

Healthcare personnels' technostress and individual innovativeness levels: Digital hospital example

Technostress, individual innovativeness

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Abstract

Aim: In this study, we aimed to investigate the relationship between healthcare personnels' technostress and individual innovativeness levels.

Material and Methods: The descriptive, correlative, and cross-sectional study was conducted with 156 healthcare personnel working at a hospital with a digital hospital certificate. The data were collected using an Information Form, Technostress Scale (TS) and Individual Innovativeness Scale (IIS). The data were analyzed using descriptive statistics, Pearson correlation analysis and multiple linear regression analysis.

Results: The total mean score of the healthcare personnel from TS was 2.57 ± 0.43 , with the highest score being from the techno-uncertainty (3.07 ± 0.75), and the lowest from the techno-insecurity (2.06 ± 0.64) sub-dimensions. The total mean score from IIS was 69.07 ± 8.88 . A statistically significant negative correlation was found between the individual innovativeness levels of the healthcare workers and their levels of technostress scale in total and from the techno-complexity, and techno-insecurity and techno-overload sub-dimensions. A statistically significant positive correlation was found between the individual innovativeness levels of the healthcare workers and their levels of techno-uncertainty. Techno-insecurity negatively affected individual innovativeness, and techno-uncertainty had a positive impact.

Discussion: The technostress level of the healthcare personnel was at a moderate level, the individual innovativeness category was in the interrogator category, and techno-insecurity and techno-uncertainty were significant predictors that predicted the individual innovativeness of the healthcare personnel. As individuals' technostress levels increased, their perception of innovations decreased.

Keywords

Digital Hospital; Healthcare Personnel; Innovativeness; Technostress

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Introduction

Today, the complexity and rapidly changing nature of information and communication and the difficulty of learning new technologies require more intense work [1]. Some individuals may experience negative emotions of concern, stress, anxiety and even fear due to the use of technology [2]. This stress is called technostress as it is caused by changes in technologies [3].

The concept of technostress is defined with terms like cyberphobia, computer phobia, computer stress and negative computer behaviors [2]; however, considering the use of information and communication technologies, it is also defined as the problems like stress, inability to cope with continuously developing technology and inadequacy in adaptation to these technologies by users in workplaces, arising from multitasking duties, permanent connection, knowledge overload, frequent system updates, continuous re-learning and corporate use of information and communication technologies [4,5]. As technostress develops, individuals become alienated from existing or changing technologies in their institutions and become afraid of making mistakes. Emotions such as worry, anxiety, and concern experienced by the staff cause them to develop a prejudice against technological tools, to have doubts and to have a limited sense of self-efficacy [6].

Tarafdar et al. (2010) explain technostress in the following five different dimensions: Techno-overload occurs when people using information and communication technologies work harder and faster. Techno-invasion requires employees to be constantly connected and available everywhere. Techno-complexity stems from the fact that rapidly and continuously developing technologies require the use of new applications, hardware and software whereby users need to spend more time and effort to understand new applications. Techno-insecurity arises when users fear losing their jobs because of those who are better at using new applications and technologies. Techno-uncertainty occurs when constant changes and advancing technologies do not give employees the opportunity to experience and specialize in certain applications, where employees feel “unsettled” because their knowledge has become “obsolete” in the face of rapidly changing information [4]. Although they may be enthusiastic early on, their constant need for renewal results in frustration and anxiety. Anxiety, technophobia, fear and worries against computer technologies caused by technostress can change the perception and behavior of individuals towards innovations and make them resist innovation [1].

Individual innovativeness is defined as the attitudes of people towards innovations, acceptance of technological developments, willingness to change and going beyond the known by taking risks [7]. Within the scope of its goals in the new era, Turkey focuses on digitization of hospitals to improve health services and increase efficiency [8], and during this process individuals have to meet different information and communication technologies [1].

Digital hospitals are hospitals where all operations are run, monitored and managed through a full automation system and advanced technology is utilized. In these hospitals, all information systems within the health institution are fully integrated with all kinds of medical and non-medical technologies. Reliable

data flow standards are determined, healthcare personnel are provided with mobile access to the necessary information from anywhere with less time and energy, with paperless work and no manual operations [9]. On the other hand, healthcare services in digital hospitals are becoming more complex day by day, and employees are becoming computer-dependent [10]. Although technology has been introduced and recognized as timesaving, it has increased the expectations that should be met in institutions [2]. It has been stated that individuals feel psychological and physical fatigue due to their involvement with information and communication technologies [6]. Technostress is widely recognized as a phenomenon associated with the “dark side” of technology [4].

The ongoing technological innovations in healthcare institutions and corresponding modifications in the job descriptions of healthcare personnel lead to changes in expectations and differentiation in the attitude and perception towards innovations [11]. In this context, considering the growing complexity of technological innovations and developments [1], it is of great importance that healthcare personnels’ attitudes and perceptions towards technology or innovation are not adversely affected and that the technostress they may experience do not prevent innovation. Therefore, studies analyzing technostress in healthcare personnel are needed. The purpose of the study, therefore, was to investigate the relationship between healthcare personnels’ technostress and level of individual innovativeness.

Material and Methods

The design of the study

This descriptive, correlative, and cross-sectional study was conducted in November 2019. The questionnaires were distributed to the healthcare personnel and the completed questionnaires were collected back from them.

Population and sample

This study was conducted at a digital hospital in Turkey. The population of the study was the healthcare personnel working (300 healthcare workers) in the hospital, and the sample (156 healthcare workers) consisted of those who accepted to participate in the study.

Data collection tools

The data were collected using the Information Form, the Technostress Scale and an Individual Innovativeness Scale.

The Information Form consists of 13 questions, including the demographic and professional characteristics of healthcare personnel, and their views on technology use.

The Technostress Scale (TS) was developed by Tarafdar et al. (2007), and its reliability and validity were established by Ilgaz et al. (2016). The scale consists of 23 items and 5 sub-dimensions (techno-overload-6 items, techno-invasion-3 items, techno-complexity-5 items, techno-insecurity-5 items and techno-uncertainty-4 items). Items are measured on a 5-point Likert-type (1 strongly disagree, 5 strongly agree) scale. The technostress level increases with an increase in the individual score (Ilgaz G, Özgür H, Çuhadar C. The Adaptation of Technostress Scale into Turkish. Abstracts of the 11th International Balkan Education and Science Congress. 2016; Poreč, Croatia) [12]. In this study, the total and sub-dimension

values of the Cronbach Alpha scale varied between 0.69 and 0.81.

The Individual Innovativeness Scale (IIS) was developed by Hurt et al. (1977), and its reliability and validity were established by Sarioğlu Kemer and Altuntaş (2017). The scale consists of 18 items and 3 sub-dimensions (opinion leadership, resistance to change, risk-taking). Items are measured on a 5-point Likert-type (1 strongly disagree, 5 strongly agree) scale.

The scale is evaluated according to the total score. When calculating the total score, items in the resistance to change dimension are reverse coded. Individuals who score 57 and less on the scale are classified as traditionalists, those who score between 58-65 as skeptical, those who score between 66-74 as interrogators, those who score between 75-82 as pioneers, and those who score 82 and above as innovative [14]. In this study, the Cronbach Alpha Value of the scale was found to be 0.89.

Evaluation of data

The demographic and occupational characteristics of healthcare workers and their views on the use of technology were expressed by number, percentage, mean and standard deviation, technostress and individual innovation levels with the minimum, maximum, average and standard deviation, and the relationship between individual innovativeness levels and technostress levels using Pearson's correlation analysis. Multiple regression analysis was performed to determine the predictive power of the sub-dimensions of the technostress scale for innovativeness. From the technostress dimensions, technostress-complexity, technostress-insecurity and technostress-uncertainty were accepted as independent variables, and individual innovativeness as dependent variables in the analysis.

Ethical considerations

Approval was obtained from Istanbul Sabahattin Zaim University Ethics Committee (31 October 2019, number 2019/09). This study was conducted in accordance with the ethical standards of the Declaration of Helsinki. Volunteering participants were included in the study and their personal identity information was kept confidential. In addition, consent was obtained from individuals participating in the study after the purpose of the study had been explained to them. Participation relied on the provision of verbal consent.

Results

The mean age of the participants was 35.58 ± 7.67 years, 59.6% of them were women, 79.5% were married, 42.3% were dentists, 20.5% were nurses, 20.0% were health technicians, 14.7% were clinical support workers and 2.5% others (Physician, Sociologist). The average time of working in the profession was 12.28 ± 8.12 years, and the average working time in the institution was 6.88 ± 4.77 years; 95.5% of the participants had a computer and 97.4% could use a computer; 51.3% stated that the hospital information system was easy, 82.1% received training on the hospital information system, 58.1% thought that the training they received was adequate and 64.1% found themselves competent in using technology.

The total mean score of the healthcare personnel from TS was 2.57 ± 0.43 , with the highest score being from the techno-uncertainty (3.07 ± 0.75), and the lowest from the techno-

Table 1. Mean scores of the Technostress Scale and Individual Innovativeness Scale according to the health personnels (n= 156)

Scales	In study		Scales Min.-Max.
	Min.-Max.	Mean± SD	
Technostress Scale Total (TS)	1.22-3.87	2.57±0.43	1-5
Techno-Overload Subscale	1.33-4.33	2.82±0.69	1-5
Techno-Invasion Subscale	1-4.67	2.57±0.84	1-5
Techno-Complexity Subscale	1-4.60	2.39±0.64	1-5
Techno-Insecurity Subscale	1-4.40	2.06±0.64	1-5
Techno-Uncertainty Subscale	1-5	3.07±0.75	1-5
Individual Innovativeness Scale Total (IIS)	49-90	69.07±8.87	18-90

Table 2. Pearson correlation matrix showing the correlation between healthcare personnels' technostres levels and individual innovativeness levels (n= 156)

	Individual Innovativeness Scale Total	
	r	p
Techno-Overload Subscale	-0.197	0.014*
Techno-Invasion Subscale	-0.157	0.050
Techno-Complexity Subscale	-0.405	0.000**
Techno-Insecurity Subscale	-0.579	0.000**
Techno-Uncertainty Subscale	0.348	0.000**
Technostress Scale Total	-0.337	0.000**

*p<0.05 **p<0.001

Table 3. Distribution of mean scores on technostress subdimensions predicting individual innovativeness scale scores (n= 156)

Variables	Unstandardized Coefficients		β	t	p
	B	SE			
*Constant	74.843	3.192		23.449	0.000**
Techno-Complexity Subscale	-1.151	1.040	-0.083	-1.107	0.270
Techno-Insecurity Subscale	-7.132	1.032	-0.517	-6.913	0.000*
Techno-Uncertainty Subscale	3.796	0.716	0.321	5.300	0.000*

Dependent variable: Individual Innovativeness Scale Total Score R=0.666; R²=0.444; F=40.495; p<0.001, *p<0.001

insecurity (2.06 ± 0.64) sub-dimensions. The total mean score of healthcare personnels from IIS was 69.07 ± 8.88 (Table 1).

A statistically significant negative correlation was found between the healthcare personnels' individual innovativeness levels and their levels of technostress total ($r=-0.337$; $p<0.001$) and techno-complexity ($r=-0.405$; $p<0.001$) and techno-insecurity ($r=-0.579$; $p<0.001$) and techno-overload ($r=-0.197$; $p<0.05$) subdimensions. A statistically significant positive correlation was found between the healthcare personnels' individual innovativeness levels and their levels of techno-uncertainty ($r=0.348$; $p<0.001$). No significant relationship was found between healthcare personnels' individual innovativeness level and techno-invasion levels ($p=0.05$) (Table 2).

The model created in the multiple regression analysis to determine the predictive power of the technostress scale sub-dimensions for individual innovativeness was found to be highly significant ($F = 40.495$; $p < 0.001$). The independent variables included in the model (techno-complexity, techno-insecurity, techno-uncertainty) explained 44% of the total variance in individual innovativeness ($R^2=0.444$). In addition, techno-insecurity and techno-uncertainty were significant predictors

of individual innovativeness level. Techno-insecurity negatively affected individual innovativeness, and techno-uncertainty had a positive impact ($p < 0.001$) According to the regression coefficient, individual innovativeness was influenced by techno-uncertainty, and to the highest extend, by techno-insecurity ($= -0.517$) (Table 3).

Discussion

In this study, conducted in a digital hospital, the individual innovativeness levels of the healthcare professionals, who were mostly women, married and had been working in their institutions for an average of 7 years, were found to be in the Interrogator category, consistent with some study results [15,16]. In other words, healthcare professionals rarely lead in implementing new ideas, behave cautiously against innovations, and spend a great deal of time thinking about it before adopting innovations.

Healthcare personnel working in the digital hospital were observed to experience moderate technostress. While Mahdian et al.'s (2017) study with nurses and Çoban's (2019) study with medical staff reported that nurses and healthcare personnel experienced moderate technostress (Çoban İ. Teknolojik Değişimin Hastane Çalışanları Üzerine Etkileri: Bir Devlet Hastanesi Örneği (Master's thesis) 2019; Kırklareli Üniversitesi) [17], Khuntia et al. (2015) reported in their study with nurses using smart care systems that these systems caused stimuli fatigue and technostress. As can be seen, new applications brought about by constantly developing technologies can cause technostress in healthcare personnel [18].

When the sub-dimensions of the technostress scale were examined in the study, it was seen that the healthcare personnel received the highest score from the technostress uncertainty dimension and the lowest score from the technostress insecurity dimension. This shows that healthcare personnel have a low fear of losing their job, and that new technological applications have motivated them at first. However, innovations and changes brought about by technology invalidate hard-gained knowledge and experience and create continuous learning and development pressure [4]. For this reason, it is seen that employees experience concern, disappointment and anxiety. In other words, it can be said that employees are enthusiastic about innovations, but they experience stress due to innovations in the process.

In the study, techno-uncertainty, followed by techno-insecurity, respectively, affected the individual innovation level of healthcare personnel the most. In other words, a decrease in the techno-insecurity levels of the health personnel and an increase in their techno-uncertainty levels positively affected the individual innovation levels. Similar to the research findings, Çetin and Bülbül (2017) found a negative relationship between individual innovativeness and techno-confusion and techno-insecurity and a positive and significant relationship with techno-uncertainty, and explained that this may be due to the fact that developing technologies and new applications could be attractive at first to users [1]. The study reported that nurses stated that learning new technologies was challenging and they only used the parts they knew about in the system and could not explore the system much due to its complexity. In addition, it was stated

that nurses increase the level of technostress [19]. Employees will be more open to innovations when they do not fear losing their jobs. This was the expected result. Technostress is defined as a disease that occurs in adapting to modern technology. The reasons that significantly increase technostress among healthcare personnel are new and growing fears or difficulties associated with computers or other modern equipment [4]. When individuals start working with new technologies, they experience stress, make more mistakes, try to stay away from work, lack confidence, and experience disappointment and lack of concentration [20]. It is thought that the stress caused by all these experiences may lead to confusion, uncertainty, insecurity, and negative attitudes such as resisting innovations. In order to adapt to increasingly important technological changes and reduce the associated stress, institutions should be able to successfully manage technostress and innovativeness [21]. Leadership and support of management are considered a prerequisite for innovativeness. It is of great importance that managers support and believe in innovation, in other words, leadership of the top management is critical [22]. In addition, it has been stated that innovations made by giving voice to the demands of the employees reduce the resistance to innovation as they meet expectations of the employees and increase their satisfaction [23].

Conclusion

Research questions were answered by the findings that the health personnel had a moderate level of technostress, that the individual innovativeness category was the Interrogator category, that there was a significant relationship between technostress level of healthcare personnel and that individual innovativeness and techno-insecurity and techno-uncertainty subdimensions of technostress were significant predictors that predicted individual innovativeness of healthcare personnel. This finding is important as it shows that technostress is an effective factor on innovation culture in health institutions. As the technostress levels of individuals increase, their perspective towards innovations decreases. Technostress changes individuals' perceptions and behaviors towards innovations and may cause them to resist innovation.

Providing an innovative organizational culture in institutions and determining policies in this direction will significantly reduce the techno-stress level of health personnel. The fact that innovation is currently heavily emphasized in hospitals increases the need for individuals who are open to innovation. In order to develop innovative behaviors, it is recommended that healthcare professionals see themselves as innovative leaders, and to encourage them to be open to innovation, and provide sufficient time and resources.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

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Conflict of interest

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