Techno-stress as a barrier in front of sustainable innovation: A research in food retail sector

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Araştırma Makalesi/Research Article		DOI: 10.70736/ijoess.1659
Gönderi Tarihi/ Received:	Kabul Tarih/ Accepted:	Online Yayın Tarihi/ Published:
14.10.2024	01.06.2025	15.06.2025

Abstract

In recent years, especially with Industry 4.0, which is in interaction with innovation, rapid digital developments in the world have affected not only the way organizations do business, but also employees. While the increase in the use of machinery and the fact that innovative artificial intelligence (AI) applications have become almost a part of daily life and increase the efficiency in organizations in a visible way, in some cases these developments cause negative effects on employees. One of these effects is the stress experienced by the employees when using technology in innovation based organizations. This stress experienced by employees is called "technostress". The motivation of this paper is to research chain supermarket industry employees' attitudes regarding technostress. In this context, a survey form, which includes demographic questions and the Technostress Scale with 14 items was prepared and delivered to the potential participants. 184 employees participated in the research. Descriptive statistics, factor analysis, non-parametric tests and post-hoc tests were applied to the gathered data. Findings show that there is statistically significant difference (p <0.05) between demographic characteristics (gender, marital status, age) of the participants and their attitudes towards technostress. In addition, according to the participants the most important items of the Technostress Scale are "I have co-workers who are more knowledgeable than me about the technology I use at my workplace", "Frequent updates are made to the technological devices we use at my workplace" and "We constantly use new technologies at my workplace". Furthermore, post-hoc tests show that, in the context of gender characteristics the difference stems from women participants, in the frame of marital status characteristics it is found that the difference stems from single participants. Finally, it is found that in the frame of age characteristics the difference stems from 30-39 age group. The fact that there is hardly no researches on technostress in the frame of chain supermarkets in literature, causes the current study to constitute originality. Therefore, it is expected that this research will shed light to both future researchers and professionals.

Keywords: Innovation, sustainable innovation, sustainability, technology, technostress

Sürdürülebilir inovasyonun önünde bir engel olarak tekno-stres: Perakende sektöründe bir araştırma

Öz

İnovasyonla etkileşim halinde olan Endüstri 4.0 ile birlikte dünyadaki hızlı dijital gelişmeler sadece örgütlerin iş vapıs bicimlerini değil, calısanları da etkilemistir. Makine kullanımının artması ve venilikci vapav zekâ (YZ) uygulamalarının günlük yaşamın neredeyse bir parçası haline gelmesi, örgütlerde verimliliği gözle görülür şekilde artırırken, bazı durumlarda bu gelişmeler çalışanlar üzerinde olumsuz etkilere de neden olmaktadır. Bu etkilerden biri de inovasyon temelli örgütlerde çalışanların teknoloji kullanırken yaşadıkları strestir. Bu strese "teknostres" adı verilmektedir. Bu araştırmanın amacı, zincir süpermarket sektörü çalışanlarının teknostrese ilişkin tutumlarını ortaya koymaktır. Araştırma kapsamında demografik sorulardan ve 14 maddelik Teknostres Ölçeğinden oluşan bir anket formu kullanılmıştır. Araştırmaya 184 çalışan katılmıştır. Topanan verilere betimsel istatistikler, faktör analizi, non-parametrik analizler ve post-hoc analizleri uygulanmıştır. Bulgulara göre katılımcıların demografik özellikleri ile teknostrese yönelik tutumları arasında istatistiksel olarak anlamlı bir farklılık (p < 0,05) bulunmaktadır. Ayrıca, katılımcılara göre Teknostres Ölçeği'nin en önemli maddeleri "Çalıştığım yerde kullandığım teknoloji hakkında benden daha bilgili çalışma arkadaşlarım var", "Çalıştığım yerde kullandığımız teknolojik cihazlarda sık güncellemeler yapılır" ve "Çalıştığım yerde sürekli yeni teknolojiler kullanırız" maddeleridir. Ayrıca, post-hoc testler, cinsiyet özellikleri bağlamında farkın kadın katılımcılardan kaynaklandığını, medeni durum özellikleri çerçevesinde ise, farkın bekar katılımcılardan kaynaklandığını göstermektedir. Son olarak, yaş özellikleri çerçevesinde farkın 30-39 yaş grubundan kaynaklandığı bulunmuştur. Literatürde zincir süpermarketler çerçevesinde teknostres konusunda neredeyse hiç araştırma olmaması mevcut calışmaya özgünlük yüklemektedir. Dolayısıyla bu araştırmanın hem gelecekteki araştırmacılara hem de profesyonellere ışık tutması beklenmektedir.

Anahtar Kelimeler: İnovasyon, sürdürülebilir inovasyon, sürdürülebilirlik, teknoloji, teknostres

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INTRODUCTION

The concept of innovation is based on the ideas of Austrian-American political economist Joseph Schumpeter (Karakaş, 2020). Schumpeter allocated an important place to innovation in his theory of economic development and defined the concept as a new product, service, market or production process. According to Drucker, on the other hand, innovation is the unique tool of entrepreneurship and is an action with a new capacity to enrich resources. In this context, innovation actually creates resources (Drucker, 1985).

Nowadays, it has become mandatory for organizations that want to have a sustainable structure to adapt to innovative thinking and production methods. It is inevitable for organizations that cannot keep up with innovation to enter a process of entropy rapidly, especially in today's environment in which change accelerates gradually (Öztırak & Yazıcı, 2023). Therefore, Industry 4.0 represents the transition towards an innovation-based economy with big data, information and the internet of things and it will continue to pave the way for a new era of digitalization and business processes in which production systems are interconnected and become smarter (Avunduk, 2023). On the other hand, organizations are living structures and they have to adapt to changes in order to gain competitive advantage, as afore mentioned. In this sense, any situation, especially regarding change, that occurs within the organization carries the risk of putting pressure on employees. At this point, the concept of "technostress" comes to the fore (Tanyıldızı & Habip, 2023).

The concept of technostress has been studied mostly in organizational environment (Rose et al., 1998). Therefore, it is seen that the definitions focus mostly on organizational facts and the use of technology in organizations (Orhan Göksun, 2016). Tarafdar et al., (2007) have suggested that conditions that create technostress in organizations are associated with adverse psychological outcomes such as an increased level of role stress, reduced job satisfaction and reduced organizational commitment, as well as with adverse information system (IS) outcomes such as decreased innovation in employees' tasks while using the IS, reduced productivity when using the IS and dissatisfaction with the IS (Hwnag & Cha, 2018). When considered in the broad frame, it can easily be understood that techno-stress stands as a barrier in front of sustainable innovations in organizations.

In this sense, the motivation of this research is to reveal the attitudes of supermarket chain industry employees' towards technostress. As it is highly observed, supermarkets have started to use technology more intensively than before. Almost every duty have become digitalized. In

addition, artificial intelligence have caused cashiers to feel unnessary. In this context, it is inevitable for employees to both feel the stress of using these technologies in the right way in order not to make a mistake and to feel the fear of losing their jobs since the technological processes are complex to understand and use.

Theoretical background of innovative and sustainable organizations

According to the definition of the Oslo Manual, the Organization for Economic Co-Operation and Development (OECD)'s international reference guide, innovation is a new or improved product or process, or a combination of these, that is significantly different from the unit's previous products or processes and is offered to potential users (product) or made available for use by the unit (process) (Boyacı, 2018; Cellek, 2022).

Although innovation highlights concepts such as new or innovative, it also refers to the process of creating and implementing new ideas, processes, products or services in order to improve the current situation or create new value (Akyürek, 2020). Drucker defines innovation as innovation-oriented activities carried out with the aim of changing and developing the organizational activities to be carried out, the products and services to be produced in line with certain purposes, and emphasizes that innovation is a prerequisite for organizations to continue their existence (Carayannis Samara & Bakouros, 2015). In this context, organizational and environmental needs, and as a result, will not be able to meet both their organizational and environmental needs, and as a result, will not be able to continue their existence and will disappear (Avcı, 2009). Therefore, organizations need innovation for sustainability (Şahin & Demiral, 2023).

Innovation is seen as a sustainable growth tool and creates new employment opportunities while creating a creative, energetic working environment for organizations. On the other hand, it is not a correct approach to perceive innovation only as the creation of new ideas, information, inventions and technologies in the sense that innovation must gain commercial meaning in order to create social and economic benefit. Technological developments, increased flexibility, speed and efficiency, changes in the requirements of the information society, shortening of product lifecycles and the time to introduce new products to the market have led to the formation of an intense competitive environment. In the face of these changes, organizations have had to consider product, service and information flows as a whole, from suppliers to customers, in order to maintain the balance between competitiveness and the needs of their customers. This

change needs to be closely monitored in order for organizations to both increase their competitiveness and develop successful innovation strategies (Polat & Erciş, 2013).

Today, it is no longer correct to assume that innovation is created only in R&D units or laboratories. Innovation is considered as a corporate-wide process that includes production, marketing, administration, purchasing and many other functions. Although there is no single "best" structuring model for organizations, it can be said that successful organizations are mostly structures that provide good harmony between structure and operational processes. When there is good fit, innovative behavior is motivated. On the contrary, it is not easy to talk about creativity and innovation in structures where communication is limited and hierarchy is high. Innovation involves the act of bringing together different perspectives to solve problems, therefore it requires teamwork (Bayhan, 2004). In this context, it is of great importance for organizational employees to accept, learn and use new technologies for organizations to implement sustainable innovations.

Theoretical background of technostress

Selye (1956), is the first researcher that mention the concept of "stress". The individual's reaction to expectations and actual events has also been expressed as a state of tension in his/her emotions and thought processes that threatens the individual's ability to cope with his/her environment (Soysal, 2009). In Chinese civilization, the word stress is a combination of the words "danger" and "opportunity". In this sense, in stress, there are both difficulties and opportunities that arise and there are also advantages that are gained when these difficulties and tensions are overcome (İgrer, 1989). Stress is the reaction that occurs in an individual's body or brain when he/she feels a threat in any situation (Hughes & Boothroyd, 2002). It is the unclear physiological and psychological reaction to events that are perceived and considered as a danger to individual's happiness and peace (Şimşek et al., 2005). Stress is also defined as an individual's reaction to threatening environmental characteristics and indicates the harmony between the individual and his/her environment (Yumuşak, 2008; Keleş, 2018). Furthermore, The World Health Organization (WHO) explains stress in the organizational context as employees' reactions to work demands and pressures that do not match their knowledge and abilities and challenge their coping skills (Küçükdursun et al., 2022).

In terms of technostress, it is important to define the term "technology" in the first place. The term "technology" includes several concepts such as machinery, technical operations, science, culture, society and organization. When these concepts come together and are organized effectively, they form the term "technology" (İşman, 2014). In this sense, it can be observed that the concepts it depends on change very rapidly in a short time and this rapid change continues exponentially. Technology has gained a very important meaning for today's individuals and it can be said that it has become an integral part of individuals (Ahmad et al., 2012). In today's rapidly changing and competitive world, neither individuals nor organizations can act without technology. Technological change in organizations has become mandatory due to the pressure created by the competitive conditions in the environment (Çetin & Bülbül, 2017; İlseven, 2019). At this point, information and communication technologies can cause anxiety and tension on users. Depending on an individual's inclination towards information and communication technologies, causing feelings of helplessness and powerlessness, resulting in reluctance and phobia towards technology usage (Tarafdar et al., 2007). This fobia is called "technologies (Nisafani et al., 2020; Küçükcivil et al., 2024).

The term "technostress" was first mentioned by Brod (1984), as "a modern disease of adaptation caused by inability to cope with new computer technologies in a healthy manner". Weil and Larry (1997) improved the term as "any negative impact on attitudes, thoughts, behaviors or psychology caused directly or indirectly by technology". In this sense, technostress can be defined as a reflection of an individual's fear and anxiety while learning and/or using computer technology. This process ends in psychological and pshyological negativities and thus, the individual do not desire further learning or using technology (Wang et al., 2008).

According to Tarafdar et al. (2007), technostress is the stress created by information and computer technologies and it benefits from socio-technical system theory. The socio-technical system approach was first used during the Tavistock research conducted on coal mine workers in England during World War II (Heller, 1997). According to socio-technical system theory, organizations are socio-technical systems and consist of two important dimensions. The first of these dimensions is the *social dimension* and deals with the abilities, attitudes, values that people have, the roles they take, reward systems and authority structures. The second dimension is the *technical and task-oriented dimension*, which relates to the actual tasks performed by individuals or the associated processes and technologies. These two related dimensions determine the roles of employees within the organization (Tarafdar et al. 2007; Türen et al., 2015). The penetration of new information and computer technologies into the working

environment, changes the aspects of the performance of the task in the role set of individuals. For example, automation of routine data processing tasks causes managers to change their role definitions by allowing them to focus on the decision-making process. Then, due to the interconnection of organizational tasks, the change in individuals' duties can lead to broader changes in the organizational structure, redefinition of areas of responsibility, communication and coordination mechanisms and the degree of centralization (Barley, 1990; Türen et al., 2015).

As for the international and national studies on technostress, La Torre et al., (2018), conducted a detailed literature review on electronic databases with the key Word "technostress". According to the results, there are 84 cross-sectional studies, 8 experimental studies and 13 reviews in the litearure. In addition, there are 70 studies that address work-related technostress and 26 studies that address nonwork-related technostress. Furthermore, it is also concluded that technostress has effect on both professional life and private life.

Ayyagari et al. (2011), tested a model of technostress and they gathered data from 661 employees. According to the results, work overload, role ambiguity and intensive technology are among the most important stress factors.

Küçükcivil et al. (2024), aimed at revealing the technostress experiences of university employees via interview technique. According to the results, the participants feel technology overload. In addition, academic staff feel complexity and uncertainty when they use technology.

Can et al. (2021), aimed at revealing the teachers' technostress level and its effects on their work-life balance during distance education. According to the results, technostress causes both work-family and family-work conflicts.

The causes and consequences of technostress

Although the concept of Industry 4.0 has been in our lives since 2011, organizations have begun to perceive the benefits and effects of adopting digital technologies in the last few years (Strazzullo, et al., 2022). Since the organizations of the future aim to carry out business functions completely electronically (Kablan, 2018), it has become important for organizations to adapt to Industry 4.0 faster and integrate new technologies into their processes in order to gain competitive advantage. Industry 4.0, which makes the traditional production processes more effective, digital, smart and fast, includes the internet of things, additive manufacturing, artificial intelligence, smart factory, augmented reality, cloud computing and many other new

technological tools. Using these new technologies not only produces high-quality products, but also saves time and costs (Avunduk & Kazan, 2019; Avunduk, 2023).

On the other hand, because of the rapid pace of these technologies, negative attitudes towards information and communication technologies can occur among employees and this can cause individuals to fear when interacting with technological devices, which includes confusion about how to use technology and which reveals behaviors such as being overly careful and stressed while using these devices. Computer-based technologies have therefore been associated with technostress in the workplace (Ragu-Nathan et al. 2008; Burke, 2009). Individuals feel that they are almost always connected, on call and alert and this situation causes them to believe that they have lost control over time and space and they feel under the pressure of stress (Küçükcivil et al., 2024).

Tarafdar et al. (2007) identified the factors that cause technostress in organizations under five categories as *technology overload*, *effects of technology on private life*, *difficulty in using technology*, *distrust in technology* and *variable technology*. *Technology overload* refers to the situation where employees have to work faster and longer. *Effects of technology on private life* is a situation where employees have difficulty distinguishing between business relationships and personal contexts due to their constant availability. *Difficulty in using technology* is the situation where employees feel that their technical skills are insufficient to use information technologies. As a result, they have to spend additional efforts to learn and understand various aspects of information technologies. *Distrust in technology* refers to the situation in which technology users feel threatened of losing their jobs due to new technologies or due to more technically competent people and *variable technology* refers to the situation in which technology users feel uneasy and uncertain due to constantly changing and updated technologies (Doğrular, 2019).

As for the consequences of technostress, it is considered that they are both organizationally and individually affective. In this sense, absenteeism, decrease of professional effectiveness, conflict and isolation are among main consequences (Chiappetta, 2017; Esposito et al., 2019; Perciavalle & Prunesti, 2016). In the literature, it is also seen that the negative consequences of technostress have been demonstrated on many organizational variables such as motivation (Jena, 2015) and productivity (Rafter, 1998). On the other hand, although it is thought that technology, which is an important component of every organization today, will increase both individual and organizational performance, many studies have concluded that the

technostress created by the technology negatively affects business performance with its different dimensions (Tarafdar et al., 2007; Al-Fudail et al., 2008; Jena, 2015; Can Yalçın & Beğenirbaş, 2021).

To sum up, technostress causes individuals to feel anxiety, fear and technophobia towards information and communication technologies, and it forces them to change their perspectives, behaviors in addition to resisting to technological innovations (Çetin & Bülbül, 2017). Technostress also has negative consequences such as shifting the employee's attention from work-related stress to personal stress, decreasing the ability to process information correctly, slowing down the response time given by the computer to incoming requests and shortening rest breaks (Sankar & Natale, 1990). In addition, it is also observed that people who experience technostress cannot give normal reactions to the situations since they constantly work in front of the computer. Furthermore, they react quickly and they lack emotion. They cannot wait and they get angry easily when the commands they give to the computer and/or AI are delayed (Kalay, 2009). It can be said that these people are more impatient and intolerant towards technological delays and disruptions (Merdan, 2021). In this sense, these negative consequences of technostress affects sustainability in organizations in a negative way through creating a major obstacle in front of organizations' innovativeness.

Coping strategies for technostress

There are two major strategies for technostress as *problem-focused strategies* and *emotion-focused strategies*. According to Monat and Lazarus (1991), *problem-focused strategies* stands for the efforts for improving the negative relationship between the individual and the organization. In this sense, the individual who feel technostress can ask information about what to do and refrain from impulsive actions. *Emotion-focused strategies*, on the other hand, stands for the thoughts or actions that aim at decreasing the emotional negative effect of stress. Although these strategies do not alter the threatening conditions, they can contribute to making the individual feel more positive. The culture and the climate of the organization have also direct influence on fear and stress perceived by individuals. In this sense, it is mandatory for organizations to take precautions in order to prevent technostress and maintain organizational efficiency and sustainable performance (Murphy, 1987; Wang et al., 2008).

In addition, there are technostress preventers that consist three dimensions which are, *literacy facilitation, providing technical support* and *facilitating participation in work. Literacy facilitation* is a situation that helps users understand and learn how to use information and

communication technologies and thus, reduce technostress through the use of information sharing, teamwork, user training and user guides. *Providing technical support* is the assistance provided to employees to solve technological problems and reduce technological complexity and technological uncertainty. *Facilitating participation in work*, on the other hand, is to help alleviate technostress by using mechanisms that enable employees to adopt systems through informing technology users about new developments and encouraging them to use and try new technological devices (Ragu-Nathan, 2008; Tarafdar et al., 2011; Atanasoff & Venable, 2017; Merdan, 2021).

Furthermore, Technology Acceptance Model (TAM) is a model created by Davis and has four important variables. These variables are defined as active use, perceived usefulness, attitude towards use and perceived ease of use. According to the TAM, methods based on perceived ease of use and usefulness are widely used to predict *active use*. In this way, while active use is evaluated as a repetitive behavior aimed at specific goals, it is emphasized that factors such as perceived usefulness and ease of use affect active use (Doğan et al., 2015). Perceived usefulness expresses the degree of belief that the user will increase his/her work performance by using a certain system (Toraman & Yüksel, 2022). Attitude towards use refers to an individual's emotional response (positive or negative) towards a behavior. Perceived ease of use, on the other hand, refers to the individual's belief that using a particular system or technology will reduce his/her workload both physically and mentally and can have a significant impact on the user's adoption and active use of a new technology. Therefore, it is important to ensure technology users with the ease of use in order to provide effectiveness (Kalyoncuoğlu, 2018). This can be beneficial for creating organizational performance. An individual who can do his/her job more easily and efficiently by using a system or technology can achieve higher efficiency and effectiveness (Esen, 2020; Karakaş & Sıvacı, 2023).

To sum up, employees cannot be expected to make efforts alone against the negative effects of technostress. Managers, as well as employees, are responsible for neutralizing technostressors and providing employees with a more comfortable and peaceful environment. Therefore, it is possible to divide coping strategies of technostress into two groups as individual and organizational. Traditional stress management techniques are also thought to be very beneficial for the individual coping strategies of technostress. Eating habits, meditation, motivation, breathing control, relaxation techniques, anger management and time management are some of these techniques. (Soysal, 2009). In the frame of organizational coping strategies

of technostress, it is aimed for organizations to keep technostress at a useful level for employees (Doğrular, 2019).

METHOD

Research group (population-sample)

The aim of the current study is to research supermarket chain industry employees' attitudes towards technostress. In recent days, supermarkets have started to use technology more intensively than before. Labels have digitalized, barcods have digitalized, stock tracking programs have become digitalized and moreover, cashiers have become digitalized via artificial intelligence. Furthermore, chain supermarkets have now gained an important place in social life, both with their own concepts and the private label products they offer. Thus, the retail sector has brought about many structural changes and opportunities. One of the opportunities is "smart store" systems or formats. Smart stores, touted as the technology of the future, respond to the demands for speed, diversity and innovation, which are three important elements of marketing success. Smart stores are organizations that integrate many different technologies and use devices and hardware connected to computer networks to take action instantly, based on customer and product information (Çakmakçı, 2009). In this sense, it is inevitable for employees to both feel the stress of using these technologies in the right way in order not to make a mistake and to feel the fear of losing their jobs since the technological processes are complex to understand and use. As a consequence, innovativeness is affected in a negative way and thus, sustainability becomes harder for organizations. In this sense, it is thought that innovativeness is affect by the demographic qualities such as gender, marital status and age. In this frame, the hypothesis of the research are as follows:

H₀: There is no statistically significant difference between the attitudes of chain supermarket employees towards technostress and their socio-demographic (gender, marital status, age) characteristics. h0: μ 1> μ 2

H₁: There is statistically significant difference between the attitudes of chain supermarket employees towards technostress and their socio-demographic (gender, marital status, age) characteristics. h1: μ 1> μ 2

H₂: There is statistically significant difference between the attitudes of chain supermarket employees towards technostress and their gender characteristics. H2: μ 1> μ 2

H₃: There is statistically significant difference between the attitudes of chain supermarket employees towards technostress and their marital status characteristics. H₃: μ 1> μ 2

H₄: There is statistically significant difference between the attitudes of chain supermarket employees towards technostress and their age characteristics. H4: μ 1> μ 2

Data collection tools

The survey form, which is structured in the scope of the research as 5 point Likert Scale, consists demographic questions and the Techno-Stress Scale, which has 5 sub-dimensions as technological workload, technological invasion, technological complexity, technological insecurity and technological uncertainty, that is developed by Tarafdar et al. (2007), as mentioned before, and modified and adapted into Turkish by Türen et al. (2015). The survey forms are delivered to the employees through e-mail. 184 employees paticipated in the research and the data that was gathered from the participants were analysed via SPSS 22.0 package programme. According to the reliability analysis, the reliability of the technostress scale (Table 1) is 0.727.

Table 1. Reliability test

Technostress scale	Cronbach's alpha value
14 items	0.727

Data collection/processing method

In this frame, because of the fact that it is not possible to reach all supermarket chain industry employees, the employees of one of the biggest supermarket chains in Bursa city Osmangazi district, Türkiye, is defined as sample. There are 23 branches of the sample supermarket chain in the district and according to the information gathered from the managers of the stores, the approximate number of the employees that work in the sample supermarket chain is around 400. According to 5% error margin and 95% reliability level, the sample number is defined as 80. The research was approved by Bursa Technical University Research Ethics Committee, dated and numbered 10.06.2024-E.29245. The data was gathered between June-August 2024. The criterion for data gathering was that the participants were cashiers and/or department clerks. The data apart from these duties were excluded. The gathered data will be made available on request.

Data analysis

The data gathered from the participants is analysed via SPSS 22.0 package programme. Demographical findings Show that (Table 2), 112 (60.9%) participants are women, 72 (39.1%) participants are men. In terms of marital status, 34 (18.5%) participants are married and 150 (81.5%) participants are single. As for age groups, 125 (67.9%) participants are in 18-29 age group, 25 (13.6%) participants are in 30-39 age group and 34 (18.5%) participants are in 40-49 age group.

Variables	Gruops	n	F(%)
Condor	Women	112	60.9%
Genuer	Men	72	39.1%
Marital status	Married	34	18.5%
	Single	150	81.5%
	18-29	125	67.9%
Age	30-39	25	13.6%
	40-49	34	18.5%

Table 2. Demographical findings

FINDINGS

Descriptive statistics

The descriptive statistics (Table 3) results of the Technostress Scale show that the most important item according to the participants is item 9 "I have co-workers who are more knowledgeable than me about the technology I use at my workplace" with an average of 3.25. Secondly, there is the idea "Frequent updates are made to the technological devices we use at my workplace" which is item 14 with an average of 2.97. In the third place, there is the idea "We constantly use new technologies at my workplace", which is item 11 with an average of 2.92.

In this frame, it can be inferred that, participant employees are exposed to highly up to date technology in their organizations and furthermore, they feel insufficient from time time as they force themselves to learn and use new technologies effectively. Therefore, it can be concluded that they feel technostress.

On the other hand, the least important item for the participants, it is item 7, "I need a long time to learn and use a new technology at my workplace", with an average of 1.97.

In this frame, it can again be deduced that the participants feel under stress because of the technological innovations. As afore mentioned, they still feel insufficient in the process of learning and using new technologies.

Items			Disagree	Neutral	Agree	Totally	X	SD
1. The technology used at my workplace forces me to f		65	32	50	24	13	2 20	1 29
do work much faster, which makes me stressed.	Y.fi	35.3	17.4	27.2	13.0	7.1	2.39	1.20
2. The technology used at my workplace forces me to		40	28	54	49	13	2.02	1.24
do more work, which makes me stressed.	Y.fi	21.7	15.2	29.3	26.6	7.1	2.82	1.24

Table 3. Descriptive statistics of technostress scale

Items		Totally disagree	Disagree	Neutral	Agree	Totally agree	X	SD
3. The technology used at my workplace keeps me on very tight schedules, which makes me stressed	fi V fi	34 18 5	63 34 2	34 18 5	47 25 5	6 3 3	2.60	1.14
4. Changing my work habits to keep up with the technology used at my workplace makes me stressed.	fi Y.fi	59 32.1	57 31.0	16 8.7	40 21.7	12 6.5	2.39	1.30
5. My workload is very high at my workplace because the technology I use is becoming increasingly complex.		59 32.1	25 13.6	46 25.0	48 26.1	6 3.3	2.54	1.27
6. I do not have sufficient knowledge about the technology I use to do my job fully.	fi Y.fi	47 25.5	91 49.5	25 13.6	6 3.3	15 8.2	2.19	1,10
7. I need a long time to learn and use a new technology at my workplace.	fi Y.fi	87 47.3	44 23.9	24 13.0	29 15.8	-	1.97	1.11
8. I have not yet had enough time to update my technological knowledge at my workplace.	fi Y.fi	51 27.7	59 32.1	45 24.5	23 12.5	6 3.3	2.31	1.10
9. I have co-workers who are more knowledgeable than me about the technology I use at my workplace.	fi Y.fi	10 5.4	53 28.8	22 12.0	78 42.4	21 14.4	3.25	1.15
10. I often find the technology I use at my workplace too complicated to understand.	fi Y.fi	50 27.2	83 45.1	37 20.1	-	14 7.6	2.15	1.06
11. We constantly use new technologies at my workplace.	fi Y.fi	32 17.4	7 3.8	107 58.2	18 9.8	20 10.9	2.92	1.12
12. The software of the technological devices we use are changed periodically at my workplace.	fi Y.fi	26 14.1	73 39.7	53 28.8	-	32 17.4	2.66	1.24
13. The hardware of the technological devices we use is changed periodically at my workplace.	fi Y.fi	10 5.4	89 48.4	53 28.8	17 9.2	15 8.2	2.66	1.00
14. Frequent updates are made to the technological devices we use at my workplace.	fi Y.fi	6 3.3	52 28.3	94 51.1	5 2.7	27 14.7	2.97	1.01

*fi: Data frequency; *Y.fi: Frequency value percent; *STD: Standart deviation

Factor analysis

The original Technostress Scale has 5 dimensions and these are *technological workload*, *technological invasion*, *technological complexity*, *technological insecurity* and *technological uncertainty*. According to the results of factor analysis, the items of the scale was grouped under 4 dimesions as *technological workload (items 1, 2, 3, 4, 5)*, *technological invasion (items 11, 12, 13, 14)*, *technological complexity (items 7, 8)* and *technological uncertainty (items 6, 9, 10)* (Table 4). The reason of this can stem from the participants. As it is mentioned above, the sample is defined as 23 supermarkets, which are branches of a national supermarket chain, in Osmangazi district, Bursa city. In this sense, the participants could have evaluated the scale items in terms of their branches and their organizations' structure. In addition, the number of participants could have affected the interpretation of the scale items.

Since the distribution of data is not normal according to the normality (Kolmogorov-Simirnov) test, Mann-Whitney U test and Kruskal-Wallis test, which are non-parametric tests, were used to analyze if there was a statistically significant difference between the participants' answers according to their socio-demographic findings and the dimensions of the scale. Furthermore, post-hoc tests were applied to the data in order to reveal multiple comparison results.

Component	С	alculated Sum of	Squares	Rotated Sum of Squares			
component =	Total	%Variance	Cumulative%	Total	%Variance	Cumulative%	
1.Technological workload	5.722	40.869	40.869	3.982	28.444	28.444	
2.Technological invasion	3.727	26.623	67.492	3.386	24.183	52.627	
3.Technological complexity	1.533	10.951	78.443	2.436	17.397	70.024	
4.Technological uncertainty	1.176	8.397	86.841	2.354	16.817	86.841	

Table 4. Explained total variance

Comparative statistics

As afore mentioned, since the distribution of data is not normal according to the normality (Kolmogorov-Simirnov) test (Table 5), Mann-Whitney U test and Kruskal-Wallis test were used to analyse if there was a statistically significant difference between the participants' answers according to their socio-demographic findings and the dimensions of the scale. Findings show that, there is not a statistically significant difference (p > 0.05) between gender characteristic and *technological complexity* dimension, marital status characteristic and *technological workload* and *technological uncertainty* dimensions and age characteristic and *technological workload* dimension. On the other hand, there is statistically significant difference (p < 0.05) between gender, marital status and age characteristics and *all other dimensions*.

Post-hoc tests (Table 7) show that, in the context of gender characteristics the difference stems from women participants. In this sense, it can be deduced that women employees have more different attitudes towards technology and technological expertise. In this context, it can be mentioned that since women and men have different characteristic styles, their attitudes towards technostress show differences as well. Furthermore, in the frame of marital status characteristics, it is found that the difference stems from single participants. In this sense, it can be concluded that single participants have different points of view about technological innovations when compared to married participants. Because of the fact that married employees carry more responsibilities since they have spouses and children, they give importance to the responsibilities in the work place as well and their technological literacy is probably higher than single participants. Therefore, single participants may feel more under stress in terms of technology since their technological literacy is inadequate. Finally, it is also found that in the frame of age characteristics the difference stems from 30-39 age group, which implies that since

this age group is more experienced than younger age groups in addition to being at an age that they probably live with their spouses and children, their attitudes towards technological innovations and thus technostress, is different from other age groups. It is also important to underline that they have a long way to retire and therefore, they have to work professionally, which forces them to learn and use technological innovations. This can be inferred as a cause of stress as well.

Hence, H_2 hypothesis, There is statistically significant difference between the attitudes of chain supermarket employees towards technostress and their gender characteristics. H2: μ 1> μ 2, is accepted.

 H_3 : There is statistically significant difference between the attitudes of chain supermarket employees towards technostress and their marital status characteristics. H3: μ 1> μ 2, is accepted.

H₄: There is statistically significant difference between the attitudes of chain supermarket employees towards technostress and their age characteristics. H4: μ 1> μ 2, is accepted.

	Statistic		df		Sig.			
Technostress Scale	0.228		184		0.000			
Table 6. Skewness-Kurtosis test								
Sub-dimensions of scale	Scale Items	Skewne ss	Std. Error of Skewness	Kurtosis	Std. Error of Kurtosis			
Technological workload	Item 1	0.435	0.179	-0.917	0.356			
Technological workload	Item 2	-0.120	0.179	-1.06	0.356			
Technological workload	Item 3	0.200	0.179	1.079	0.356			
Technological workload	Item 4	0.530	0.179	1.049	0.356			
Technological workload	Item 5	0.043	0.179	-1.376	0.356			
Technological uncertainty	Item 6	1.228	0.179	1.100	0.356			
Technological complexity	Item 7	0.750	0.179	-0.866	0.356			
Technological complexity	Item 8	0.501	0.179	-0.556	0.356			
Technological uncertainty	Item 9	-0.275	0.179	-1.099	0.356			
Technological uncertainty	Item 10	1.208	0.179	1.400	0.356			
Technological invasion	Item 11	-0.138	0.179	-0.101	0.356			
Technological invasion	Item 12	0.754	0.179	-0.340	0.356			
Technological invasion	Item 13	0.881	0.179	0.240	0.356			
Technological invasion	Item 14	0.719	0.179	0.126	0.356			

Table 5. One sample Kolmogorov-Smirnov test

Variable	Dimension	Ν	Mean rank	Sum of A ranks	Asymp.Sig. (2- tailed)
	Technological		96.29	10784.00	0.226
	complexity	** 7	86.61	6236.00	0.220
	Technological	women	73.54	8236.00	0.000
Condon	workload	112 Man	122.00	8784.00	0.000
Genuer	Technological	72	85.45	9570.00	0.022
	invasion	72 Totel 184	103.47	7450.00	0.022
	Technological	10tal 104	81.82	9163.50	0.001
	uncertainty		109.12	7856.50	0.001
	Technological		78.65	11797.00	0 000
	complexity	Single	153.62	5223.00	0.000
	Technological	150	89.43	13414.00	0 094
Marital status	workload	Married	106.06	3606.00	0.074
man national status	Technological	34	88.77	13316.00	0.041
	invasion	Total 184	108.94	3704.00	
	Technological		91.82	13773.00	0.712
	uncertainty		95.50	3247.00	0.712
	Sample1-Sample2	Test statistics	Std. test statistics	Adjuste	d sig.
	30-59 18-29	37.976	3.280	0.0	03
Age	30-39 40-49	-106.618	-7.658	0.0	00
	18-29 40-49	-68.642	-6.715	0.0	00

Table 7. Comparative post-hoc tests of variables (Gender, marital status, age)

DISCUSSION AND CONCLUSION

Adopting change and interactive use of innovation plays an important role in order for organizations to be effective in the market in terms of competing with their rivals and gaining competitive advantage. Adopting change, depends on the ability to use innovations effectively (Aygen, 2006). Organizations can instantly access technical information with advanced technologies and benefit from these technologies to direct innovation (K1yc1, 2019). In order for an invention to be considered as an innovation, a new or improved product or process must be converted into commercial value. It is innovation that puts the invention into use and adds value in terms of technology and market (Alpaslan Danışman, 2015; Dural et al., 2023).

On the other hand, information and computer technologies change the organizational roles of employees and changing roles can cause stress on individuals. Especially, rapid increase of modern technologies cause the occurrence of technology-related stress through a number of mechanisms, since modern information and computer technologies generally have a complex structure. In addition, as technology changes frequently, employees have difficulty in getting used to innovations. While this situation causes individual and organizational skills in using technology to remain at an inadequate level, it may cause employees to spend additional time learning new information technologies (Türen et al., 2015).

The findings of the current study reveal that the most important items of the Technostress Scale according to the participants are "I have co-workers who are more knowledgeable than me about the technology I use at my workplace", "Frequent updates are made to the technological devices we use at my workplace" and "We constantly use new technologies at my workplace". In this frame, it can be inferred that, participant employees are exposed to highly up to date technology in their organizations and furthermore, they feel insufficient from time time as they force themselves to learn and use new technologies effectively. In this sense, it can be concluded that they feel technostress.

In addition, findings also show that, there is not a statistically significant difference (p >0.05) between gender characteristic and technological complexity dimension, marital status characteristic and technological workload and technological uncertainty dimensions and age characteristic and *technological workload* dimension. On the other hand, there is statistically significant difference (p <0.05) between gender, marital status and age characteristics and all other dimensions and according to post-hoc tests, as mentioned in the previous section, the differences stem from women participants, single participants and participants that belong to 30-39 age group. In this sense, it can be inferred that women employees have more different attitudes towards technology and technological expertise. In this frame, it can be mentioned that since women and men have different characteristic styles, their attitudes towards show differences as well. For example, women are tend to be more emotional than men and this situation may cause them to adopt a totally different attitude towards technology and the stress that is caused by technology. Furthermore, in the frame of marital status characteristics, because of the fact that married employees carry more responsibilities since they have spouses and children, they give importance to the responsibilities in the work place as well and their technological literacy is probably higher than single participants. Therefore, single participants may feel more under stress in terms of technology. This can also cause them to quit their jobs and seek more traditional positions. Since they are single and have less responsibilities when compared to married employees, it may beome easier for them to quit their jobs and look for new opportunities. Finally, it is also found that in the frame of age characteristics the difference stems from 30-39 age group, which implies that since this age group is more experienced than younger age groups in addition to being at an age that they live with their spouses and children, their attitudes towards technological innovations and thus technostress, is different from other age groups. It is also important to underline that they have a long way to retire and therefore, they have to work professionally, which forces them to learn and use technological innovations. This can be inferred as a cause of stress as well. Furthermore, since nowadays it is a necessity to have technological knowledge, can make them feel obliged to grasp all technological

advences in their sector. In addition, since it is not easy to change jobs since a high number of positions are started to be replaced by artifical intelligence (AI), they may feel that they have to be among the bests who use technology in the work place.

Although there are limited studies in literature in terms of food retail sector, it is possible to compare the results of the current research to other researches that are conducted in different sectors. Especially in international literature, there are a number of studies that focus on technostress in the frame of other sectors.

For example, Ficapal-Cusi et al. (2025), aimed at examining how the sociodemographic characteristics of gender, age, living arrangement, education level, work experience, tenure, organization size, and organization type is related to techno-stress. In the scope of the research, 1187 Chilean workers were selected as sample. According to the findings, certain socio-demographic characteristics have effect on technostress. In this sense, it can be inferred that the findings of this research constitute similarities when compared to the current research, in the context that socio-demographic characteristics affects attitudes towards technostress.

Kumar et al. (2025), aimed at revealing how technology-organization-environment (TOE) factors affect innovation capability. The data was colleted from 258 managers and according to the findings, blockchain integration is positively associated with competitive advantage and technostress moderates the relationship between innovation capability. In this sense, although this research focuses on the effects of technostress in the context of innovativeness, which makes it difficult to compare the results with the current research, it is possible to mention that technostress affects effectivity and productivity of employees regardless of socio-demographic qualities.

Irfan et al. (2024), aimed at revealing the relation of digitalization with sustainable business practices in addition to the effects of technostress on employees. In the scope of the research, food industries in Pakistan and China are defined as sample. According to the findings, there is crucial effect of digitalization on both resource mobilization and interaction quality. Furthermore, it was found that technostress acts as a mediating factor and reveals the psychological challenges caused by digital transitions. The fact that the research was conducted on food industry, constitutes resemblance with the current research. Although sociodemographic qualities are not taken into consideration, the results prove that digital transformation in the sector causes employees to adopt a negative attitude towards technostress

and this attitude affects sustainability and innovativeness. In this sense, it can be mentioned that the results constitute similarity with the results of the current research.

A systematic literature review by Bahamondes-Rosado et al. (2023) focused on systematizing the impact of technostress on work during the COVID-19 lockdown, identifying determinants, stressors such as techno invasion and their outcomes. In this sense, the study puts forward the versatile nature of technostress in addition to its positive and negative effects. In this context, although the current study focuses on empirical research, in the frame of the literature review sections it is obvious that the findings constitute resemblance. Technostress has both positive and negative effects on both the organizations and the employees. The point is to being aware of the ways to cope with it and make employees feel confident in order to increase their job satisfaction, which is very effective on productivity, effectivity and innovativeness.

Upadhyaya and Vrinda (2021) conducted a research on 673 Indian private university students and found that students reported being overwhelmed by the technology used in online learning and experienced moderate levels of technostress. Additionally, they found that technostress had a negative impact on students' academic productivity. In this sense, although specific socio-demographic qualities are not taken into consideration in this research as in the researches above, it is again obvious that technostress has a crucial effect on productivity and effectivity regardless of the sector. In this context, it can be inferred that, if the students are considered as employees, they are afraid of technological transformation in their sector since they are afraid of being unsuccessful. This situation constitutes similarity with the current research in the sense that in the current it is found that the employees are afraid of digital transformation since they feel the fear of losing their jobs.

A literature review by Nisafani et al. (2020) aimed to establish a conceptual model to explain employee technostress by considering stressors, strains, outcomes, and situational factors for organizational understanding and risk management. The study focuses on the basis of technostress, the remedies for technostress and the importance of coping with technostress. In this frame, since this research is not an empirical research like the current study, it is not possible to compare resekarch findings. On the other hand, in the context of literatüre review, it is obvious that organizations need to understand the effects of digital transformation, which causes technostress and therefore causes a decrease in productivity, effectivity and

sustainability. In this sense, it constitutes cruciality to find effective ways to cope with technostress.

It is observed that the effects of technostress on organizational commitment were examined in a study conducted in the Malaysian context by Ahmad et al. (2009). In the study, a quantitative method, was adopted and as a result, it was revealed that technostress reduces organizational commitment. In this sense, since this study is an empirical research its results are available for comparing to the current research. Although socio-demographic characteristics are not taken into consideration as in the current research, it is obvious that technostress affects job satisfaction, organizational commitment, productivity, effectivity, innovativeness of the employees and in the long term it affects the productivity of the organizations, which is destructive. Therefore, it can be concluded that not only specific socio-demographic characterists have negative attituteds towards technostress, but also digital transformation has an overall negative effect on employees regardless of socio-demographic characteristics.

In this frame, it can be concluded that technostress is studied broadly especially in terms of its affects and consequences. In addition, it can be inferred that that technostress has a negative effect on employees' organizational commitment, job satisfaction, productivity and in broad sense on organizations' productivity and longevity. In this sense, it can be mentioned that these results Show similarity with the results of current research, since the current research proves that employees feel insufficient when they are exposed to new technologies in their workplaces, which decreases job satisfaction and organizational commitment. Therefore, it needs to be eliminated.

To sum up, technostress can be defined as an organizational disease, which affects the innovative characteristics and sustainability of the organizations in the long term. Therefore, organizations can take some precautions to hinder technostress and integrate employees with new technologies through providing them with the opportunity of taking place in the change process. Including more people in the innovation process not only increases the cumulative effect, but also facilitates the change process. Furthermore, organizational culture should support employees not only generate new ideas but also implement the new ideas. Continuous improvement can only be achieved in environments where innovative attempts are possible and where innovative attempts are not penalized even if they fail. Instead of punishments and/or rewards, mechanisms/tools should be created to support new ideas. A suitable mechanism for this, can be supporting intra-company entrepreneurship (Bayhan, 2004).

In literature, the number of researches on technostress are limited. In addition, there is hardly no researches on technostress in the frame of chain supermarkets. In this sense, despite the fact that this situation constitutes an obstacle for the current study in terms of comparing the results to previous researches, it is expected that this research will shed light to both future researchers and professionals. In addition, in the current research only 3 demographic variables are analysed. This situation constitutes another limitation for the research. Therefore in future researches different demographic variables can be analysed. Finally, the sample of the research can be widened to different chain supermarket stores.

Recommendations

Technostress can be defined as an organizational disease, which affects the innovative characteristics and sustainability of the organizations in the long term. Therefore, organizations can take some precautions to hinder technostress and integrate employees with new technologies through providing them with the opportunity of taking place in the change process. Including more people in the innovation process not only increases the cumulative effect, but also facilitates the change process. Furthermore, organizational culture should support employees not only generate new ideas but also implement the new ideas. Continuous improvement can only be achieved in environments where innovative attempts are possible and where innovative attempts are not penalized even if they fail. Instead of punishments and/or rewards, mechanisms/tools should be created to support new ideas. A suitable mechanism for this, can be supporting intra-company entrepreneurship (Bayhan, 2004).

In literature, the number of researches on technostress are limited. In addition, there is hardly no researches on technostress in the frame of chain supermarkets. In this sense, as mentioned above, despite the fact that this situation constitutes an obstacle for the current study, it is expected that this research will shed light to both future researchers and professionals. In this sense, comparative analysis among different chain supermarkets can be tested. In addition, different samples and different variables can be associated.

Limitations and strengths

The fact that the number of researches are limited in literature, causes a difficulty in comparing results with other studies. In addition, since it is not possible to reach all universe, causes a difficulty in drawing a general frame of whole sector. Furthermore, since the number of female participants is almost twice the number of male participants, can imply that the answers are based on emotions. On the other hand, although the mentioned limitations, it is thought that the current research constitutes originality in terms of its contribution to the

literature in the frame of food retail sector. In addition, managers would be able to draw conclusions from the results of this study and apply both new Technologies and eliminate the technology fear of the employess. Therefore, technostress would be able to be eliminated as well and the productivity of the businesses in the sector would be able to increase as the job satisfaction of employees increase.

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KATKI ORANI	AÇIKLAMA	KATKIDA BULUNANLAR				
CONTRIBUTION RATE	EXPLANATION	CONTRIBUTORS				
Fikir ve Kavramsal Örgü	Araştırma hipotezini veya fikrini oluşturmak	Nilüfer DÜZGAD				
Idea or Notion	Form the research hypothesis or idea	NIIIIIIII KOZOAK				
Tasarım	Yöntem ve araştırma desenini tasarlamak	NH#f- DÜZCAD				
Design	To design the method and research design.	Niluler KUZGAK				
Literatür Tarama	Çalışma için gerekli literatürü taramak	Niliifan DÜZCAD				
Literature Review	Review the literature required for the study	NIIUIEI KUZGAK				
Veri Toplama ve İşleme	Verileri toplamak, düzenlemek ve raporlaştırmak	Nilüfor DÜZCAD				
Data Collecting and Processing	Collecting, organizing and reporting data	NIIUICI KUZUAK				
Tartışma ve Yorum	Elde edilen bulguların değerlendirilmesi	Niliifan DÜZCAD				
Discussion and Commentary	Evaluation of the obtained finding	Niluler KUZGAK				
Destek ve Teşekkür Beyanı/ Statement of Support and Acknowledgment						
Bu çalışmanın yazım sürecinde ka	ıtkı ve/veya destek alınmamıştır.					

No contribution and/or support was received during the writing process of this study.

Catişma Beyani/ Statement of Conflict

Araştırmacıların araştırma ile ilgili diğer kişi ve kurumlarla herhangi bir kişisel ve finansal çıkar çatışması yoktur.

Researchers do not have any personal or financial conflicts of interest with other people and institutions related to the research.

Etik Kurul Beyanı/ Statement of Ethics Committee

Bu araştırma, Bursa Teknik Üniversitesi Etik Kurulunun 10.06.2024 tarihli ve E-29245 sayılı kararı ile yürütülmüştür. *This research was conducted with the decision of Bursa Technical University Ethics Committee dated 10.06.2024 and numbered E-29245*.



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