Review

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AN OVERVIEW OF HEALTH SERVICES IN THE INDUSTRY 5.0 ERA

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ABSTRACT: Industrial revolutions are recognized as one of the most important turning points in human history. These revolutions, which created a profound transformation in social, economic and technological fields, took place in a wide process ranging from the age of mechanization to mass production, information technologies, smart production and personalization. Technology is of great importance in industrial revolutions. The automation of production processes was enabled by technology, which increased productivity, reduced dependence on human labor with the use of machines and led to a radical change in industrial production. The stages of industrial development have also been reflected in the health sector and have led to significant transformations in this field. In the field of health, technology is increasingly making its impact felt as one of the important external factors. The use of technology in healthcare provides many advantages for healthcare professionals, patients, healthcare managers and other interested parties. In this study, in which current developments in the literature are analysed through a review method, the objectives, tools and potential results of Industry 5.0 aiming to improve the health and quality of life of the society in the light of various perspectives are included in detail. New technologies should be examined in depth, priority areas should be identified, as in the case of healthcare, and the contribution of technological advances to public health should be analyzed. By identifying the gaps and the priority areas of need, research should be conducted on behalf of human health.

Keywords: Industry 5.0, Healthcare Sector, Technology, Digital Health.

1. INTRODUCTION

Throughout human life, there is a constant change and development in every field. Industry, which is one of these areas, includes many indicators such as the level of education, degree of development and economic capacities of countries. Societies can make progress in parallel with their level of adaptation to current developments. States, scientists, industrial plants and institutions are also important actors in industrial progress. In addition to sciences such as economics and engineering, the health sector can be counted among the main disciplines that are most affected by development processes.

Today, the internet and its components are rapidly becoming widespread. The Internet has become an integral part of our lives at both individual and social levels. The main reason for this is the wide range of possibilities and conveniences provided by the Internet. Technology has led to great changes in institutions, individuals, societies and states [1]. When we look at the starting point of the industrial revolutions, we can observe that inventions such as fire, the wheel, the steam engine, the telescope, the telephone, electricity, and the microscope have been of key importance that have radically changed world history from the moment they were discovered. The common goal of these inventions is to make human life more convenient and

comfortable. With the same aim, Tim Berners Lee and Vinton Cerf invented the Internet, starting a domino effect that would create major changes in the following generations. Internet technology is considered a revolutionary innovation. The rapid and easy accessibility of information is a revolution in itself. Today, beyond the transmission of information, there is talk of machines that can think, and perhaps in the future, feel. In this context, technology is a powerful element that has the potential to change society, industry and the understanding of marketing throughout human history [2].

The term industrial revolution refers to the technological advances that gave rise to new ways of life that transformed society on a large scale. This revolutionary process started with the first industrial revolution (Industry 1.0) and was characterized by steam engines. With the help of mechanical machines, the basis for the technological revolution (Industry 2.0) was created, which allowed for superior production, and then led to Industry 3.0, which enabled the automation of the entire production process (computers). For example, the concept of mass production emerged during Industry 3.0. Production systems that already utilized computer technology have incorporated new technologies such as robotics, artificial intelligence, augmented reality, 3D printing, etc., fueling the digital evolution of the post-2011 era (Industry 4.0). Improving the network connectivity of manufacturing and production systems laid the foundations for the era of human-machine collaboration (Industry 5.0), with increased collaboration between humans and intelligent systems [3].

The world is changing from one revolution to another at a dizzying pace. Global socioeconomic tensions, armed conflicts, scientific advances, climate change, and especially the recent COVID-19 pandemic are catalysts for a rapid transition from the 4th industrial revolution to the 5th industrial revolution [4]. The Industry 5.0 era adopts a more personalized, human-focused production approach, where humans and machines collaborate. The healthcare sector is also experiencing a major transformation with the integration of artificial intelligence, robotic systems and biotechnology. This is creating a new working ecosystem with a radical change in methods, processes and occupational risks [5, 6]. The health sector should be considered differently from other sectors with its unique characteristics.

In healthcare services; besides technology, the labor of healthcare professionals is also used intensively. The use and day-to-day development of artificial intelligence paves the way for important developments in health systems. It is inevitable that digital transformation, which has been mobilized with the start of the Industry 5.0 era, will play a decisive role in the health sector. Progress continues to be made towards the provision of services such as diagnosis-treatment-examination without or with minimal use of healthcare professionals. However, these changes have some bad aspects as well as benefits. A wide range of benefits will be provided, ranging from the ability of people to reach health experts without leaving their homes, to request tests and examinations, to make appointments, to interpret the results, and to perform surgeries remotely, as well as procedures that seem relatively easy to perform in the first place. On the other hand, with the widespread use of artificial intelligence, it can be foreseen that problems may arise in various different issues such as digital security and privacy, responsibilities, the level of health literacy of the society, and the selection of the most appropriate treatment.

In general, industrial and social revolutions have deeply interacted with each other since the first industrial revolution [6]. In this study; firstly, the historical development of the industry is examined and its effects in the field of health are included. Then, Industry 5.0, also known as Society 5.0, which is a new concept and focuses on society, is evaluated. Although Industry 5.0 (more business and production) and Society 5.0 (more technology and social life) are different

concepts, they are assumed to have the same meaning in this study as they are closely related to each other. Finally, the current and potential impacts of this new concept in the field of health are discussed.

2. CONCEPTUAL FRAMEWORK

In this section, the concepts that constitute the main themes and the theoretical background of the research are examined in detail and discussed in the light of existing approaches in the literature.

2.1. History of Industrial Revolutions

The industrial revolution is usually defined by a number of changes in industrialization and production methods. Revolutionary processes affected not only production, but also working life and, by extension, the whole way of life of people. With the industrial revolution, working methods changed and the division of labor began to be applied in factories with mass production mechanisms. Workers, who previously had to master all stages of the products they produced, are now responsible for only a part of the products. In mass production lines, overtime is spent repeating the same tasks. Agricultural workers have migrated to work in factories in big cities. Farmers, who could plan their own time with flexible working hours in the fields, were forced to work overtime in factories. As a result of this transformation, individuals have become alienated from their work and then from themselves [7].

The industrial revolution is fundamentally a technological revolution and progress in understanding it can be made by focusing on the sources of invention. The reason why the industrial revolution took place in Britain in the 18th and 19th centuries, Allen (2006) argues, was not luck, British genius, culture or the rise of science. Rather, Britain's success in the international economy triggered economic developments that offered British inventors unique and highly lucrative opportunities. Commercial success created a wage and price structure that differentiated Britain from the continent and even Asia. Since wages were high and energy cheap in Britain, the industrial revolution was a response to this opportunity [8].

Industrial revolutions have created significant transformations in line with the unique conditions and needs of each period. These revolutions have brought about radical changes not only in health and industry, but also in many other disciplines and sectors. People's habits, lifestyles and working standards have also evolved over time. In the first industrial revolution, water and steam power replaced muscle power in production processes. In the 2nd industrial revolution, the mass production method came to the fore with the discovery of electricity. In the 3rd industrial revolution, information technologies and the internet started to play an important role in people's lives. Computers developed and were included in daily life and production processes. In the 4th industrial revolution, technology was integrated into the production phase in order to realize production in a fast, collective and systematic way. The development of cyber physical systems and the implementation of real-time technologies coincide with this period. Finally, the 5th industrial revolution, or Industry 5.0, aims to utilize the integration of technology into the production process as a beneficial element rather than a threat to society. This new era is shaped by rapidly developing fields such as artificial intelligence, the internet of things, biotechnology and the space industry. The 5th industrial revolution has the potential to determine the future of humanity by creating profound effects in economic, technological and social dimensions. This period, which should not only be understood as a technological progress, also has the power to radically change human life, working methods and communication styles [9, 3, 10].

Today, there is an evolution from Industry 1.0 to Industry 5.0 with the transition to smart factories capable of unmanned production. The communication of machines both with each other and with humans has radically transformed not only production but also society. Society 1.0, which started as hunter-gatherers, is evolving into Society 5.0, where common living spaces are shared with machines [2]. The transformation initiated by Industry 4.0 in the industrial sector has also manifested itself as Health 4.0 in the field of health. This change is expressed with the term digital health. Digital health aims to make healthcare services more quality and efficient and to provide them for the benefit of society. Similarly, the concept of Society 5.0 is based on the principle of using the digitalization of technology for social benefit [11]. The progress of the industrial revolutions until today is schematized in Figure 1. In every period, different innovations and developments make their weight felt in people's lives. Following Industry 5.0, speculations and ideas about the beginning of Industry 6.0 have started to be discussed. According to current developments, Industry 5.0 is still an evolving process and is not yet complete.

Figure 1. Processes in the industrial revolution.

2.2. Industry 5.0 (Society 5.0)

Industry 5.0 has its roots in the concept of Industry 4.0, which was introduced in Germany in 2011 and is part of the advanced technology strategy adopted by the country's business community, scientists and decision makers [12]. Industry 4.0 is a period characterized by the integration and automation of digital technologies in production. Unlike previous industrial revolutions, it involves the intensive use of innovative technologies such as big data analysis, artificial intelligence and cyber-physical systems. Thanks to technology, production processes have become more efficient. Recently, the Industry 5.0 paradigm has also been developing. Industry 5.0 refers to an approach in which humans and machines work in closer collaboration. The aim is to create more flexible, more adaptable and human-oriented production systems by combining human capabilities and the power of machines. In short, Industry 4.0 and Industry 5.0 are important concepts that represent different stages of technological advances in production and social changes [13].

The Industry 5.0 paradigm promotes agility and resilience of systems through the use of flexible and adaptive technologies. It also respects planetary boundaries by seeking to take action on sustainability [6]. The periods and characteristics of industrial paradigms are presented in Table 1 below.

Table 1. History of Industrial Revolution

Paradigma	Characteristic&Time	Information
1.0	Mechanisation-1780	Industrial production based on water and steam powered machinery
2.0	Electrification-1870	Mass-production using assembly lines
3.0	Automation-1970	Automation using computers and electronics
3.5	Globalisation-1980	Offshoring production to low-cost economies
4.0	Digitalisation-2011	Introduction to connected devices, data analytics and artificial intelligence technologies to further automate processes

5.0	(Future) Personalisation-2020-…	As human intelligence works in concert with cognitive computing, collaboration between human and machine resulting in human/user-centered products and services

Source: [3, 14].

The concept of Society 5.0, which aims to integrate new technologies, which have been frequently discussed recently, into people's daily lives and society, is considered as a perspective that aims to be a pioneer in this process by taking a proactive approach to the necessity of adapting to the world transformed by Industry 4.0. Society 5.0, called "Smart Society" or "Super Smart Society", was introduced by Japanese Prime Minister Shinzo Abe at CEBIT, one of the world's largest information-technology fairs held in Hannover, Germany in 2017. While introducing this philosophy, Shinzo Abe emphasized that technology is not a threat to societies, but a help. Shinzo Abe pointed out that Society 5.0 represents an understanding of a society that is transformed under the leadership of science and technology, with the opportunities offered by Industry 4.0 and digitalization [15].

Society 5.0 represents a smart society with standardized processes that can assess human needs with artificial intelligence. A digitally integrated and knowledge-based society must therefore work towards social, environmental and economic sustainability. While human and social capital are at the center of developments in smart cities and societies, innovative methods are critical for predictive and adaptive processes [16]. The 5th industrial revolution, in other words, Society 5.0, which is based on the principle that technology, which has started to be used to a great extent in the production phase, should not be considered as a threat to society, but rather as an auxiliary element for society, is already making its impact felt in our lives [9]. In this study, the concepts of Society 5.0 and Industry 5.0, which are intertwined with each other, are used in the same sense. Figure 2 shows the historical development of social revolutions (1.0-5.0).

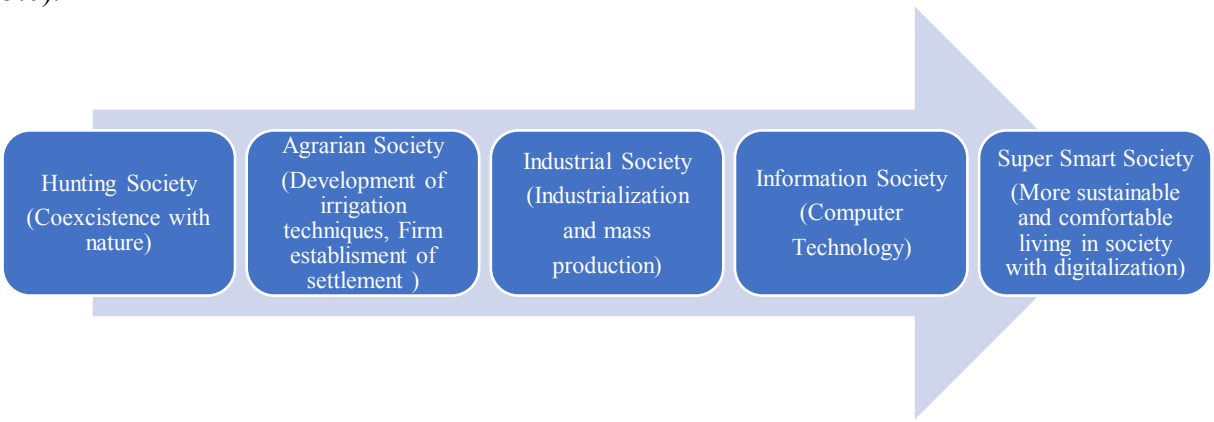

Figure 2. Historical development of society revolutions (Society 1.0-5.0) [17].

The concept of Society 5.0, put forward by Keidanren, Japan's most important business federation, has also been supported by the Japanese government. Climate change, the rapid progress of the digital revolution and the Covid-19 pandemic are among the factors that have led to the shaping of Society 5.0. Society 5.0 seeks to balance economic development with solving social and environmental problems. It is based on the principle that advanced computer technologies, the internet of things, robots and artificial intelligence are actively used in daily life, industry, and healthcare, not primarily for economic benefit, but for the convenience of citizens [12]. The fact that technological transformation is limited to industry is only a small part of this change; the main focus should be on social issues. In this process, legislators and executive bodies have important responsibilities in terms of legal reforms and transparent

governance. This is because the open society phenomenon stands out as one of the indispensable elements of Society 5.0. Society 5.0 is not a spontaneous concept, but rather an initiative to be built through joint efforts. In this society, the main focus is on people rather than technology. Society 5.0 reassesses the interest in socially responsible development among stakeholders [18].

While in Industry 4.0, the target audience was determined according to production, in Industry 5.0, instead of a uniform production approach, a production model based on the unique demands and needs of individuals was adopted. With this approach, the pressure of uniformity on individuals has been eliminated, while the differences in demands and expectations between people have become more apparent with the effect of digitalization. While Industry 5.0 aims to reduce increasing social inequalities, it also aims to build an order in which every individual will have universal equal rights and opportunities. Thus, any individual will be able to access the same rights and opportunities as a person in another part of the world. While Industry 4.0 enables everyone to benefit from digital processes thanks to technological developments, it has also created concerns among individuals due to cyber security vulnerabilities and various security measures have been taken against these risks. Industry 5.0 aims to provide a stronger protection against future threats by offering a more robust and secure process against these dangers [19].

Following the European Commission's workshop, 6 enabling technologies for Industry 5.0 were identified [20];

- Artificial intelligence technologies,
- Personalized human-machine interaction technologies that connect and combine the strengths of humans and machines,
- Data transmission, storage and analysis technologies that can manage data and system interoperability,
- Technologies that enable holistic modeling of systems, such as digital twins and simulation,
- Technologies inspired by biology and powered by smart materials and embedded sensors that enable materials with recyclable properties to be equipped with advanced features,
- Energy efficiency, renewable energy and storage technologies.

Industry 5.0 is based on 3 different approaches. These are human-centric, resilience and sustainability (Figure 3). Unlike Industry 4.0, the main issue is not centered on technology or production, but on maximizing the benefit of production for people. It has become clear how important a skilled workforce will be in enabling the digital transition. Beyond business and growth, it is an approach that puts respect for the limits of our planet and the well-being of workers at the center of the production process in order to achieve social goals [12].

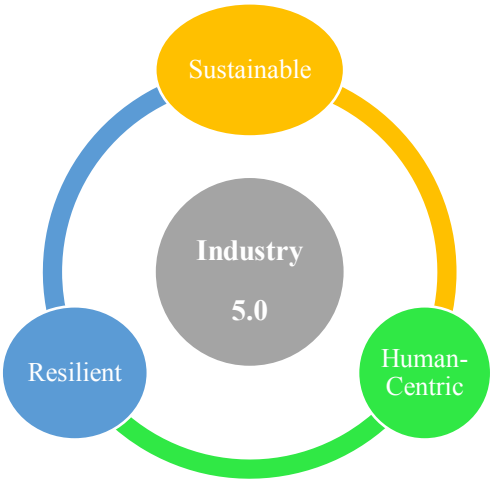

Figure 3. The basics of Industry 5.0 [12]

Human-centric is an approach that prioritizes human needs in production processes and questions how technology can benefit employees. Sustainability focuses on the reuse, repurposing and recycling of natural resources, while minimizing waste and environmental impact. Resilience means increasing the robustness of industrial production, which is supported by flexible processes and adaptive production capacities, especially in times of crisis [21].
Industry 5.0 could encompass not only human-robot collaboration, but also developments in renewable power sources, bioeconomy, etc. In the future, space life, space industries and space mining may also be at the center of or form part of the next industrial revolution. Table 2 shows a comparison of Industry 4.0 and Industry 5.0 visions [22].

Table 2. Comparison of Industry 4.0 and Industry 5.0 Visions

	Industry 4.0	**Industry 5.0 (Vision 1)**	**Industry 5.0 (Vision 2)**
Motto	Smart production	Human-robot collaboration	Bioeconomy
Motivation	Mass production	Smart society	Sustainability
Power Source	Electric power Fossil-based fuels Renewable power sources	Electric power Renewable power sources	Electric power Renewable power sources
Involved Technologies	Internet of Things (IoT) Cloud computing Big data Robotics and artificial intelligence (AI)	Human-robot collaboration Renewable resources	Sustainable agriculture Production Bionic Renewable resources
Involved Research Areas	Organizational research Process improvement and innovation Business administration	Smart environments Organizational research Process improvement and innovation Business management	Agriculture Biology Waste prevention Process improvement and innovation Business management Economy

Source: [22].

The Experimental section should provide details of the experimental set-up and the methods used to obtain the results. To make this section interesting, explain the choices you made in your experimental procedure. This section should provide sufficient detail for other scientists

to be able to reproduce the experiments presented in this paper. The Methods and Experimental part may be combined.

3. INDUSTRY 5.0 ERA DEVELOPMENTS IN HEALTH SERVICES

Innovative applications emerging in the Industry 5.0 (Society 5.0) process have led to significant developments in healthcare services. In this section, the transformation in healthcare services in the Industry 5.0 process, e-health, smart health applications and current applications for healthcare services will be discussed and information on these issues will be presented.

3.1. E-Health

Health services play a critical role at every stage of human life, starting from the womb to the moment of death, in terms of maintaining a healthy life, preventing and treating diseases, and have an irreplaceable importance. It is of great importance for both individuals and public administration that every individual, regardless of time and place, can access health services on time, benefit from these services fairly, and provide health services effectively and efficiently [23]. E-health is a field born at the intersection of medical informatics, public health and business. It covers health services and information provided or developed through Internet-related technologies. It represents not only a technical advance, but also a mindset, an attitude, and a networked commitment to improve health services on a local, regional and global scale using information and communication technologies (databases, robotic devices, digital hospitals, network connections, etc.) [24].

E-Health components include tele-medicine, electronic patient records, digital hospitals, robotic applications, mobile health programs [23]. E-health components gain more importance in the Industry 5.0 era and can be examined under different headings. High-tech equipped devices are used extensively in the health sector. Examples include keeping patient records digitally rather than in files and folders, preventing waste, reducing time loss, making them accessible from anywhere, and making them accessible to patients.

Thanks to electronic health records, patients' histories can be easily monitored and digital data can be stored. In treatment processes and planning, the risk of healthcare personnel making mistakes has been minimized and infrastructure has been created for more successful treatments. In periods such as pandemic processes, it has been revealed how important telemedicine and other digital health applications are for human life [25]. During the Covid-19 pandemic, the application called Hayat Eve Sığar (HES), which was put into use by the Ministry of Health in Turkey, played an active role in helping people plan their vaccination schedule, travel safely, and obtain information such as the risk of transmission in their environment. The level of health literacy of societies is one of the determining factors in e-health.

Investments in digital hospitals (global funding of USD 26.5 billion in 2020) are growing rapidly. Health practices during pandemic periods, such as Covid-19, increase the appetite for digital health. In a study by Canfell and colleagues, indicators of patient experience in digital hospitals were found to be positive or neutral [26].

3.2. Smart Health Apps

Technology, as an important external factor in the health sector, has been making its impact felt in various dimensions in recent years. The use of technology in healthcare has provided many conveniences and opportunities for patients, healthcare professionals, managers and other

stakeholders. The development stages of the industry are also reflected in the health sector and rapidly shape the innovations in this sector [1].
With Society 5.0, a new health team consisting of Patient+Doctor+Machines (PDM) or the concept of smart health has emerged. With this concept, people aim to manage their own health using wearable devices or mobile applications. We can group smart health applications that make our lives easier in Society 5.0 as follows:

- Wearable health applications,
- Mobile health apps,
- Artificial intelligence applications [11].

3.2.1. Wearable Health Sensors and Devices

The great development of Internet technologies in the early 2000s was supported by the rapid spread of intelligent mobile technologies. Smartphones, glasses, watches and other wearable devices are able to collect various data from the environment in which individuals are located thanks to the sensors they carry. These collected data can be collected and analyzed in a center over the Internet and provide comprehensive information about the person using the device or the surrounding environment. These developments have revealed the concept of the Internet of things (IoT). One of the most important areas of use of IoT is healthcare. In the diagnosis, treatment of diseases and follow-up of processes, the data of patients in their daily lives are of great importance. The best way to collect this data is through the use of IoT-based wearable or wearable health devices. These devices provide instant and accurate information about the patient's health status, enabling the development of more effective and individualized health services [27]. The Internet of things has the potential to accurately track people, equipment, samples, supplies and even service animals and analyze the captured data. With patients connected to sensors to measure vital signs and other biometric information, problems can be diagnosed faster, a better quality of care can be provided, and resources can be used more efficiently. High level of attention should be paid to the security and privacy criteria for the implementation of IoT health systems [28]. Wearable sensors work through continuous and real-time recording of the patient's physiological states as well as pathophysiological information. Although wearable sensor technology is in its infancy, tremendous attempts have been made to approach flexible polymeric sensors. Among the various polymer candidates suitable for synthesizing flexible and wearable sensors, bio-based ones are of interest [29]. There are various studies related to wearable health devices.

For example, for a bulimia (eating disorder) patient in a hospital or home care setting, sensors in the patient's room can detect increased body temperature or blood pressure and even the smell of vomit. The sensors could be used to detect exercise abuse, such as excessive cardio exercise or accelerated walking activity compared to walking at a normal pace. As another example, in Alzheimer's disease, IoT can use geographical location to prevent the patient from wandering or other undesirable mobility behaviors. Alzheimer's patients often suffer from comorbidities that coexist with other diseases, such as hypertension, macular degeneration or diabetes. Therefore, suitable interconnected devices can capture data to monitor the unique signs and symptoms of these conditions [28].

Compared to conventional devices, wearable sensors have become increasingly important in the medical field due to their advantages in terms of portability and comfort. These applications are being developed in different diseases such as skin diseases and injuries, cardiovascular diseases, abnormal human movement inhibition, endocrine and metabolic disorders. From a patient care perspective, the widespread use of wearable sensors will facilitate the realization of remote healthcare and personalized medicine. In the context of unequal distribution of

medical resources, the widespread use of wearable sensors will benefit the diagnosis and continuous monitoring of patients in remote areas and promote the implementation of health metrics. Moreover, from the perspective of medical advancement, wearable sensors can collect user information that can become an integral part of medical big data, facilitate real-world medical research, and provide valuable information for disease diagnosis and treatment [30].

3.2.2. Mobile Health Apps

In the health sector, which has to adapt to the Industry 5.0 era, one of the most used innovations with technological developments is mobile health applications. Many important data such as patient follow-up, appointments, medication usage status can be collected through various applications. Warnings can also be sent to people through push notifications to encourage healthy living habits. Mobile applications are also being developed for healthcare personnel to help them in their work.

Workload in health services is one of the most important social and economic problems worldwide, especially in aging societies, requiring high health expenditures and a qualified workforce. One of the most common complaints is dissatisfaction with long waiting times in hospitals. There is dissatisfaction with the inconvenience and unavailability of appointment times for patients with urgent needs. For these reasons, new mobile health app solutions are being developed, for example, to reduce waiting times in emergency rooms and alleviate the heavy burden of the existing healthcare system [31].

Security and violence are real problems in health services today. There are cases of horizontal violence, such as nurse's violence against nurse, as well as cases of violence from visitors or families towards health care providers or patients. Although medical institutions are equipped with video surveillance systems, IoT can be another layer that implements a zero-tolerance policy. For example, monitoring the movements of staff, patients and visitors can provide warnings of abnormal or threatening behavior. Biometric sensors can be used to detect signs of aggression or stress in people who enter or reside in these environments [28].

In a study of apps that offer support and treatment for a variety of mental health issues with a built-in chatbot feature, it was shown that chatbots have great potential to offer social and psychological support in situations where real human interaction is not preferred or possible, such as connecting with friends or family members or seeking professional support. The disadvantages include risks such as over-reliance on technology, isolation and inadequate help in times of crisis [32].

Many ways of monitoring in hospitals can be designed. Health workers may try to keep some equipment, such as serums or oxygen cylinders, in their departments for future use. A small number of shared equipment in a hospital, such as ECG machines, IV pumps, and patient-controlled analgesia (PCA) drug pumps, can be tracked via an IoT. October October, in addition, the use of such equipment will attract the interest of individual units and management, as well as insurance companies, in documenting the need for additional equipment. IoT can also be used to monitor equipment that needs to be refilled or calibrated, such as oxygen cylinders, and to alert personnel in such situations [28].

In an acute or long-term care environment, low-cost barcode labels allow many materials to be labeled for scanning, making it easier to charge from the patient's account. Such materials can also be tracked using an IoT while being delivered from a warehouse or administered to a patient. In some cases, the location of a product can be detected faster when a barcode label is

used. Traceable items include disposable items such as dressings, different types of catheters, and personal care products. In the home environment, medical supplies can be marked with barcodes to monitor usage and alert the home care team when a product is overused or supply is too low [28]. Also in the field of dentistry, some materials that are not always used but are expensive (for example, whitening gels, oral measurement materials, etc.) can be tracked with the barcode system. Priority use of products with expiration dates can be provided.

3.2.3. Artificial Intelligence (AI) Applications

Artificial intelligence is used to tell computers to have a thinking ability similar to humans. In health services; analysis of big data, epidemiological studies, diagnosis and treatment processes of diseases (for example, radiological examinations, mammography, etc.), artificial intelligence can be used at many stages, such as determining risk factors. Machine learning is a sub-branch of artificial intelligence. Machine learning is used in the analysis of patients' medical histories, determination of risk factors and evaluation of treatment options [25].

Healthcare services are one of the cornerstones of the global economy and are undergoing a major transformation with the impact of developments in science and technology. Digitalisation in administrative and clinical processes and new automation steps have become routine. In particular, artificial intelligence applications have rapidly integrated into the healthcare sector and contributed to the reduction of costs by being used in both management and clinical processes. In clinical processes, artificial intelligence aims to minimise human errors and increase service quality by accelerating diagnosis, diagnosis and treatment processes [33]. The intended use of artificial intelligence is summarised in Table 3.

Table 3. Application Areas of Artificial Intelligence in Healthcare Services

Management Purposes	For Clinical Applications
-Documentation Operations -Tele-Health -Cost Management -Quality Processes -Optimum Evaluation of Hospital Capacity	-Diagnosis -Treatment Processes -Medical Research -Home Health Services -Detection of Disease Risks -Prevention of Malpractices -Evaluation of Radiological Images

Source: [33].

Artificial intelligence reduces both administrative and clinical costs by restructuring service processes in healthcare. By accelerating processes such as diagnosis, diagnosis and treatment in clinical processes, it reduces human interaction and aims to increase service quality [33]. Machine learning techniques could potentially offer new ways to learn human behavioral patterns; identify mental health symptoms and risk factors; develop predictions about disease progression, and personalize and optimize treatments [34].

3.3. Current Practices in Healthcare

With the developments in technology and industry; quantum computers and artificial intelligence-assisted gene editing, applications in the field of molecular biology and genetics, neuralink interventions (e.g. To the cerebral cortex), the software used in patient follow-up is increasingly entering human life [25]. For example, in Turkey, patients can make an appointment with a specialist physician in the branch they need (by checking the day and time of availability) via telephone or mobile application (Central Hospital Appointment System). They can view their past appointments, test and examination results and radiographs through

the system called e-pulse. There are also some additional applications such as e-pulse, family medicine information system, decision support system in Turkey.

The high prevalence of mental illnesses and the need for effective mental health services, combined with the recent developments in artificial intelligence, have led to an increase in research that the field of machine learning can be used for the detection, diagnosis and treatment of mental health problems. Until now, most of the designed models have rarely been tested for use in clinical settings, which has left gaps in practicality, acceptance and effectiveness assessments for improving mental health-related outcomes or services [34].

The outbreak of the COVID-19 crisis has shown a negative impact on the mental health of the population. Mobile health has the potential to help meet the psychological needs of existing and new patients during and after the pandemic. Of the 16 apps analysed in the research, 10 were meditative in nature. The number of downloads of 13 apps has increased, and the number of downloads of 11 apps increased by more than 10% after the pandemic started. Although popular apps are satisfactory in terms of functionality and aesthetics, they lack a clinical basis and evidence base. There is a gap between app quality and app popularity [35]. This shows that not all current applications should be trusted infinitely. As well as the benefits of applications, there may be situations where they do not work.

4. DISCUSSION AND RESULTS

In this study, the effects of developments in technology on the field of health have been examined within the scope of literature and the results of the current situation have been tried to be revealed. Considering that digitalization will increase rapidly and will play an important role in every field, it is foreseen that research in the field is of great importance. Industrial revolutions and their consequences bring with them very important differences from a social point of view. It is estimated that the development of projects aimed at digitalization in the health sector and new discoveries will make important contributions to the direction of the scientific world. Smart health applications have also come to the forefront during the transition from industry 4.0 to 5.0. With the industrial developments, smart devices have become useful for humanity and have made life even easier. Especially in aging societies, machines and robots play major roles in improving people's quality of life and protecting their health. In line with this goal; health solutions such as mobile health applications, artificial intelligence-supported robots, smart devices with wearable sensors have been developed.

Just as humans may prefer machines that can feel and learn to other humans, dystopian or utopian scenarios are no longer a far-fetched idea. With Industry 5.0; It is expected from industry, health and society to adopt an approach that solves such problems by creating common living spaces with new generation machines. Nowadays, it is foreseen that new technologies are used in many areas such as health, economy, education and social life; a future that can offer a higher level of well-being, environmentally friendly and high-quality life may be possible with Society 5.0 [16].

For doctors and other health professionals, the environment in which they can best monitor patients with chronic diseases is the patient's natural habitat. Observations made in hospitals may not accurately reflect patients' natural living conditions, such as their daily activities and stress levels. For these reasons, portable monitoring devices are needed to be able to monitor patients in their daily lives. Monitoring devices send the data they receive from patients to health service providers (hospitals, insurance companies, etc.) by transmitting wirelessly, it provides instant and continuous information about patients. These data help doctors to make

more informed and timely decisions, better understand the patient's condition and optimize the treatment process. At the same time, stakeholders such as insurance companies can make more accurate assessments about the health status and needs of patients thanks to these data. This both enables the development of patient-specific health services and can increase the overall efficiency of health services [27]. In general, the Industry 5.0 paradigm has brought about a change of basic research goals from sustainability to people-oriented. From a management perspective, this means focusing on employee training and lifelong learning, rather than focusing on the acquisition of new technology or similar. Compared to Japan and South Korea, the US and the EU still do not invest enough in employee education, which is becoming an important issue [21].

In a study that examined research conducted based on wearable health applications based on the Internet of things, it was found that the authors focused on establishing correlations between conditions such as fitness, anger and stress control, abnormal heart activity and hypoglycemia by using cardiovascular system data. It has been determined that some of the studies are on live subjects or intelligent systems using data sets. These intelligent systems are based on machine learning and deep learning technologies. The Researchers; it has been observed that they use measurements such as ECG, pulse, body temperature and body acceleration based on wireless sensor networks. In particular, it has been observed that studies on systems that provide follow-up of neurological diseases such as Multiple Sclerosis (MS), Parkinson's and epilepsy in daily life are gaining momentum. Thanks to intelligent devices and algorithms for the management of such diseases, the health status of patients can be constantly monitored. It is possible to make more accurate predictions about the symptoms of diseases. This enables the personalization of health services and the implementation of more effective treatment methods [27].

In order for people to make their decisions based on real-time data, efforts should be made in the areas of data collection and interpretation through various useful reports. Efforts are also being made to create robots that are autonomous and can cooperate with humans. However, these efforts should be carried out taking into account their impact on sustainability and durability. On the one hand, there are organizational, social and ergonomic aspects of technology that people should have at their disposal, while on the other hand there is energy reduction to satisfy the environmental aspects. The important thing is to maintain a balance between all the basic segments in the context of new paradigms, but to keep the human being at the center at all times [21].

Although the Internet of things is still a new concept for most health professionals, its use in health services is inevitable. A more in-depth evaluation of the benefits of IoT technologies should be encouraged [28]. In the Industry 5.0 period; it can be expected that individuals will use and manage their vital signs with smart devices on their own initiative, providing appropriate care for individual health by encouraging some protective measures to be taken. By bringing human and environmental needs into perfect harmony with production processes, it is aimed to continuously improve process data, services and products together with the infrastructure provided by intelligent systems.

Nurses are usually at the bedside of patients and are the people who should be most comfortable with these technologies. Patient monitoring can take place in hospitals and outside our communities through IoT. In populations that are monitored through telehealth and are not easy to reach, nurses can more easily care for patients who may be overlooked. The IoT can enable monitoring and communication that has not been available until now. in 2013, it was reported that there are two internet-connected devices per person and it is predicted that this number will

be more than 6 by 2025. As new IoT systems are developed and used, the quality of care will be able to increase by reducing human contact with patients [28].

Many biometric parameters such as EEG, ECG, blood pressure and blood sugar can be taken from patients' bodies through wearable devices with artificial processing units (AI and NPU-Neural Processing Unit). Thanks to these devices, patients can access instant information about their health status without going to the hospital. The devices are not only limited to simple biometric measurements, but can also be equipped with technologies that may be an alternative to diagnostic methods such as MRI and ultrasonography in the future. For example, wearable devices equipped with chips with NPUs that provide regional body simulation can detect lesions developing under the skin or changes in internal organs. Thus, any health problems that develop in the patient can be determined in advance and rapid intervention with early diagnosis may be possible. Such technologies will be of great benefit, especially for situations where early diagnosis is critical, such as chronic diseases and cancer [27]. It is envisaged that the development of solutions for the elderly population in the technological environment, ensuring the sustainability of the natural environment and making improvements in basic areas such as health and education, policies that harmonize technology with society in general will provide significant added value in the future [15].

The difficulties associated with short-range and long-range communication technologies are related to the fact that network performance (delay, packet loss, etc.) lack of stability, high cost of communication services and lack of high-level skills of an experienced surgeon who performs the most complex tasks in surgery remotely can be considered among the disadvantages in the field of health [3].

Industrial revolutions are a long and ongoing adventure from Industry 1.0 to Industry 5.0 for now. With the development of technology every day and the changing human needs, it is possible that new industrial revolutions will take place in the future. Industrial revolutions are a long and ongoing adventure from Industry 1.0 to Industry 5.0 for now. With the development of technology every day and the changing human needs, it is possible that new industrial revolutions will take place in the future. Come and get it. in the screening study of research involving the keyword Society 5.0 In a study conducted by Akın et al. (2021) on the scanning of studies containing the keyword Society 5.0 between 2017 and 2019, it was determined that the most research was conducted in 2019 and in Japan. This result shows that there has been an increasing interest in the subject in recent years.

5. CONCLUSIONS

In the Industry 5.0 world, it is thought that detailed studies involving all stakeholders and devices in the healthcare sector are needed. Health, industry and society are systems that have to be intertwined with each other. Nowadays, technologies are renewed at very short intervals, current inventions enter our lives and are made available to the new generation. Therefore, a good understanding of the 5.0 world will prepare industry representatives, researchers and healthcare enterprises for the next generation of developments.

Focus should be on analytical thinking, adapting to new technologies, increasing people's competencies and learning processes. Awareness studies should be conducted so that creative and innovative approaches can be adopted by the society. Current artificial intelligence technologies that will meet the future needs of the society and make their lives easier can be developed. New technologies should be examined in depth, priority areas should be determined as in the health example, and the contributions of technological developments in terms of social

health should be analyzed. Deficiencies and in which areas the need is prioritized should be determined, and the direction of research for human health should be determined.

Since it is predicted that outbreaks such as COVID-19, which prohibit people from leaving their homes, cause many workplaces to close or be closed, and trigger unemployment, may continue in the future, people may have to meet their needs, especially in education and health, with e-based methods. Some jobs done by people (e.g. environmental cleaning, driving, etc.) will be taken over by robots. Although some of the duties of healthcare professionals (patient registration, laboratory tests, etc.) may decrease in the Industry 5.0 era, human capital (healthcare workers) is expected to maintain its importance. The dynamism in medical services necessitates working together with many different sectors. Suppliers should take digital health steps by also highlighting the features that distinguish the healthcare sector from other areas (quality, safety, irreversibility, etc.). In some areas (e.g. mental health, surgery, etc.) it may be suggested to conduct new studies with current developments in the Industry 5.0 era.

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