

Social Imperatives for Regulating the Development of Education in the Context of University Digital Transformation

Natalia Bobro¹

¹European University, Ukraine, Switzerland

Abstract— Digital transformation of higher education is one of the determining factors of its development in the context of Industry 4.0. It provides expanded access to knowledge, personalization of the learning process, and increased efficiency of educational technologies. At the same time, the digitalization of education causes significant social effects that affect the interaction of participants in the educational process, changes in teaching strategies, and the adaptation of pedagogical techniques to new realities. The research is aimed at analyzing the social imperatives that determine the features of digital education, including the level of digital literacy, the role of network technologies in the learning environment, and the social risks of digital transformation. A qualitative approach is used, including the analysis of scientific sources and conceptual models of digital education. It has been established that the effectiveness of the university digital transformation largely depends on the ability to adapt educational processes to digital challenges, while maintaining a balance between technological progress and social needs.

Keywords— Digital education; Higher education; Social imperatives; University digitalization; Digitalization

I. INTRODUCTION

The digital transformation of higher education is one of the key areas of modern socio-economic development, which leads to a change in the methodology of the learning process, models of interaction between teachers and students, as well as the adaptation of the education system to the requirements of the digital economy and Industry 4.0 [1]. The implementation of digital technologies in higher education contributes to improving the accessibility of knowledge, personalizing the learning process, and increasing the effectiveness of teaching, but at the same time creates a number of social challenges and risks that require careful regulation [2, 3].

Industry 4.0 stimulates the expansion of the use of artificial intelligence, big data technologies, automated educational platforms, and hybrid learning models, which radically changes traditional approaches to training specialists. Particular attention should be paid to the study of social imperatives for regulating digital education, which should ensure the preservation of academic standards, the development of digital literacy, the adaptation of the regulatory framework, and the balance between technological innovation and the social needs of society [4;5].

According to the modern concepts of the educational environment digitalization, the educational space is transformed into a network system, where the integration of information and communication technologies provides flexibility and inclusiveness of the learning process. The use of digital services contributes to the development of open education, increased mobility of students and teachers, and the emergence of new forms of cooperation between academic institutions and the business environment [6;7].

However, along with the benefits of digitalization, social risks are also growing: inequality in access to digital technologies, cybersecurity risks, threats to personal data,

reduced level of personal interaction between participants in the educational process, and potential simplification of the content of training courses [8;9]. This requires a comprehensive analysis and development of regulatory mechanisms that would ensure a balance between technological progress and social responsibility of universities.

The study of digital imperatives in the context of educational transformation is extremely relevant, as their consideration allows minimizing the negative effects of digitalization and creating effective strategies for integrating digital solutions into the university environment [10]. In particular, the need for normative and legal regulation, adaptation of educational programs, development of digital competencies of teachers and students, and creation of a secure digital space are important components of the formation of a quality educational process [11;12].

Thus, this article is aimed at a comprehensive analysis of the social imperatives for regulating digital education in the context of university digital transformation, identifying the main challenges and prospects for implementing digital solutions in higher education.

II. RESEARCH METHOD

This research uses a qualitative approach with the use of an analysis methodology that allows for a comprehensive study of the social imperatives for regulating the development of education in the context of university digital transformation. The research involves the analysis of regulatory acts, strategic documents, and scientific sources related to the digitalization of the educational process.

The main method of data collection is content analysis, which allows to systematize information about digital educational technologies, their impact on the university system, as well as to assess social effects and potential risks of digital transformation. The data analysis was conducted taking

into account conceptual approaches to digital education and mechanisms for its regulation in modern conditions.

The analysis of the results obtained was based on a comparative approach that allows comparing different models of university digital transformation and identifying key aspects of their regulation. The use of these methods allows to form a generalized picture of the processes of digital transformation of higher education and to develop recommendations for minimizing social risks associated with the implementation of digital technologies in the learning process.

III. DEVELOPMENT OF DIGITAL EDUCATION

Modern education is one of the priority components of national policy and is a driver of virtually all aspects of society, state, and economy modernization. The main driving force of this modernization is Industry 4.0, which poses a number of practical and theoretical challenges to education, the successful and timely solution of which determines the development of the state and society as a whole. Industry 4.0 is characterized by the widespread implementation of digital services that inevitably transform existing structures and form a new social reality for both individuals and the state as a whole.

The ideas of transforming the educational sphere are being implemented through a number of measures, in particular, updating the material and technical base, actively implementing digital services in the industry, changing the paradigm of personnel training, and significantly revising the forms, content, and methods of teaching educational material. Currently, digital transformation, which is expressed in the desire to digitize key sectors of the economy through radical changes in their main processes, is becoming increasingly active.

The educational sphere is at the stage of realizing its place and role in the context of digital changes, determining the potential for adaptation, and formulating responses to the challenges posed by the digital revolution. The implementation of new digital technologies not only greatly facilitates access to knowledge and improves the comfort of life, but also opens up new opportunities for the development of personal competencies and social interactions. However, such rapid technological growth can be accompanied by risks to the security, rights, and interests of citizens. Considering this, reasonable and carefully thought-out measures should be taken to manage social risks, in particular by analyzing and predicting the potential consequences of implementing digital solutions in the educational process.

Certainly, it is impossible to completely eliminate the risks and threats that arise during the digitalization of higher education. The only rational strategy is to minimize the negative consequences. One of the ways to reduce risks and threats is to take into account social imperatives during the large-scale digital transformation of higher education. Social imperatives are understood as a set of mandatory requirements aimed at maintaining the balance of interests, meeting the needs, and ensuring the safety of a person, society, and the state as a whole, arising during the digital transformation of the educational sphere according to current state priorities.

The social imperatives for the development of higher education in the digital age, which ensure the balance of interests of the individual, society, and the state, are: high level of digital literacy of participants in the educational process, taking into account their age characteristics and individual knowledge needs; personalization and continuity of the educational process achieved through the implementation of digital services that allow students to learn and develop independently; practice-oriented training of young professionals, which is ensured through the involvement of the real sector of production and business in the educational process; training of highly qualified personnel capable of meeting the needs of the national economy, rapid retraining, and development of creative thinking; a modern regulatory framework that protects the interests and rights of citizens and ensures security in the digital educational environment.

Ensuring that these social imperatives are taken into account in the process of education digitalization allows to effectively minimize the negative consequences of digital transformations in universities.

The active integration of social imperatives into the process of digital transformation of higher education can significantly minimize the potential negative consequences of this transformation. The implementation of curricula and courses that take into account the age and individual characteristics of the target groups, on the one hand, contributes to the improvement of digital literacy among students and teachers, and on the other hand, ensures the personalization of the educational process that meets modern practice-oriented standards.

With regard to the development of individual educational trajectories and lifelong learning, thanks to the widespread use of digital technologies, these processes are gaining real practical significance. Digitalization contributes to the implementation of the concepts of self-education and self-development of students, regardless of their age, geographic, and educational characteristics. It greatly facilitates access to knowledge and resources, allowing each participant in the learning process to carry out personalized learning.

Changes in the economy, which is actively being transformed and is based on the real sector of production and business, require the integration of practical knowledge into the training of graduates of higher education institutions. Understanding the industry specifics of enterprises and the peculiarities of the work of teams contributes to the formation of specialists focused on the needs of the modern labor market. The human resources of young professionals with high professional flexibility, creativity, team spirit, and the ability to retrain are a key factor for the transformation of society and the state.

3.1 Networked educational reality of a digital university

In the context of the digitalization of higher education, an important aspect is the development of a networked educational reality, which is the result of the integration of digital technologies into learning processes and interaction between participants in the educational process. The networked educational reality is formed through the combination of three interconnected worlds: digital data and

technologies, real objects and processes, and social relations. Such a reality requires synchronization and digital replication of data about all objects and actors, including their relationships, properties, and patterns.

In the conditions of the digital transformation of education, an important task is to create an adaptive, sociotechnical network structure that includes both educational institutions and digital avatars of participants in the learning process. Such avatars are able to function in conditions of high information and organizational uncertainty, ensuring the continuous exchange of data and resources, including real goods and services, as well as digital content.

The digitalization of education inevitably leads to changes in the learning process, in particular in blended and distance learning. This transformation has become a reality not only because of the pandemic, but also due to the constant development of digital technologies, including artificial intelligence, virtual and augmented reality. These innovations open up new opportunities for interactive and personalized learning that supports the concept of continuous self-development of students.

Changes in the educational reality also require a radical modernization of educational institutions. Higher education institutions must adapt their structures and learning processes to the challenges of the digital age, particularly in the context of globalization and technological breakthroughs. Networked education, based on flexible and accessible digital platforms, is changing the role of traditional institutions, making them part of global educational networks that allow access to learning resources from anywhere in the world.

Integration of digital technologies into higher education requires constant analysis of risks and social effects arising in the process of digital transformation. Along with benefits such as accessibility and personalization of learning, new challenges arise, including ensuring data security, protecting the rights of participants, and adapting to a rapidly changing digital environment. The education system should be ready not only to respond to technological challenges, but also to actively implement changes to meet the needs of Industry 4.0 and modern society.

3.2 Social effects and risks of education digitalization

In recent years, there have been significant challenges posed to education by the industrial revolution, as well as a mismatch between the pace of its digitalization and the speed of digital innovation in society. Nevertheless, the industrial revolution, based on the implementation of technological advances, stimulates the educational sphere to actively engage in the digital transformation of its main processes and raise awareness among providers and consumers of educational services about the possibilities of positive changes that are expected. To move to the Education 4.0 concept, the existing educational system must not only actively implement but also effectively use modern technological capabilities, including digital technologies (DTs).

Education 4.0 is an open access, individualized learning, mental transformation, integration of digital technologies into education, barrier-free learning environment, lifelong learning, research education, and interdisciplinary learning. The new

format of education in the context of Industry 4.0 develops not only the skills of modern forms of cooperation and communication, but also technological learning skills.

Therefore, the main focus should be on two key aspects: first, on analyzing the potential of digital technologies in the context of their impact on the transformation of the education system towards Education 4.0, and second, on identifying possible social effects and risks related to this digital transformation. One of the main aspects of digitalization is that cross-cutting technologies not only determine the direction of education evolution towards a new formation - Education 4.0 - but also radically change its main paradigms. In particular, the issue of the feasibility of using all digital technologies in the educational process and identifying their potential for functionality and efficiency in the context of learning is important.

Thus, the digitalization of education is an important stage in the development of the modern educational reality, but this process brings with it both great opportunities and significant risks. Technologies such as big data, virtual and augmented reality, robotics, and artificial intelligence are already actively integrating into the educational process and changing its structure. We will consider in more detail how these technologies affect education. So, big data in education is used to predict student performance, analyze the quality of teaching staff, and the efficiency of educational institutions. This allows to increase the efficiency of educational processes, making them more personalized and focused on the needs of each student.

Virtual and augmented reality technologies open up new opportunities for learning, in particular in creating interactive environments for students, which not only improves sensorimotor activity but also creates new methods of learning in real and virtual spaces. The use of virtual reality can significantly increase student motivation and provide access to specialized educational materials without time and space restrictions.

Robotics and sensors, in turn, are becoming indispensable tools for automating learning processes, ensuring safety, and helping students with special needs, such as children with attention deficits. They are used to solve routine tasks and provide accurate measurements, which in turn contributes to improving the quality of education. Artificial intelligence allows to create intelligent learning systems that support personalized learning and allow to develop individual trajectories of students' development, according to their interests and career goals.

Blockchain technology, although only in the initial stages of its implementation in education, can significantly change the way educational data is stored and managed. It provides greater data security and reliability, and can be used to create open and transparent systems for managing student certificates and marks.

Along with positive changes, the digitalization of education also brings risks. They include: a decrease in the quality of educational materials that do not always meet state standards, as well as a reduction in personal interactions between participants in the learning process, which can lead to

a loss of the social component of education. In addition, personal data security is a serious problem in the conditions of digital platforms, where there is a threat of information leakage or misuse. The deterioration in the quality of traditional educational documents due to the full transition to electronic format may also lead to problems with the reliability of such documents.

There is also a risk that non-alternative digitalization may force participants in the educational process to learn new technologies and software that do not always meet their professional requirements or level of digital literacy. All of these factors can significantly affect the quality of education and social interaction in the educational process if not solved in time.

IV. CONCLUSION

Based on the study, it can be concluded that the digital transformation of higher education is an integral part of the development of modern society. The implementation of digital technologies contributes to improving the accessibility of knowledge, personalizing the learning process, and integrating the latest educational methods. However, along with positive changes, the digitalization of higher education is accompanied by a number of social risks that require proper regulation.

First, an important social imperative of digitalization is to ensure a high level of digital literacy among participants in the educational process, which allows for the effective use of technology for learning and teaching. Second, the personalization of education, including the implementation of digital services, plays an important role in developing students' competencies and ensuring continuous learning.

Third, digitalization contributes to the transformation of approaches to specialist training, including the integration of business and the real economy into the educational process. Fourth, effective regulation of digital education requires updating the regulatory framework to protect the rights and interests of citizens and ensure security in the digital educational environment.

Therefore, the social imperatives of university digital transformation define the key areas of education development in the digital age. Taking them into account minimizes the social risks that accompany digitalization and contributes to the formation of an effective educational environment that meets modern challenges.

V. SUGGESTION

The management of higher education institutions is recommended to promote the development of digital literacy of teachers and students through the implementation of specialized training programs and trainings. It is also important to create conditions for the effective use of digital

technologies in the learning process and ensure the security of personal data.

Teachers should actively use modern digital teaching methods, develop individual educational trajectories of students, and take into account their needs in the context of the digital transformation of education.

For future researchers, it is advisable to expand the analysis of the social effects of university digitalization, in particular, to study the impact of digital technologies on students' academic performance, psychological aspects of digital learning, and new models of organizing the learning process.

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