

Digital Healthcare Industry and Technology Trends

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Abstract—Healthcare is an enormous industry based on legacy systems, which can lead to inefficiencies. While governments and medical companies have long been the main investors, major tech companies including Google, Microsoft have started investing more into digital health. Moreover, with the global pandemic of COVID-19 around the world, discussions about digital healthcare are once again emerging. This has caused a major shift in areas of focus within digital health as new technologies emerge and regulations evolve due to combined expertise. In this paper, we will look at the digital healthcare industry, policies, and technologies.

Keywords– Digital healthcare; Healthcare; Big Data; AI

I. INTRODUCTION

Recently, as it became known that Canada's artificial intelligence platform BlueDot was the first to recognize the risk of a new Coronavirus disease (hereinafter referred to as COVID-19), the convergence of ICT technology in the medical field is drawing attention once again.

In addition, some types of telehealth were temporarily allowed on the occasion of the global pandemic of COVID-19, confirming domestic demand for telemedicine. 'Telehealthcare' was selected as the most necessary non-face-to-face technology after COVID-19 to improve medical accessibility of the vulnerable [1].

Even prior to COVID-19, the demand for the digital healthcare industry was expected to continue to increase as the trend to manage one's own health in daily life spread through aging, rising income levels, and the development of smart devices and sensor technology. As COVID-19 is expected to increase the demand for non-face-to-face medical care, the need to revitalize related industries is becoming more prominent [2].

Therefore, in this paper, we will look at the digital healthcare industry, policies, and technologies.

II. DIGITAL HEALTHCARE INDUSTRY

With the development of the information age, a new era of medical information is opening, and the direction of the development of healthcare services from telemedicine to digital health is rapidly changing. In addition, various technologies are being developed together, and the term collectively referring to the age of healthcare is constantly

changing [3]. In a report on the digital health industry prepared by Deloitte, a global consulting firm, for the Office of Life Sciences in the UK, digital health was classified into four sub-sectors as shown in "Fig.1" [4].

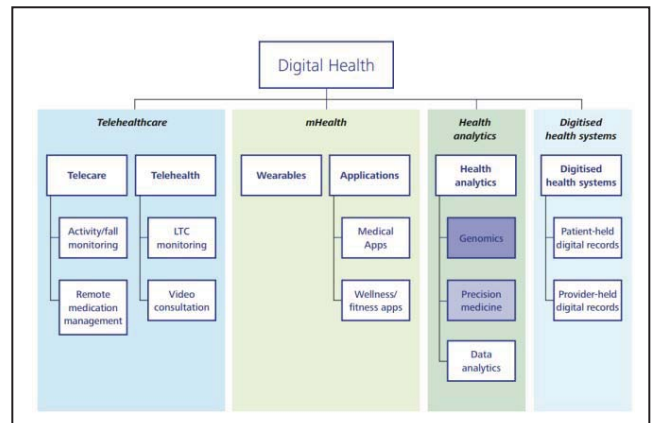


Figure 1. Digital health industry sub-sectors

Telehealthcare can be seen as a telemedicine, non-face-to-face medical service industry. Until now, health care services have been made in a way to visit a hospital when symptoms of a disease appear, diagnose the disease according to the symptoms through various tests, find a treatment method according to the diagnosis result, and implement it to remove or relieve symptoms. Telehealthcare remotely exchanges clinical data between patients and doctors, and provides medical services from long distances using ICT technologies. Advanced information and communication technologies such as IoT, mobile, big data, artificial intelligence, and cloud technologies are actively fused to make effective and efficient non-face-to-face healthcare possible [2].

The second "mHealth" area includes wearable devices and related applications. In other words, it uses wearable devices to monitor activity levels, heart rate, or sleep patterns and provides mobile applications (apps) as software-based health solutions related to health and well-being, from consumer-oriented well-being and fitness apps to expert-oriented medical apps. Wearables are inevitably essential in all areas of digital healthcare.

The third "Health Analytics" covers various areas such as data mining, advanced analysis, and data visualization.[4] Healthcare analytics is growing in importance, fueled by health industry stakeholders' thirst for information; the need to manage large, diverse data sets; increased competition; growing regulatory complexity; and innovations ranging from precision medicine to value-based care to population health management. Today, robust and meaningful analytics hold the potential power to transform a health care organization, unlock new sources of value, and differentiate it from competitors [5]. For example, in the area of healthcare analytics, you can diagnose real-time medical images based on artificial intelligence, learn vast amounts of data to find drug candidates related to specific diseases and genes, or collect, integrated and analyzed clinical information data of cancer patients from electronic medical records.

Finally, the "Digitised health systems" area includes functions of digital health information storage and exchange of digitized patient medical records [4]. Data resources such as personal genetic information, personal health information, electronic medical records and national health information are creating various values for the purpose of quickly discovering many diseases, developing new treatments, or enhancing work efficiency of medical institutions. As the Data 3 Act recently passed the National Assembly, opportunities for individuals and institutions to use data are expected to increase in the medical industry. Due to this, the industrial development in the personal health management sector was relatively sluggish, but it is expected that the extension of the medical industry could expand as innovative services using personal biometric information are released [6].

According to a report published in June 2020 by Global Market Insights, a global market research and management consulting company, Digital Health Market size was estimated over USD 106 billion in 2019 and the industry will grow at 28.5% CAGR through 2026 [7]. As shown in Table 1, according to a report by the Korea International Trade Association that predicts the market size by sector, the "mHealth" sector is poised to exhibit robust growth during the analysis period [1]. Growing number of COVID-19 cases across the globe has increased the adoption of digital health technologies and will boost the digital health industry growth.

TABLE I. GLOBAL DIGITAL HEALTHCARE INDUSTRY MARKET SIZE FORECAST ('19~'26)

Digital health industry sub-sectors	Market size (billions of dollars, %)				Annual Average Growth Rate (%)
	Year 2019		Year 2026		
	Money	Prop.	Money	Prop.	
Telehealth	45.5	35.1	175.5	27.1	21.3
mHealth	35.3	27.2	341.3	52.8	38.3
Health analytics	20.9	16.1	83.9	13	22
Digitised health systems	28	21.6	45.7	7.1	6.9

III. DIGITAL HEALTHCARE POLICY

In September 2020, the U.S. Food and Drug Administration announced it is launching the Digital Health Center of Excellence [8]. This appears to be an important step in furthering the agency's overarching dedication to the advancement of digital health technology, including mobile health devices, Software as a Medical Device (SaMD), wearables when used as a medical device, and technologies used to study medical products.

It is pointed out that Korea has great restrictions on the growth of related industries, such as the fact that doctor-patient telehealth is not legally allowed.[1] But recently, the government is also making various efforts to promote innovation.

The Ministry of Trade, Industry and Energy announced that it will designate the bio-health industry as one of the five new industries from 2017 and expand the R&D budget. Its absolute size accounts for the second largest share (21.7% of the total budget for the five new industries) after the new energy industry. Through this, it can be confirmed that the government will expand policy support for health projects in the future [9].

The Ministry of Science and ICT has been promoting the My Data business in which individuals can lead the distribution and use of data since 2019. This year, two medical tasks were selected to build a platform which could provide various health/medical services by personally managing and sharing health data [10].

The government is also actively promoting deregulation on new technologies such as the recent revision of the Data 3 Act. And in July 2020, the 10 major tasks to materialize the Korean version of the New Deal were introduced. Among them, the 'Smart Medical Infrastructure' project is aiming for the institutionalization and activation of non-face-to-face medical care, such as establishing a digital-based smart hospital capable of real-time monitoring of patients and cooperation with medical institutions [11].

IV. DIGITAL HEALTHCARE TECHNOLOGY

ICT convergence technology is leading the digital transformation based on the evolution of new forms of technology such as people-centered fusion, space-object-centered fusion, and industry-to-industry fusion. The digital transformation of healthcare is also evolving to keep pace. Non-face-to-face healthcare induces change from existing hospital-centered to consumer-centered, community-centered healthcare services, and the convergence of space and objects through IoT and wearable devices provides people with everyday healthcare free from time and space [2]. These ICT convergence technologies, namely, big data, Internet of Things, artificial intelligence, robotics, and blockchain are the main underlying technologies of digital healthcare [9].

It can be said that the core foundation driving innovation in healthcare is big data technology. One individual will create not only 0.4 TB of medical data and 6 TB of genomic data, but also 1,100 TB of environmental and daily life data,

which is an incomparable amount of data throughout their lifetime. It can be used significantly through big data technology [12]. For this reason, the medical community is attempting to change the paradigm from “evidence-based medicine”, which is the basis of existing medical treatment, to “data-based medicine”. Since “Evidence” can be said to have a form of knowledge processed from data, efforts to actively use source data to minimize errors and limitations that may occur in data processing can be said to be a natural change [6].

These data can be collected through Internet of Things (IoT) technology, which supports information exchange and communication by connecting all things based on the Internet. It is applied to wearable devices and monitoring hardware [3]. IoT-enabled technology makes it possible to grasp information about changes in a patient's real-time health status that does not exist in traditional medical information. Therefore, it contributes to enhancing the effectiveness of healthcare services by providing information necessary to detect, predict, and infer the patient's condition through life-log information related to the patient's behavior change and response [9].

The importance of artificial intelligence (AI) as a fundamental technology transforming healthcare continues to grow rapidly [13]. From diagnostic accuracy and patient care to medical research and drug development, AI is revolutionizing the healthcare sector. Advancements in machine learning and voice recognition are being touted by healthcare professionals as the way forward for delivering effective treatments and accurate diagnosis. Likewise, pharmaceutical and healthcare companies are recognizing the advantages of AI and are showing increased commitment to leveraging it to enhance offerings. Big data and AI technologies grant immense life-saving potential, making healthcare smart, helping prevent epidemics, and reduce maintenance and medication costs [14].

The demand for medical assistants and automated robots is increasing due to the need to improve medical productivity and reduce everyday mistakes. Robotics is being applied not only to surgical robots, but also to patient care and research robots [3].

Blockchain application in the medical field, including smart healthcare services, has the advantage of lowering the risk of information leakage through prevention of forgery of personal information, and increases the convenience and compatibility of medical information exchange through consistently structured data. After all, this is very effective in activating patient-centered medical information [15].

The domestic smart healthcare market is still formed around existing healthcare such as chronic disease management and telemedicine. Compared to the United States, SW technology and health care service technology, such as bio-signal measurement technology and feedback technology, show a gap of about two years or more, so it is necessary to expand new markets through discovery of new smart healthcare business models [9].

V. CONCLUSION

Healthcare is an enormous industry based on legacy systems, which can lead to inefficiencies. While governments and medical companies have long been the main investors, major tech companies including Google, Microsoft have started investing more into digital health [14].

Moreover, the COVID-19 outbreak is expected to further increase demand and investment in the digital healthcare industry. With the development of ICT technologies such as big data, IoT, artificial intelligence, robotics, and blockchain, digital healthcare integrating these technologies can effectively meet the rapidly increasing demand for medical services with aging. However, it is still inferior to advanced countries in terms of utilizing new technologies and attracting investment due to various regulations. If regulatory rationalization and market environment improvement are supported, the digital healthcare industry is expected to play an important role in realizing a healthy life by enabling the provision of routine healthcare services.

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