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## THE IMPORTANCE OF DIGITALIZATION TECHNOLOGIES IN THE MODERN HEALTHCARE SYSTEM

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### **Abstract**

Today, healthcare systems in many countries are facing a number of complex challenges, including increasing life expectancy, slowing the pace of population aging, and rising medical costs. The COVID-19 pandemic has demonstrated the need for economic and social changes in every country. One of the most significant consequences of the pandemic has undoubtedly been the rapid implementation of digital technologies across all spheres of life, including healthcare, which underscores the relevance of this topic.

The transformation of the healthcare sector encompasses many aspects, including the automation of various operational processes; the implementation of treatment algorithms and protocols; the introduction of electronic data collection on the functioning of medical institutions and patients' clinical indicators, followed by the application of statistical analysis methods; the use of user-friendly online and mobile applications; and the deployment of telemedicine tools and artificial intelligence systems.

The use of information technologies increases the efficiency of medical personnel and improves the quality of diagnostics.

### **Keywords**

healthcare, digitalization, artificial intelligence, telemedicine, electronic document management.

Recent technological advances observed worldwide have formed a new paradigm of socio-economic development, embodied in the comprehensive digitalization of all sectors [6,9,10,11,16]. Today, global processes of economic digitalization are gradually affecting all areas of economic activity. The healthcare system is no exception [1,3,6,7,8,10,13,17].

The specific features of the digital transformation of this sector are determined by the unique characteristics of the established relationships among the entities involved in organizing and implementing healthcare processes, as well as by the specific nature of the technologies applied. The rapid spread of digital technologies has attracted the attention of scholars to the study of the prospects and consequences of the new technological revolution [2,9,12].

The key components of the digital industry influencing business processes in healthcare include cyber-physical systems (CPS), the Internet of Things (IoT), the Internet of Services (IoS), and smart factories (SF) [2,9]. The digital industry is characterized by the extensive use of virtualization through the Internet and other distributed registries.

Currently, many developing countries are showing interest in the digitalization of healthcare systems and the technological advancement of all medical care processes. Modern individuals are increasingly focusing on maintaining a healthy lifestyle, and as patients, they are actively participating in collecting health data and accessing information resources.

Several key areas can be identified in the digital transformation of the healthcare system: remote patient monitoring, artificial intelligence (AI) systems, telemedicine, and mobile health monitoring tools.

Remote patient monitoring relies on electronic devices and wireless remote observation methods, enabling physicians to monitor patients' conditions online. For example, some authors emphasize that monitoring cardiac parameters in heart patients is effective through the use of portable implantable devices [5]. Thus, monitoring serves as a convenient tool for ensuring high-quality and safe patient supervision.

The introduction of artificial intelligence systems in medicine has several areas of application. First, it assists in surgical procedures. For instance, researchers provide examples of the use of robotics in surgical operations [8]. Second, it processes patient data and helps physicians diagnose diseases and prescribe

treatment. Artificial intelligence technologies make it possible to analyze data on patients' symptoms and support medical decision-making.

However, the implementation of artificial intelligence systems does not eliminate the need for direct interaction between doctor and patient, and the use of robotic technologies requires the supervision of qualified medical personnel.

Telemedicine is one of the rapidly developing high-tech areas of healthcare. Many researchers distinguish between two telemedicine systems: "doctor-to-doctor" and "doctor-to-patient." The "doctor-to-doctor" system includes lectures and consultations for physicians. The "doctor-to-patient" system involves remote communication between patients at home and healthcare professionals [2,3,7].

Thus, among the advantages of telemedicine are the simplification of organizing doctor visits, the provision of medical care in remote and underserved areas, and the reduction of infection risks for both healthcare workers and patients during outbreaks of infectious diseases.

Analyzing the strengths and weaknesses of telemedicine, researchers highlight certain limitations, such as the inability of a virtual provider to conduct a full physical examination of a patient, which is necessary for obtaining a complete medical history, making an accurate diagnosis, and prescribing treatment (3). This argument cannot be denied, since personal interaction with a physician allows for more comprehensive data collection, identification of hereditary predispositions to specific diseases, and assessment of the patient's psycho-emotional state.

Currently, there are hundreds of portable health monitoring devices available, and their number continues to grow each year. Specialized smartphone applications, as well as various gadgets such as bracelets, watches, and smart clothing, are highly popular (8). These devices can measure not only steps and heart rate but also, for example, blood pressure. V.V. Belik and co-authors emphasize in their work that mobile wireless sensor networks (WSN) and body local area networks (BLA) have become significant achievements in microelectronics and wireless communication (2). Their advantages include self-healing and self-organizing capabilities, the ability to transmit data over long distances with low transmission power, compact size, low energy consumption, and operation from autonomous power sources. Modern technologies continue to evolve, and active efforts are currently underway to develop innovative and universal gadgets.

When considering the issue of digitalization in healthcare, it should be noted that in most developed countries, the widespread introduction of automated information systems in medicine and pharmaceuticals began after the adoption of the eHealth Resolution at the 58th World Health Assembly in 2005. Digital

transformations open new opportunities for changes in healthcare infrastructure and for the development and implementation of technologically advanced devices, which in turn positively affect public health and quality of life.

P.S. Pugachev and his co-authors, studying global trends in the digital transformation of healthcare, emphasize the increase in national healthcare expenditures, noting that in some countries these expenditures exceed economic growth rates [4]. Thus, one of the key drivers of digital transformation in healthcare is the growth of investment in this sector.

Let us consider the 2023 Global Innovation Index (GII) ranking. The Global Innovation Index is calculated annually by INSEAD in cooperation with Cornell University and the World Intellectual Property Organization (WIPO) (16). It represents the arithmetic mean of the input and output sub-indices. The input sub-index reflects the factors and conditions necessary for innovation (institutions, human capital and research, infrastructure, market and business sophistication), while the output sub-index demonstrates the results of innovative activity and the effective use of innovation potential (scientific and creative outputs).

Of the 81 indicators included in the GII, 54 are input indicators characterizing a country's innovation potential, and 27 are output indicators reflecting the effectiveness of utilizing this potential. Each indicator is standardized on a scale from 0 to 100. The input and output sub-indices are calculated as the arithmetic mean of all their respective components.

The 2023 Global Innovation Index shows that the top positions in the ranking are occupied by countries with developed economies, high investments in science and education, and well-developed innovation infrastructure (10). Switzerland, Sweden, the United States, the United Kingdom, and Singapore are among the top five. These countries possess highly qualified personnel, rapidly developing innovation clusters, and strong research bases.

This ranking was compiled by Bloomberg analysts using data from WHO, the UN, and the World Bank, taking into account parameters such as average life expectancy, public healthcare expenditures (as a percentage of GDP), and per capita healthcare spending. A scoring system is applied to assess the efficiency of a country's healthcare system: the higher the life expectancy and the lower the expenditures, the more efficient the healthcare system is considered to be.

Many scholars in their research identify key challenges of the digital economy for healthcare: the development of new methods for record-keeping, patient databases, and access to such data; the implementation of telemedicine; and the application of mathematical and artificial intelligence methods in medical data

processing [2,3,6,9]. Addressing these challenges helps improve the effectiveness of medical care through timely diagnosis and the reduction of medical errors.

Based on the above, it can be concluded that the most in-demand projects today include predictive analytics and areas related to the analysis of digital diagnostic images.

The healthcare system of New Uzbekistan is actively introducing services and mobile applications that facilitate access to medical services [1]. Today, the digitalization of healthcare has been defined as one of the national priorities of our state.

By analyzing the programmatic aspects and outcomes of healthcare digitalization in the Republic of Uzbekistan, it can be concluded that the digital transformation of the healthcare system has been identified as one of the most important components of the country's socio-economic development.

Based on Resolution No. PQ-415 of the President of the Republic of Uzbekistan, dated December 28, 2023, "On Additional Measures to Accelerate the Digitalization of the Healthcare System and the Introduction of Advanced Digital Technologies," information systems in the healthcare sector are being improved and new electronic platforms are being launched to ensure that medical services provided to the population are high-quality and comprehensive.

In this regard, large-scale efforts are being carried out to digitalize the activities of medical institutions across all regions of the republic. Today, modern digital technologies are being introduced into all healthcare institutions in every region of the country, including the Republic of Karakalpakstan. In particular, the "Electronic Polyclinic" and "Electronic Hospital" information systems have been upgraded, and the "Unified Medical Information System" (DMED) has been created and is being implemented in medical institutions throughout all regions.

To ensure the implementation of the system, numerous qualified IT specialists with sufficient expertise in information and communication technologies are being mobilized within regional medical associations. Unlike the previous system, the new system has digitalized patronage services, ensured the generation of statistical data in real time, provided adequate protection of patients' personal data, and integrated various information systems.

As a result of the implementation of the "Unified Medical Information System," the following outcomes have been achieved:

- If a patient previously waited 40 minutes for a doctor's appointment, online booking has reduced the waiting time to 10 minutes;
- The possibility of storing patients' medical data generated during polyclinic visits in electronic form has been created;

- The system has been integrated with the State Personalization Center, MIS-2, and Electronic Government platforms;
- Through facial recognition programs, an immediate service mode has been introduced, eliminating the need to request identity documents from patients.

As a result, medical information about a patient can now be obtained in real time at any medical institution.

**Conclusion.** Based on the conducted research, it can be concluded that the digitalization of healthcare is aimed at improving the quality of life of the population. The active implementation of information technologies such as telemedicine, remote patient monitoring, artificial intelligence systems, and portable self-management devices can enhance access to medical services. Digital healthcare programs can increase the accuracy of diagnoses and reduce the bureaucratic workload of medical personnel.

The key participants in the digitalization process include the government, investors, manufacturers of computer equipment, medical institutions, and healthcare service providers. In recent years, there has been a noticeable increase in investments directed toward projects focused on creating and improving services and mobile applications that facilitate access to healthcare; systems and platforms for diagnosing various diseases; and projects in the field of predictive analytics.

However, despite private investments in the digital transformation of healthcare, as well as significant state support through legislative measures and regional budget allocations, the implementation of digital technologies in medicine in Uzbekistan still lags considerably behind leading countries.

The data presented in this article demonstrate that the use of digital technologies in the healthcare system is an essential element for the future successful development of the healthcare system of the Republic of Uzbekistan. Therefore, in order to maximize the potential of digital healthcare in New Uzbekistan, it is important to continue attracting investment in digital technologies, to develop and implement new artificial intelligence platforms, and to equip medical institutions with the necessary equipment and electronic devices.

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