that their understanding of technology and its nature of not always working helped in lessening the negative effect experienced. One of the interviewees reported that they would rather take the viewpoint of learning how to solve or understand the technical issue faced, than stressing about it.

### 6.2.3 Negative Effects Experienced by Individuals

In this part of the study, the different kind of negative effects that were experienced by individuals and from which technostress creator did the negative effect come arise from will be addressed.

The research interviewees reported experiencing various different negative effects caused by technostress. The reported negative effects were identified and categorized into four different categories: dissatisfaction with the IS used, reduced productivity while using IS, decreased innovation in job tasks involving IS and reduced commitment to goals and values. It was found that one negative effect experienced by an individual can be caused by more than one technostress creating condition, and that one technostress creating condition can create more than one negative effect on an individual. Additionally, it was found that one interviewee could have experienced a similar negative effect from a similar technostress creating condition but from two different cases not relating to one another, resulting into interpreting them as two separate reported cases.

The most frequent negative effect that was reported by most interviewees was dissatisfaction with the IS used with 20 reported cases reported by 14 different interviewees. They consisted of 11 cases of techno-complexity, seven of techno-uncertainty, one of techno-insecurity and one of techno-overload. Techno-complexity resulted from six cases of external software used as a tool, four cases of company own product software and one case of computer operating system. Techno-uncertainty resulted from four cases of software crash, two cases of unreliable internet connection and one case of multiple similar IS in use. The one case of techno-insecurity was caused by insecure feeling of own technical abilities, and the one case of techno-overload was caused by multiple new different IS introduced simultaneously. A quote representing the effect of dissatisfaction with the IS used due to techno-complexity and company own product software can be seen below:

> "Sometimes I have been thinking, why is this like this? When we have an old software and it is no longer relevant in any way, so why do we use it. It is old and hard to use. Why do not we just delete it or something." – Interviewee E.

The negative effect on an individual reported by the second most interviewees was reduced productivity while using IS with 33 reported cases reported by 13 different interviewees. Reduced productivity while using IS consisted of 18 reported cases of techno-complexity, 10 reported cases of techno-uncertainty and five reported cases of techno-overload. Techno-complexity resulted from 13 cases of external software used as a tool, and five cases from own company product software. Techno-uncertainty resulted from four cases of unreliable

internet connection, three cases of insufficient introduction, two cases of software crashes and one case of software updates or changes. Techno-overload was caused by five cases of multiple new different information systems introduced simultaneously. A quote representing the effect of reduced productivity while using IS due to techno-complexity and external software used as a tool can be seen below:

> "Well, when it comes to doing the billing, there is this external software we use to split the bills. It is not the easiest tool to use. In the matter of fact, I had this case today where I needed to split the bill into three parts, and it took so long to do. I guess that is a concrete example." – Interviewee I.

The third and fourth most frequent negative effects on individuals that were reported were decreased innovation in job tasks involving IS and reduced commitment to goals and values. Both effects were reported by three different interviewees and three cases. Decreased innovation in job tasks involving IS was caused by one case of techno-complexity and external software used as a tool, one case of techno-overload and multiple new different IS systems introduced simultaneously, and one case of techno-uncertainty and insufficient introduction. Reduced commitment to goals and values consisted of three cases of techno-complexity and external software used as a tool. Below can be seen a quote from one interviewee representing both decreased innovation in job tasks involving IS caused by techno-complexity and external software used as a tool, and reduced commitment to goals and values caused by techno-complexity and external software used as a tool.

> "Lately I have noticed that the quality standard is really high here regarding code. And coming previously from a big IT organization with looser requirements, it creates some unwanted pressure. It slows down my work when having to think of all those little things. I am only human, and I think that errors are humanly. Because of my personality and being used to working independently, both in good and bad, it makes me question the process here. It accumulates pressure by forcing me to think outside of my own worktable." – Interviewee P.

A noticeable fact is that the negative effect of reduced job satisfaction did not appear in the study. This might be because of two reasons. The first one might be because reduced job satisfaction implies some sort of previous experience in the specific job position which is non-existing in new knowledge workers. The second reason might be because a potential positive boost a new job position provides in an individual, which mitigates against dissatisfaction that might be experienced in a new job position.

In table 8 below can be seen a summary of all the negative effects reported by the interviewees (NE) and how many cases came up, how many interviewees reported each negative effect, what were the technostress creating conditions of the negative effect (TSCC) and how many cases came up, and the exact causes of these technostress creating conditions (Causes of TSCC) and how many cases came up.

| NE (cases) | Interviewees (number) | Interviewees (%) | TSCC (cases) | Causes of TSCC (cases) |
|---|---|---|---|---|
| **Dissatisfaction with the IS used** (20) | 14 | ~88% | Techno-complexity (11) | - External software used as a tool (6)<br>- Company own product software (4)<br>- Computer operating system (1) |
| | | | Techno-uncertainty (7) | - Software crashes (4)<br>- Unreliable internet connection (2)<br>- Multiple similar IS in use (1) |
| | | | Techno-insecurity (1) | - Insecure feeling of own technical abilities (1) |
| | | | Techno-overload (1) | - Multiple new different IS introduced simultaneously (1) |
| **Reduced productivity while using IS** (33) | 13 | ~81% | Techno-complexity (18) | - External software used as a tool (13)<br>- Company own product software (5) |
| | | | Techno-uncertainty (10) | - Unreliable internet connection (4)<br>- Insufficient introduction (3)<br>- Software crashes (2)<br>- Software updates or changes (1) |
| | | | Techno-overload (5) | - Multiple new different IS introduced simultaneously (5) |
| **Decreased innovation in job tasks involving IS** (3) | 3 | ~19% | Techno-complexity (1) | - External software used as a tool (1) |
| | | | Techno-overload (1) | - Multiple new different IS introduced simultaneous- |

| | | | | |
|---|---|---|---|---|
| | | | | ly (1) |
| | | | Techno-uncertainty (1) | - Insufficient introduction (1) |
| **Reduced commit-ment to goals and values** (3) | 3 | ~19% | Techno-complexity (3) | - External software used as a tool (3) |

TABLE 8. Summary of negative effects experienced by research interviewees and from which technostress creating conditions and exact cause they arouse from

The most frequent cause of technostress creating conditions is external software used as a tool, which created techno-complexity. It was reported to have created techno-complexity in 15 of all 16 research interviewees. This again was reported to create four negative effects: reduced productivity while using IS (13), dissatisfaction with the IS used (6), reduced commitment to goals and values (3) and decreased innovation in job tasks involving IS (1). Multiple new different IS introduced simultaneously was reported to have created techno-overload in seven different research interviewees and being solely responsible of all techno-overload creations. It also created three different types of negative effects: reduced productivity while using IS (5), dissatisfaction with the IS used (1) and decreased innovation in job tasks involving IS (1).

The two technostress creating conditions that affected at least half of the research interviewees were techno-complexity (15) and techno-uncertainty (11). The two negative effects that were experienced by at least half of the research interviewees were dissatisfaction with the IS used (14) and reduced productivity while using IS (13).

## 6.3 Perceived Self-Efficacy

The aim of the study includes observing the four creators of perceived self-efficacy and their relation to technostress in new knowledge workers. This sub-chapter will go through what was found from each perceived self-efficacy creator in its relation to technostress and what kind of actions the employees have undertaken to create perceived self-efficacy.

The study is based on knowledge workers, who need technology to perform their work. Therefore, when considering the context of new knowledge workers, the study especially focuses on how they create perceived self-efficacy to use new information systems to perform their work and what factors effect this process. Additionally, it was found that employees who had experienced mastery experiences, vicarious experiences, social persuasion or psychological arousal, where less prone to technostress. That is why the exact ways of how

these perceived self-efficacy creators were manifested in new knowledge workers is important to bring forth in these results.

The study results are in line with theory, that mastery experiences are the most effective way of creating perceived self-efficacy. However, all four perceived self-efficacy creators effect on the creation process. It was found that combining multiple perceived self-efficacy creators at once is much more efficient in creating perceived self-efficacy, than any single creator on its own. The results suggest that the most effective way of creating perceived self-efficacy in new knowledge workers was to first provide the employee with vicarious experiences and mastery experiences combined, and then provide social support and persuasion, if seen necessary, while the whole process is boosted by a positive psychological arousal. The following subchapters will go through the details of each perceived self-efficacy creator and their relationship both in creating perceived self-efficacy and with technostress.

### 6.3.1 Mastery Experiences

Regarding mastery experiences, the study did not find any mastery experience that would have caused technostress or would have had any negative effect on the individual's perceived self-efficacy. However, the study did find that failures did happen and according to theory, failures should undermine the perceived self-efficacy of an individual. The results however do not show any evidence to support this. Contrarily, the results show that the failures that occurred created perseverance in employees, which ultimately resulted to success. According to theory, this type of perseverance occurs more likely in individuals who already have a higher level of perceived self-efficacy. The quote below is an example of a interviewee showcasing this type of behavior, when they had initially done a mistake when using a certain software.

> "At that point [when the mistake happened] I felt that, well okay a small irritation, but I wanted to try again and fortunately now I learned from it and I feel that I know how to use it better." – Interviewee A.

Even though the interviewee reported that the mistake caused a small irritation, it did not cause technostress. It rather caused the interviewee to persevere which lead to success and a higher level of perceived self-efficacy.

Mastery experiences showed to have a mitigating relationship towards technostress. Employees who had mastery experiences from a certain technology versus employees who did not have or had very little mastery experiences from the same technology, comparably were less prone to technostress from that technology. The quotes below illustrate this phenomenon happening in two interviewees, when interviewee H had some mastery experience from a technology from previous work and interviewee B had no mastery experience from the same technology prior to using.

> "I have previously used that interface and done a certificate in using it, so it was quite easy for me to start using it here and understand the logic behind how people use it here. It maybe even made me more enthusiastic in using it." – Interviewee H.

> "I had no experience from that system, so I had to learn everything from scratch. And because it is quite large, it took a lot of time and effort. In the beginning I felt quite tired after the workdays." – Interviewee B.

In creating mastery experiences as new knowledge workers, mainly three different ways were found in the research interviewees. The first one included purely individual work in getting to know a new technology. It included the interviewee individually getting to know a technology without any introduction on how to use it. Only the technology's purpose in the organization was revealed. The interviewees who experienced this type of mastery experience told that it helped in learning the technology better than if someone would have only told them how to use it without letting them try it for themselves, but it also took more time to fully comprehend the technology. The interviewees reported that this would not be the optimal way of learning a technology but works to an extent.

> "Well, I felt that in using that system I was 'thrown in the deep end' without any introduction. I ultimately learned the system, but it took some time." – Interviewee P.

The second way included a short introduction to a technology, where an instructor used the technology first explaining their use simultaneously, and then the interviewee would independently get to use the technology without supervision. For example, an instructor would show on a big screen how to do a certain action in a system, and then the interviewee would individually try to do the same action in their work. This way basically first provides a vicarious experience and then a mastery experience. The interviewees who experienced this felt that it was a quicker and better way to learn a technology than the first way and generated a better mastery experience. Generally, the interviewees were satisfied with this type of way of generating a mastery experience, but there were some negative factors associated with it as well. For example, some interviewees felt that the instructor, whom was highly experienced with the system, showed the actions too fast and the interviewees had difficulties in keeping up with the instructor. Some also reported that they did not remember all the things the instructor showed them. The quote below shows a response to a question when the interviewee is asked to give their opinion on this way of gaining mastery experience.

> "It was partly good, but on the other hand the one who is instructing you has become so routined that they start clicking very fast and I did not catch how they did something, and I had to then think how they did it and go back. That interrupts with your workflow." – Interviewee O.

The third way of creating mastery experiences included a simultaneous combination of vicarious and mastery experiences. In this way, the instructor would instruct the interviewee on how to use a technology while the interviewee

themselves would be using the system simultaneously. This combines the visuality of actually seeing how to use a certain technology from the instructor and the interviewee simultaneously doing the same action themselves. The interviewees who experienced this way generally felt that this was the best way to gain mastery experiences. The interviewees felt that this way enabled them to see the system in use and learn the best practices of how to use the system, while the interviewee themselves were given time and the chance to copy the instructor's actions in the system simultaneously. It was also held important that there was the instructor present who kept the control of the introduction and instructed the interviewee to the most relevant things they need to learn in the system.

> "I am quite a visual learner, so I enjoy the fact that I get to see, but I think that by doing myself I learn the best. But clearly when you see a good example of how to use the system by the showing of someone else, it helps, myself at least, very much when learning a system. Especially because many systems are not that informative, so it helps when there is someone showing what happens when you press that button and go there. I do believe that this combination of visual learning and concretely doing yourself provides the best learning experience and memory of the system." – Interviewee C.

### 6.3.2 Vicarious Experiences

Vicarious experiences had a two-way relationship with technostress. In one way, they lowered the level of perceived self-efficacy in an individual, and in another way, they created it. Because vicarious experiences mainly focus on the social aspect, it is obvious that the behavior of others have a major influence. It was found that in new workers, the way others talk or use a technology has a great impact on how the new worker will think about or use the technology. Additionally, the majority of the interviewees reported that the negative way of talking about or using a technology has a greater impact towards negative, than the positive way towards positive. This again might lead to a negative snowball effect, where the new workers further introduce the system to other new workers in the future. These observations are in line with theory.

> "A good example is that in the first few days here when my instructor held my introduction to the organization, whenever we would even talk about that system, he basically puked a little bit. That gave me a clear message about his opinion about that system. And I believe that I generated some sort of negative outlook towards that system right from the start because of it." – Interviewee F.

> "I believe that how other people react to a certain system has an impact on my outlook as well. If they struggle using it, it will have a negative impact. If they are however praising the system, it will have some positive impact. Between these, I think that the negative impact is a lot stronger than the positive." – Interviewee B.

There was however one exception when interviewee C thought the contrary. Interviewee C thought that talking positively about a certain technology has a greater impact on the positive, than the negative towards the negative. One

explanation to this might be because of the combination of an already high perceived self-efficacy level (excellent) and relatively longer work experience when compared to other interviewees (seven years):

> "I myself am a problem-solving kind of person, so I am not afraid of small challenges. So, I think that do take some sort of note of the negative struggle of others using the system, but I want to have the last say by confirming myself to see if the system really is that bad. But again, if someone is really praising a system, I get a feeling that 'wow that system must be good'." – Interviewee C.

Vicarious experiences showed to have a clear line when they were regarded as a good way of creating perceived self-efficacy and when they were regarded as a bad way. In addition to talking positive about a system, the vicarious experiences worked well when the showed system was simple. They worked well in showing, for example, appointment system's and task management system's functionalities. When again the system was much larger and had multiple functionalities, for example CRM systems, the interviewees required additional mastery experiences to raise their level of perceived self-efficacy towards the system.

When it comes to ways how vicarious experiences happened, the majority happened in two ways: the instructor showing the new system from a big screen or from a computer screen, and the interviewee observing other employees' behavior during work. Both ways reported to have a similar level of influence on the interviewee.

When the interviewees had generated a low self-efficacy and negative attitude towards a technology, they did not want to use it. If their work required them to use it, they did it reluctantly and kept the negative attitude towards the technology. These interviewees then reported technostress creating conditions of these same technologies. When the interviewees had generated a higher level of perceived self-efficacy towards a technology, they did not mind using it. Therefore, the results show a relationship with vicarious experiences and technostress. When the vicarious experience is negative, it can be associated with technostress creating conditions in new workers. When vicarious experiences are positive, they can be associated with technostress mitigation in new workers.

### 6.3.3 Social Persuasion

When it comes to social persuasion, it mainly had a positive influence towards perceived self-efficacy creation and technostress mitigation. Social persuasion had however a thin line in what situations it created a raised level of perceived self-efficacy and in what situations it caused a negative effect on the individual. It was regarded as positive in situations where the interviewees already felt they probably have the ability to complete the task prior to the social persuasion. Conversely, in situations where the interviewee would not have any reason to believe that they can perform the task, the social persuasion would be regarded as having a negative effect. This is in line with theory.

> "It [social persuasion] helps to believe in yourself to an extent if it is a task you kind of know how to solve. But if it is a task which you clearly cannot handle beforehand, and then they [an instructor or colleague] positively encourage you, then it is not good. It feels like someone is just too lazy to help." – Interviewee A.

Social persuasion was received mainly in two ways: face-to-face and via online interaction, for example, through email or company internal communication platform. Most of the interviewees felt that there was not a significant difference how the social persuasion happened with a few exceptions. Two of the interviewees felt that face-to-face social persuasion is more meaningful. However, a major difference between these two ways was not found.

Positive social persuasion also helped in creating a positive mindset and psychological arousal. This further helped in raising the level of perceived self-efficacy and mitigating technostress. This especially applied in situations where the interviewees had experienced small failures or setbacks in using technology. Social persuasion acted as a positive boost in these situations helping in recovering from the setback.

> "Once I did quite a big mistake in my opinion, which really irritated me, but then everybody was so supporting and said, 'no worries, that happens' and encouraged me forward. After that I felt that it [the mistake] wasn't so big of a deal." – Interviewee D.

### 6.3.4 Psychological Arousal

Psychological arousal could be categorized into positive and negative psychological arousal. Positive psychological arousal mainly had a positive impact in creating perceived self-efficacy and technostress mitigation, with a couple of exceptions. interviewees felt that positive psychological arousal made them less prone to technostress by creating a feeling of being more resourceful, patient, receptive and generally happier.

> "When I am feeling positive the small glitches in the systems do not create as big emotional reactions. You may even have the patience to start solving the issue and find out that it was because of a small mistake you made instead of a glitch in the system. So yes, mood plays a big part in it." – Interviewee N.

Some interviewees reported that positive psychological arousal is crucial in mitigating technostress especially in new workers. They felt that in the beginning when they have to learn many new systems and technologies, the positive psychological arousal energizes them to try different things in the new systems and encourages them to ask questions when faced with problems. In essence, it encourages them to gain mastery and vicarious experiences.

> "Everybody kept repeating in the start that if I do not know, just ask. I did not have to know everything, and they did not presume it either. The threshold to ask questions was very low. It made starting to do things a lot easier." – Interviewee L.

The results also indicated that creating a positive psychological arousal is affected by four things: being a new worker, the factors happening outside of work, other people's positive mindset at work and 'fake it till you make it' thinking. Interestingly, simply being a new worker had a major positive effect on the majority of the interviewees. The interviewees reported that they were very eager to learn new things and found new things very exciting, which resulted to a positive boost in general. The factors happening outside of work included physiological things, like good night sleep and exercise, and other things, like healthy social relationships. Other people's positive mindset made the interviewees feel more positive as well and helped them in entering the organizational culture. 'Fake it till you make it' thinking was explained as actively keeping up a positive mindset which then subconsciously drives the interviewee to be more positive as well and look for alternative solutions when faced with setbacks.

> "When you actively keep a positive mindset, it then starts to accumulate and suddenly things start to succeed and I think that when you have this open and forward-thinking mindset, you will start looking for alternative solutions also when you face obstacles. They then do not bother you so much anymore." – Interviewee C.

However, there were also some interviewees who said that neither positive nor negative psychological arousal have any effect on experienced stress when faced with technological difficulties if you cannot influence it. If it is a technological difficulty you cannot influence or solve, the state of your psychological arousal is not relevant. If the difficulty can be influenced or solved by yourself, only then does a positive psychological arousal create perseverance and mitigation against stress the technological difficulty may have otherwise caused.

> "A positive mental state does affect how you face technological difficulties. But it highly depends on whether you can influence it. If you cannot influence it, your positive mental state does not matter. If you can influence it, your positive mental state has a stronger positive effect." – Interviewee B.

There was also couple of case were interviewees reported positive psychological arousal had a negative effect. They felt that too much positivity might go too far, and you become too reckless with your work. It might negatively affect your concentration ability, which may lead to mistakes with technology use or other problems. Additionally, too much positivity emerged as too much eagerness, which lead couple of interviewees to suffer from work-home conflict.

> "But I have also noticed that, because this it is fun to work here and this job and environment is very social and is surrounded by positive vibes and hustle, that has at times made me more vulnerable to mistakes. When you are having too much fun and you might not have the patience to concentrate, you might make mistakes with software or something." – Interviewee D.

Negative psychological arousal showed to mainly make interviewees more prone to technostress. They felt that when they had a negative psychological state, they were less resourceful, patient, felt unhappier and were far less perse-

verant. The interviewees described that even one small setback or failure can trigger a negative stress reaction when in a negative psychological state.

> "Even the smallest things bother you then, like the simplest tasks of writing something to a document and then you forget to save it, and you have to do it all over again. That can be very infuriating. Even if that normally would not cause any reactions." – Interviewee K.

Results show that negative psychological arousal can be caused by three things: factors happening outside of work, other people's attitudes and the feeling of hurry. Factors happening outside of work include physiological factors, such as bad night sleep and injuries, and other things, such as poor social relationships. Other people's negative attitudes at work can be contagious and create negative moods in individuals themselves. The feeling of hurry can cause the individuals to feel less resourceful and unsure about tasks they were performing, especially since as a new worker they had not yet gained sufficient mastery experiences. The feeling of hurry can cause the new worker to feel that they do not have sufficient time to fully get to know the technologies and generate perceived self-efficacy towards them.

> "When I came to work here, it was a very busy time of the year. The hurry that people had here and what I also had in my work tasks felt quite stressful. Especially when I did not have the time to learn all the details in some systems, because I had to focus on the most important functionalities in order to be able to do my job. I think that because of this I still feel unsure when using them."

## 6.4 Other Factors Affecting Technostress Mitigation

This subchapter will go through additional things that came up in the study which affect technostress mitigation in new knowledge workers. It will go through the significance of social support, setting limits to technology use and technology characteristics affecting technostress mitigation.

In addition to the perceived self-efficacy creators, interviewees expressed other concrete ways to mitigate technostress. The biggest factor that was brought forth was social support. Social support in the context of new workers means that the instructor is able to provide help when asked and makes themselves easily accessible. Being easily accessible is crucial in social support so that the threshold is low for the new workers to ask for help when faced with technological challenges.

An instructor can make themselves easily accessible by, for example, being next to the employee ready to help. Being easily accessible is important also because you do not want the employee to feel like they are bothering others, which is a technostress strengthening factor as mentioned earlier. Social support in principle provides a mastery or vicarious experience, depending on how the help is then actually provided.

> "In the beginning, it was better that there was someone in immediate proximity because so many new things were introduced, and the instructor could right away provide help and they could see my computer screen and know what is going on rather than shouting from the other side of the room without seeing what the situation actually is." – Interviewee O.

Another interesting mitigating factor that was found relates to setting limits for technology use. Three interviewees reported to have suffered from a work-home conflict that caused technostress which was then solved by setting limits to technology use outside of work environment. This is especially interesting, because it basically provides less mastery experiences by limiting technology use. However, one could argue that mastery experiences played a crucial part here because they enabled the employee to find out where the limit is between healthy and unhealthy use, which allowed the employee to do preventive actions towards it. Interesting here is that the increase of mastery experiences negatively affected psychological arousal, which indicates that there are certain connections between perceived self-efficacy creators. This strengthens the fact that the relationship between technostress and perceived self-efficacy is not always straight-forward.

There were also some things that interviewees found either directly or indirectly affecting on technostress mitigation. Some interviewees reported that the visuality, quickness and pleasant user experience of a technology had an impact on technostress mitigation. The more pleasant, easy to use and quick the technology was, the less technostress it created. Also, the benefits that technology brought were found as mitigating factors against stress. These included the possibility of remote working and the flexibility it provides, combining and automating different tasks making work more efficient and reducing manual labor, and the new information that only technology provides making it possible to do adjustments and thus gain benefits.

Table 9 shows a summary of all perceived self-efficacy creators, the different ways they were created in new workers and their relationship to technostress. A positive relationship is regarded as a mitigating relationship towards technostress and a negative relationship is regarded as creating technostress.

| **Perceived self-efficacy creator and ways to create it in new workers** | **Relationship with technostress** |
|---|---|
| **Mastery experiences**<br>- Purely individual use<br>- Short instructed introduction first followed by individual use<br>- Simultaneous instructed introduction and use | **Mainly positive relationship.**<br>- Exception:<br>  o when the overuse of technology results in techno-invasion |
| **Vicarious experiences**<br>- Instructing from computer or big screen<br>- Employee observing others | **Both positive and negative relationship.**<br>- **Positive**: when technology taught was simple |

| | |
|---|---|
| | - **Negative:** when technology was more complex, and others' behavior with them was negative |
| **Social persuasion**<br>- Face-to-face<br>- Online interaction | **Both positive and negative relationship.**<br>- **Positive**: when interviewee already had a reason to believe that they have the ability to perform the task<br>- **Negative**: when interviewee already did not have a reason to believe they can perform the task. |
| **Psychological arousal**<br><br>Positive psychological arousal:<br>- Being a new worker<br>- Factors outside of work<br>- Other people's positive mindset<br>- "Fake it till you make it"<br><br>Negative psychological arousal:<br>- Factors outside of work<br>- Other people's negative mindset<br>- Feeling of hurry | **Mainly positive relationship**<br>- Exceptions:<br>o when positivity goes too far and creates recklessness or techno-invasion<br>o a small minority of interviewees feeling that it is irrelevant regarding technostress mitigation.<br><br>**Mainly negative relationship**<br>- Exception:<br>o a small minority of interviewees feeling that it is irrelevant regarding technostress mitigation. |

TABLE 9. Summary of perceived self-efficacy creators' relationship with technostress

# 7 DISCUSSION

This chapter will go through the discussion part of the study. It will first answer the research question by examining the relationship of technostress and perceived self-efficacy in new knowledge workers. Then it will examine the differences and similarities between theory and the study regarding the influence of individual characteristics in technostress mitigation. Then, the study will propose a model for new knowledge worker introduction to the organization and some practical implications on what it requires from both the individual and the organization. After that, the chapter will address the limitations of the study regarding reliability and generalization. Finally, the chapter will go through contributions and suggestions for future research.

## 7.1 Technostress, Negative Effects and Perceived Self-Efficacy in New Knowledge Workers

This subchapter will address and further discuss the meaning of the results found in the interviews. It will firstly address the most significant technostress creating conditions found. Secondly, it will address the most significant negative effects found. Thirdly, it will address and discuss the relationship between perceived self-efficacy and technostress.

Firstly, the results suggest that technostress does occur in new knowledge workers. Techno-complexity is the most dominant technostress creating condition with new knowledge workers with approximately 94% of the interviewees, all but one, reporting to have experienced it. Moreover, all of these interviewees reported to have experienced it from an external software used as a tool. Additionally, techno-uncertainty (~69%) and techno-overload (~63%) occurred in more than half of the interviewees. When considering these results in the context of new knowledge workers, they reveal certain factors. New knowledge workers are exposed to a large amount of new technology and technical problems. They have to learn external software, company own software and possibly different computer operating systems all at the same time, while simultaneously experiencing challenges such as software crashes, insufficient introduction to the used technologies and ambiguity with software choice.

Secondly, these technostress creating conditions cause negative effects in new knowledge workers. The most significant negative effects include dissatisfaction with the IS used (~88%) and reduced productivity (~81%). The causes of these negative effects were again mainly dominated by techno-complexity and techno-uncertainty. With so large percentages of new knowledge workers reporting negative effects from technology, the matter is clearly important. Knowing the importance of human capital in today's workplaces, these negative effects might have substantial effects on organizational performance and create additional financial costs. Especially, since previous research has showed that employee turnover is often the highest during the first year of a new recruit (Allen & Shanock, 2013) and the cost of a new employee can be relatively high. That being said, the negative effect of reduced job satisfaction did not appear at all in new knowledge workers. The reason behind this is unclear, but the huge positive boost to an individual's psychological arousal that being a new employee in a new workplace brings, can be an affective factor.

Thirdly, in order to find out the relationship between technostress and perceived self-efficacy, the study looked at each perceived self-efficacy creator's relationship with technostress individually. The results generally indicate that higher perceived self-efficacy levels with technology in new knowledge workers is associated with lower levels of technostress. However, these results are not self-explanatory.

Mastery experiences mainly have a positive relationship with technostress. Particularly, mastery experiences are found to be especially effective against techno-complexity, the main technostress creating condition in new knowledge workers, and techno-insecurity. This means that the higher the mastery experience with a certain technology, the less techno-complexity and techno-insecurity one will experience from it. Individuals who had more previous mastery experiences with the technologies, did not find the same technologies as complicated and thus, experienced less technostress. Additionally, techno-insecurity was tackled in one employee by raising their mastery experiences with the technologies they experienced techno-insecurity from. Interestingly, there was one situation where using a technology, which is the core principle of mastery experiences, lead to technostress. When an individual would overuse a technology, like in a work-home conflict situation, they would certainly feel more capable of using the technology, or a higher perceived self-efficacy, but would experience techno-invasion. This indicates that knowing how to use a technology very well might raise the level of perceived self-efficacy with the technology, but ultimately not using a technology in a healthy manner results in technostress. One could argue that not knowing how to use a technology in a healthy manner lowers the perceived self-efficacy level of an individual with the technology. However, discovering the individual's healthy limits of using a technology is beneficial and provides more information from which technostress mitigation actions can be based on. Therefore, not only does mastery experiences possibly create techno-invasion but can also help in mitigating it.

Vicarious experiences have a more complex relationship with technostress. They can serve as a great technostress mitigating factor if the new technology taught is simple enough to be learned only by observing. In these cases, vicari-

ous experiences effectively mitigate techno-complexity. However, technology in nature is complicated and is associated with steep learning curves, therefore vicarious experiences are not effective enough in some cases. A mastery experience is needed in addition to get an assurance of your abilities and raise the level of perceived self-efficacy. Solely relying on vicarious experiences in cases where it is not enough can lead to techno-uncertainty. Additionally, vicarious experiences are a social experience. This means that they are affected, not only by the learner's, but by others' behavior as well. This brings additional variables that can go wrong and affect the level of perceived self-efficacy negatively. For example, if the individual who is providing the vicarious experience, has a negative attitude against the technology or is biased towards it and shows it openly, it can be transmitted to the learner as well. The learner may then gain a negative vicarious experience, lower the level of their perceived self-efficacy, create a disinterest to use that technology, gain a negative psychological arousal and ultimately create technostress when having to use that technology. This again lowers work efficacy and can even spread negativity towards the technology to other employees. Having a negative attitude should be especially avoided in new workers because they are more likely than others to not have any previous experiences with the technologies used in the organization, which makes them more prone to other employee's attitudes and opinions because they might have not yet formed an opinion of their own. Additionally, having a negative attitude has a larger effect towards the negative than a positive attitude has towards the positive, but again a positive attitude is not associated with any negative effects. If, however the new worker already has a high perceived self-efficacy, the balance between the effects of negative and positive attitudes is different: they are less prone to the negative attitudes of others and are more reinforced by the positive attitude of others. Therefore, if negative attitudes towards technologies are avoided and the focus is more on the positive, and the technology is simple to learn, vicarious experiences can be a very effective and quick way to raise the level of perceived self-efficacy with the technology and mitigate technostress.

Social persuasion has a dual-relationship with technostress. According to theory, social persuasion is an effective way of creating perceived self-efficacy in an individual when they already have the reason to believe that they are capable of doing a certain task. This fact was also found to be true when it comes to technostress mitigation. When the new worker had a reason to believe that they were capable of doing a task, social persuasion was found to be helpful in some cases raising their perceived self-efficacy. This mitigates against techno-uncertainty because the employee might be uncertain of their capability of performing the task. If, however the new worker did not have any reason to believe that they would be able to perform the task, social persuasion had the opposite effect in some cases, it created techno-uncertainty. The significance of social persuasion can be great because new workers are many times more agreeable to more experienced individuals' behavior in organizations because they are looking for social models to learn from. At best, social persuasion can be an empowering experience, help recover from failures and setbacks and create a positive psychological arousal further reinforcing perceived self-efficacy.

From all of the four perceived self-efficacy creators, positive psychological arousal seems to be the most common found in new workers right from the beginning of starting in a new job position. Simply being a new worker created a positive psychological arousal which was found to make the employee more resistant and create perseverance in them when faced with difficult tasks. Even when faced with failures, the new workers would bounce back and persevere, which would many times lead to creating a mastery experience and ultimately to a raised level of perceived self-efficacy. This could be for many reasons but being in a new environment where you are eager to learn and show what your abilities can have an effect. Additionally, many of the interviewees were in their twenties and fairly newly graduated, which could have reinforced the positive psychological arousal. Positive psychological arousal mitigated against techno-complexity, techno-uncertainty and techno-overload. A new worker would be more perseverant when learning difficult technological tasks, more courageous and resistant to uncertainty, such as unreliable internet connection and software crashes, and more eager to learn new technologies. Although, too much positivity can be harmful as well. New workers who become too positively aroused are more prone to recklessness in their work or can become too eager to learn which may result in a work-home conflict creating techno-invasion. Psychological arousal can also be negative. New workers with a negative psychological arousal are more prone to emotional agitation, which might lead to technostress. Interviewees reported that during days where they were tired and felt distressed, they would be more prone to technostress as well. In general, it can be considered that a good amount of positive psychological arousal creates perceived self-efficacy and mitigates against technostress, and negative psychological arousal makes new knowledge workers more prone to technostress. Additionally, there are small minorities who feel that psychological arousal, being it positive or negative, is irrelevant regarding technostress mitigation. These differences could be possibly explained by differences in individual characteristics or personality traits.

Figure 3 below summarizes the mitigating relationships between perceived self-efficacy and technostress creating conditions in new knowledge workers.

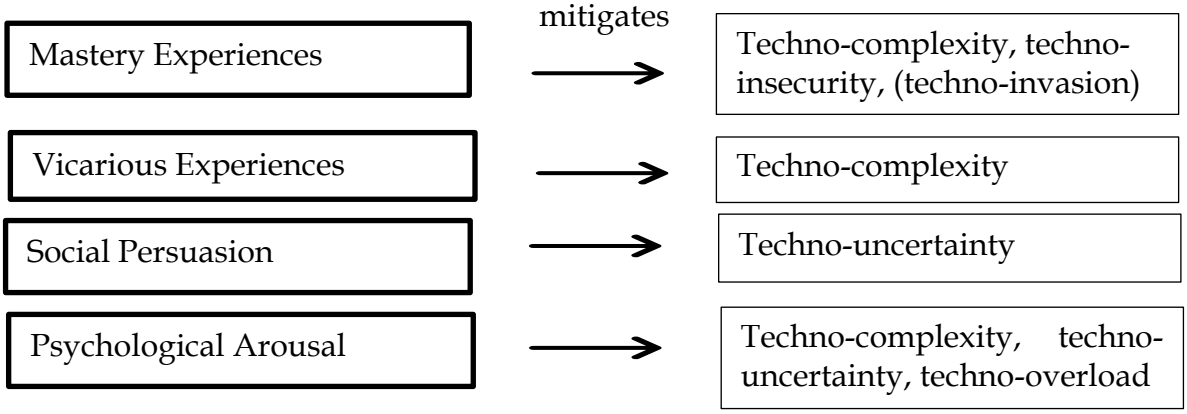


FIGURE 3. The mitigating relationships between perceived self-efficacy creators and technostress creating conditions in new knowledge workers.

## 7.2 Influence of Individual Characteristics in Technostress Mitigation

This subchapter will address the influence of different individual characteristics that were found in the results. It will go through the possible individual differences in interpreting physical or emotional reactions, the differences in experiencing technostress in men and women knowledge workers, and if there were any correlations found in the personal evaluation of computer confidence prior to interview and experienced technostress in the interviewees.

When interpreting technostress mitigation through perceived self-efficacy, it is important to remember a few things. In addition to the nature of the emotional and physical reaction to a certain task determining perceived self-efficacy, it also matters how these reactions are interpreted by the individuals. Individuals with already high perceived self-efficacy levels are more likely to view the reaction as an energizing factor pushing them towards perseverance and resistance when faced with technostress creating situations. Whereas individuals with low perceived self-efficacy will perceive the reaction as a negative debilitative factor and will thus, suffer from technostress. In addition to this, theory states a there are certain other individual characteristics which influence technostress mitigation. Among these are gender and computer confidence.

In new knowledge workers, certain relationships were found between the mentioned individual characteristics and technostress mitigation. When it comes to gender, theory states that men are more capable of mitigating technostress but experience more technostress than women. In this study, there was no significant difference found in men and women. There was one woman more than men in every category except techno-overload, but the difference is not significant. Thus, theory is not supported regarding gender differences.

Theory states that individuals who have a higher computer confidence are positively able to mitigate technostress. In this study, the significance of computer confidence was found in the polar opposites. The ones who rated their computer confidence as ‘excellent’ experienced the lowest number of technostress creating conditions, and the ones who evaluated their computer confidence as ‘below average’ experienced the most technostress creating conditions. However, the difference between the middle values, ‘above average’ and ‘average’, was not significant. Thus, the theory is somewhat supported.

## 7.3 Model for New Knowledge Worker Introduction to New Technologies

This subchapter proposes a new model for new knowledge worker introduction to new technologies based on findings in this study. The objective of the model is to familiarize the employee with the technologies quickly and efficiently and to minimize the discomfort brought by technostress. The model is based on cre-

ating perceived self-efficacy in new knowledge workers from the organization's perspective. Some simplifications have been done in the proposed model. The concepts in the proposed model, when applied practically, may consist of complex and detailed interdependencies. Additionally, the model is designed specifically for learning totally new technologies from which the learner has not had any, or has had very little, previous experience before.

In order to learn, one must invest time and resources, which can be stressful. Perseverance is key in these situations. When looking at the most dominant technostress creating conditions and negative effects reported in new knowledge workers, they can be associated with learning. It might even be obligatory to go through them in order to master a new technology. Even so, making this journey easier for a new worker is possible and worthwhile without sacrificing the learning experience. In the end, the starting phase of a new job position in a new organization sets the foundation for the future path of a new worker. The model introduced in this chapter includes four phases: introduction, supported mastery, increase of worker independence and sustained mastery. Each phase includes an organizational mechanism for technostress mitigation. Additionally, positive psychological arousal plays an integral part in the model. It should be reinforced throughout all the four phases and continued through the lifespan of the technology in the organization. In the model, positive psychological arousal implies altering the tendencies to negative emotions and reducing stress reactions by enhancing a positive mood towards the new technology. Negative psychological arousal should be actively avoided at all times because of the risk of technostress associated with it.

The first phase of new knowledge worker introduction to a new technology should focus on the most important part: generating mastery experiences. According to the results of the study, the most effective way to do this with a totally new technology the individual has not previously used, is to provide a simultaneous vicarious and mastery experience. Technically, this means that an instructor with a high level of perceived self-efficacy with the technology sits down with the learner showing different actions and functions of the technology, while the learner gets to do the actions simultaneously on their own. This basically combines the benefits gained from vicarious and mastery experiences: the visuality of actually seeing another employee showing how a certain function is done, and the mastery of being able to replicate it yourself. The instructor has to pay attention in keeping a positive attitude and atmosphere in the instructional situation and not talking down to the learner or about the technology being learned. This is done to reinforce positive psychological arousal. This is important because in contrary situations, the negativity might be transmitted to the learner and the learning experience might suffer. The positivity maximizes the positive psychological arousal in the learner. Additionally, ideally the instructor is a fairly new worker themselves so that they are more relatable with the new knowledge worker, but mastery with the technology should not be sacrificed by the novelty of the instructor. In principle, the first phase provides the organizational mechanism of literacy facilitation.

The second phase of the model includes further exercising the learner's mastery experience and reinforcing it by social support. Ideally, the learner gets

to practice their mastery in real scenarios and job tasks, where they get to do job tasks which are included in their job description. This practice of mastery experience is supported by social support. Social support is provided by the instructor. The instructor should right from the start be in the immediate proximity focusing on the learner and their needs. Being in the proximity and focusing on the learner is important, because as a new worker, the learner might not have the courage to come to the instructor independently and be in the fear of interrupting them. This way the learning is made as efficient as possible. According to the results of the study, social support was found as one of the most important and helpful ways of learning new technologies. The cons of social support include that the progress of the instructor's own work might suffer. That is why ideally the instructor would be given the liberty of their own work for the time being or even having a full-time employee whose job description includes onboarding new workers. Also, like in the first phase, reinforcing positive psychological arousal by the instructor in second phase is important as well. This should be done by the similar means as mentioned in the first phase; not talking down to the learner or about the technology and keeping a positive mindset. In principle, the second phase provides the organizational mechanism of technical support provision.

The third phase can be described as increasing worker independence. This phase includes a slow transition from the second phase as the learner progresses and is in less need of the instructor. The instructor can leave the immediate proximity of the learner but should still be easily accessible. The instructor should keep up the positive psychological arousal when contacted and be ready to support the learner whenever the learner is in need of it. In this phase, it is crucial for the instructor not to exit too quickly, as the learner might not be ready to work independently and be more prone to technostress. This decreases the learning experience's efficiency. The third phase ends when the instructor is no longer needed to support the learner's work with technology. In principle, the third phase provides the organizational mechanism of technical support provision.

The fourth and final phase includes sustaining mastery. This phase does not require the instructor, but rather is an organizational matter. The organization should support innovation and help in sustaining mastery in technologies the learner has learned. Innovation support provided by the organization further promotes positive psychological arousal. This includes encouraging learning and experimenting with the technology (Tarafdar et al., 2011) through, for example, providing the learner's freedom to do this in their work. This prevents specific technology knowledge decrease, supports perceived self-efficacy with the technologies and increases technostress mitigation. In principle, the fourth phase provides the organizational mechanism of innovation support.

In the model, the learner and the instructor form a special relationship. The instructor acts as a mentor and as a first-point-of-contact. The instructor should also take care that the new worker is not overloaded with new technology so that techno-overload is avoided. Additionally, the instructor should make sure that the technology use stays reasonable and at reasonable times. This is to avoid both techno-overload and techno-invasion.

The model tackles all of the technostress creating conditions found in new knowledge workers: techno-complexity, techno-insecurity, techno-invasion, techno-overload and techno-uncertainty efficiently. The focus of the model is to increase mastery experiences in a smart and efficient way and to minimize techno-complexity, which was found to be the most dominant technostress creating condition in new knowledge workers. Techno-complexity and techno-insecurity are tackled slowly but surely by making sure that the learner is ready to absorb new information, is carefully instructed along the way and has the opportunity to create own mastery experiences. Techno-invasion and techno-overload are tackled with the role of the instructor. The instructor monitors that the learner is not overloaded with technology and informs the learner about reasonable use of technology. All of this is supported with positive psychological arousal all along the way, which is provided by the instructor and the organization. The biggest challenge is to tackle techno-uncertainty, because it includes outside factors, which cannot be affected by the instructor or the organization. These include, for example, things happening in the learner's social life and things that are part of technology's nature, such as software bugs or unreliable internet connection. However, techno-uncertainty creating factors relating to job, like insufficient introduction, can be tackled with the model. The model can be used by organizations wanting to ensure a soft but efficient introduction of technologies to their employees.

Figure 4 below demonstrates the model.

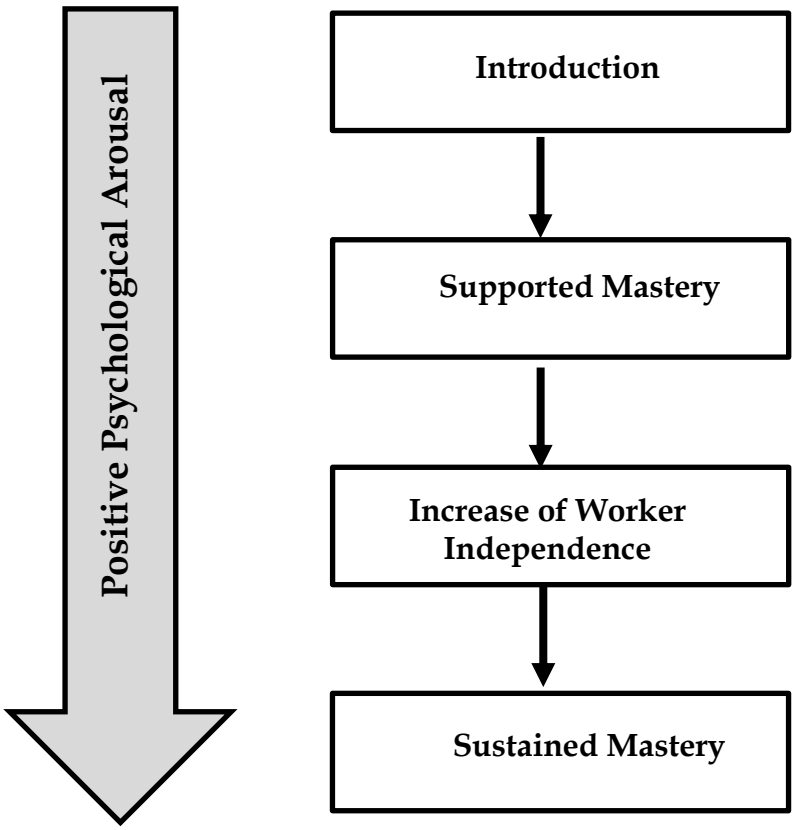


FIGURE 4. Model for New Knowledge Worker's Introduction to Technologies

## 7.4 Limitations of the Study

This subchapter will go through the limitations of the study. There were certain limitations that can affect the reliability and generalizability of the study. Specifically, there were limitations regarding the interviewees, the research sample, the existing literature, the researcher and the research context.

There were certain limitations set regarding the selection of interviewees to the study. The interviewees had to have worked for at least two weeks and maximum of four months at the time of the interview. Some of the interviewees had worked for just over two weeks, as the others had worked for closer to the four months limit. This resulted that some of the interviewees closer to the four months did not remember specifically certain things, such as specific technostress creators. On the other hand, some interviewees closer to the two-week limit had not yet been introduced to all of the technologies they would eventually learn. These factors negatively affected the reliability of the study. However, by having a larger scope of potential interviewees, the sufficient number of interviewees and research data was guaranteed. The quantity of 16 interviewees in a qualitative study can be held as sufficient (Hirsjärvi & Hurme, 2000), which affected the reliability of the study positively.

The research sample consisted of new knowledge workers from one organization located in Finland. This brings some limitations to the generalizability of the study, because the research interviewees experiences were solely based on their experiences in this one particular organization. It brings limitations when considering the international generalization possibility of the research results. Additionally, the company works in the health and wellness industry and encourages and promotes employee wellbeing. The employees were very familiar with the concept of stress and aware of ways to mitigate it. This could have affected the generalizability of the results in a negative way. However, the researcher tried to avoid using the word 'stress' or 'technostress' and used words such as 'negative charge' or 'strain' in the interviews so that any possible prejudice was in the minimum.

Regarding existing literature, the categories of technostress creating conditions, which were also applied in this study, can be limiting. The technostress creating conditions imply that stress is caused by a certain technology in a certain condition which creates a negative effect on an individual. This condition is described as, for example techno-complexity. However, when used in an empirical research, identifying a technostress creating condition is not always simple. There can be other things that can cause the technology to create stress, which are not related to the technology. For example, an organization can set a set of rules how a certain software should be used. It can be this set of rules, which can be badly designed, that cause the technology to create technostress. In other circumstances, the technology itself would not cause technostress at all, but because there is a higher authority defining certain ways to use the technology which are not the most suitable, it causes the technology to create stress in an individual. In these cases, it still is the use of technology causing the stress, but it is doing so just because of the certain ways it was defined to be used by a

higher authority, not solely because of the technology. That is why interpretation is key when trying to define what causes stress when using technology. The limitations of these definitions may also affect the reliability of the study negatively. Additionally, the term 'high technology self-efficacy' used to describe individuals in existing literature can be too general. One might have a very high technology self-efficacy when it comes to certain technologies, but quite low when it comes to others. Rephrasing the term to describe high technology self-efficacy in certain technologies or certain types of technologies should be considered for future research.

Limitations regarding the researcher relate to inexperience and personal views and interests. The empirical research conducted was a very first academic empirical research that the researcher has conducted, which can be seen as negatively affecting reliability of the study. This matter was however minimized by receiving guidance from the research supervisor and by extensively researching existing literature about the subject.

The research context was specifically new knowledge workers. This has to be kept in mind when considering the generalizability of the study because the views presented by the research interviewees were all given from the viewpoint of a new knowledge workers in a new company. That is why these are not generalizable to all employees in a company nor to all new workers in any field of work.

## 7.5 Contributions and Suggestions for Future Research

This subchapter will go through the contributions this study has done to the research area of technostress, perceived self-efficacy and new knowledge worker introduction. Additionally, the subchapter will propose suggestions for future research.

This research contributes to the research area of technostress. The term 'technostress' was first coined by Brod in 1984. Since then, there has been quite a lot of research conducted in defining technostress, finding out what creates technostress, and researching what effects it causes in both the organizational and individual level. The amount of research that has been conducted on technostress mitigation is still relatively low, but a few studies can be already found on the subject. There has been a certain amount of diversity in research contexts, but there still is a call for theoretical and scholarly development in the technostress domain by researching the technostress phenomenon in particular contexts, such as with specific types of technologies, tasks or roles (Ayyagari, Grover & Purvis, 2011; Shu, Tu & Wang, 2011; Tarafdar, Pullins & Ragu-Nathan, 2015). This study contributes to the specific context of technostress in new knowledge workers, which has been unprecedented before. The study successfully brought forth what are the key issues when introducing technology to new knowledge workers and what kind of relationship perceived self-efficacy creators have with technostress.

By clearly defining the key concepts, technostress and perceived self-efficacy, and using them as part of a research, this study contributed to both the technostress and perceived self-efficacy research. The study also contributed by summarizing several proven mitigation strategies, both organizational and individual, that have been researched and found at least partly successful to this date. This is especially important, since a clear efficient mitigation strategy has not been yet identified, and summarizing the existing mitigation strategies, helps in providing a justification and a base to testing the psychological concept of perceived self-efficacy as a mitigation strategy. Establishing the relationships between technostress and perceived self-efficacy in new knowledge workers helps to bridge the two concepts together lowering the ambiguity associated between them.

The research has several practical implications as well. The established relationships can be used in predicting the amount of technostress one might experience in a potential job position by evaluating their perceived self-efficacy. It helps especially when evaluating one's suitability for a job position with a steep technological learning curve. Additionally, the relationships can be used to provide IT-training with existing staff, especially for those known to be prone towards technostress. Also, the proposed model is a practical tool designed to be used as new knowledge employee introduction to technologies to mitigate possible technostress. It also enforces good practices with technologies, such as avoiding overuse.

An especially interesting topic for future research includes examining if the personality traits and individual characteristics that have proven to have a mitigating effect towards technostress also influence the level of perceived self-efficacy one has. This would help more in understanding if perceived self-efficacy can be affected through those means and would broader our understanding of perceived self-efficacy.

This research focuses on the time limit of first few weeks or months of starting a new job position. Because of this, for future research it would be interesting to examine if the significance of negative psychological arousal created by other employees on new knowledge workers would diminish in the future. This is especially interesting, since with new knowledge workers the attitudes of others have a major impact on how the new worker shapes their attitudes towards certain technologies. Discovering whether this is the case when the worker has gained more experience in the company, would be interesting.

Relating to the time limit of this study, it would be interesting to research if the employees have gained perceived self-efficacy with the same technologies a year or so after starting the new job position and what kind of relationship perceived self-efficacy has with technostress at that point. This would allow the comparison of these two time periods and could potentially validate the findings of this research. Additionally, a validation of the proposed model of this study would be interesting to research. If the model was found to be validated, its significance for practical use would be even more increased.

# 8 CONCLUSION

This chapter concludes the study. The objective of this Master's Thesis was examine the relationships between perceived self-efficacy and technostress in new knowledge workers and how this relationship manifested in the beginning of the employment. The research area is very attractive, because there is very little prior research in this specific context and, in the digitalized world, technology has become an increasingly integral tool in the modern workplace.

The study included a literature review and a qualitative empirical study. The literature review was presented in chapters 2-4. The literature review consisted of existing research forming a theoretical base for the empirical research. The empirical research was presented in chapters 5-7. Chapter 5 addressed the research methodology, which included a qualitative semi-structured interview as a data collection method and grouping and coding as an analysis method. Chapter 6 addressed the results of the empirical research. It presented what kind of technostress was found in the study group, what kind of relationship perceived self-efficacy has on technostress and other factors found to affect technostress mitigation in new knowledge workers. Chapter 7 included a discussion section, which addressed the set research question and proposed a new model based on the findings of the study. It also addressed the limitations and contributions of the study and proposed topics for future research. The final chapter concludes the study.

The conclusions of the study include that technostress and perceived self-efficacy in new knowledge workers do not have a self-explanatory relationship. Simply assuming that mastery experiences, vicarious experiences, social persuasion and psychological arousal have a mitigating effect towards technostress is not entirely correct. In reality, the issue is more complicated. The perceived self-efficacy creators have interdependencies and certain requirements that affect the outcome they have on technostress mitigation. With the acknowledgement of these interdependencies and requirements, perceived self-efficacy can be a powerful tool in battling technostress in new knowledge workers.

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