Customer Satisfaction with Metaverse and Twin Avatar in Health Marketing

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Abstract

Even though people approach a new technological development with distance, they have to use these technologies in order to keep up with the requirements of the age. As a result of the rapidly developing artificial intelligence and technology sector, the concept of metaverse is a virtual world that can be used in the health, tourism, marketing, advertising, education and gaming industries. When the literature is reviewed, it is seen that there are many domestic and foreign sources on the subject, but most of these sources are generally related to developments in the gaming and entertainment sectors. But apart from this, studies are being carried out to make it possible to use it in many sectors, including its use in the health sector. With this study, it is aimed to briefly mention what the existing metaverse studies are and to prepare a detailed research result for its use in the health sector. This study consists of five chapters. In the first part, information on the definition of the metaverse concept and how it has developed is given, and the infrastructure requirements necessary for the formation of the metaverse universe are mentioned. In the second section, it is discussed what kind of hardware and software tools may be needed if metaverse technology is possible. In the third section, research on the areas in which metaverse technology can be used in the health sector and current studies and future studies are included. In the fourth section, the legal aspects of this situation when a metaverse-based health service is to be initiated with twin avatars are discussed. In the last section, the advantages and disadvantages of metaverse technology are discussed. It can be seen from the study that the positive aspects of this kind of activity in the field of health will be more positive. As a result, the study constitutes an important value that will be a source for similar studies to be conducted in the future.

Keywords

Health Marketing, Metaverse, Twin Avatar, Customer Satisfaction

1. Introduction

According to Lee [1], our world experiences a great change and transformation in information and communication technologies every ten years. This transformation started with the introduction of computers into our lives in the 1990s and continued with the widespread use of the Internet in the 2000s. In the 2010s, cell phones turned into smart phones and became capable of performing all the work and operations that can be done on a computer. The technological transformation paradigm of the 2020s is the metaverse. Kang [2] argues that the concept of metaverse emerged from people's need for digitalization during the COVID-19 Pandemic. Lee [1], on the other hand, states that it is a manifestation of the fact that people stay away from face-to-face communication during the pandemic period. In both views, it is seen that the pandemic period is caused by the mental and physical needs created in people. The concept of metaverse started to arouse curiosity in people in November 2021. When Google Trends data is analyzed, it is seen that there is a significant increase in the search data of the word metaverse between November/2021 and January/2022. It is known that the reason for this increase occurred after Mark Zuckerberg, CEO of Facebook Inc. announced that he changed the name of the umbrella company, where he gathered all his companies together, to meta. After January/2022, it was observed that people's interest in this concept gradually decreased. When the data between January/2022 and May/2024 is analyzed, it is seen that there is a serious decrease in the searched word metaverse.

Although the intense impact of the pandemic process and the curiosity of people will be towards the end of 2021, large companies have invested in this technology, which has been in a natural development process for a long time. Facebook Inc. announced the Codec Avatars project in March 2019 and announced that they started artificial intelligence-supported studies in virtual reality laboratories where people can create their own avatars. Borak [3] stated that ByteDance took steps to create its own metaverse universe and acquired Pico Interactive, one of the market leaders in the production and sales of virtual reality products, in 2021. Özdemir [4] stated that Sandbox company started to sell land in its own metaverse universe, where it completed its software and put it into use. Huang *et al.* [5] mentioned that the fact that Roblox company became the first game platform with the metaverse concept on the New York Stock Exchange with a volume of 40 billion dollars directed the attention of investors to this field. In the light of all these developments, it is inevitable that metaverse technology will shape our future and will appear in many areas, especially in the gaming and entertainment sector. Metaverse studies in the health sector are also evaluated in this context. Avatar studies to be carried out in relation to human health, diagnosis and treatment processes, rehabilitation processes to be followed after treatment and the benefits it will provide to people should be discussed in detail. It is essential to prepare legal grounds for the legal rights of the parties providing and receiving health services and the legal grounds where they can be defended or tried before the law if they encounter a problem. It is of great importance that the advantages and

disadvantages of metaverse technology and what it will bring and take away from our lives should be addressed in a comprehensive manner. In this context, this study aims to conduct field research on the question of how metaverse technology and twin avatars can affect customer satisfaction in the field of healthcare and discuss the situation accordingly. For this purpose, the definitions of the basic expressions in the study will be made and the technological change processes will be explained. Then, details will be given regarding the use of metaverse technology in the field of health and the legal status of metaverse and twin avatars. Finally, the advantages and disadvantages of metaverse and twin avatars in the field of health will be mentioned.

2. Metaverse Concept and Technological Development Process

2.1. What Is Metaverse?

Metaverse was first used as a concept in a science fiction novel titled Snow Crash written by Huang *et al.* [5]. Çelikkol [6] states that metaverse is a word derived from the combination of the word meta, which means "beyond, beyond" and universe, which means "universe, world". In their study, Kırık and Memni [7] stated that there is no clear definition of the metaverse agreed upon by both academic circles and technology experts. Lee and Kim [8] made a definition in accordance with the issues mentioned in the literature and defined it as the digital universe, which is a convergence of the physical world and the virtual world, which allows people to come together in multidimensional virtual environments and make commercial relations, play games and engage in many social activities. Although this word has come to the agenda today with the announcement by Mark Zuckerberg, CEO of Facebook Inc. that he has gathered all the social media platforms he owns under the roof of a single company called Meta, Lee [1] state that the current meaning of this concept dates back to 1974 before the word metaverse was used. This process, which started with fantasy and science fiction novels, continued with graphics-based video games, then evolved into computer-based games, multiplayer online games, virtual reality-based and three-dimensional gaming platforms. Just as there is no clear idea of exactly how technology will develop, there are no clear ideas about metaverse technology, only predictions, forecasts and utopian/dystopian scenarios. Ravenscraft [9] likens the view of some parts of society towards metaverse technology to the view of the Internet in the 1970s.

The historical development process of the metaverse concept is shown in **Figure 1**.

Çelik [11] stated that if we were to position the metaverse technology somewhere; it should be positioned somewhere between the real world and the virtual world. Because it has a structure that feeds from both sides. In the real world, it is fed by wearable technology products such as VR glasses, and in the virtual world, it is fed by three-dimensional spaces created with software [10].
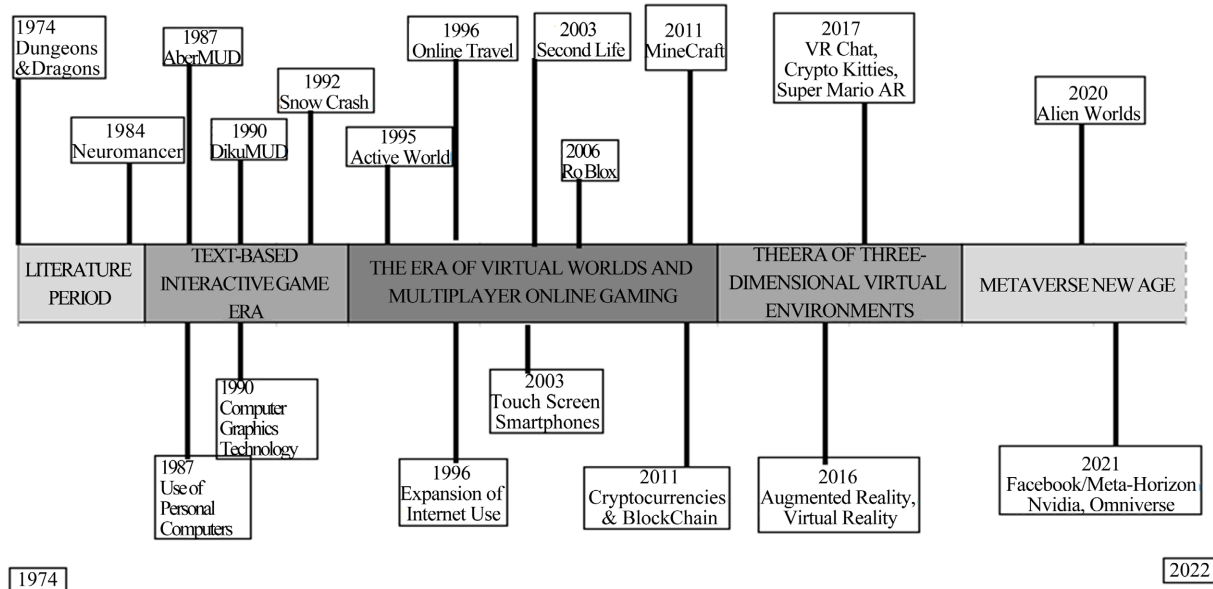
Source: [10].

Figure 1. Historical development of the metaverse.

2.2. Uses of Metaverse Technology

Research has shown that metaverse technology can be used in many sectors, especially in gaming, entertainment and education. A few experiments conducted by academics have also shown that metaverse technology can be used outside of gaming and entertainment.

In the light of studies based on experimentation and proof, these areas can be listed as follows:

1) Farra *et al.* [12] suggested in their study that it contributes to permanent learning by eliminating the difficulty of learning to a great extent and accordingly, it can be used in educational activities.

2) Arıcı [13] observed that virtual reality technology positively affected academic achievement in his experiment with 60 students.

3) Lee and Kim [8] stated that in their 4-week virtual sports experiment on 21 people, the virtual reality environment caused people to increase their body fitness and to be more determined to live healthy.

4) Damar and Turhan Damar [14] observed in their study that it is a useful element in the field of nursing and patient education.

Apart from these, there are also sectors that are thought to be made in the light of technological developments without experimentation or observation and believed to be beneficial. However, since the subject of this study is the use of metaverse technology in the health sector, only its use in the field of health will be discussed.

2.3. Components of Metaverse Technology

2.3.1. NFTs (Non-Fungible Tokens)

NFTs, translated into Turkish as "Non-Transferable Tokens", is a term that refers

to the transferable rights of a digital asset, as defined by Ante [15]. According to Nadini *et al*. [16], the concept of NFTs arose from the need to protect the property rights of assets in the digital environment. NFTs are a blockchain technology that provides clear answers to questions such as who owns a digital asset, who created that digital asset, how many copies it has, and which of these copies is the original. They can be bought and sold with cryptocurrencies. The sale is recorded by a contract on the blockchain network and cannot be changed indefinitely. All objects in the digital environment, such as artworks, videos, photos and audio files, can be associated with NFT.

2.3.2. IoT (Internet of Things)

IoT, which is translated into Turkish as "Internet of Things", aims to enable all objects and electronic devices in the physical environment to act, interact with each other and fulfill certain functions by communicating via wired/wireless Internet. While the Internet offers opportunities such as sending e-mails, e-commerce, playing games and making conference calls, IoT is a technology in which all kinds of objects that people can think of will communicate and interact with each other. Nadini *et al*. [16] exemplified IoT as objects that can be placed on all objects from asphalt to pacemakers, with sensors and actuators that can convert the information it receives from the environment into large amounts of data, send it to a main server on the same network, and perform its function according to the commands from the server.

2.3.3. Block Chain

Nadini *et al*. [16] defined blockchain technology as a digital ledger that tracks digital assets, cryptocurrencies, or recorded transactions between people within a business network without a central authority and can only be controlled by authorized persons. Yıldırım [17] explained the working principle of this system as follows; the work and transactions are sent to the network, the transaction is verified by other people on the network, and a block is created and recorded in the system. These records cannot be deleted or changed. By using cryptographic (encrypted) algorithm software, third parties are prevented from accessing this information.

2.3.4. Cryptocurrency

Howart [18] defines cryptocurrency technology as a technology that enables the free circulation of money by encrypting the money with blockchain technology in the light of current technological developments, without depending on a central authority and without the need for an intermediary. Unlike physical money, cryptocurrency can only exist in a digital environment. It has all the characteristics of physical money; it can be exchanged and used as a medium of value. Although the number of cryptocurrency users in the world is not clearly known due to its anonymity, it is thought that more than 420 million cryptocurrency users, 8985 active cryptocurrencies and more than 18,000 businesses use cryptocurrencies as a means

of payment.

2.3.5. Virtual Reality (VR)

VR technology, which Lee and Kim [8] define as a technology that allows people to experience a virtual universe designed using three-dimensional graphics, is used with headsets called HMD (Head Mounted Display). Although people are physically in the real world, they spend time completely in the virtual world with the help of the headset and headphones and cannot hear the sounds and images in the real world.

2.3.6. Augmented Reality (AR)

Güler and Savaş [19] define it as a technology that presents some digitally prepared visual and auditory data on real world images. Unlike VR technology, the user can perceive real-world sounds and images. AR brings certain objects and data to the screen on the glasses or headset even when the person is moving or doing a job with the help of a pair of glasses or a headset. Thus, the person can experience some experiences in the virtual world without completely disconnecting from the real world.

2.3.7. Mixed Reality (MR)

Siyaev and Jo [20] stated that it is a technology where people interact with physical objects and digital objects created in a virtual environment using VR glasses or HMD headsets. MR technology, created by combining VR and AR technologies, is an experience obtained by superimposing digitally created images on real images.

2.3.8. Expanded Reality (Expended Reality-XR)

Kaplan *et al.* [21] explained XR technology as an umbrella concept that offers a new experience by incorporating all existing VR, AR and MR technologies. In XR technology, unlike other types of reality, technology design is planned to appeal to the senses of people experiencing virtual experience. Sensors that can be perceived by other sense organs, especially the sense of touch, and software R&D studies are ongoing.

2.3.9. Artificial Intelligence (AI)

Kaplan and Haenlein [22] define artificial intelligence as a technology that enables a system to analyze and classify external data correctly, learn from this data and use what it has learned for certain purposes and goals. AI technology is widely used in the world and is software that has the ability to perform many tasks and operations that humans can do in a shorter time and effectively.

2.3.10. Digital Twin

Demir [23] defines digital twins as the placement of exact copies of physical objects in the real world into the metaverse universe. They state that with the help of sensors and cameras placed on objects or on people's bodies, it will be possible to transfer all objects to the metaverse universe in a fast and practical way.

2.3.11. Avatar

Terzioğlu [24] stated that all users who have a place in the virtual world are a virtual technology that has a three-dimensional design, either similar to themselves or in another shape and image, and makes various movements depending on the wishes of the person. Avatars are the essentials of the metaverse universe. It is mandatory for every user who wants to take part in the universe to have an avatar.

2.3.12. Web 3.0

Istanbullu [25] states that Web 1.0 technology was a technology that performed more limited transactions, had low bandwidth and only one-sided information transfer at the time of its emergence; Web 2.0 is a technological development that not only receives information but also produces and publishes content, with websites, social media platforms and e-commerce applications taking up a large place in our lives. Web 3.0, on the other hand, is a technology that centers on the individual instead of a central authority, is based on blockchain technology, can use artificial intelligence technology, and is suitable for use in the metaverse ecosystem and can provide users with a new Internet experience.

With Web 2.0, people's personal information, especially on e-commerce sites and social media platforms, can be accessed by third parties. Because all this information is recorded on a centralized network and these networks can be hacked or used for the malicious purposes of the network owners. This creates security and privacy problems for users. In Web 3.0 technology, it is foreseen that user information will not be registered on a central network, that it can only be accessed by people who have given access permission to the block chain, and that it will be a technology that allows websites and applications to be developed completely independently, not on a central network server.

2.3.13. Cloud Computing

Çelik [11] defines this concept as a technology that allows us to store, store, back up, and share data production, which has increased with the introduction of Industry 4.0, on the Internet, and access and share it over the Internet when needed. Software and hardware costs are less and updates are made instantly. It can be accessed at any time without time and space restrictions.

2.3.14. Requirements of Metaverse Technology

In order for metaverse technology to be realized, it needs to be in an ecosystem with its own unique components. Park and Kim [26] divide the requirements of metaverse technology into three as hardware, software and content.

1) Hardware Requirements

a) Computers and Devices

Access to the metaverse universe requires hardware such as computers, smartphones, tablets and VR/AR devices [17].

b) Sensors and Input Devices

Sensors (such as motion sensors) and input devices (such as keyboards, mice,

touch screens, VR controllers) are required for interaction within the metaverse [17].

2) Software Requirements
a) Virtual Universe Platforms

The virtual universe platforms that underpin metaverse technology provide virtual environments where users can interact and create content [17].

b) VR/AR Software

Virtual reality and augmented reality applications allow users to have a more immersive experience with virtual worlds [17].

c) Communication and Social Media Software

Software that facilitates interaction and social connections within the metaverse falls into this category. Examples include chat applications, virtual community platforms and other social media tools [17].

3) Content Requirements
a) Three-Dimensional Modeling and Animation

Three-dimensional modeling and animation software is used to create the objects, characters and environments used in the metaverse [17].

b) Audiovisual Content

Graphic design, sound design and video editing software are used to create and present the visual and audio content within the metaverse [17].

c) Games and Entertainment Content

Games, activities and entertainment content in the metaverse are created using specialized software and game engines [17].

3. Use of Metaverse Technology in Healthcare

The main objective of a health system should be to use its resources effectively and efficiently and spend them on sustainable, innovative, beneficial and improvement-oriented activities [27]. At the same time, technologies developed in the field of healthcare primarily aim to improve service quality, increase efficiency in treatment and care processes, and create a safe service framework [28]. These objectives contribute to the national economy as well as to the developments in industry and industry. Rapidly changing technological developments bring great revolutions in the health sector as in every sector. Breakthroughs such as making medical devices more technological, introducing mobile health systems, digitizing medical imaging and examination results, and developing robotic surgery techniques are some of them. From this perspective, the stakeholders of healthcare services in the digital age (patients, healthcare personnel, healthcare operators, etc.) have also had to follow and adapt to this rapidly changing evolution. Considering the concrete conditions in today's healthcare services, it can be costly for both healthcare organizations and patients. After the emergence of a new technological change, the cost of the previous one decreases, making it more feasible to own it. However, previous technologies may be outdated and less preferred compared to current technologies. Nevertheless, it is an alternative choice option. Sebastian and Babu

[29] argue that the use of metaverse technology in healthcare can significantly reduce healthcare costs and has the potential to significantly increase recovery rates. They state that the most important pillars are the twin avatar, digital twin and blockchain technology. They emphasized that by bringing these three elements together in the metaverse universe, communication between hospitals and physicians will be faster and more effective, patients' recovery processes will be more easily monitored, and treatment and care processes will be more effective and result-oriented.

The concept of metaverse in health marketing, which constitutes the main subject of this study, is discussed under three headings: its use in terms of health education, its use in terms of people and institutions providing health services, and its use in terms of people receiving health services.

In the metaverse, examinations will be performed by a chain of algorithms that know millions of patients, instead of a doctor in a hospital, paving the way for accurate diagnosis and effective treatment.

3.1. Use in Health Education

Education methods change and diversify over time. From blackboards and chalkboards to smart boards, many educational methods have been diversified and developed. Especially during the COVID-19 pandemic period, educators have searched for methods and tools related to distance education for students. Over time, these education methods have led to studies on VR and AR-based education due to the development of technology.

In terms of health education, it will be possible for teachers and students to come together and interact in a virtual universe without the need for restrictions such as social distance [30]. At the same time, with VR and AR technologies, they will have the opportunity to fully enter the human body and obtain a comprehensive image and all kinds of information about the organism. They will also have the chance to learn new applications and techniques in the field of medicine without changing location.

3.1.1. Nursing Education

Nurses, who are indispensable elements of health services, are health professionals who play an active role in meeting the health needs of individuals and carrying out treatment and care services. Since their profession is directly related to human life, they need to have sufficient knowledge and skills especially in clinical nursing services. In this respect, Erdem and Sarı [31] stated that new technological developments can help create great convenience in clinical nursing practices. Chang *et al.* [32] mentioned that virtual reality applications can be used effectively in nursing practices and argued that it saves time, is more useful in terms of practice development and is an effective way of learning, especially in learning clinical nursing practices. In another study, when video-based virtual simulation training was given to nursing students and the results were observed, they expressed their satisfaction with this training method; their motivation and self-confidence

increased, their stress and anxiety decreased, they were able to practice more easily and they expressed their satisfaction with this training method. In the light of these studies, it can be said that the use of metaverse technology in nursing education will provide savings in terms of time, space and cost, as well as benefit in terms of skill development and contribute to the training of competent health professionals.

3.1.2. Medical Education

It is thought that it will make a great contribution to the learning processes of physician candidates studying at medical faculties. In their study, Yoganathan *et al.* [33] observed that students who were trained in surgical suture application with 360-degree videos could learn without the need for someone else to instruct them. Peden *et al.* [34], in their study with VR goggles, showed a virtual reality training video in which surgical methods were explained to medical students. At the end of the study, when they examined the efficiency obtained, they determined that they obtained results close to face-to-face training. In 2016, VR/AR glasses and classical book training were compared with VR/AR glasses for students studying anatomy and physiology, and it was observed that those who received training with VR/AR were more motivated and more involved in the training [35]. Ekstrand *et al.* [36] suggested in their study that the use of virtual reality glasses in anatomy education would support learning. In a study on ultrasonography imaging, it was found that the user focused better on the image while performing the procedure in an examination using VR glasses [37]. Boulos *et al.* [38] concluded that there is a great potential in this field when they examined the ongoing medical and health examples in the virtual reality world.

It has been determined that the surgical success rate of students receiving medical education in the surgical branch increased by 230% in the education they received using VR glasses compared to normal education [39]. With AR technology, medical students will have the chance to physically learn new applications and techniques as well as experience these applications [40]. At the same time, medical students will have the chance to improve their surgical skills with interactive applications at any time without the concept of time and space with AR technologies [41].

When the research conducted is evaluated, the use of metaverse technology in terms of medical education will create a revolutionary effect. The increase in success and satisfaction rates in trainings using VR and AR technologies supports this view.

3.1.3. Self-Care, Healthy Living and Rehabilitation Process Training

One of the most important application areas of metaverse technology in the field of healthcare is thought to be applications for people who are bedridden and receive home healthcare services. Easy monitoring of such patients, access to instant health data and remote monitoring of clinical data such as blood sugar, blood pressure, pulse rate, oxygen level in the blood will provide great convenience [42].

This can also be used to monitor a patient's rehabilitation process after discharge from the hospital. Information such as the patient's mobility and clinical data can be recorded and monitored by the relevant doctor and the recovery status can be examined.

Even today, we can record this data instantly with wearable technology products such as smart wristbands and smart watches. We can access this data at any time and share it with someone else. However, with the introduction of metaverse technology into our lives, it will be possible to see and monitor this data instantly with the help of blockchain technology, only by those who are granted access.

Lee and Kim [8], in their 4-week virtual sports experiment on 21 people, stated that the virtual reality environment caused people to increase their body fitness and be more determined to live healthy. Freeman *et al.* [43] mentioned that therapies created using VR technologies can be used to relieve mental conditions such as anxiety, stress, anxiety and depression in people.

XRHealth [44] provides physical therapy and rehabilitation, mental health and therapy services to people with VR/AR technology. Thanks to the HMD headsets, users can perform physical therapies in a virtual environment whenever they want, and receive instant virtual help in cases such as anxiety, stress, depression and substance abuse. At the same time, they have the opportunity to learn how to do some physical therapy movements in their environment without having to go to hospitals or centers. The application, which is based on Web 3.0 and provides data security with blockchain technology, enables users to carry out their rehabilitation processes regardless of time and place, as well as to access their activity records and share them with the people they allow access to.

3.2. Use in Terms of Persons and Institutions Providing Health Services

3.2.1. Use for Examination and Diagnosis

It can be said that the biggest innovation that metaverse technology will bring to the field of health is wearable technology products that can provide tactile feedback [45]. There are also ongoing studies on this subject. In ongoing research on XR technology, it is mentioned that a skin-like soft material is being studied and if this material can be integrated into wearable technology products, tactile feedback can be obtained. Studies are ongoing on the tactile information (vibro-haptic) feedback through vibration and emotional information (thermo-haptic) feedback through temperature sensation [46]. These technologies will have the power to enable people who are physically far away from each other to touch each other in a virtual environment, to feel the hardness/softness levels of objects, to perceive their temperature and many other issues.

With the introduction of wearable technology products in the field of health, doctors will be able to examine their patients remotely, keep them under observation, if necessary, detect the patient's pain points, and start the clinical process without changing the environment in cases where patient transportation is difficult.

This will create a significant time saving and workload reduction in the field of health [47].

3.2.2. Use for Treatment and Post-Treatment Rehabilitation

Although it is not very common today, there are organizations that initiate rehabilitation processes using VR/AR applications. In these organizations, patients participate in gamified rehabilitation processes with virtual reality applications. Physicians who observe the speed of recovery of people note that this process progresses very quickly.

For example, it was reported that a patient with a condition originally called Hemiplegia but popularly called "stroke" was able to walk again with VR applications in a physiotherapy center, that there was a significant improvement in the mobility of the paralyzed parts and that they were able to continue their daily lives from where they left off at the end of the treatment [48]. Similarly, it was reported that a 60-year-old patient who had a brain aneurysm was able to reuse his muscle and motor functions and regain his reflexes over time with virtual reality technology. Stating that they made serious progress despite the patient's age, physicians stated that they would make more effective progress if rehabilitation processes were started earlier [49].

In the light of these examples, it will be possible to return the loss of movement in the body after an illness to its former functions with metaverse technology. This means that people can both increase their quality of life and fulfill their physical activities without depending on anyone.

3.2.3. Use for Surgical Operation

For operating physicians, every surgical operation, no matter how big or small, carries a risk. Therefore, physicians must minimize all risks before deciding to operate on a patient. Before going into surgery, they have to evaluate the patient's condition, think about the complications that may occur, plan the interventions they can do in the face of complications and eliminate all risks that may cost the patient's life. Because the right to life is the most fundamental right and physicians return this right entrusted to them by restoring the person to health.

When metaverse technology starts to be used in the field of health, it will be possible to perform exemplary surgeries by minimizing these risks. For example, a neurosurgeon can determine the complications that may occur by operating the patient's twin avatar in a virtual environment many times before a risky and difficult surgery. He can determine what measures he should take in the face of these complications, consult and get ideas from another colleague. Thus, instead of the stress of reactive crisis management in a negative situation that occurs during surgery, they will know what to do by acting proactively beforehand. This will create a great advantage for both the patient and the physician. In this sense, metaverse technology will create a great revolution in terms of minimizing the risks with repetition by providing a simulated virtual surgery convenience through the patient's avatar [47].

3.2.4. Use for Radiological Imaging

Radiological concepts such as X-rays (X-rays), ultrasonography (USG), Computed Tomography (CT) and Magnetic Resonance Imaging (MRI) are imaging examinations that are vital in diagnosis and diagnosis for healthcare providers. If metaverse technology is implemented in the field of healthcare, it is of course unthinkable that there will be no work on radiological imaging. Existing studies on this subject are ongoing [50]. Metaverse will enable radiologists to see medical images in three-dimensional format, provide a more dynamic and clearer image quality, provide great convenience in diagnosis and treatment, and contribute to the creation of more robust reports [51].

3.3. Use in Terms of People Receiving Health Services

The use of metaverse technology in the healthcare sector provides various benefits to the people who will receive healthcare services. Metaverse is thought to radically transform patients' access to and experience of healthcare services. This technology can enable patients to experience healthcare services in advance, understand and learn about treatment processes. Through interactive guides, videos and simulations in a virtual environment, patients can learn more about treatment options and procedures. Furthermore, metaverse technology can help patients make more informed decisions and access healthcare services more easily and efficiently. Even people who live in remote areas or have limited mobility can access healthcare services through metaverse. This technology also personalizes patients' experience of care and reduces stress. Patients can browse customized treatment plans, perform rehabilitation exercises and access support materials in a virtual environment. All these advantages represent just a few of the potential gains that are likely to come with the use of metaverse technology in the healthcare sector. Today, technologies such as virtual reality are known to be used to reduce anxiety and improve the patient's experience, especially during waking operations [52]. These technologies may also be effective in reducing the level of anxiety and pain associated with procedures [53]. Especially in minor pediatric plastic surgery operations, it has been found that although it does not reduce the pain level in awake procedures, it shortens the operation time [54]. Also in 2019, VR goggles were used at St. George's Hospital in the UK in surgeries that did not require anesthesia or heavy anesthesia. It was noticed that the anxiety and concerns of patients using VR glasses during surgery were greatly reduced. In interviews with patients who underwent surgery, it was noted that 80% felt less pain and 73% experienced a significant reduction in anxiety [55]. Studies in this field are ongoing.

4. Legal Aspects of Metaverse Technology and Twin Avatars in Healthcare

Metaverse technology is rapidly developing as an innovative platform that increases the interaction of digital worlds and virtual environments with the real

world. However, with the proliferation of this technology, various legal issues are likely to arise. The uncertainty and shortcomings of the legal framework on issues such as intellectual property rights, data privacy, trade regulations and anti-crime are among the main issues that need to be evaluated from a legal perspective. Özyiğit [56] states that the metaverse technology should not be considered as a blind spot where the law cannot be applied, but should be considered in terms of where existing legal rules should be applied within this technology, which rules should be revised and which problems they will shed light on. First, intellectual property rights regarding the ownership and use of digital assets in the metaverse may create uncertainties. There are no clear rules and regulations on who owns assets such as avatars, digital commodities, virtual real estate, and the rights to use these assets. This can lead to copyright infringement, asset theft and similar legal disputes. Some of the incidents that occur in games and social platforms in the digital universe and are reflected in the law show that there is a legal gap regarding negative situations that may occur on these platforms. These gaps are tried to be filled through existing legal rules after the events and situations occur. An example is the decision of the Dutch Supreme Court in 2012, when two players on a virtual gaming platform transferred the digital assets in another player's account to their own account by using force. The court ruled that a digital asset acquired through one's own effort and endeavor has a real value, even if its physical existence does not exist in the virtual universe and convicted the two players of theft [57]. At the same time, the UK Supreme Court ruled in April 2022 that NFTs are legal property [58].

4.1. Protection of Personal Rights

Secondly, the issue of whether abrasive actions and situations against twin avatars can be evaluated within the scope of personality rights. Özyiğit [56], while stating that Articles 23 - 25 of the Turkish Civil Code No. 4721 and Article 58 of the Turkish Code of Obligations should be examined in this regard, emphasizes that there is a gap in this issue by stating that there is no definition of personality that sets out certain criteria. In the light of this uncertainty, the issue of what parts of the personality right are worth protecting is determined by the relevant judges by examining one by one, and the judges can only decide by taking into account the conditions of the period.

4.2. Protection of Personal Data

Another important issue is the protection and privacy of personal data in the metaverse. In the real world, people share their personal information and digital data with others within their control. However, this may not be the case for metaverse technology [59]. Monitoring and recording users' interactions and activities in virtual worlds may raise concerns about personal data privacy. Existing data protection laws should be updated to meet the new challenges presented by metaverse technology.

4.3. Protection of Consumer Rights

It is also important to regulate trading activities and digital economies that take place across the metaverse. Issues may also arise in terms of a purchased medical NFT or digital healthcare service, given that it operates in the healthcare space. Incompatibilities between trade regulations in different countries can increase the complexity of international trade and make it difficult to protect consumer rights. In addition, the legal framework for combating crime in virtual worlds needs to be strengthened and effective measures need to be taken to prevent crime.

4.4. Sharing of Responsibilities in Terms of Health Service Receiver/Provider

In Türkiye, the Ministry of Health is the institution that determines and supervises the framework of health services and practices. The restrictions imposed by the COVID-19 pandemic period have made it mandatory to provide some health services remotely. In order for these practices to be carried out in a more legal framework, the Regulation on the Provision of Remote Health Services was implemented by the Ministry of Health [60]. From this point of view, it is possible to say that the first step has been taken regarding metaverse technology in the field of health.

It is also not clear what legal responsibilities physicians will be under in malpractice cases after metaverse technology is applied in the field of health. Ertem *et al.* [61] defined malpractice as a situation where the service recipient is harmed as a result of faulty practices, lack of knowledge, skills and care or negligence of those who perform a job professionally. In such cases, it is of great importance for a physician who provides healthcare services in the metaverse universe to be able to defend himself/herself and prove mistakes in complications that may occur when possible instant software or hardware defects occur. Therefore, in the event of medical errors in healthcare services provided through the metaverse, it should be determined who is responsible for these errors. A clear legal framework should be established between physicians, healthcare providers and technology providers on what kind of responsibilities exist in which situations and how they are shared. Likewise, it is important to ensure compliance with medical standards of practice in healthcare services provided through the metaverse. Healthcare providers and technology providers should act in accordance with internationally recognized medical standards and practices.

4.5. Storage of Data, Protection of Rights Such as Life and Property

Another issue is how the health data of patients with avatars will be processed and stored in the metaverse. It is a fact that the need to protect the security, privacy, social, cultural, economic, life and property rights of these avatars will arise [62]. The protection and privacy of personal data should be ensured by legal regulations. This can be supported by local regulations such as the Personal Data Protection Law (PDPL). It should not be forgotten that patients with avatars have

rights related to services from healthcare providers and technology providers. Protection of patient rights and consumer protection should be secured by relevant legal regulations. Technical problems or security gaps related to the use of metaverse technology in healthcare should be addressed through legal regulations. Healthcare providers and technology providers should take the necessary technical measures to ensure the safety of users and ensure compliance with regulatory standards. With the provision of healthcare services in the metaverse, legal regulations regarding the processing and storage of personal health data must be complied with. Appropriate technical and administrative measures must be taken to protect the confidentiality of personal data and protect it from unauthorized access. Organizations providing healthcare services through metaverse should be licensed and audited. Healthcare providers must act in accordance with the standards and legal requirements set by the relevant healthcare organizations. The rights of patients receiving healthcare services through the metaverse and consumer protection are important. Standards should be set on issues such as patient information, obtaining consent, and processing complaints, and legal regulations should be made to ensure patient rights. These legal considerations address the malpractice risks and liabilities associated with the use of metaverse technology in healthcare. By taking appropriate regulatory measures, these risks can be minimized and patient safety can be ensured.

Platform owners store user habits and personal data in their own databases. This data allows them to learn consumers' tastes and preferences and produce content tailored to them. However, this leads to privacy violations and misuse of personal data. Likewise, if this information is requested from the relevant platforms in any case, it is not provided on the grounds of trade secret or privacy policy [57]. It is a fact that there will be a need for an effective authority to protect the rights and privacy of users, especially if this technology is implemented in the field of health. In conclusion, the legal evaluation of metaverse technology shows that existing legal regulations should adapt to the characteristics of metaverse technology and new regulations should be created. This is important for protecting the rights of users, regulating trade and adopting an effective approach in the fight against crime. From the protection of personal data to the supervision of economic activities on these platforms, a legal regulator with broad and exclusive powers is needed [63].

5. Advantages and Disadvantages

In the 21st century, which is called the digital age, technological developments continue unabated. Before we can get used to a new technology, a new one enters our lives and we try to adapt to it. It is a fact that technological developments bring many innovations to our lives. While bringing many innovations, it also takes away many things from our lives. When social media platforms are included in use, it is a very reasonable use in terms of friend interactions. By writing personal information (such as year and date of birth, schools graduated from, and the city we

live in) in the profile section, it has become easier to find old friends and new communication channels have started to be established with people with whom we could not communicate. In this respect, it can be said that social media platforms have a good place and importance in our lives. However, as time passes, the place of social media platforms in our lives is questioned when privacy and confidentiality violations such as the content on the platforms pushing people to spend more time with commercial concerns, users becoming increasingly socially isolated as a result, personal information being sold to other companies and platforms for commercial purposes, and user habits being filtered and tried to be changed for political or commercial purposes come to light.

The metaverse technology, called the "new Internet" by Garavand and Aslani [42], is an issue that needs to be considered not only for the advantages it will bring to our lives in the field of health, but also for the disadvantages it will bring.

5.1. Advantages

- Metaverse technology is thought to provide a new experience in health education [7]. It can provide a great advantage in terms of training more competent health professionals, especially in nursing education.
- It is thought that remote health services, which started with e-health services, will reach a more extreme dimension with metaverse technology. In this respect, people can benefit from health services with the help of their twin avatars without the need to change their environment.
- Another convenience of providing services in a virtual universe is that it is cheap in terms of service costs, first and foremost, since space expenses are eliminated [64]. It has the advantage of providing services at low cost as it has the potential to be realized anywhere with Internet connection instead of buildings, offices or clinic environments.
- For employees, it offers the opportunity to work without being tied to the location [64]. This situation can also lead to increased motivation for employees and increased productivity for businesses.
- Employees all over the world can come together in the virtual version of the environment they need to be present in case of need, hold instant meetings and produce solutions to problems [65]. For example, physicians in different parts of the world can have the opportunity to operate on a patient at the same time.
- It offers highly interactive learning at a lower cost [66].
- Since cadavers used in medical schools for training purposes contain a limited number of pathological models, some trainings are limited in terms of application. When this technology is realized in the healthcare field and becomes applicable in medical schools, multiple pathologies and subtle anatomical variations can be easily added [67]. Thus, physician candidates may have the chance to observe and learn pathologic conditions in every situation in the field of education.

- Avatars can provide great advantages in terms of surgical intervention and research in the field of medicine. They can be implemented through clinical trials that will minimize the risk for patients [68].
- It can be monitored to what extent the staff develop their knowledge and skills in terms of patient safety. With the feedback received in response to the trainings given, it is easier to determine the level of self-improvement of the personnel or the aspects in need of improvement [69].
- Primary healthcare services will undoubtedly be one of the areas of use of metaverse technology. In particular, it is thought that integrating this service with metaverse technology will have an important place in family medicine and general practitioner practices [70].
- It will provide a great convenience in terms of benefiting from health services in a way to ensure anonymity. People diagnosed with bipolar disorder and schizophrenia generally tend to avoid psychiatric help [71]. Likewise, people diagnosed with HIV Positive have to avoid seeking medical help in order not to be stigmatized by the society due to the fact that there is no known treatment for this disease and that it is caused by a moral error [69]. It is envisaged that it will be beneficial in preventing the occurrence of such situations and enabling them to receive the necessary medical assistance.
- It is thought to provide great convenience for patients receiving physical therapy services. In this regard, there are clinics that provide game-based physical therapy services with the help of motion sensors [72].
- If metaverse technology is implemented in the field of health, it is thought that the fear and anxiety experienced by children during treatment processes can be minimized [11].
- Within the scope of health tourism activities, metaverse technology can be considered to provide a great convenience to patients [11]. Before changing the country, they may have the chance to digitally experience the clinic and health services they intend to receive service in the virtual universe and make their choice of preference accordingly.

5.2. Disadvantages

- The first and most important disadvantage can be said to be data security, confidentiality and privacy [55]. The biggest disadvantage is the possibility of users' health data and personal information falling into the hands of third parties and organizations. Mamun [73] mentions that public blockchains can create problems in privacy and confidentiality issues. He states that this problem stems from the fact that clinical institutes prioritize confidentiality in their research. Mamun argues that being open to the public may create a hacking situation at some point, and suggests that it would be better to design a blockchain that requires permission to participate in the network instead.
- There is no study on the budget spent on infrastructure costs and how long it takes to return the economic investment [55].

- Healthcare providers are untrained in the use of this technology and the society does not have a high level of technological literacy [55].
- People who have the potential to use this technology do not have the financial means to acquire the necessary hardware tools [55]. While some people will have these opportunities, others will not. This is due to the fact that there is a serious cost in the use of technology [74].
- Communication deficiencies may occur between the patient and the physician. It is thought that a face-to-face communication and a communication established in a virtual environment will not provide the same effect. The negative impact of this communication in e-health services has been reported in the literature [75].
- Technology addiction may be a negative consequence of spending too much time in the metaverse virtual universe [76].
- The fact that social media channels weaken the perception of truth in users may lead to more serious consequences in the metaverse [76]. This situation facilitates disinformation and manipulation and may turn into a paradise for schizophrenia patients to escape. As a possible consequence, it will detach the person from reality, distract him/her from responsibilities and may lead to an increase in psychotic symptoms [77]. Psychologically and sociologically, depression, loneliness, disconnection from reality, violence, aggression, tendency to lie and mental disorders can be counted among the possible consequences [23]. In addition, social media, which is shown as the previous step before the metaverse technology, has been shown to cause a decrease in self-esteem and it is thought that this situation may increase with the metaverse technology [78].
- AR applications used today are known to cause accidents by causing distraction [79]. Likewise, it has also been found in the literature that someone using HMD equipment may take actions that may harm themselves in the physical world [80]. In addition, as the difference between the virtual and real-world blurs, it can cause confusion in the perception of reality [30].
- Symptoms such as dizziness and nausea are the most common in current VR applications [81].
- Holding meetings in virtual environments may cause a decrease in the need for socialization. This may lead to social isolation [82].
- In the studies conducted, it has been determined that AI studies in the field of medicine cause people to worry about losing their jobs, and that systems lack human touch, empathy and emotional intelligence [83]. Following the implementation of metaverse technology in the field of health, it may be worried that this situation will increase gradually.

6. Discussion

The fact that metaverse technology will be a part of our lives in the coming years should not be forgotten. Metaverse technology was first studied for use in the

gaming and entertainment sectors, and over time, the potential to be used in the health sector has gained reality. Marketing should reach all consumers. It is essential for patients who will use metaverse technology in the field of health to have technological literacy first and foremost. Because it is important for people to be able to control the hardware equipment correctly and to use the software correctly in order for the consumer to benefit from this technology in the field of marketing.

Filiz and Güngör [84], in an interview with nine physicians, tried to reveal their perceptions and the meaning they attributed to this situation by utilizing the subjective experiences of the participants in the event of the implementation of metaverse in the field of health. Surgeons have concluded that the safety of a surgical operation may be jeopardized due to interruptions during the operation. Therefore, it is essential to take all kinds of precautions in such serious interventions. In the study, they suggested that physicians may have communication problems with patients, patients' negative perceptions of metaverse technology and patients' adaptation problems to this technology may arise. It was also stated that it offers significant advantages for individuals with disabilities in terms of easily obtaining healthcare services and identity privacy. However, ethical concerns about privacy and data confidentiality were also included in the study. On the one hand, while it brings a serious lightening of workload for healthcare professionals, the view that physicians may experience professional atrophy was expressed. It has been observed that there is a concern that inexperienced physicians may be trained at the point of medical education.

Kuş [85] selected an intensively watched Turkish video as a data source by searching the word metaverse on the YouTube platform and conducted a study aiming to understand the reasons for the emergence of these perceptions by dividing the comments written by users on the video into 17 categories to determine their perceptions of opportunities and concerns about metaverse.

In the light of all this information, it is necessary to focus more on what the metaverse technology, which is thought to lead to a significant change in the field of health, can take away from people rather than bringing some innovations to people in terms of increasing customer satisfaction in health marketing. Because every new technology is marketed and presented to users by the people who hold the market in the sector by prioritizing profit and without considering customer satisfaction and without explaining the negative aspects. In addition, when similar studies are examined in the literature, it is seen that the advantages and disadvantages are almost the same number. In other words, it is seen that there are as many bad or in need of explanation as the good aspects it offers to health marketing. The customer satisfaction process can be determined as the negative aspects of technologies are used and the negatives that occur are revealed. For this reason, the physical, mental and spiritual negative effects that this technology can create in customers should be analyzed in detail and analyzed correctly by experts in terms of health marketing.

7. Conclusions

As a result, the integration of metaverse and twin avatar technologies into marketing strategies in the healthcare sector has significant potential to increase customer satisfaction. Studies have shown that providing personalized healthcare services through virtual environments and avatars can positively affect the customer experience and increase patient loyalty and satisfaction. The real-time interaction provided by technology allows individuals to establish a stronger relationship with healthcare services, while the acceleration and transparency of processes will increase satisfaction rates.

How metaverse and twin avatar technologies can be used in different healthcare areas can be examined in more detail. The benefits of these technologies, especially in patient monitoring systems, rehabilitation services and remote treatment processes, can be analyzed. In order to increase customer satisfaction, healthcare providers and patients should be provided with more information and training on how to use these technologies. This training can accelerate the more effective use and dissemination of the technology. In order for metaverse and twin avatar technologies to be successfully implemented in the healthcare sector, strong and advanced technological infrastructures need to be developed. More research should be conducted on the cost-effectiveness of the implementation of metaverse and twin avatars, and the long-term value these technologies will create for healthcare providers should be analyzed. It is also recommended that the effects of twin avatar and metaverse experiences on different groups be examined.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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