



Metaverse and A Swot Analysis of Turkish Health System

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ABSTRACT

The aim of this study is to reveal the effect of Metaverse on health services and the situation of Türkiye's health system against Metaverse with SWOT analysis from a holistic perspective. In the study, keywords determined from Google Academy, EBSCO, ULAKBİM, Science Direct, Scopus and SOBIAD databases were searched. In the study in which secondary data were used, the data were evaluated with the SWOT analysis technique. It has been seen that the Turkish health system has advantages such as the presence of a young population, not being far behind the developments, and the experience of Covid-19. However, it has been found that the existing inequality in access to health services will deepen, virtual dependence will increase and related health problems will become widespread. As a result, it is predicted that Metaverse will have positive and negative effects on health services in many ways.

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Metaverse ve Türkiye Sağlık Sistemine Yönelik Bir Swot Analizi

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ÖZ

Bu çalışmanın amacı Metaverse'nin sağlık hizmetleri üzerindeki etkisini ve Türkiye sağlık sisteminin SWOT analizi ile Metaverse karşısındaki durumunu bütüncül bir bakış açısıyla ortaya koymaktır. Çalışmada, Google Akademi, EBSCO, ULAKBİM, Science Direct, Scopus ve SOBIAD veri tabanlarından belirlenen anahtar kelimelerle tarama yapılmıştır. İkincil verilerin kullanıldığı çalışmada SWOT analiz tekniği ile veriler değerlendirilmiştir. Türkiye sağlık sisteminin genç nüfusun varlığı, gelişmelerin çok gerisinde olmama, Covid-19 deneyimi gibi avantajlara sahip olduğu görülmüştür. Ancak sağlık hizmetlerine erişimde mevcut eşitsizliğin daha da derinleşeceği, sanal bağımlılığın artacağı ve buna bağlı sağlık sorunların yaygınlaşacağı da öngörülen bulgular arasındadır. Sonuç olarak Metaverse'nin çok yönlü olarak olumlu olumsuz yönden sağlık hizmetlerine etkisi olacağı düşünülmektedir.

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Introduction

Increasing cost of health services, increasing chronic diseases, aging population, insufficient health manpower and physical resources are among the important agenda topics in the literature and practices for a long time and pose serious problems. It is of great importance to solve these situations, which are the general problems of many health systems in the world. Digital health provides great opportunities for solving these problems. It can produce solutions that push the possibilities in the field of health care services, pharmaceuticals and biotechnology. (Thomason, 2021a: 14).

The world economic forum predicted in 2016 that digital services will soon be one of the most critical factors in transforming healthcare services (World economic forum, 2016). Thomason (2021b) predicted that there would be three important developments in the field of health services at the beginning of 2021. These are the involvement of big tech companies in the delivery of healthcare services, the marketing and monetization of health data, and finally Asia's prominence as a leader in digital healthcare (Thomason, 2021b).

With the onset of the COVID-19 outbreak in December 2019, social interactions have decreased significantly. Due to reasons such as social distancing policies, mandatory

quarantines and the closure of many workplaces, the mediating power of communication technology has significantly increased. Many activities such as corporate work, training and conferences have been moved online via social media, Metaverse or mobile phone (Thomason, 2021a: 15).

Changes in many areas have caused serious changes in the field of health services. For example, before the pandemic, 43% of healthcare facilities were able to provide telehealth, but this rate increased to 95% in 2020 (Demeke, 2021: 244). Tufts University, in a study on the impact of Covid-19 on clinical research, found that the increasing adoption of electronic informed consent is the second largest trend behind telehealth service use (Le Breton et al., 2020). Table 1 below shows the change in the ratio of health services provided by some OECD countries with telemedicine application. As seen in Table 1, it has been observed that the rate of health services provided by telemedicine, which is a branch of digital health services of all the countries in question, has increased significantly in a short time. In Table 1, while 32,94% telemedicine was performed on average in 22 OECD countries in June-July 2020, this rate increased to 45.25% in February-March 2021 after 7-8 months.

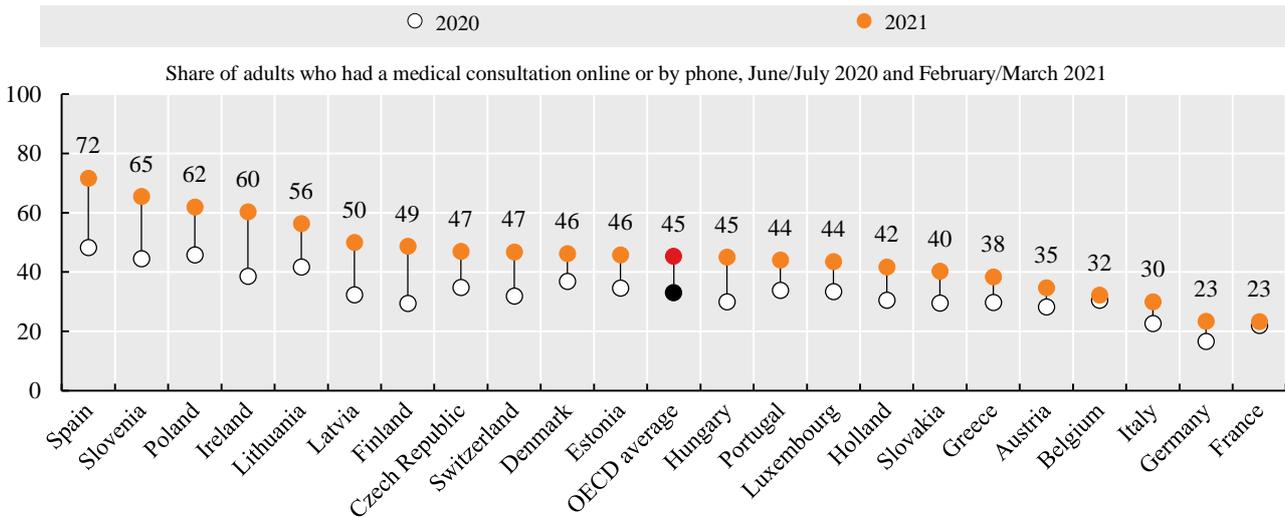


Figure 1. Share of Adults Receiving a Physician Through Telemedicine
 Kaynak: Eurofound (2020), "Living, working and COVID 19", <http://eurofound.link/COVID-19data>.

DailyCoin is an online media outlet (Dailycoin, 2021a) focused on covering news, opinions, trends and helpful articles on Fintech, digital assets, blockchain technology and other related technologies. DeHealth, a sub-branch and a non-profit British healthcare organization, aims to bring the healthcare industry field to the Metaverse with its new move. In the Metaverse to be created, millions of doctors and patients will be able to work and interact together. In addition, virtual assets can be acquired by selling anonymized medical data. It has also been announced that the name of the cryptocurrency to be used in the ecosystem will be the HLT (Health) token. It will be an extension of DeHealth's Metaverse, Virtual Reality, Augmented Reality and Mixed Reality technologies. That is, a doctor and a patient will be able to communicate just like in the real

world. Users will be able to create their digital identity. Users' medical data will be collected and anonymized through other digital platforms. Regardless of their residence, social status and financial situation, it is necessary to protect the health of individuals, the future of health services is in prevention methods rather than treatment methods and this should be given priority. With the developed artificial intelligence, it will notice the slightest deviations from the human norm and will warn about it. Thanks to HLT, anyone on the Metaverse will be able to sell their non-personal medical information. DeHealth plans to release a preliminary version of Metaverse in 2022. According to estimates, 3 million users will gain access to the platform (Dailycoin, 2021b).

In a report by Grand View Research, the global augmented reality market size is said to be \$17.67 billion in 2020. It is predicted that this figure will show a compound annual growth of 43.8% until 2028 (Coşkun, 2021). The concept of metaverse is becoming increasingly popular and its acceptability is increasing. However, there are limited studies on Metaverse in the academic field. Studies generally focus on scenarios regarding Metaverse applications, positive and negative perceptions of society, possible technical methods, user interaction, devices and sensors, identification and process, possible effects of Metaverse on games, marketing, economy, education, social relations, and organizations. Jaynes et al., 2003; Ondrejka, 2005; Rymaszewski et al., 2007; Messinger et al., 2009; Forte et al., 2010; Connolly et al., 2011; Cameron, 2012; Luse et al., 2013; Dionisio et al., 2013; Rehm et al., 2015; Chen, 2016; Sıyaev and Jo, 2021; Park and Kim, 2021; Bird, 2021; Duan et al., 2021:). There are very limited studies especially in the field of health (Bardi, 2018; Nasdaq, 2020; Rizk, 2021; Kang, 2021; Lee, 2021; Thomason, 2021; Sin-nosuke et al., 2020). It is of great importance to investigate the situation of the Turkish health system against these developments and to evaluate it with evidence-based data. This study was conducted to fill this gap in the literature. In the study, it is aimed to reveal the possible benefits of using Metaverse to the health sector and the strong-weak and opportunity-threat aspects of the Turkish health system against Metaverse.

Metaverse

The concept of metaverse was used for the first time in Neal Stephenson's science fiction novel *Snow Crash*, published in 1992. In the novel, the concept of Metaverse is used to represent a fictional world. The concept of metaverse was criticized and ignored for being an exaggerated and speculative future perspective in the early days of its existence (Felthma, 2019; Koerber, 2021). Since concepts such as metaverse, augmented reality and virtual reality can be used for different purposes in many fields, it does not seem possible to reach a clear definition in the literature (Nevelsteen, 2017: 2).

The term metaverse is expressed as the combination of the words Meta (beyond) and universe (universe), that is, the other universe. There are many different definitions of the concept of metaverse. Felthma (2019) expressed the concept of Metaverse as a hypothetical iteration of the internet, which supports a permanent online 3D virtual world through virtual and augmented reality devices as well as personal computer (Jaynes et al., 2021; Felthma, 2019; Koerber, 2021). Metaverse is a concept that allows creating virtual communities beyond commerce and entertainment; It is seen that there is a new generation internet that includes the three-dimensional virtual space where users can interact through their avatars and is defined as the "digital big bang" in cyberspace (Duan et al., 2021:53; Ko et al., 2021:331). The term Augmented Reality, which is one of the two separate components of the Metaverse, refers to the integration of digital materials into the live image. The term Virtual Reality, another important component of Metaverse, refers to the complete immersion of people in an imaginary/virtual environment.

Lee (2021) stated that a new paradigm is experienced

in information and communication technology every ten years. He states that communication with computers in the 1990s, communication over the web in the 2000s, mobile devices in the 2010s, and in the 2020s the key term is Metaverse. The concept of metaverse is becoming increasingly popular and its acceptability is increasing (Duan et al., 2021, 153). Some researchers have stated that the COVID-19 epidemic has affected this situation and accelerated digitalization as the Metaverse has become more popular and its acceptability is increasing (Kang, 2021: 1263; Lee, 2021: 13). Kang (2021) stated that the COVID-19 epidemic accelerated the transition to the physical world and the digital world, which is not affected by different variables. Lee (2021) stated that the COVID-19 process caused a sharp rise in April 2021 with online communication and the realization of many online works. In short, the COVID-19 process has accelerated the transition to Metaverse and facilitated its acceptance.

Method

Within the framework of the purpose determined in the study, it was carried out between 02.02.2022 and 07.02.2022 on Google Academy, EBSCO, ULAKBIM, Science Direct, Scopus and SOBIAD databases. Metaverse was realized by using Turkish-English combinations with keywords such as digital health, virtual health, Turkish health system, virtual reality, augmented reality. In the study, secondary data obtained from the studies evaluated were used. The obtained data were separated by SWOT analysis.

Within the framework of the inclusion criteria in the study, a search was made within the specified dates and with keywords. In this respect, studies not published in Turkish or English were not included in the study. Since the data obtained in the study are literature data, no permission was needed. Therefore, no ethical committee, informed consent or any legal permission was obtained to conduct the study.

Swot Analysis: Developed for business management purposes in the 1970s, SWOT analysis has been used as a planning and analysis method in many areas in the following years (Uçar and Dođru, 2005). SWOT analysis includes developing a strategy for the future by analyzing the strengths-weak and opportunity-threat aspects of an organization (Acuner, 2007). The word SWOT consists of the initials of four English words, Strengths, Weakness, Opportunities and Threats (Tunç ve Uygur, 2002).

Findings

In this study, it is aimed to reveal the situation of the Turkish health system against the Metaverse by using the SWOT analysis method. The summary of the SWOT analysis performed in the chapter is given in Table 1, and then the results of the analysis are confirmed by the literature. The SWOT matrix prepared for the situation of the Turkish health system against the Metaverse is given in Table 1.

It is predicted that the Metaverse will lead to great changes in health systems. In this section, the points stated in Table 1 will be confirmed by the literature.

Table 1. SWOT Analysis of the Situation of the Turkish Health System Against the Metaverse

A-STRENGTHS	B- WEAKNESSES
1-Excess of young population with high ability to adapt to changes and potential to contribute to developments 2-Türkiye is a developing country 3- Having a domestic market open to demands 4-Having an experience in digital health with the COVID-19 process 5-Easy access to the foreign market 6-Presence of a young population that will facilitate the transition of the health system to the Metaverse 7-Existence of health institutions that provide health services with advanced technology	1-Insufficient R&D studies in the field of metaverse 2-Students receiving health education at universities are not adequately prepared in the field of digital health 3- Deficiencies and delays in implementation 4-Existing inadequacies at the point of cyber security. 5-Low health literacy 6- Low access to internet use in the society 7- A health system where treatment services are weighty
C-OPPORTUNITIES	D-THREATS
1- Providing important opportunities for employment 2-Providing investment opportunities for investors outside the health sector 3-Dissemination of personal health services 4-Reducing health care costs 5- Obtaining health data with the increase in the use of wearable technologies 6-Understanding the importance of R&D 7-Incentives offered by the government for the increase of health technologies 8- Providing great opportunities in health education 9-Reducing the risk rate in treatment services 10- Establishment of a large worldwide health information system. 11-Reducing physical and psychological violence against health workers	1- Many developments and opportunities related to the metaverse are in foreign powers 2-Deficiencies in the legal field 3-R&D deficiency experienced at the academic point 4-External dependency at the technological point 5- Problems caused by the lack of cyber security 6-Potential issues regarding ethics and privacy 7-Due to the excessive use of Metaverse, a certain audience becomes addicted and the resulting health problems arise. 8- Inability of society to adapt to digital health 9-With the spread of the Metaverse, the increase in sedentary life and the associated physical health problems 10-Increasing disconnection from real life and increasing mental problems related to it 11-Deepening inequality in access to health services. Individuals with sufficient digital opportunities receive more service, while individuals who are in the opposite situation receive less service

Findings of Metaverse Regarding the Delivery of Health Services

- Metaverse will provide important facilities in the management of health services, medical education, patient diagnosis and treatment (<https://www.haberturk.com/saglikta-metavers-firtinasi-neler-olacak-3319362>).
- Rizk (2021) evaluated alternative methods for the treatment of the diagnosis made for inpatients in a health institution in the digital environment and presented many different possible scenarios. He stated that treatment methods will be evaluated with this perspective.
- Delicate and difficult operations such as removal of cancerous tumors and complex spine surgeries are much more comfortable with robotic support. The fact that the Metaverse will become the first training ground for the next generation surgical robots, where surgical robots will learn to operate on humans through Artificial Intelligence, is not seen as a challenging idea (Karakoç, 2022).
- With Metaverse, examinations will be carried out remotely online, and conditions and diseases that do not require physical control will provide the opportunity to meet with the doctor without going to

the health institution. This situation may occur on a provincial basis, on a country basis, or even on a world basis.

- Through Metaverse, it will be possible for healthcare professionals to empathize with the elderly very easily and to provide services with better experiences. According to an application at the University of New England, it has been observed that with Virtual Reality, healthcare professionals better understand the elderly and shorten the time to diagnose (Nasdaq, 2020).
- Located in the United Kingdom, St. George Hospital in December 2019, it was observed that the anxiety of the patients who underwent surgery by wearing Virtual Reality glasses was greatly reduced. In trials conducted on patients who underwent many surgeries, it was reported that all of the patients had a good experience, 80% felt less pain after wearing the glasses, and 73% reported less anxiety. It is predicted that the surgery will reduce the risks when the patient is awake and contacting his family and loved ones over Metaverse (Nasdaq, 2020).
- Healthcare professionals will be able to communicate continuously and effectively via Metaverse, thanks to their three-dimensional avatars, during the care of the

sick and the elderly at home or in hospitals. At this point, being in contact with the health worker will support the emotional state of the patients (especially the elderly people who live alone).

- With the robotic surgery to be created over Metaverse, direct surgical intervention will be possible in case of emergencies, without experiencing time and space problems.
- Diagnosis of communicable diseases will take place without risk. It will save a lot of time in terms of diagnosis and access.
- With the use of Metaverse in medicine, examinations can be made online, and doctors will be interviewed without going to the health institution in cases and diseases that do not require physical control. In this way, both cost and time savings will be achieved.
- It is foreseen that the borders in the presentation and use of health services will be lifted. A patient will be able to receive online services from a domestic or foreign healthcare professional, and the healthcare worker will be able to offer their services without the need for limits.

Findings of Metaverse on Health Education

- Thomason (2021) stated in his study that health education will be more fun and satisfying in the Metaverse environment.
- A study by the Harvard Business Review found that Virtual Reality training increased the general surgery performance of doctors and medical students by 230% compared to traditional training methods. Virtual Reality-trained surgeons participating in the application completed the procedures on average 20% faster and more accurately. With Metaverse, he will be able to operate in simulation without risk and gain experience faster (Nasdaq, 2020).
- Bardi (2018) stated that augmented reality and virtual reality will make great contributions to medical education and change the direction of education. It is predicted that medical students will have the chance to apply treatment on the patient's body created in the virtual world thanks to virtual reality, and this can be repeated. With the simulators to be created by the use of Metaverse in health services, medical students make great contributions both to experience in surgeries and to see new techniques. It is thought that the medical student will experience a much more exciting educational process as if he is actually doing the surgery.
- Thomason (2021) stated that the Metaverse will provide the opportunity to present health education continuously, at any time, at any place and in a more immersive way.
- A detailed anatomy study will be possible with the examples of the human body in the virtual world in medical education. More detailed and accessible visualization will help medical students better understand the body and produce more appropriate treatment methods.
- Thanks to the realistic surgery simulations to be created in Metaverse, students will learn to perform surgery without taking any risks, while doctors will

have the opportunity to practice especially before high-risk surgeries.

- It is predicted that patient education will be easier, more reliable and accelerated by presenting therapeutic functions such as drugs and devices used by patients in Metaverse (Sagenta Innovation, 2021).
- It will be possible to participate in the trainings offered in the field of medicine from anywhere in the world.

Findings of Metaversine on Health Technology

- Sin-nosuke et al., (2020) strive to analyze the devices to be used in the delivery of health services, learn how to use them, and take the development of health technologies to higher levels in the digital environment by providing national and international cooperation. He predicts that this system will provide the development of health technology, reduction of costs and significant training opportunities with Metaverse.
- Thomason (2021) stated that Metaverse will offer important opportunities for healthcare professionals around the world to come together in a virtual environment and benefit from each other's experience.
- Metaverse is expected to provide a large data source for health services (Karakoç, 2022).
- Great facilities will be provided in establishing cooperation between healthcare professionals, hospitals and medical research centers for alternative treatment methods.
- Thomason (2021) stated that especially the young population will be an important factor in integrating the health services of the Metaverse, accelerating learning and making successful progress in the young population.
- Thomason (2021) It is predicted that it will provide economic gain through different methods such as the use of health data and the delivery of health services in the Metaverse environment.
- As of 2018, the Augmented Reality and Virtual Reality industry used in the North American healthcare industry was worth \$477 million in total, and this figure is expected to rise to \$4.64 billion by 2025. This is a sign that there will be great changes in health services. (https://www.haberturk.com/saglikta-metavers-firtinasi-neler-olacak-3319362_).

Findings Regarding Other Topics

- According to the results of the Address Based Population Registration System, as of the end of 2020, the total population of Türkiye was 83 million 614 thousand 362 people, while the young population in the 15-24 age group was 12 million 893 thousand 750 people. The young population made up 15.4% of the total population (TSI, 2020).
- In Table 2, it is seen that Türkiye's young population ratio is 15.4%, which is relatively higher than the young population ratio of 27 European Union member countries. When the youth population ratios of 27 European Union member countries are analyzed, it is seen that the countries with the highest young population rate in 2020 are the Greek Cypriot Administration and Ireland with 12.7%, Denmark with

12.5% and the Netherlands with 12.3%, the lowest. The countries with young population ratio were Bulgaria with 8.8%, Czechia with 9.0% and Latvia with 9.1%, respectively.

- The high population of young people is an important resource for adapting to the Metaverse universe and catching up with the developments. It is foreseen that Türkiye is in an advantageous position compared to European countries in this respect and serious progress will be achieved by using the existing potential. It is thought that with the integration of health services into the Metaverse, great progress will be achieved with the employment of the young population.
- While Türkiye's young population is seen as an advantage in many areas, it is also an important risk factor for the increase in the internet-dependent population. If the young population is not carefully directed and employed, it is predicted that the rate of internet addiction and risky internet use will increase with the development of Metaverse. In this situation, it is predicted that a generation with less activity, high obesity, and many physical and mental problems disconnected from real life will emerge.
- According to the meta and systematic review results of Lozano-Blaco et al., (2022), to determine internet addiction among young people; found that internet addiction among young people reached the highest levels in the world between 2017 and 2020 and carries serious risks. He emphasized that internet addiction should be considered as a public health problem.
- Genç and Avcı (2020) found that the average internet addiction rate in Türkiye is 13% with their meta-analysis of 71 studies. In terms of regions; Aegean and Central Anatolia region 17%, Black Sea 14%, Marmara 13%, Mediterranean 11%, Eastern Anatolia 5% and Southeastern Anatolia 3% internet addiction. When the sample groups of the studies included in the study were examined, they found internet addiction to be 5% in secondary school, 9% in high school, 30% in secondary-high school, and 13% in university.
- According to the results of the household information technologies usage survey, it has been observed that 92.0% of the households in Türkiye have access to the

Internet from home in 2021. The rate of internet usage was found to be 82.6% in the 16-74 age group in 2021 (TSI, 2021). In the Turkish Statistical Institute (TSI) research, it was determined that the age group with the highest computer and internet usage rate was the 16-24 age group and 87.60% of the students were using the internet. When these figures are taken into account, it is seen that the most intensive use of technology, and especially internet technology, is in children and young people, and this usage behavior tends to increase. This situation makes children and young people a potential risk group in terms of unhealthy use of technology and related situations such as internet addiction or technology addiction.

- In the development process of children and young people, the virtual environment relationships provided by the internet begin to replace real life experiences and relationships, they perceive the internet as an important tool to get rid of difficulties, they seek satisfaction in the virtual environment by ignoring their real life needs and expectations, they focus on internet applications and perform their developmental tasks in real life. Situations such as not making efforts to achieve success and displaying usage behaviors that will negatively affect their daily lives can also lead to the emergence of an addiction to the virtual environment. It is thought that this situation will have higher rates and more serious risks together with Metaverse.

Conclusion

There is no tolerance for mistakes made in health services (Filiz, 2020). However, with the widespread use of Metaverse in the use of health services, the repetition of virtual treatment with augmented reality in the virtual world, especially in medical education, is provided and gains important experiences. This shortens the training process, trains more qualified health workers in a short time, reduces the possibility of harm to patients, and reduces health costs directly and indirectly. It is also predicted that the violence and workload of health workers, which is seen as an important issue in Türkiye and in the world, will decrease.

Table 2. Comparison of young population ratio with European Union member countries (2020)

No	Country	Ratio(%)	No	Country	Ratio(%)
1	Turkey	15,4	15	Hungary	10,5
2	South Cyprus A.	12,7	16	Romania	10,5
3	Ireland	12,7	17	Greece	10,3
4	Denmark	12,5	18	Germany	10,3
5	Holland	12,3	19	Lithuania	10,2
6	France	11,8	20	Slovakia	10,2
7	Luxembourg	11,5	21	Spain	10,0
8	Belgium	11,4	22	Poland	10,0
9	Sweden	11,2	23	Italy	9,8
10	Finland	11,1	24	Estonia	9,5
11	Croatia	10,8	25	Slovenia	9,4
12	Austria	10,7	26	Latvia	9,1
13	Malta	10,7	27	Czech Republic	9,0
14	Portugal	10,6	28	Bulgaria	8,8

European Union Average (27 countries):10,6

Source: European Union Statistical Office (Eurostat) Database, 2020 TurkStat, Address Based Population Registration System, (2020).

While Metaverse contributes to health services in many ways, on the other hand, there is a young population with a high potential to become addicted to the virtual world, individuals who have problems in accessing health services do not have the necessary technological materials for digital health, so the inequality in access to health deepens, It also includes many concerns, such as the increase in physical and mental problems that may arise due to addiction.

This study was evaluated with SWOT analysis in order to see the possible positive and negative scenarios of Metaverse on the health system as a whole. SWOT analysis is an important guide for seeing possible scenarios as a whole.

As a general result in the study; It is predicted that Türkiye's health system will provide many positive developments such as making medical education effective with Metaverse, facilitating diagnosis, treatment, appointment, examination functions, reducing health costs, easy and versatile data access, reducing human-induced problems in the health system, and reducing the burden of health workers. In addition, it has been observed that there are negative aspects such as the fact that privacy, ethics and information security in health services have not been fully clarified, the increase in the virtual dependency rates of the population, the inability of the society to adapt to digital health services, and the general dominance of external states in Metaverse.

Türkiye's health system ready for the Metaverse both as a physical resource and as a human resource. In this respect, this study is of great importance in order to guide. It is a necessary condition for healthcare professionals to catch up with the era of the virtual universe, for the system to progress and be ready for the future. For this, both the healthcare professionals in practice and the health education system need to work together with technology. It is necessary to use the experience gained during the epidemic period and to continue additional studies. Considering that the surgeries performed with limited artificial intelligence will be replaced by full artificial intelligence, it reveals the importance of the subject to some extent.

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