REVIEW

Seda H. Bostanci[1]
Seda Yildirim[1]
Fatma Erdogan[2]

[1] Tekirdag Namık Kemal University, Business Administraion, Tekirdağ, Türkiye
[2] Tekirdag Namık Kemal University, Tekirdağ, Türkiye

Corresponding Author:
Seda Yildirim
mail: sedayildirim@nku.edu.tr

Received: 13.12.2021
Acceptance: 03.02.2022
DOI: 10.18521/ktd.1036010

Konuralp Medical Journal
e-ISSN1309–3878
konuralptipdergi@duzce.edu.tr
konuralptipdergisi@gmail.com
www.konuralptipdergi.duzce.edu.tr

A Review on e-Government Portal's Services within Hospital Information System during Covid-19 Pandemic

ABSTRACT

The Covid-19 pandemic has initiated an important change that affects all economic and social life, especially in the field of health. First of all, pandemic restrictions have made it necessary to transform living habits. This change appears as digital transformation. Especially, decreases in physical mobility, distance obligations, reorganization of working environments have made the way and process of doing business more digital. At this point, innovative technologies and applications are saviors for information system management. In crisis management, the biggest disadvantages of today are that the world population has increased considerably and the interaction in the global system is high. However, the biggest advantage is that the technological possibilities can be developed in a way that contributes to the isolation. It is possible to manage hospital information management more quickly and effectively with new applications. Covid-19 pandemic has also shown the need of digital transformation in the short term, globally. This study aims to review hospital information system management and to give some sample implications based on e-services of e-Government Portal in Turkey. HIS has been used more effectively during the pandemic process. e-Government was observed as a digital tool accelerating processes such as document inquiry, application and information track in Turkey in the context of hospital information system management. It was observed that e-Government portal accelerated the process for the management of hospital information system in Turkey and e-Government portal provided several e-services for healthcare professionals and citizens during the Covid-19 pandemic.

Keywords: E-Government Portal, Hospital Information System, E-Service, Health Information Management, Covid-19 Pandemic.

Covid-19 Pandemi Sürecinde Hastane Bilgi Sistemi Açısından e-Devlet Portalı'nın Hizmetleri Üzerine Bir Derleme

ÖZET

Covid-19 pandemisi, başta sağlık alanı olmak üzere bütün ekonomik ve sosyal yaşamı etkileyen önemli bir değişimi başlatmıştır. Öncelikle pandemi kısıtlamaları yaşam alışkanlıklarının dönüşümünü zorunlu hale getirmiştir. Bu değişim, dijital dönüşüm olarak ortaya çıkmaktadır. Özellikle fiziksel mobilitenin azalması, mesafe zorunlulukları, çalışma ortamlarının yeniden düzenlenmesi, iş yapma şeklini ve sürecini daha dijital hale getirmiştir. Bu noktada, yenilikçi teknolojiler ve uygulamalar bilgi sistemi yönetimi için kurtarıcı niteliktedir. Kriz yönetiminde, günümüzde en büyük dezavantaj dünya nüfusunun oldukça artmış olması ve küresel sistemde etkileşimin fazla olmasıdır. Bunula birlikte en büyük avantajı ise teknolojik olanakların izolasyona katkı sağlayacak şekilde geliştirilebilmesidir. Hastane bilgi yönetiminin yeni uygulamalar ile daha hızlı ve etkin şekilde yönetilmesi mümkün olabilmektedir. Bu çalışma, hastane bilgi sistemi yönetimini incelemeyi ve Türkiye'deki e-Devlet Portalı e-hizmetlerine dayalı olarak bazı örnek uygulamalar vermeyi amaçlamaktadır. HIS pandemi sürecinde daha etkin kullanılmaya başlanmıştır. Türkiye'de e-Devlet portalı, hastane bilgi sistemi yönetimi açısından belge sorgulama, başvuru ve bilgi takibi gibi süreçleri hızlandıran dijital bir araç olarak gözlemlenmiştir. e-Devlet portalının Türkiye'de hastane bilgi sisteminin yönetim sürecini hızlandırdığı ve e-Devlet portalının Covid-19 pandemisi sürecinde sağlık çalışanları ve vatandaşlara çeşitli e-hizmetler sunduğu görülmüştür.

Anahtar Kelimeler: E-Devlet Portalı, Hastane Bilgi Sistemi, E-Hizmet, Sağlık Bilgi Yönetimi, Covid-19 Pandemisi.

INTRODUCTION

Covid-19 pandemic changed the everyday life with new normal standards globally. Recent researchers have pointed out that there is a rapid digital transformation among economic, social and environmental issues. For example, digital transformation in government and business models were accelerated during the Covid-19 (1); (2); (3); (4); (5). On the other side, remote education model (6); (7); (8); (9); (10) and remote work model (11); (12); (13); (14) adapted in many economies during the Covid-19 pandemic. This transformation has made health management more technology-based. Accordingly, Hospital Information Systems (HIS) have also developed faster in every country than in the past. This section contains information about HIS. Today like all areas of human life, the field of health is also undergoing a digital transformation process. In this process, applications such as e-health, telemedicine, hospital information systems are developing. In the World, any new parameters such as population growth, which increases income inequality, possible pandemics expected after the Covid-19 pandemic process and increase in mental health problems in a changing World make applications such as HIS necessary. These applications have many functions such as providing services to more patients, obtaining accurate data in pandemics, and reducing the workload of healthcare workers. Hospital information systems (HIS) can be defined as a regulated technology-based system for medical and administrative information that can be described as big data for hospitals (15); (16).While HIS organizes valuable data for hospitals, it enables statistics, projection and record tracking activities to be carried out more easily and systematically with the contribution of automation systems (17). This creates efficiency in hospital management.

Digital health-based tools such as HIS and e-health have provided productivity, with opportunities such as widespread information distribution, telemedicine opportunities for patients, and virtual meetings during the Covid-19 pandemic process (18). And telehealth, and digital care solutions, together with the HIS infrastructure, increased the efficiency of health services during the pandemic process (19). The Internet of Things IoT interconnects all computing, mechanical and digital technologies, including HIS. This technology has had a great impact on the monitoring of health services during the Covid-19 pandemic process (20). The use of virtual software and telemedicine offers promising potential in the fight against pandemics (21). So these technologies reduce the hospital burden in the pandemic process, and they also provide vital data for making predictions on the pandemic.

In general, initially adapting to HIS systems and obtaining appropriate medical records can create various difficulties for healthcare personnel and physicians. So sometimes electronic information systems in health care is a challenge for the doctors (22). But as systems become streamlined, they make it easier for doctors to keep track of medical records. Various studies have shown that healthcare professionals can get more efficiency and satisfaction levels from switching to HIS applications compared to manual registrations (23); (24). HIS ensures that health services are offered to the public more efficiently.

This study aims to review e-services of e-Government Portal in the context of hospital information system in Turkey. This review study includes five main parts. Firstly, introduction part gives the importance of hospital information system during the Covid-19 pandemic. Secondly, there is a part examining hospital information system management. This part also examined prior studies that investigated hospital information system management in the literature. Third part gives some sample implications of HIS service through e-Government Portal in Turkey. The fourth part is about strengths and weaknesses of HIS. Then, the last part gives a conclusion as a result of this review study. In the conclusion, this study provides a SWOT analysis for using HIS through e-Government Portal.

Hospital Information System Management: Health information systems, including HIS, are being adopted more and more among healthcare professionals as a patient-centered approach (25). Health information systems is the name given to the whole process of creating and sharing information and data in the field of medicine, and ultimately determining, selecting and developing the care and treatment of patients (26); (27). Develops the predictions of the health field on the future by combining health information systems, health system and statistical system (28).

Technological possibilities of each country on HIS are quite different from each other. HIS practices differ in public and private hospitals of countries. Integration with e-government in public hospitals can make these systems easier to implement. In many countries HIS is a part of e-government system. For example, in Turkey, e-nabız is integrated with e-government services (29). User satisfaction on HIS is also one of the important content in this field. “HIS is stated to lag behind business and industrial information systems in terms of IT use and implementation of quality standards for patient satisfaction”(24). However, e-health systems as mobile applications, wearable technologies and the Covid-19 pandemic process have made significant progress in the relationship of HIS user satisfaction. There are many factors that will affect HIS applications, such as technological factors, human factors, organizational factors (30). Artificial Intelligent (AL) also a component for HIS. For example, the smartwatch as an AI-enabled medical device so this is also a wearable technology (31). As part of medical healthcare in the Internet of Things

(IoT) affect citizen satisfaction (32). Many studies investigated HIS management with the practices of countries in this field as a case. Table 1 presents the main articles published with this approach.

Table 1. Some prior studies on Hospital Information System

Researchers	Methodology	The study
Patermann, et.a. (2020)	Qualitative research, Germany case	This study developed an approach over systems integrated with HIS. (33)
Salahuddin, et.al. (2020)	Qualitative research,	This study aims to develop a model for evaluating the safe use of a HIS from a sociotechnical standpoint. (34)
Motevali Haghighi and Torabi (2020)	Qualitative research	The study evaluates HIS risks; a fuzzy risk matrix is constructed. (35)
Salahuddin, et.al. (2020)	Qualitative research, Malaysia case	The study aims to investigate the behavior of health practitioners in adopting HIS practices. (36)
Carvalho, et.al. (2019)	Qualitative research	The study presents a proposal to measure HIS maturity with regard to data analytics. (37)
Khajouei, et.al. (2018)	Quantitative research,	The study evaluated causes and errors of communication to electronic health record.(38)
Gartner, et.al. (2018)	Quantitative research,	The study, creates a mathematical programming model in order to minimize the cognitive workload of doctors related to prescribing order sets.(39)
Nadri, et.al. (2018)	Qualitative research, Iranian case	This study includes a research on the use of HIS in hospital units.(40)
Haghighi and Torabi (2018)	Qualitative research,	This study proposed HISs in order to enhance their performance from a mixed sustainability-resilience view.(41)
Handayani, et.al. (2018)	Qualitative research,	This study is a literature review about the most important acceptance factors associated with HIS. (42)
Saluvan and Ozonoff (2018)	Qualitative research, Turkey case	The study aims to determine the usability of HIS functions and their perceived importance on quality and patient safety.(43)
Alipour et.al. (2017)	Quantitative research, Iranian case	This study aimed to assess the success or failure of HISs in public hospitals. (44)
Sahay and Walsham (2017)	Qualitative research, India case	The study includes the examination of the hospital information system over a public hospital.(45)
Wen, et.al. (2017)	Qualitative research, China case	The study aims to seek new potential strategies in information technologies to improve physician-nurse communication. (46)

Source: created by authors

Some Sample Implications of HIS through e-Government Portal: Covid-19 pandemic increased the need of digital health services and hospital information system. In this point, this study reviews e-services of e-Government Portal in Turkey to determine important hospital information system services during Covid-19 pandemic. In Turkey, users (citizens or individuals) use some public services via e-Government Portal when they access into the system by their personal password, e-signature, mobile signature, internet banking and ID card (TC-Republic of Turkey) (5); (47). Turkish e-Government Portal provides a specific point for citizens to access public services in Turkey. Currently (29th November 2021), there are 57.276.122 users, 6.161 e-services, 3.300 mobile services and 841 institutes.

There are several categories and sub-services under e-Government Portal and one of these categories is called as “health” (48). Health category aims to provide healthcare information and users can manage their medicine, appointment and clinical examination (49). Table 2 shows sub-services for health category in e-government portal.

When observing Table 3, it is seen that there are different institutions giving e-services for hospital information system.

These e-services mostly include inquiry service and application service for users.

Table 2. Health category and E-services based on e-Government Portal

Number of e-service	Institute	Sub-service
1	The Disaster and Emergency Management Authority (AFAD)	Volunteering Application and Follow-up
5	The Ministry of Family and Social Services	Alo 183 Social Support Application and Follow-up Preliminary Application for Institutional Care Requests of Disabled Persons in Need of Care Disabled Home Care Payment Information Inquiry Identity Card Application for the Disabled Free Travel Card Pre-Application
1	The Information and Communication Technologies Authority	Base Stations Measurement Information
1	General Directorate of Mineral Research and Exploration	Kidney and Bladder Stone Analysis Application and Follow-up Procedures
29	The Ministry of Health	Family Physician Information Inquiry Service Score Inquiry Doctor Knowledge Base Organ and Tissue Transplant List Inquiry Organ and Tissue Waiting List Inquiry Organ and Tissue Donation Inquiry and Cancellation Travel Health Vaccination Status Inquiry Seafarer Medical Report Inquiry Inquiry about Vaccination at School Age e-Signed Birth Reports Inquiry Public Hospitals Additional Payment E-Payroll (EKOBS) Service TITCK Electronic Document Management System Document Verification Medication Reports Inquiry e-Signed Psychotechnical Evaluation Reports Inquiry Rest Reports Inquiry e-Signed Athlete Reports Inquiry e-Signed Driver Reports Inquiry e-Signed Driver Reports Inquiry Medical Equipment Reports Inquiry e-Signed Adult Disability Health Board Reports Inquiry e-Signed Child Special Needs Reports Inquiry Personal Health Information Form Driver Behavior Development Training Exam Result Inquiry e-Signed Status Reports Single Physician Health Reports Inquiry TITCK Citizen Petition Application HES Code Generation and Listing HES Code Inquiry Mass HES Code Inquiry e-Signed TSK Health Board Reports HES Code Permission Settings
2	The Insurance Information and Monitoring Center	Health Insurance Policy Information Inquiry (Real Person) Compulsory Liability Insurance for Medical Malpractice (Physician Professional Liability Insurance)
12	Social Security Institution	Insurance Practices General Health Insurance Registration and Premium Debt Inquiry 4B Insured (5510 SK headmen, self-employed and self-employed) 4/B-2020 Postponement Scope List (Covid-19) General Health Insurance Applications 4A/4B/4C Medication Duration Inquiry 4A/4B/4C Inspection Contribution Inquiry Tooth Prosthesis Right Inquiry Physician Information Getting a Corporate Physician Password Medical Market Inquiry Medula Optical Glass and Frame Information Inquiry Health Aid Request and Commitment SPAS Exploitation Inquiry (Health Provision Activation System) Treatment Information Inquiry

Source: adapted from (49)

Table 3. Ministry of Health and Sub-Services

	Sub-services
Ministry of Health	Changing Family Physician
	Pharmacist Placement System (EYS)
	E-Pulse Personal Health System
	Pharmaceutical Track and Trace System (ITS) Management Portal
	Central Physician Appointment System (MHRS)
	What Have I App
	Common Entry Point
	Prioritization Application System
	Prescription App
	Ministry of Health Registration and Registration Information System
	Ministry of Health Personnel Tracking System
	TITCK (Turkish Medicines and Medical Devices Agency) Electronic Application System (EBS)
	TITCK (Turkish Medicines and Medical Devices Agency) Electronic Application System (EBS) Registration
	Product Tracking System
	Product Tracking System Application Entry

Source: adapted from (50)

Table 3 shows e-services belonged to the Ministry of Health in e-Government portal. According to e-services providing by the Ministry of Health, it can be said that most of e-services includes track service and application service.

The importance of e-Government Portal has been seen during the Covid-19 pandemic. To keep providing public services during the pandemic, e-Government Portal improved its system. Ministry of Health classifies some e-services based on e-Government Portal as below (51):

• Family Physician Information Inquiry
• e-Nabız Personal Health System
• Changing Family Physician
• Seaman Health Report Inquiry
• e-Signed Child Special Needs Reports Inquiry
• Medication Reports Inquiry
• e-Signed Birth Reports Inquiry
• Rest Reports Inquiry
• e-Signed Status Notifies Health Board Reports Inquiry
• Personal Health Information Form
• e-Signed Status Reports Single Physician Health Reports Inquiry
• Central Physician Appointment System
• e-Signed Adult Disability Health Board Reports Inquiry
• Inquiry about Vaccination at School Age
• Inquiry on e-Signed Psychotechnical Evaluation Reports
• Organ and Tissue Donation Inquiry and Cancellation
• e-Signed Athlete Reports Inquiry
• Organ and Tissue Waiting List Inquiry
• e-Signed Driver Reports Inquiry
• Organ and Tissue Transplant List Inquiry
• e-Signed TSK (Turkish Armed Forces) Health Board Reports Inquiry
• Travel Health Vaccination Status Inquiry
• Driver Behavior Development Training Exam Result Inquiry
• Medical Equipment Reports Inquiry
• TITCK Citizen Petition Application
• HES Code Generation and Listing
• HES Code Inquiry
• TITCK Citizen Petition Application

Turkey's digital face, e-Government Gateway, received record attention from citizens in 2020. The e-Government Gateway, which enables many transactions to be made digitally, especially during the Covid-19 pandemic period, has become an area where citizens can perform their transactions quickly and safely. Both the ease of access to the service and the availability of many needed services increased awareness and interest in the e-Government Gateway in this period. Mr. Koc (The Head of the Digital Transformation Office) determined that the importance of support services, stated that many public services were digitized in 2020, while citizens used the e-Government Gateway intensively and effectively. In addition, Mr. Koc stated that there are important services regarding health at the e-Government Gateway. Especially during the Covid-19 pandemic, the implementation of the HES Code was of great importance. During this period, the "HES Code Generation and Listing" service, which allowed individuals to securely share with institutions and individuals whether there was any risk in terms of the Coronavirus (Covid-19) disease, was also among the most used services over the e-Government Gateway. In terms of public health, e-government portal moved the "Travel Permit" applications, which must be obtained from the governorship for citizens over the age of 65, to the e-Government Gateway (52).

The numbers also has proven that e-Government portal helps citizens as providing many kinds of e-services during the Covid-19 pandemic. Digital services continue to be used effectively in the fight against the Covid-19 pandemic. e-Government portal service usage numbers; In March, April and May of 2020, it doubled compared to the previous year. While 278 thousand entries were made in the first three months of 2019; In 2020, 631 thousand

entries were reached. The increase in the e-Government portal, which includes more than 5000 services, has a large share in the fact that the services needed by the citizens are opened and the services are easily accessible. During this period, the e-Government portal also implemented services that provide solutions for the needs of our citizens. Among the services opened during the pandemic process, the most used ones are; pandemic social support preliminary application, travel permit application, 4/B 2020 postponement scope list (Covid-19), HES code generation and listing, bank inquiry services with deposit / participation funds (53).

Vaccination status can be inquired through e-Government portal. The HES code, which is used to securely share whether there is any risk in terms of COVID-19, was generated 66 million 254 thousand 113 times over e-Government and HES Mobile. During the epidemic, citizens can also restructure their premium debts to SSI via e-Government. Accordingly, the number of applications made via e-Government portal has reached 243,258. After the support applications made by citizens through e-Government portal within the scope of the Social Protection Shield during the epidemic, support payments were made to 2 million 56 thousand 442 people (54).

Strengths and Weaknesses of Hospital Information System Management: The Covid-19 pandemic has accelerated the development of the HIS process. Although each country has different applications, e-health and HIS have become components of health management around the world today. For example, in studies on Africa, the lack of national strategies on HIS has been mentioned. In the study, the lack of national health strategies in the HIS process in African countries was expressed as a threat (55).

Ismail et al. (2010) mentioned in their study that the need for technically trained personnel for HIS is a threat to human resource management of the hospitals (56). Chaulagai et al. (2005) with a similar approach, mentioned some weaknesses in the progress of the health sector in terms of information systems, system thinking and teamwork aspects (57). Rahimi et al. (2009) mentions that an engineering infrastructure of the HIS process should be well-designed from a technical point of view and that it is a team effort (58). The relevant literature shows that the importance of health informatics in the management of health services is increasing day by day.

Nawaz et al. (2015) stated in their research on HIS that the strength of a good reporting system and threat as objective information is sometimes not a good social economic indicator. (59). Klinis vd. et al. (2012) defined efficiency, rapid data collection, and access to more patients with remote management systems as strengths in their studies. But they also pointed out weaknesses such as data parsing and cost regulation. Data banking, data synthesis and networking i opportunities and cyber security have also identified hacker attacks and technological problems as threats (60). When these studies are examined, it is seen that subjects such as human resources, new management approach, big data, cyber security, efficiency, technical infrastructure come to the fore in the HIS process.

CONCLUSION

When searching the literature, it can be said that it is advantage to get innovative and digital tools or applications to manage hospital information system in general (61). In this context, this study thought that e-Government portal's e-services can be a good sample to understand HIS' services. Table 4 shows SWOT analysis for using HIS through e-Government portal in Turkey as below:

Table 4. SWOT Analysis for HIS Management by e-Government

Strengths	**Weaknesses**
There are important strengths of using HIS through e-Government portal as: Benefits for individuals: Acceleration into access to information Cost reduction Time efficiency 7/24 service Transparency Higher satisfaction by fast service Benefits for healthcare professionals: Acceleration into access to information Savings in time, cost, employee and office equipment Access to information quickly Mobility Time efficiency when giving less time for activities of HIS	To use e-government portal, there is a need of internet and digital devices. Also, password is a vital to access data for professionals. Some technical problems can cause problem for HIS management.
Opportunities	**Threats**
As it is purposed, e-Government portal accelerates the process of information access between healthcare professionals, individuals and institutions among HIS. Accordingly, HIS process can be directly managed by digital applications and tools in the long term. When healthcare professionals access data easily and fast, other important healthcare services can be provided in a better way.	There may be security and privacy problems for individuals and professionals when using e-Government portal.

Source: created by authors

Like as other e-services in e-Government portal, "inquiry services, application services, document production services, information services" are main characteristics of sub-services in health

category. Both of individuals and healthcare professionals can benefit from e-Government portal (5); (47). As a result, it can be said that the management of HIS may be a challenge for countries who has not adopted digital technologies or applications yet. Turkey has accelerated digital transformation in public services during the Covid-19 pandemic and e-Government Portal develops and adapts several public services (5). Future studies can investigate different digital applications or web-based systems to examine HIS management or develop new model. This study has some limitations as being a review study and giving limited sample implications from e-Government portal.

Declaration of Competing Interest: The authors declare no conflict of interest.

Funding: No funding was used in the preparation of this work.

REFERENCES

1. Organisation for Economic Co-operation and Development (OECD). Digital Transformation in the Age of COVID-19: Building Resilience and Bridging Divides, Digital Economy Outlook 2020 Supplement, OECD, Paris, [cited 2021 Dec 20]. Available from: www.oecd.org/digital/digital-economy-outlook-covid.pdf
2. BDO. Covid-19 Is Accelerating The Rise of The Digital Economy, Digital Transformation in the Pandemic & Post-Pandemic Era, 2020. [cited 2021 Dec 20]. Available from: https://www.bdo.com/getattachment/07e769aa-5755-4151-9b52-4eeccfe61710/attachment.aspx?ADV_DTS_COVID-19-is-Accelerating-the-Rise-of-the-Digital-Economy_Web.pdf
3. Soto-Acosta P. (COVID-19 Pandemic: Shifting Digital Transformation to a High-Speed Gear. Information Systems Management. 2020; 37 (4):260-6.
4. Hai TH, Van QN, Tuyet MNT. Digital Transformation: Opportunities and Challenges for Leaders in the Emerging Countries in Response to Covid-19 Pandemic. Emerging Science Journal. 2021; 5 (Special Issue: COVID-19: Emerging Research):21-36.
5. Yıldırım S, Bostancı, SH. The efficiency of e-government portal management from a citizen perspective: evidences from Turkey. World Journal of Science, Technology and Sustainable Development. 2021;(3): 259-73.
6. Iivari N, Sharma S, Ventä-Olkkonen L. Digital transformation of everyday life – How COVID-19 pandemic transformed the basic education of the young generation and why information management research should care?. International Journal of Information Management. 2020;55 (102183).
7. Mhlanga D, Moloi T. COVID-19 and the Digital Transformation of Education: What Are We Learning on 4IR in South Africa?, Education Sciences. 2020;10(7):180.
8. Armstrong-Mensah E, Ramsey-White K, Yankey B, Self-Brown S. COVID-19 and Distance Learning: Effects on Georgia State University School of Public Health Students. Frontiers in Public Health. 2020;8 (576227).
9. Pacheco JA, The "new normal" in education. Prospects. 2020; 51: 3-14.
10. Yıldırım S, Bostancı SH, Yıldırım DÇ, Erdoğan F. Rethinking mobility of international university students during COVID-19 pandemic. Higher Education Evaluation and Development. 2021;15(2):98-113.
11. Kramer A, Kramer KZ, The potential impact of the Covid-19 pandemic on occupational status, work from home, and occupational mobility. Journal of Vocational Behavior. 2020;119 (103442).
12. Stephany F, Dunn M, Sawyer S, Lehdonvirta V. Distancing Bonus Or Downscaling Loss? The Changing Livelihood of Us Online Workers in Times of COVID-19. Tijdschr Econ Soc Geogr. 2020;111(3):561-73.
13. Molino M, Ingusci E, Signore F, Manuti A, Giancaspro ML, Russo V, Zito M, Cortese CG. Wellbeing Costs of Technology Use during Covid-19 Remote Working: An Investigation Using the Italian Translation of the Technostress Creators Scale. Sustainability. 2020;12(15):5911.
14. Wang B, Liu Y, Qian J, Parker SK. Achieving Effective Remote Working During the COVID-19 Pandemic: A Work Design Perspective. Applied Psychology. 2021;70: 16-59.
15. Chen PT, Lin CL, Wu WN. Big data management in healthcare: Adoption challenges and implications. International Journal of Information Management. 2020;53:102078.
16. Celesti A, Fazio M, Romano A, Villari M. 39th International Convention on Information and Communication Technology, Electronics and Microelectronics (MIPRO) 2016, 30 Ma - 3 June 2016 - Opatija, Croazia. Conference Proceedings.
17. Lee HW, Ramayah T, Zakaria N. External factors in hospital information system (HIS) adoption model: A case on Malaysia. Journal of medical systems. 2012; 36(4):2129-40.
18. Kalhori SRN, Bahaadinbeigy K, Deldar K, Gholamzadeh M, Hajesmaeel-Gohari S, Ayyoubzadeh SM. Digital health solutions to control the COVID-19 pandemic in countries with high disease prevalence: Literature review. Journal of Medical Internet Research. 2021;23(3):e19473.
19. Anthony Jnr B. Implications of telehealth and digital care solutions during COVID-19 pandemic: a qualitative literature review. Informatics for Health and Social Care. 2021;46(1):68-83.
20. Javaid M, Khan IH. Internet of Things (IoT) enabled healthcare helps to take the challenges of COVID-19 Pandemic. Journal of Oral Biology and Craniofacial Research, 2021;11(2):209-14.

21. Bokolo AJ. Exploring the adoption of telemedicine and virtual software for care of outpatients during and after COVID-19 pandemic. Irish Journal of Medical Science 2021;190(1):1-10
22. Lærum H, Ellingsen G, Faxvaag A. Doctors' use of electronic medical records systems in hospitals: cross sectional survey. BMJ. 2000;323(7325):1344-8
23. Zakaria N, Yusof SAM. Understanding technology and people issues in hospital information system (HIS) adoption: Case study of a tertiary hospital in Malaysia. Journal of Infection and Public Health. 2016; 9(6):774-80.
24. Handayani PW, Hidayanto AN, Pinem AA, Hapsari IC, Sandhyaduhita PI, Budi I. Acceptance model of a hospital information system. International Journal of Medical Informatics, 2017;99:11-28.
25. Krist AH, Woolf SH. A vision for patient-centered health information systems. JAMA, 2011;305(3):300-301.
26. Ülke R, Atilla EA. Information Systems in Health Services and E-Health: A Case Of Ankara Province. Gazi Journal of Economics & Business. 2020;6 (1):86-100.
27. Baykal N. Değişen Dünya, Tıp ve Teknoloji. Çözüm Sağlık ve Bilişim Dergisi. 2005.
28. AbouZahr C, Boerma T. Health information systems: the foundations of public health. Bulletin of the World Health Organization. 2005;83: 578-83.
29. Öncü MA, Yildirim S, Bostanci S, Erdoğan F. The effect of COVID-19 pandemic on health management and health services: a case of Turkey. Duzce Medical Journal. 2021;23(S1):61-70
30. Yucel G, Cebi S, Hoege B, Ozok AF. A fuzzy risk assessment model for hospital information system implementation. Expert Systems with Applications, 2012; 39(1):1211-8.
31. Uzir MUH, Al Halbusi H, Lim R, Jerin I, Hamid ABA, Ramayah T, Haque A. Applied Artificial Intelligence and user satisfaction: Smartwatch usage for healthcare in Bangladesh during COVID-19. Technology in Society. 2021;67 (101780).
32. Mustafa M, Alzubi S. Factors affecting the success of internet of things for enhancing quality and efficiency implementation in hospitals sector in Jordan during the crises of Covid-19. In: Chakraborty C, Banerjee A, Garg, L, Rodrigues, Joel JPC. Internet of Medical Things for Smart Healthcare. Springer Singapore:2020. P107-140.
33. Patermann K, von Ohlen L, Kühr A, Ranjbar M, Pauls W, Dück R, Grisanti S. Electronic patient files in hospital information systems. Der Ophthalmologe: Zeitschrift der Deutschen Ophthalmologischen Gesellschaft. 2020; 117(10):1015-1024.
34. Salahuddin L, Ismail Z, Hashim UR, Ismail NH, Raja Ikram RR, Abdul Rahim F, Hassan NH. Healthcare practitioner behaviours that influence unsafe use of hospital information systems. Health Informatics Journal, 2020;26(1):420-34.
35. Motevali Haghighi S, Torabi SA. Business continuity-inspired fuzzy risk assessment framework for hospital information systems. Enterprise Information Systems, 2020; 14(7):1027-60.
36. Salahuddin L, Ismail Z, Raja Ikram RR, Hashim UR, Idris A, Ismail NH, Hassan NH, Abdul Rahim F. Safe use of hospital information systems: an evaluation model based on a sociotechnical perspective. Behaviour & Information Technology. 2020;39(2):188-212.
37. Carvalho JV, Rocha A, Vasconcelos J, Abreu A. A health data analytics maturity model for hospitals information systems. International Journal of Information Management. 2019;46:278-85.
38. Khajouei R, Abbasi R, Mirzaee M. Errors and causes of communication failures from hospital information systems to electronic health record: a record-review study. International Journal of Medical Informatics, 2018;119:47-53.
39. Gartner D, Zhang Y, Padman R. Cognitive workload reduction in hospital information systems. Health Care Management Science. 2018;21(2):224-43.
40. Nadri H, Rahimi B, Afshar HL, Samadbeik M, Garavand A. Factors affecting acceptance of hospital information systems based on extended technology acceptance model: a case study in three paraclinical departments. Applied Clinical Informatics, 2018;9(2):238-47.
41. Haghighi SM, Torabi SA. A novel mixed sustainability-resilience framework for evaluating hospital information systems. International Journal of Medical Informatics. 2018;118:16-28.
42. Handayani PW, Hidayanto AN, Budi I. User acceptance factors of hospital information systems and related technologies: Systematic review. Informatics for Health and Social Care. 2018;43(4):401-26.
43. Saluvan M, Ozonoff A, Functionality of hospital information systems: results from a survey of quality directors at Turkish hospitals. BMC Medical Informatics And Decision Making. 2018;18(1):1-12.
44. Alipour J, Karimi A, Ebrahimi S, Ansari F, Mehdipour Y. Success or failure of hospital information systems of public hospitals affiliated with Zahedan University of Medical Sciences: A cross sectional study in the Southeast of Iran. International Journal of Medical Informatics. 2017;108:49-54.
45. Sahay S, Walsham G. Information technology, innovation and human development: Hospital information systems in an Indian state. Journal of Human Development and Capabilities. 2017;18(2):275-92.
46. Wen D, Zhang X, Wan J, Fu J, Lei J. The challenges of emerging HISs in bridging the communication gaps among physicians and nurses in China: an interview study. BMC Medical Informatics and Decision Making. 2017;17(1):1-11.

47. e-Devlet Kapısı [Internet]. Sıkça Sorulan Sorular. [cited 2021 Dec 20]. Available from: https://www.turkiye.gov.tr/bilgilendirme?konu=sikcaSorulanlar
48. e-Devlet Kapısı [Internet]. [cited 2021 Dec 20]. Available from: https://www.turkiye.gov.tr/
49. e-Devlet Kapısı, [Internet]. Sağlık. [cited 2021 Dec 20]. Available from: https://www.turkiye.gov.tr/saglik-hizmetleri
50. e-Devlet Kapısı, [Internet]. [cited 2021 Dec 20]. Available from: https://www.turkiye.gov.tr/tek-tikla-giris
51. The Ministry of Health (Turkish Republic) (Sağlık Bakanlığı), [Internet]. (2021). e-Hizmetler. [cited 2021 Dec 20]. e-Hizmetler. Available from: https://www.saglik.gov.tr/TR,11680/e-hizmetler.html
52. Presidency of the Republic of Turkey Digital Transformation Office, [Internet]. (2021), e-Devlet Kapısı 2020'de Türkiye'nin Dijital Yüzü Oldu, [cited 2021 Dec 20]. Available from: https://cbddo.gov.tr/haberler/4987/e-devlet-kapisi-2020-de-turkiye-nin-dijital-yuzu-oldu
53. Presidency of the Republic of Turkey Digital Transformation Office. [Internet]. e-Devlet Kapısı Kullanımı 2 Kat Arttı, [cited 2021 Dec 20]. Available from: https://cbddo.gov.tr/haberler/4818/e-devlet-kapisi-kullanimi-2-kat-artti
54. Anadolu Agency (AA). [Internet]. Salgın dönemindeki desteklere e-Devlet üzerinden erişim mümkün, [cited 2021 Dec 20].Available from: https://www.trthaber.com/haber/gundem/salgin-donemindeki-desteklere-e-devlet-uzerinden-erisim-mumkun-554486.html
55. Koumamba AP, Bisvigou UJ, Ngoungou EB, Diallo G. Health information systems in developing countries: case of African countries. BMC Medical Informatics and Decision Making. 2021;21(1):1-10.
56. Ismail A, Jamil AT, Rahman AFA, Bakar JMA, Saad N M, Saadi H. The implementation of Hospital Information System (HIS) in tertiary hospitals in malaysia: A qualitative study. Malaysian Journal of Public Health Medicine, 2010;10(2):16-24.
57. Chaulagai CN, Moyo CM, Koot J, Moyo HB, Sambakunsi TC, Khunga FM, Naphini PD. Design and implementation of a health management information system in Malawi: issues, innovations and results. Health Policy and Planning. 2005;20(6):375-84.
58. Rahimi B, Vimarlund V, Timpka T. Health information system implementation: a qualitative meta-analysis. Journal of Medical Systems, 2009;33(5):359-68.
59. Nawaz R, Khan SA, Khan GS. SWOT analysis of district health information system in Khyber Pakhtunkhwa. Gomal Journal of Medical Sciences. 2015;13(2).
60. Klinis S, Markaki A, Kounalakis D, Symvoulakis EK. Monitoring reasons for encounter via an electronic patient record system: The case of a rural practice initiative. International Journal of Medical Sciences, 2012;9(8):704.
61. Kahveci R, Meads C. Analysis of strengths, weaknesses, opportunities, and threats in the development of a health technology assessment program in Turkey. International Journal of Technology Assessment in Health Care. (2008);24(2):235–40.