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DIGITAL TRANSFORMATION IN TURKISH HIGHER EDUCATION

Research article

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Abstract

This study examines digital transformation-oriented priorities and practices in Turkish higher education. While digital technologies are gaining importance in every field with Industry 4.0, the business-human-technology relationship has entered the digital transformation process in a broader and systematic framework. Many digital technologies, such as blockchain, big data, artificial intelligence, and the Internet of Things, have occurred in almost all sectors. While the digital transformation process, accelerated by the fourth industrial revolution (Industry 4.0), increases the use and functionality of technology, digital technologies have become indispensable parts of individual and social life. While the digital transformation process increases the need for human resources with digital skills, digital technologies, which have gained importance with digitalization, have also led to the development of new professions. The digital transformation process has affected higher education as well as all sectors. Many digital-dimensional applications such as blockchain, metaverse, and digital twin, where digital technologies gain prominence in higher education, have begun to take their place. Turkish higher education also has a strategic role in the digital transformation process, training human resources, developing education and career relations, and university-industry cooperation. Implementing digital transformation-focused programs in Turkish higher education and training human resources sensitive to the digital economy has become more critical than ever in the digitalizing world. In this context, the first part of the study examines the concept of digital transformation and higher education. The second part reviews Turkish higher education's digital transformation goals and practices.

Keywords: digital transformation, industry 4.0, higher education, turkish higher education

1. Introduction

Industry 4.0 has accelerated the digital transformation, and digital technologies have appeared in almost all sectors. The field of higher education is also affected by digital transformation and must prioritize digital technologies in education policies and practices. Turkish higher education also actively uses digital technologies in teaching, research, and management processes with many applications such as Blockchain technology, artificial intelligence technologies, cloud computing technologies, NFT (non-fungible token), metaverse (virtual universe), and digital twin. Higher education is one of the priority areas where digital transformation should be prioritized in educational practices, research, and university-industry cooperation policies.

Digital transformation is increasing its impact in almost all sectors and all areas of life. Staying away from this influence or not perceiving the digital transformation process adequately means falling behind competitive conditions. Higher education should use digital technologies and develop new ones due to their ability to affect all sectors. As a matter of fact, with the increase in digital technologies, new technologies such as Blockchain, big data, artificial intelligence, internet of things are rapidly developing, while interest in new concepts

such as smart businesses, cryptocurrencies, autonomous vehicles, and sustainability is also increasing (Deng et al., 2021: 126).

While these concepts did not come to the agenda very often in the recent past, digital technologies and concepts have rapidly taken their place on the world's agenda with the pandemic that has affected the whole world and confined life to homes, away from the streets, workplaces, and social life. Digital transformation, which came to the fore with the fourth industrial revolution, has further increased the use and functionality of technology with the COVID-19 pandemic, and digital technologies have become indispensable parts of individual and social life. Social media was mainly used heavily during the pandemic period. Social media offers many opportunities that provide access to information, where new information can be shared instantly, new information can be learned, communication and coordination activities can be carried out with the masses, and people can be reached quickly in disasters, epidemics, and similar situations (Demir, 2023: 90).

While digital transformation includes using digital technologies and transferring data to the digital domain, it also includes interconnected internal and external components in a more systematic structure. It consists of the transformation of information into meaningful data. Social life, which started with hunting, turned into agriculture, industry, and information society, and Society 5.0, put forward by the Japanese, began to be described as a super-intelligent society (Saracel and Aksoy, 2020: 26). Considering this process, it is put forward that with the use of robots in production, unemployment will gradually increase, the role of unions in social life will decrease, and new regulations in the field of labor legislation will be inevitable (Yankın, 2019: 1).

The digital transformation process, which continues to develop with the influence of Industry 4.0 or the fourth industrial revolution, which constitutes the fourth phase of the industry, has various effects on the individual and social areas. Personal e-mail accounts, smartphones, service provision in the public sphere with e-government applications, e-recording, documentation, and storage, etc., created with digital technologies in education, unmanned production organizations, and robotic technologies called dark factories, etc. Therefore, as in every field, businesses have tried to use Industry 4.0 technologies to achieve this transformation. Thanks to the data obtained from these technologies, strategic decisions such as real-time monitoring, prediction, decision-making, and adaptation are made (Çalış-Duman, 2022: 190). On the other hand, the increasing importance of digital technologies in production and business life brings up issues such as employee performance and job satisfaction. In contrast, applications such as remote working are being developed. Job satisfaction can affect both depression and self-esteem.

It would be unfair to think of industrial revolutions as only the production and use of specific technologies. These revolutions are a world and human revolution (Özdoğan, 2017: 30). With industrial revolutions, not only technology changes but also labor relations, education, social life, and many practices. Industry 4.0 shows an integrated structure with digital transformations, smart factories, and the Internet of Things, where robotic technologies will replace human resources. The spread of robotic applications and the evolution of human resources to robotic resources direct human resources management towards new expansions (Şendoğdu, 2020: 163). For this reason, Industry 4.0 and Industry 5.0, which have radically changed life and what they bring, should be analyzed very well. While the Industry 4.0 era contains essential opportunities for businesses and countries that perceive the realities of the period correctly and take precautions, it will become a threat for countries late in perceiving these realities (Asiltürk, 2019: 542). For digital transformation to occur, it is essential to include some applications that include basic digitalization steps in the education system. In the digital

transformation process, all elements of education, face-to-face, distance, online and offline, must be used together (Özen, 2019:7). Strengthening access to education, providing personalized learning and teaching solutions with the help of digital technology, active use of virtual reality applications and cloud-based learning opportunities, increasing access to the internet, cyber security, and active use of artificial intelligence technologies constitute the priority actions of digitalization in education. In this study, considering the developments in the industry and the increasing impact of digital technologies in every field, digital transformation and higher education are examined in the first part, and digital transformation in Turkish higher education is reviewed in the second part.

2. Digital Transformation and Higher Education

Digital transformation is a holistic transformation in human, business processes, and technology elements to provide more efficient and effective product, service, and application processes. The digitalization process, which started in the 1950s, has led to the emergence of many new technologies, such as cloud computing technology, artificial intelligence, data mining, and the Internet of Things (Alptekin & Türkmen, 2023: 2). Digitalization, which refers to the transfer of data to the digital domain and the use of digital technologies, should not be confused with digital transformation, which includes broader and interconnected internal and external components and the transformation of information into meaningful data. In other words, digital transformation does not only refer to digitalization but also to interconnected internal or external stakeholders, the creation of a digital content pool, the transfer of data to the digital space, and the use of this data/data to create insights in many areas, including decision-making. Digital transformation aims to improve business processes, efficiency, productivity, costs, and customer experience and combine the interaction and communication of internal and external stakeholders with a systematic understanding.

While the development of digital technologies has introduced many new technologies such as blockchain, digital twin, big data, artificial intelligence, internet of things, cloud computing, and augmented reality into living spaces, innovative businesses, cryptocurrencies, autonomous vehicles, and new concepts, digital education networks, digital Applications such as agricultural market, e-commerce, e-signature, and e-doctor have gained importance in almost all areas.

The digital transformation process, which continues to develop under the influence of the fourth industrial revolution known as Industry 4.0, is observed in various ways in the individual and social areas. Industry 4.0, which includes intelligent mobile phones, personal e-mail accounts, e-government applications and service provision in public places, e-recording in education, documentation and storage, unmanned production organizations, and robotic technologies called dark factories, constitutes the fourth phase of industrial revolutions, is transformation. It covers the process. When we look at the industrial revolutions in general, Industry 1.0 refers to the use of machines powered by water and steam power, Industry 2.0 refers to machines powered by electric power and mass production, Industry 3.0 refers to manufacturing automation and computer-controlled production, and Industry 4.0 refers to the digitalization of the industry, referred to as Industry 5.0 or Society 5.0. It refers to a smart society integrated with technology. Regarding content, Society 5.0 represents an understanding that aims to use the developmentally acquired knowledge of humanity to benefit humanity (Er et al., 2021: 27).

Rapid technological developments in the industry show that robotic technologies will replace human resources, and a structure integrated with smart factories and the Internet of Things will develop. The spread of robotic applications and the predominance of human

resources in robotic technologies direct human resources management toward new expansions. For this reason, the effects of the Industrial Revolution, which radically changed life, should be analyzed very well. Institutions that perceive the Industry 4.0 and especially Industry 5.0 processes correctly and significantly higher education institutions will have an advantage in becoming more efficient and offering competitive human resources, products, and services. Society 5.0 aims to increase the welfare level of society by taking advantage of the opportunities provided by technology and producing technology-based solutions to social problems (Sağlam & Çetintaş, 2022: 81).

To successfully carry out digital transformation processes, some applications that include basic digitalization steps and improve the digital skills of human resources must be included in the higher education system. Especially in higher education, using face-to-face, distance, online, and offline all elements of education together, strengthening access to education, providing personalized learning and teaching solutions with the help of digital technology, active use of virtual reality applications, and cloud-based learning opportunities, increasing access to the internet, artificial intelligence technologies. Active use of technologies such as blockchain technology and digital twin technology is essential for the success of digital transformation.

As digital technologies and the digital transformation process gain importance in every field, digital transformation in higher education has gained a new dimension in education and training activities, with human input, financial input, and technology taking their place in all processes. All inputs traditionally used in the management process (incredibly human, technology, material, and all others) require re-evaluation with technology. The success of the digital transformation process in higher education requires considering the system's internal and external inputs and stakeholders and the realities of the digital age in management processes. The digital transformation process in higher education includes not only the use of digital technologies but also the interaction and integration of the internal and external structure of the system. Industrial revolutions have changed technology in higher education and educational practices, research, collaboration, and many other practices.

On the other hand, giving face-to-face or digital courses in higher education is also among the issues that need to be addressed together. In other words, although face-to-face education is active, every higher education institution should develop the infrastructure to carry out educational activities in the digital environment.

3. Digital Transformation in Turkish Higher Education

Digital transformation in Turkish higher education refers to the holistic transformation of human and business processes and technology elements. Integrating digital technologies and university-industry cooperation studies, based on implementing Industry 4.0 concepts in higher education institutions, constitute essential components of digital transformation in Turkish higher education. In this context, the use of digital technologies, university-industry cooperation, and the digital transformation project in higher education are evaluated under this heading.

3.1. Use of Digital Technologies

Transferring management work and transactions to the virtual environment is necessary for the system's efficiency and the interaction and access to the system of all other internal and external components with which higher education is in relationship. For example, with blockchain technology, transcripts of all students can be transferred to the virtual environment, and all other relevant institutions can access the system in the virtual environment, wherever they are in the world. For example, with NFT (non-fungible token) technology, virtual copies

of many assets, mainly works of art, can be transferred to the digital space, and changing or copying them is impossible. In this state, it is possible to preserve its existence. On the other hand, a virtual environment is created with metaverse technology, and it is possible to give various courses in a virtual environment. Giving courses on metaverse campuses (implemented at Yıldız Technical University in 2022) has been started in Turkish higher education, as is the case worldwide. Considering other examples, for example, in law, the implementation of data & cyber law, digital regulation law, e-commerce law departments, the inclusion of virtual classroom management training and courses in educational programs, the dissemination of digital twin technology applications in universities (2022 at Istanbul Technical University). Many similar digital transformation-focused applications have begun to take their place in higher education.

3.2. University-Industry Corporation

University-industry cooperation directly relates to developing universities' research capacities and meeting the labor market's workforce and technology needs. Encouraging workplace-oriented education, allowing universities to establish technology transfer offices, employing scholars in scientific research projects, and employing postdoctoral researchers can also be evaluated in this context. On the other hand, within the scope of university-industry cooperation, one of the essential components is to train human resources with the qualifications needed by the industry, have advanced digital skills, and constantly cooperate with sector representatives in the more active development of employment-oriented policies and practices.

The digital economy is where digital technologies predominate and online connections occur between people, businesses, data, technology, work, and transactions. In these activities, there is a process in which people, organizations, and machines work interconnectedly with Internet technologies, mobile technologies, the Internet of Things (IoT), and digital technology. This process is not a structure that works alone but involves advanced technologies, human resources equipped with digital skills, and a systematic collaboration focused on digital transformation. In the digital economy, it is essential to provide higher education with a structure that supports digital skills, new professions, and university-industry cooperation. In this context, CoHE 's efforts to implement initiatives, projects, and practices to improve digital transformation and university-industry collaboration in higher education have accelerated in the last decade. Projects such as vocational schools established in organized industrial zones (CoHE, 2021) are implemented to strengthen university-industry cooperation.

Within the scope of the ‘CoHE 100/2000 Doctoral Scholarship Program’, which was launched with the slogan "Raising strong generations for the next ten years," the project to provide scholarships to those doing doctorates at state universities in 100 priority thematic areas needed by Turkey (CoHE, 2021) is one of the notable initiatives in this context.

Within the scope of the Action Plan for the Development of University-Industry Cooperation (CoHE, 2021), supporting students studying at the undergraduate level in science and engineering sciences to provide practical training in their fields, training human resources with the qualifications needed by the industry and high application and skill competence, and establishing employment-oriented policies in higher education. In countries that have developed in technology and industrial production, the University-Industry Cooperation Commission (CoHE UIC) was established within the scope of studies focusing on university-industry cooperation, which is the key to development.

On the other hand, the ‘ASELSAN Academy Graduate Program,’ approved and implemented by CoHE in 2017 with the understanding of a "fourth-generation university," has produced its first graduates as of 2020. This program can be considered an essential

contribution of CoHE to the industry in national technology development in terms of scientific postgraduate theses having direct industrial outputs (CoHE, 2021). The University-IV Industry Cooperation Commission was established within the Council of Higher Education at the beginning of 2019 to ensure that the education curricula and R&D studies of universities are of a quality that meets the needs of the industry and where stakeholders such as universities, various sectors of the industry, as well as public and techno-parks, are represented, is also in this regard. It can be said that it plays a vital role in this regard.

3.3. Digital Transformation Project in Higher Education

To properly structure the requirements of digital transformation components in higher education, the "Digitalizing YÖK" project has been launched by the Higher Education Council (CoHE) in Turkey (Taşlıbeyaz&Taşcı, 2021: 173). The digital transformation project in higher education was implemented with the Council of Higher Education's (CoHE) digitalization of the CoHE motto and quality-oriented approach. The arrangements made/planned to be made within the scope of the digital transformation project in higher education (CoHE, 2019) are summarized below.

Digital literacy lessons: Within the project's scope, digital literacy lessons were given to students and faculty members. Digital literacy courses cover a range of digital skills related to using smart devices, reading and understanding digital data, accessing information, and producing and sharing information. Digital literacy can also be considered the digital dimension of traditional literacy. When viewed as such, several digital skills, such as critical and creative thinking, reading comprehension and interpretation, digital citizenship, cyber security, and electronic services, can also be considered within the scope of digital literacy.

Learning and teaching courses in higher education in the digital age: Within the project's scope, lessons on learning and teaching in the digital age were given in the digital environment. Within the scope of this course, online courses with digitalization and new approaches were evaluated. Several issues, such as the roles expected from faculty members, approaches, and course materials, were also examined in this context. The widespread use of digital technologies in all processes of courses and assignments at universities is foreseen and supported.

Online access to scientific publications and research data: It is considered an indispensable part of scientific and technological innovations within the scope of open access and open science. The establishment of open academic archive systems at international standards and the use of ORCID (Open Researcher and Contributor ID) in all universities in Turkey have been prioritized.

National Technology Move and Digital Turkey: The digital transformation target is defined by Germany as Industry 4.0, Japan as Society 5.0, and the USA as the 4th Revolution. Turkey's National Technology Move and the goals expressed in the Digital Turkey understanding range from education to health and economy; it is reflected in every field, from space studies to robotic technologies. Within the scope of this understanding in higher education, it should take its place with both the production of scientific knowledge and its success in technology within the scope of the digital transformation that Turkey needs. Universities' competitive understanding of these issues is critical to Turkey's success and competitive place in digital transformation.

Developing global competitive power in Turkish higher education: Competitive power can be defined as higher education's higher education performance or its ability to achieve more successful results. Establishing a competitive power in Turkish higher education means a global win for other sectors in Turkey and Turkey. The development of Turkish higher education as a competitive power depends on many factors. Factors such as the quality of human resources in Turkish higher education, access to finance and usage capacity, innovation, infrastructure, higher education culture, and legal and political system will affect the development of globally competitive power in Turkish higher education. CoHE continues its initiatives to create a competitive structure, especially digital transformation, in Turkish higher education by supporting it with projects. With the digital transformation project in higher education, the creation of a competitive structure in line with Turkey's goals and the success of digital transformation in Turkish higher education have been prioritized as Turkey's digital transformation success. With the Digital Transformation Office established within the Presidency, digital transformation-oriented targets and initiatives in higher education are supported with an understanding that feeds each other and contributes to the development of technological infrastructure in higher education.

Learning Management System: Learning Management System (LMS) is a web-based software application. LMS aims to manage, share, test, monitor, and develop the content used in the education and training process and the various applications developed. With LMS, basic materials used in education are created, course registrations are made, data on the system is accessed, and communication is provided. On the other hand, LMS offers a practical software application for developing the sharing of learning experiences. LMS prevents interruption of education by making education more accessible for students and faculty, providing access advantages by being easy to manage and reducing costs. In Turkish higher education, courses or projects can be continued in the digital environment for faculty members and students through interactive communication through the learning management system. With these applications, as technology takes its place in the learning processes in Turkish higher education, applications such as artificial intelligence, cloud computing, and blockchain will be able to be continued more effectively. With the LMS application, it is also planned for students to have a particular area for themselves in the system. Thus, students can also access and follow digital course materials via LMS. Since real-time information can be accessed through the learning management system application, monitoring and increasing student success will be possible.

Digital transformation in Turkish higher education is the main focus of catching up with the times, creating the technological infrastructure by taking advantage of all the benefits of digitalization, and developing the basic concepts, technological innovations, and projects required by the age in education and training with university-industry cooperation. There is a significant effort in Turkish higher education to ensure that education, projects, scientific research, and collaborations are not limited to campus boundaries. Today, digitalization in Turkish higher education and efforts to improve the use of digital technologies will strengthen Turkey's security in every field, especially in the cyber homeland, which will shape technology in the future and sell technology to the world with blockchain technology, artificial intelligence

technology, innovative software technologies. Investing in digital transformation in Turkish higher education is valuable for Turkey's future, prosperity, and security.

Universities are trying to use new information technologies and even add new ones to free information transfer from the boundaries of space and time (Koral-Gümüşoğlu, 2017: 31). Therefore, digital technologies will be used even more in higher education in the future. Digital transformation in higher education should also occur in Turkish higher education, a prominent issue in the digitalizing world and education systems.

4.Conclusions

Higher education must stay current in the face of the worldwide digital transformation. It must actively use and produce digital technologies in conducting and managing business and transactions in all education, scientific research, and relations with society. The rapid penetration of digital technologies into daily life forces all countries to train human resources with digital skills. The need for human resources with digital skills increases as technology develops daily. In realizing these priorities, digitalization in education is essential to train human resources to assimilate digital technologies, have digital skills, and find a place in the digital economy. With the support of CoHE, it is necessary to develop the digital transformation process and the production and dissemination of digital technologies in Turkish higher education.

In a digitalizing economy, technology's importance increases daily. Developing digital technologies, strengthening the scientific research infrastructure, and ensuring continuous university-industry cooperation have become essential. Turkish higher education has made significant progress in using digital technology in education and training processes and developing scientific knowledge in collaboration with universities and industry, with an understanding of the needs of the age and advanced technology.

In Turkish higher education, to develop and direct advanced technology, importance is given to R&D, education and employment policies, and digital-oriented skills and professions, especially software, which are the needs of the age. As a requirement of digital transformation-oriented development in higher education, new programs focused on digital transformation have been rapidly included in higher education. On the other hand, data and cyber law programs, graduate programs in blockchain technology, artificial intelligence and leadership, space technologies, e-commerce, and data science have been implemented. On the other hand, many digital applications and programs, especially NFT and blockchain, Metaverse, virtual classroom applications, and digital twin campuses, have been included in Turkish higher education. In addition to many initiatives focused on digital transformation in Turkish higher education, some of the prominent practices are as follows: Vocational schools established in organized industrial zones by CoHE to develop digital transformation and university-industry cooperation in higher education, CoHE initiative, which was launched with the slogan "raising strong generations for the next ten years" '100/2000 Doctoral Scholarship Programme', the project to provide scholarships to doctoral students at state universities in 100 priority thematic areas needed by Turkey, is one of the notable initiatives in this context. Within the scope of the Action Plan for the Development of University-Industry Cooperation in Turkish Higher Education, supporting students studying at the undergraduate level in science and engineering sciences to receive practical training in their fields, training human resources with the qualifications needed by the industry and high application and skill competence, and establishing employment-oriented policies in higher education, within the scope of CoHE. University-Industry Cooperation Commission was established.

Initiatives focused on digital transformation in Turkish higher education are not only limited to university-industry cooperation on a national basis but are also strengthened by international cooperation. Many projects, especially within the Digital Europe program's scope, create a digital transformation structure within higher education, develop science and technology that contribute to the country's economy, and bring Turkey's digital transformation capacity to a competitive structure.

Since digital technologies will increase, steps to transform digital technology should be taken quickly in Turkish higher education. Because technological developments will affect the labor market and the status of existing professions, planning and implementation studies should be carried out to shape the education and training structures in higher education according to this fact, considering the professions of the future.

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