SAĞLIKTA DİJİTAL DÖNÜŞÜM: GİYİLEBİLİR TEKNOLOJİ

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ÖZ

Teknolojik gelişmelerin hız kazandığı günümüzde, yenilikçi ürünler hayatımızın birçok alanında kullanım alanı bulmuştur. Sağlık alanında önemi ortaya çıkan dijitalleşme sayesinde tanı, tedavi ve tedavi sonrası iyileşme süreçlerinde iyileşme yaşanırken, diğer yandan hasta ve yakınlarına online randevu alma, doğru bilgiye ulaşma ve sorularına cevap alma konusunda kolaylık sağlamaktadır. Bu nedenle dijital sağlık kavramı; bireylere fayda sağlarken, daha güncel, verimli ve kaliteli sağlık hizmeti sunulmasında da önemli rol oynamaktadır. Giyilebilir teknoloji ürünlerinin pazar büyüklüğü sayesinde, yenilikçi ve yaratıcı fikirler sürekli olarak ortaya çıkmakta ve gelişmektedir. Bu çalışmada, sağlıkta dijitalleşmede hızlı bir gelişim gösteren giyilebilir teknoloji ürünleri açıklanacak ve bu ürünlerin pazar büyüklüğü ve Avrupa ve Asya bölgeleri özelinde giyilebilir teknoloji piyasasını gelişimi ortaya konulacaktır.

Anahtar Kelimeler: Dijital dönüşüm, Sağlık, Giyilebilir teknoloji, Dijital hastane, E-sağlık

DIGITAL TRANSFORMATION IN HEALTH: WEARABLE TECHNOLOGY

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Abstract

In today's world where technological developments are accelerating, innovative products have gained usage in many aspects of our lives. Thanks to digitalization, the importance of which has been demonstrated in the field of health, there has been an improvement in diagnosis, treatment and post-treatment recovery processes, while on the other hand, it provides convenience to patients and their relatives in online appointments, access to accurate information and getting answers to questions. For this reason, the concept of digital health; while benefiting individuals, it plays an important role in providing more up-to-date, efficient and quality health services. Thanks to the market size of wearable technology products, innovative and creative ideas are constantly emerging and developing. In this study, wearable technology products that have shown rapid development in digitalization in healthcare will be explained and the market size of these products and the development of the wearable technology market in Europe and Asia will be revealed.

Keywords

Digital transformation, Health, Wearable technology, Digital hospital, E-health

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Giriş

Digitalization is one of today's popular concepts encountered in many business areas such as health, education, agriculture, industry, finance, transportation and retail. Here are some definitions about digitalization: Digitalization refers to the fundamental technological advances that have contributed significantly to recent developments in information and communication technology. Digitalization is a technological process that enables the transmission, processing and electronic storage of audio, text and video. Combining audio, text and video by digitizing them makes the integration of information available (Ormanlı, 2012: 32).

The integration of electronic technology into all areas of an organization is also referred to as digital transformation. This changes the way the organization operates and the value it offers to the professionals and users of the system. With this transformation, not only the internal processes of organizations are digitalized, but also the development of electronic services to users. While digitalization causes a change in organizational culture, it forces systems to think, execute and relate (Özşahin, 2024: 148).

The process called digitalization has been the process that has shaped social change with the replacement of traditional mass communication by new media, the birth of the internet, the introduction of communication technologies into human life and, most importantly, the formation of social media tools. On the one hand, technologies such as mobile applications, the internet of things, nanotechnology, wearable technologies, big data, artificial intelligence make our work faster, cheaper, safer and more accessible, while on the other hand, applications such as 3D printers, robotic technologies, technology 4.0, software and internet-based sharing economy radically change the way we do business and our models. Developments in technology increase individuals' access to technological tools and applications and cause individuals to carry out their activities in the digital environment. The increasing prevalence of digitalization in the information society has led to a number of changes in the phenomenon of health and disease, as in many social phenomena.

Since the beginning of the 2000s, digitalization has been one of the most important trending topics in almost every sector and business area worldwide. As in all sectors, there has been a rapid transition to the use of information technologies in the health sector. With developments such as digitalization in health, digital hospital and electronic health applications, which we frequently hear about day by day, information

technologies are used for many purposes such as ensuring the welfare of people, meeting the needs for health services easily, collecting, protecting, converting and storing health data from birth to death. Rapid developments in the health sector and in the field of information technologies bring these sectors closer together and enable them to develop in harmony with each other. While scientific knowledge in all areas of health is increasing rapidly and proliferating, information technology has a fundamental role in the process of service delivery, recording, storing, sharing and managing information in this field (Erdoğan, 2021:64).

Changes in information and communication technologies (ICT) have led to technological advances in all industries. In this transformation process, professional tasks and needs have also changed. For this reason, changing working conditions in the digitalization process are also discussed in the literature. Schneider and Kokshaniga (2021) emphasized the importance of digital transformation, the way it is organized, measuring the success and performance of digital transformation initiatives, its future position, and the interaction between physical and digital environments. It is clear that these issues need to be examined and questions need to be answered with digital transformation (Özşahin, 2024: 148).

Digital transformation has also been widely analyzed in the healthcare sector due to its potential (Burton-Jones et al., 2020). According to Massaro (2021), digital transformation will help solve problems in medical practice by introducing new value creation trends.

Ivancic et al. (2022) conducted a systematic literature review on the impact of digital transformation on the healthcare sector. In their study, they stated that the digital transformation of healthcare has recently started to generate more interest among researchers. They also found that academics from many disciplines can be involved in the topic, including engineering and data scientists, as well as medical and healthcare researchers.

The aim of this study is to explain the wearable technology products that show a rapid development in digitalization in health and to reveal the market size of these products. In this direction, the study first evaluates the concept and practices of digital transformation in health. Then, the concept of wearable technology in health is discussed in detail and the current situation is examined.

1. Digital Transformation in Health

The health sector is one of the sectors with the highest rate of scientific knowledge progress. Factors such as the need for new generation vaccines, which is an output of advanced technology, as a result of the emergence of epidemics that spread all over the world, comfortable and easy accessibility to advanced technology output medical needs with the increase in the economic development levels of countries, technically equipped qualified human power and knowledge as a result of the transition from the industrial field to the service field, etc. have accelerated the technological development of the health field. While the digital transformation in healthcare is driven by the need to improve quality and reduce costs while providing healthcare services, it benefits from the benefits that technological progress can create in terms of patient care, patient experience, workforce performance, value and efficiency in healthcare. Digital transformation in the healthcare sector is mainly driven by the application of digital innovations in the service sector. Such digital innovation projects aim to improve the quality and productivity of healthcare and access to medical treatment (Tunçsiper, 2023:22).

In the digital transformation in health, individual health solutions are virtualized and presented with technological innovations. Foremost among these are wearable technologies such as watches, shoes and wristbands. These products can measure a person's pulse, calculate how many calories they burn, provide nutritional benefits, and even track and compare the person's history. These wearable technological devices can connect to computers via the Internet of Things and transmit data. In this way, many health information about those people can be easily accessed. It is then evaluated with artificial intelligence technology to improve individuals' lifestyles (Büyükgöze, 2019).

Digital investments in the health sector not only make our lives easier, but also allow us to benefit from health services more effectively. With technology advancing very rapidly, efficiency and satisfaction in healthcare services are increasing, which positively affects costs. Digital technologies are spreading from many sides and aim to improve health performance, enable new business models and reshape relationships in the health sector.

2. Digital Transformation Practices in Health

A paradigm shift in digital technologies, from classical, old-style healthcare systems to smart healthcare systems, is evolving to radically change healthcare on a global scale. Smart healthcare systems incorporate digital technologies to easily navigate healthcare services, connect people and institutions, and effectively address and respond to healthcare requests and demands in a smarter system (Tunçsiper, 2023, s.22).

Digital health applications used in the field of health can be listed as e-health application, digital hospital, digital code, artificial intelligence, 3d printing, wearable technology, medical internet of things (miot), big data.

E-health application: The positive changes brought by digitalization to human life are also reflected in the health system. E-health is instrumental in providing a more efficient healthcare service by increasing the service access and service quality of the entire society. As a main topic, the concept of 'e-health' covers all technological fields and has sub-topics such as robotic applications, tele-medicine, digital hospital, mobile health and electronic patient records.

With the increase in the place and importance of technology in the health sector, the part of vital health services offered through e-health applications offers individuals 24/7 access. It also enables the service to be free from time and space limitations (Kılıç, 2017: 205). E-health refers to the provision of health services and information, which is located at the intersection of medical informatics, public health and commerce, and which has developed through the internet and other related technologies. The concept is not only characterized by technological developments, but also brings about the development of a global reasoning, thinking and attitude by using information and communication technologies to improve health services in local, regional and global terms (Eysenbach, 2001: 1-2).

If we look at the benefits of e-health applications; in cases where the patient does not have the opportunity to reach the hospital in matters requiring limited resources and expertise, it enables the examination process to take place over the internet. It allows the doctor to diagnose the health problem by accessing the patient's health information, diagnosis and examinations inside or outside the health institution. At the same time, since the connection is provided over the internet, it enables the doctor to make a definitive diagnosis by taking the opinions and suggestions of other doctors in cases where he/she is insufficient (Broderick and Smaltz, 2003: 3).

E-Health system is not designed to exclude physicians and other health service providers from the system, on the contrary, it is designed to increase the performance of service providers by further strengthening them with technological tools, accelerating the health sector, ensuring that it is dynamic, contributing to the optimal point of the outputs obtained, and at the same time ensuring the innovation and flexibility of the services provided (Kılıç, 2017: 216).

Digital hospital: With the concept of digital hospital, it is aimed to establish advanced technological applications in hospitals, to increase quality and efficiency in health services, to reduce costs, to provide paper-free, fully automated, information flow, diagnosis and treatment services, to save time and transportation costs with mobile health and tele-medicine, to access health services regardless of geographical location, to reduce the workload of healthcare professionals and to work more efficiently with these applications.

In integrated digital hospitals, applications such as electronic health record, laboratory and radiology information systems, e-prescription, e-dispatch, e-appointment systems are diagnostic and treatment applications; applications such as e-finance, quality assurance policies, device tracking, smart building, e-procurement, internet are corporate applications; applications such as banks, insurance companies, suppliers, smart health cards, home care are external connection applications; applications such as smart hospital buildings, network call center, storage, IP communication are technological applications (Ak, 2013: 974-975).

Digital code: Technological developments in the Industry 4.0 revolution also affect pharmaceutical companies. Thanks to the processing of medicines with digital codes, medicines can be tracked in a healthy way even after they are distributed from production to distribution. Thus, since original medicines can be tracked, counterfeit medicines can be easily detected. In line with the steps taken in this direction, as of 2019, only non-deformed medicines with digitally coded serial numbers on the packaging can be sold in the European Union (Kesayak, 2020).

Artificial intelligence: The first person to define artificial intelligence was John McCarthy. He defined it as "the science and engineering of making intelligent machines, especially intelligent computer programs". It is a branch of science that aims to incorporate the ability of machines to analyze, make use of recorded data, move objects from one place to another, organize, plan and program, learn and communicate. What is expected from artificial intelligence in the field of medicine is the production

of artificial intelligence programs that can diagnose patients and offer treatment options (Demirhan, Kılıç and Güler, 2019: 32).

With the applications developed with artificial intelligence technology, it is aimed to save time and expenditure, to prevent human errors, to reduce the workload of healthcare personnel, to work more efficiently and to improve healthcare services in general.

3d printing: In classical industrial production, the stages of the emergence of the product; It consists of designing, making molds and pouring different materials into the mold. The obstacle that arises in making individual products is the high cost of creating molds and the need for a large area. With 3D printers, even if a single product is needed, it can be designed with computer software and produced without intermediate processing. This process is called 'rapid prototyping' (Yolcu and Celayir, 2015: 77).

3D printers, also known as additive manufacturing, do not create a product by subtracting from the product, but create the product from scratch and create the product by adding layer by layer. Three-dimensional printers use the material efficiently compared to other production techniques and produce an unlimited variety of products in a single machine. Three-dimensional printers are printing machines that enable the process of producing solid objects of three-dimensional drawings digitally in a computer environment (Tümer, 2020: 9).

Printing technology is also defined as 'boutique production' due to its ability to produce personalized or tailor-made production in health. The main areas of use of 3D printing are tissue and organ production, orthosis-prosthesis-implant production, surgical planning and radiological applications, pharmacological applications, educational applications and surgical instrument production (Emre, Yolcu and Celayir, 2015: 78-80).

Medical internet of things (miot): The Internet of Things is a technology that provides communication between smart devices with a number of warning systems to store, store and access data to evaluate analyzes. In terms of health application, it is a health service in which the patient's health data is collected from a series of sensors and data is transferred to physicians to examine the patient's condition (Aslan & Tosun, 2019: 279).

Thanks to the Internet of Things, not only smart devices but also all objects can be connected to the Internet and be operational. For example, even the simplest water

bottle can be loaded with information thanks to Radio Frequency Identification (RFID) technology and the amount of beverage in it can be monitored. With the sensors on it, the amount of water decreasing can be transmitted as information.

Big data: The increase in the total number of devices connected to the Internet has increased the size of the data in parallel. It is seen that the concept of 'big data' and Internet of Things applications interact with each other. Big data provides instant access to real-time data by collecting and analyzing data. In this sense, the Internet of Things and big data have a transformative effect in the field of health as in other fields.

Due to the increase in the amount of data stored in health, it has become very difficult to process this data with traditional methods. Even if it can be processed, the accessibility of the information is also important, so the traditional method has also become difficult, and for this reason, big data application has started to be used in the health sector. This processed information can be used in all kinds of R&D studies, especially related to health. In addition, as a result of these studies, it can offer competitive chances to institutions and positive results can be obtained in terms of cost (Altındiş & Morkoç Kıran, 2018).

3. Wearable Technology in Health

In recent years, wearable devices developed for various purposes have evolved, but mostly for fitness purposes. However, in the last few years, wearable health technologies have become both a research topic and a focus of interest for healthcare providers. The new tools developed are more detailed and functional than previous products due to their potential to fulfill various tasks and perform professional operations (Aydan and Aydan, 2016: 327).

Wearable technology devices have an important place in our daily lives. Wearable technology products are technological and mechanical products that can be worn by people (Raj and Brookshire, 2015:137).

Jewelry such as watches, wristbands, glasses, lenses, e-textiles, smart fabrics, headbands, rings and hearing aids are the wearable devices used today. Fitness bracelets, trackers and smart watches are among the most widely used wearable devices. The first wearable device was designed in 1955 to cheat at games. Since then, there have been great developments in wearable technologies in the fields of gaming and entertainment, mainly in the fields of health and exercise (Sağbaş et al., 2016: 2).

Wearable technologies have the potential to build awareness by increasing health awareness with just-in-time feedback. As these technologies enable individuals to manage their health, they have also become tools that can help improve lifestyles. More importantly, wearables can reduce the tasks and responsibilities of healthcare providers by preventing diseases before they start, rather than treating them, and keeping the patient more in control. Wearable technologies can promote healthy behaviors by rewarding positive behaviors through meaningful messages, attractive visuals, and various methods that give users certain points, such as in gaming systems (Ananthanarayan and Siek, 2012: 236).

Wearable technologies, which have become very popular especially in the field of health, enable patients to monitor their health status remotely and send the data to the physician without the need for outpatient visits. Due to the continuous monitoring of the health of the patient, it enables preventive health interventions to prevent bigger problems that may arise. Thus, unnecessary procedures are prevented, reducing costs and increasing the quality of health services (Öksüz, 2018: 36-39).

In wearable technology applications, the elderly, those with chronic diseases and low-income groups who will benefit the most from these applications are ignored. Companies in the technology market neglect this group and focus on product development that will serve the group with high income and who closely follow technology (Herz, 2014).

With the data collected from individuals by wearable devices, healthcare providers can create a large database and quickly decide which medical test to perform or which medication to prescribe for an individual. In addition to reducing healthcare costs, the creation of a database can also provide powerful epidemiological information to improve public health. For example, while it may take a long time to learn the positive/negative side effects of a new drug introduced to the market, the side effects or benefits of the drug can be learned very quickly with the behavioral data to be obtained through the database (Pentland, 2004: 43).

Figure 1 shows the benefits that wearable technologies will provide to people and which activities they will fulfill. In particular, the process of measuring the electrical activity of the brain, heart and muscles, which is done by larger devices, can become more ergonomic with wearable technologies, thanks to sensors embedded in clothing and headbands developed to measure the electrical activity of the brain.

Figure 1: Wearable Devices
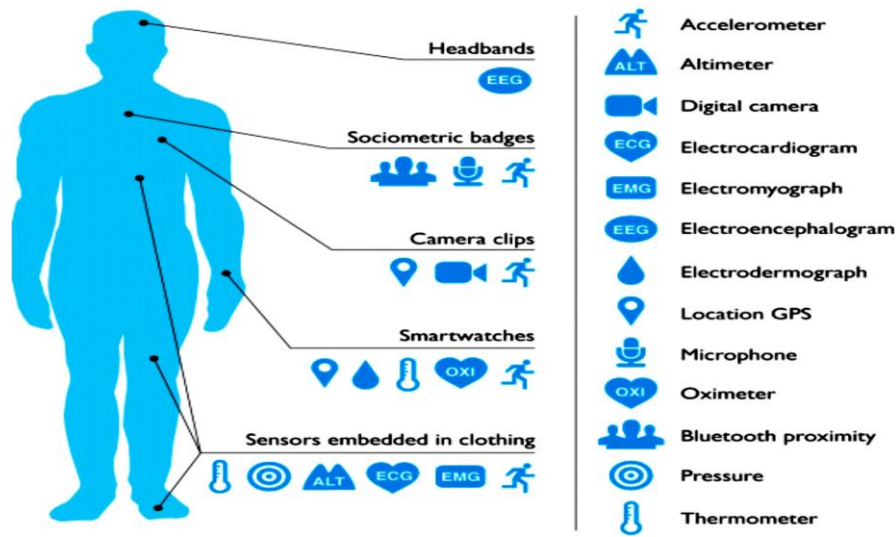
Source: Viyajan vd. 2021

The most in-demand wearables, including fitness trackers and smartwatches that can measure users' running distance, calories burned or heart rate, are also made attractive to consumers by their ease of use. These products not only collect data on a person's physical condition, but also provide medical advice. More advanced medical products are devices that are worn by the patient (wearable portable medical device) or implanted in the patient's body (embedded device), enabling early detection of risks such as heart attacks. The sensors in these products especially help to monitor health parameters and obtain important data (Kır and Yıldırım, 2023:52).

4. Development of the Wearable Technology Market in the World

Given that healthcare is not only a part of life, but also one of the most important aspects of the economy, it is not surprising that the use of wearable technology products has increased remarkably (Safavi and Shukur, 2014: 1). Within the market structure, many factors drive growth in the healthcare sector, as in other sectors. However, the strong incorporation of new technology, the increase in health awareness, the rise in health costs, and the fact that individuals prefer virtual networks instead of face-to-face communication also stimulate the wearable technology market in the health sector (Lim, 2016, p.7).The presentation of many smart wearable technology products that can contribute to the continuous and regular monitoring of any disease, instant interventions, informing authorized health units and even contributing to the recovery process after surgeries continues rapidly in the market and has new areas of use (Patlar Akbulut & Akan, 2016: 440).

Another factor contributing to the increase in demand for wearable technology is the change in the structure of society. The fact that individuals are in intense work tempo and time is limited can reveal the desire to remotely monitor the health of their children and family elders, thus increasing the demand for wearable technology products for health. Businesses that want to meet the rapidly increasing demand and find a place in the market are making efforts to develop and market wearable technology products that can improve the quality of life of individuals. Thanks to these products, even if individuals are alone, having products that constantly monitor their health information will also affect them and their relatives to feel peaceful and safe (Kılıç, 2017: 109).

Table 1: Wearable Device Product Categories by Shipment Volume, Market Share, and 2022-2027 CAGR (shipments in millions)

Product	2023 Shipments	2023 Shipments	2027 Shipments	2027 Market Share	2022-2027 CAGR
Earwear	313.0	62.1%	390.6	62.1%	4.9%
Smartwatch	157.3	31.2%	206.2	32.8%	6.8%
Wristband	32.1	6.4%	30.1	4.8%	-3.0%
Others	1.7	0.3%	2.5	0.4%	8.4%
Total	504.1	100.0%	629.4	100.0%	5.0%

Source: IDC Worldwide Quarterly Wearable Device Tracker

Table 1 shows the wearable device product categories by shipment volume, market share and 2022-2027 compound growth rate. Accordingly, 313 million headphones, 157.3 million smartwatches and 32.1 million wristbands were shipped in 2023. Headphones account for 62.1% of the total market share, smartwatches 31.2% and wristbands 6.4%. In the 2027 forecast, headphone shipments are estimated to reach 390.6 million, smartwatches 206.2 million and wristbands 30.1 million units. In five years, the compound growth rate is projected to be 5% in total.

1. **Graph 1:** Number of Connected Wearable Devices Worldwide By Region (in millions)
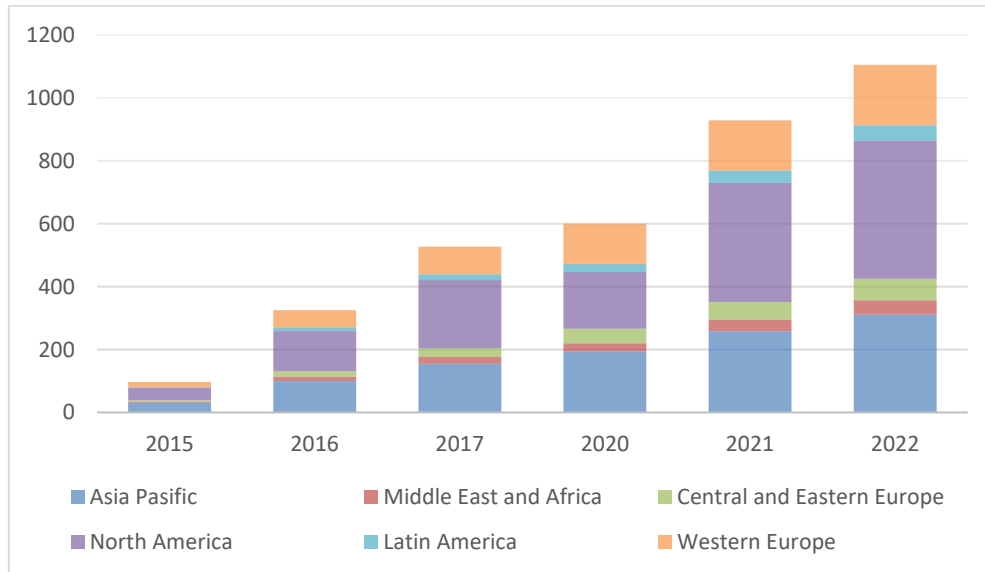
Source: Statista, 2024.

Graph 1 shows the number of connected wearable devices worldwide by region. Accordingly, the highest increase was realized in Asia Pacific. While there were 30 million wearable devices in Asia Pacific in 2015, this number reached 311 million in 2022. The lowest increase was realized in the Middle East and Africa. In this region, the number of wearables in use has increased from 4 million in 2015 to 46 million in 2022.

Table 2: Top 5 Wearable Device Companies

Quarter	% Growth in 2022Q4	% Growth in 2023Q1	% Growth in 2023Q2	% Growth in 2023Q3	% Growth in 2023Q4
Apple	33.1%	24.5%	21.1%	20.6%	25.3%
Imagine Marketing	4.3%	6.2%	7.4%	9.8%	3.9%
Samsung	7.9%	9.0%	7.4%	7.4%	8.4%
Huawei	5.9%	5.9%	7.2%	5.9%	7.4%
Xiaomi	5.5%	7.9%	7.7%	8.0%	8.4%
Others	43.4%	46.4%	49.2%	48.4%	46.7%

Source: IDC Wearable Devices Market Insights.

Table 2 shows the quarterly growth figures of the five largest wearable device companies. Apple, Samsung, Huawei and Xiaomi have the largest shipment volumes in wearable technology. Apple, which ranked first, achieved 33.1% growth in the last quarter of 2022 and 25.3% growth in the last quarter of 2023. Imagine Marketing achieved 4.3% growth in the last quarter of 2022 and 25.3% growth in the last quarter of 2023.

5. Development Of Wearable Technology in Europe and Asia

Wearable technologies that we encounter in many areas are mostly preferred to be compatible with smartphones or have mobile applications. There is also a different reason why these products are preferred. Especially in European countries, the desire to control and monitor the health status of individuals due to the aging of the population has been tried to be solved with Society 5.0. Basically, the concept of Society 5.0 is a concept created as a result of industrial revolutions and is based on the logic of using technology on behalf of and for the benefit of society (Büyükgöze & Dereli, 2019b).

The wearable technology market is divided into 5 regions. These are:
• North America (USA, Canada and Mexico)
• Europe (Germany, UK, France, Italy, Russia and Türkiye etc.)
• Asia-Pacific (China, Japan, Korea, India, Australia, Indonesia, Thailand, Thailand, Philippines, Malaysia and Vietnam)
• South America (Brazil etc.)
• Middle East and Africa (Egypt and GCC Countries)

The development of the market in the Asia-Pacific and Europe regions is shown in Table-3.

Table 3: Asia Pacific and Europe wearable technology market

	Asia Pacific	Europe
Market revenue in 2023	USD 21,348.5 million	USD 18,008.5 million
Market revenue in 2030	USD 63,373.7 million	USD 48,511.5 million
Growth rate	16.8% (CAGR from 2023 to 2030)	15.2% (CAGR from 2023 to 2030)
Largest segment	Wrist-wear	Wrist-wear
Fastest growing segment	Wrist-wear	Wrist-wear
Market segmentation	Wrist-Wear, Eyewear & Headwear, Footwear, Neckwear, Body-wear	Wrist-Wear, Eyewear & Headwear, Footwear, Neckwear, Body-wear

Source: Grandviewresearch.com

Table 3 shows the wearable technology data of Asia Pacific and Europe. Accordingly, in terms of revenue, the 2023 market revenue of the Asia Pacific region, which accounts for 29.7% of the global wearable technology market in 2023, is 21,348.5

million dollars, while the 2023 revenue forecast is 63,373.7 million dollars. On the other hand, the Europe region, which accounts for 25.0% of the global wearable technology market in 2023, has a 2023 market revenue of $18,008.5 million, while the 2030 revenue forecast is $48,511.5 million. The fastest growth in both markets was realized in wrist wear.

The fast-growing Asia-Pacific region is projected to grow by 20% in the next five years. Here are some details about this region:

• Increases in disposable income are likely to drive demand for advanced wearable technologies.

• Innovations in VR wearables and smart clothing

• Increasing sales in fitness memberships with expanding health awareness after the pandemic Brand Boost Pulse (2024).

As the focus in Europe is mainly on health and wellness, most consumers are interested in devices that track health metrics. Going forward, the European wearable technology market is expected to grow by 15%. Some details for this region:

• Support for health-related wearable devices is expected to increase

• Growing interest in mental health monitoring devices

• Older population also adopting wearables in health management Brand Boost Pulse (2024).

The Asia-Pacific region has recently overtaken North America to become the largest market. In addition, China and India account for about 40% of the market in this region. Xiaomi, Huawei, Samsung, Apple and Fitbit are some of the popular brands producing smart wearables in the APAC region. As the functionality of smart wearables has increased, the popularity of these devices has also increased. Another reason for this increase is the fitness functions of the devices. On the other hand, in South Korea, the main reason for the demand for smart wearables is the ease of access to smartphones (Statista.com).

7. CONCLUSION

As a result of technological developments all over the world, the concept of Industry 4.0 first entered our lives with the industry and then the process of integration into other sectors was experienced rapidly. With new developments, patient care is becoming more and more value-based, thanks to the increasing ease of implementation of healthcare services and information sharing. As a result of digitalized healthcare and hospital practices, important steps have been taken towards simplification of healthcare services, such as the reduction in waiting and hospitalization times of

patients, the replacement of piles of documents and files with electronic media, and interactive communication between patients, physicians and staff.

Although current wearable technologies are mostly used for preventive health services and simple operations, developments in the field of wearable technologies indicate that devices that will perform more specific operations will emerge in the future. It is thought that these technologies, which are still in the development stage, will become indispensable for individuals and health institutions in the future as they will eliminate important health problems and simplify complex procedures.

In the health sector, the increase in individuals' expectations for a long and healthy life and the increase in their level of awareness in parallel with the increase in their knowledge accelerate the demand for wearable technology products upwards. Another factor contributing to the increase in this demand is the change in the structure of society. The fact that individuals are in a busy work schedule and have limited time can reveal the desire to remotely monitor the health of their children and family elders, thus increasing the demand for wearable technology products for health. Businesses that want to meet the rapidly increasing demand and find a place in the market are making efforts to develop and market wearable technology products that can improve the quality of life of individuals. Thanks to these products, even if individuals are alone, having products that constantly monitor their health information will also affect them and their relatives to feel peaceful and safe.

Wearable technologies, which offer a wide range of uses, will provide significant improvements in human life in the near future. Its widespread use in the medical field will facilitate diagnosis outside the clinic and facilitate patient self-care. With its use in medical education activities, significant reductions in current expenses will occur. Since more precise information will be obtained and diagnosis will be made, misdiagnosis will be prevented and patient victimization will be reduced.

Although the technologies developed have the potential and capability to create a new market, they are still in their infancy and have some difficulties before they become popular and affordable. However, studies show that wearable devices will create a billion-dollar industry and have the potential to further develop this technology. Currently, with the potential and practical uses of these technologies, a new era in the interaction between humans and technology has opened.

Moreover, wearable medical devices are a fast-growing market that needs to be carefully monitored for new developments. Although investors' predictions of market

expansion may be over- or under-stated, wearable medical devices will impact consumer healthcare and medical delivery systems in the very near future.

Kaynakça | References

Ak, Bilal. (2013). *Sağlıkta Yeni Hedef: Dijital Hastaneler*, Akademik Bilişim 2013 – XV. Akademik Bilişim Konferansı Bildirileri, Akdeniz Üniversitesi, 23-25 Ocak, Antalya, 971-976.

Altındiş, Selma. & Morkoç Kıran, İlknur. (2018). *Büyük Verinin Sağlık Hizmetleri Kalitesindeki Rolü*. Ömer Halisdemir Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, 11(2), 257–271.

Ananthanarayan, Swamy, & Siek, Katie A. (2012). *Persuasive Wearable Technology Design for Health and Wellness. In: Pervasive Computing Technologies for Healthcare (PervasiveHealth),* 2012 6th International Conference on , San Diego, 236-240.

Asia Pacific Wearable Technology Market Size & Outlook (2024). grandviewresearch.com

Aydan, Seda, & Aydan, Murat (2016). *Sağlık Hizmetlerinde Bireysel Ölçüm ve Giyilebilir Teknoloji: Olası Katkıları, Güncel Durum ve Öneriler.* Hacettepe Sağlık İdaresi Dergisi, 19(3).

Bostancı, Erkan. (2015). *Medikal Alanda Kullanılan Giyilebilir Teknolojiler: Uygulamalar, Karşılaşılan Sorunlar ve Çözüm Önerileri.* In: Tıp Teknolojileri Ulusal Kongresi, Muğla, 549-552.

Brand Boost Pulse (2024). *Wearable Technology Ecosystems Market Trends by Region: Insights and Analysis.*

Burton-Jones, Andrew, Akhlaghpour, Saeed, Ayre, Stephen, Barde, Payal., Staib, Andrew, & Sullivan, Clair. (2020). *Changing the Conversation on Evaluating Digital Transformation in Healthcare: Insights From an Institutional Analysis.* Information and Organization, 30(1), 100255.

Büyükgöze, Selma. & Dereli, Ebru (2019). *Dijital Sağlık Uygulamalarında Yapay Zeka.* VI. Uluslararası Bilimsel ve Mesleki Çalışmalar Kongresi-Fen ve Sağlık, 7.10.

Büyükgöze, Selma. (2019). *Sağlık 4.0'da Giyilebilir Teknolojilerden Sensör Yamalar Üzerine Bir İnceleme.* Avrupa Bilim ve Teknoloji Dergisi, (17), 1239–1247.

Emre, Şenol, Yolcu, Musa Batuhan & Celayir, Sinan. (2015). *Üç Boyutlu Yazıcılar ve Çocuk Cerrahisi,* Çocuk Cerrahisi Dergisi 29(3), 77-82.

Herz J. C. (2014). *Wearables Are Totally Failing the People Who Need Them Most.*

Ivančić, Lucija., Glavan, Ljubica Milanović, & Vukšić, Vesna Bosilj. (2020, September). *A literature review of digital transformation in healthcare.* In 2020 43rd International Convention on Information, Communication and Electronic Technology (MIPRO) (pp. 1351-1355). IEEE.

Kesayak, Burak. (2020). *Sağlık 4.0: Sağlık Endüstrisinin Dijital Dönüşümü.*

Kılıç, Taşkın. (2017). *"E-Sağlık, İyi Uygulama Örneği; Hollanda",* Gümüşhane Üniversitesi Sağlık Bilimleri Dergisi, 6(3), 203-217.

Lim, Minji. (2016), *"Wearable Technologyand Sleep Disorders"* San Mateo Country Physician, 5 (6), 7-9.

Massaro, Maurizio. (2021). *Digital transformation in the healthcare sector through blockchain technology.* Insights from academic Research and business developments. Technovation, 120, 102386.

Öksüz, Ergün. (2018). *"Giyilebilir Sağlık Teknolojileri",* Actual Medicine, 26 (4), 35-41.

Özşahin, F. (2024). SAĞLIKTA DİJİTAL DÖNÜŞÜM. *Sağlık Yönetiminde Teknolojik Yaklaşımlar-I,* 147.

Patlar Akbulut, Fatma. & Akan, A. (2016), *"Akıllı Giyilebilir Hasta Takip Sistemleri", Tıp Teknolojileri Ulusal Kongresi",* 15-18 Ekim TıpTekno15 Muğla, 440-443.

Raj, Deepika & Ha-Brookshire, Jung (2015), *"Exploration of Knowledge Creation Processes and Work Environments in the Wearable Technology Industry",* International Textile and Apparel Association Annual Conference Proceedings, November11, 137.

Safavi, Seyedmostafa & Shukur, Zarina. (2014), *"Conceptual lPrivacy Framework for Health Information on*

Wearable Device, PLoS ONE, 9(12).

Sherr, Ira. (2015). *Apple announces ResearchKit, a New Service for Medical Studies,* CNET, Available from: https://www.cnet.com/news/apple-announcesresearch-kit-a-new-service-for-medical-studies/.

Statista Research (2024). *Smart Wearables in the Asia-Pacific Region - Statistics & Facts.*

Sultan, Nabil. (2015). *Reflective thoughts on the potential and challenges of wearable technology for healthcare provision and medical education. International Journal of Information Management*, 5(37), 521-526.

Tunçsiper, Çağatay. (2023). *Dijital Dönüşüm ve Sağlık Ekonomisi: Dijital Sağlık Üzerine Bibliyometrik Bir Analiz.* Gümüşhane Üniversitesi Sağlık Bilimleri Dergisi, 12(1), 21-31.

Vijayan, Vini, Connolly, James P., Condell, Joan, McKelvey, Nigel, & Gardiner, Philip (2021). *Review of wearable devices and data collection considerations for connected health. Sensors,* 21(16), 5589.