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OPPORTUNITIES AND CHALLENGES OF DIGITALIZATION OF THE EDUCATIONAL PROCESS IN THE 21ST CENTURY: THE EXPERIENCE OF UKRAINE

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The process of formation and development of the digital society began at the end of the 20th century, but the situation in 2019-2020 related to the "Covid 2019" pandemic accelerated this trend. According to the forecasts [1], global investment in Digital technologies and services by 2023 should reach to 2.3 trillion dollars. But the coronavirus pandemic became a trigger for intensifying the efforts of business structures to implement digital technologies. According to the 2020 Dell Digital Transformation Index [2], which surveyed more than 4,000 business leaders worldwide, eight out of ten organizations accelerated their digital transformation programs in 2020. The digital revolution has affected almost every aspect of our lives. More than 3.5 billion people have access to the Internet, and more than 5 billion have some kind of mobile device. This level of connectivity has affected how people interact with others, receive news, and see the world around them.

Information technologies, digital maturity, digitalization of society, and business are the main innovative directions for the development of society and significantly change the educational process, requiring a transition to digital education. The purpose of this transition is to ensure that each student achieves the level of training fixed in the approved educational program at each level of education. It is "digital" literacy (or "digital" competence) that is recognized by the EU as one of the 8 key competencies for a full life and activity [3].

The need for widespread use of modern information technologies and services in various types of university activities, work with Big Data, the creation of a digital environment for university management, the formation of a corporate information and educational system, and the protection of corporate information are becoming the main tasks of university management. In addition, the adaptation of national institutions of

higher education to the changing needs of the main stakeholders, namely the consumers of educational services, potential employers, and government organizations, necessitates an innovative search or development of appropriate tools, approaches, and strategies to maintain a high level of education quality in the new conditions. Thus, digitalization is becoming a driving force for development and a factor in the competitiveness of Ukrainian HEIs in the national and international educational market.

Many higher education institutions understandably have struggled with their digital transformation requirements and, as a result, wasted considerable time and money without achieving the desired results. In general, this is due to the fact that digital transformation is mistakenly perceived as the introduction of only technologies into the educational process. Technology is a tool that promotes innovation and improves educational business processes necessary to meet the needs of students and teachers. By turning digital transformation into a path that combines information technologies and business processes, universities can create a positive learning environment for their students, increase operational efficiency and finally fulfill their mission effectively.

As Kim Fahy notes [4], higher education around the world faced 4 main barriers to the digitalization of educational processes, namely (Fig.1).

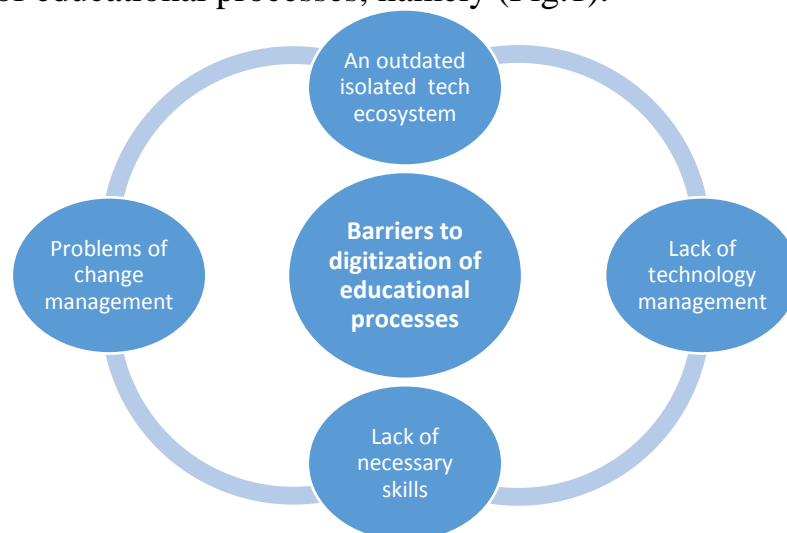


Figure 1. The main barriers to the digitalization of educational processes

1. ***An outdated isolated tech ecosystem.*** Many universities use outdated, legacy systems that are not properly secured and not integrated with each other to provide the interoperability needed to improve business processes and enhance the end user experience [5].

2. ***Lack of technology management.*** It is difficult for universities to move towards digital transformation because they lack formalized management, that is, a certain IT structure that ensures the effective and efficient deployment of information technologies to support the organization's goals.

3. ***Lack of necessary skills.*** Another challenge is attracting and retaining the talent needed to implement and support the technologies needed to transform an institution. Typical HEI IT departments tend to be understaffed and underfunded, forcing those limited resources to focus on "keeping things running" rather than moving the

institution forward. In addition, the ability and readiness of university professors to implement digital tools in the learning process are significant.

4. ***Problems of change management.*** Universities often fail to take advantage of the pre-configured integration opportunities provided by new software, modern digital tools, and cloud services because they have over-configured their processes according to the relevant procedures. In addition, these unique processes require expensive maintenance and support. Critical to the success is university's commitment to change management and recognition of the importance of adapting processes to make the best use of technology and focus on the student experience. In this sense, the development, implementation, and support of a corporate educational and scientific information system is of crucial importance, which is the basis for the effective implementation and use of modern tools of digitization of all university activities and creates its competitiveness in the new conditions of functioning of the world and national educational markets.

The identified barriers are also characteristic of the modern stage of modernization of the higher education system of Ukraine. Taking into account the integration intentions of the higher education system of Ukraine to the educational and scientific market of Europe and the world, to the experience and trends of its modernization, it can be noted that the Higher Education Institution of Ukraine faces an urgent task. This is the creation of a new type of university that, in accordance with the new concepts of entrepreneurial and digital university, to the peculiarities of functioning and requests of the digital society and digital economy has the resource readiness to promote accelerated socio-economic development through the intensive transfer of knowledge and technology, created on the basis of partnership with the main stakeholders, namely from the subjects of the labor market, state, and public organizations.

In the Ukrainian society, the transformation of higher education system is carried out in accordance with the values of the European Higher Education Area, the principles of improving teaching and learning process, and five main trends in the future development of the world higher education system (HES) [6, 7]. It is the result of a synergistic combination of efforts from each university and government agencies. Thus, on the one hand, the introduction and widespread use of various tools for digitalization of the learning process and its supporting processes is identified as a key factor in the competitiveness of a university, depending on its readiness for transformation and resource capabilities; on the other hand, the government must create an environment of regulatory opportunities for the digitalization of the educational process.

The Ukrainian Institute of the Future in its report “Ukraine 2030E – a country with a developed digital economy” determined that digitalization is the introduction of digital technologies in all spheres of life: from interaction between people to industrial production, from household items to children’s toys, clothing, etc. This is the transition of biological and physical systems into cyberbiological and cyberphysical systems, the transition of activity from the real world to the world of virtual (online) space [8]. Based on a thorough analysis of the achievements and expected prospects for the development of Ukraine, scenarios for the development of the digital economy and digital transformation projects have been identified. Among the latter, one of the key

projects is digitalization of the education sector. Significant changes in this area are primarily associated with a change in the model of learning and teaching: from the “know everything” model to the “know how to learn throughout life and become self-fulfilling and competitive” model.

Digital transformation in the higher education sector should take place in three directions (Fig. 2).

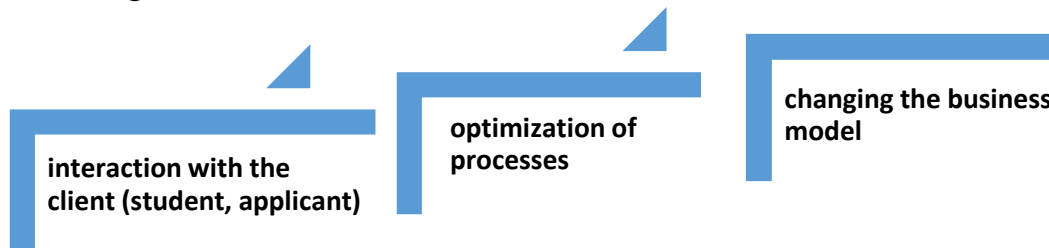


Figure 2. The directions of digital transformation of the higher education system of Ukraine

The higher education system needs reformation and transition to a modular cross-platform system in which a student will be able to choose subjects without being tied to a university and receive a maximum of services and materials online. In addition, it is necessary to accredit international online education platforms and assign them credit points, by gaining which the student will be able to independently formulate their curriculum. Thus, University 2030 is an ecosystem that prepares students for the active and effective realization of themselves in future, takes them to the next social and professional levels, and also creates a base for innovation and commercialization. This requires systematic digitalization of all business processes and areas of the university’s activities.

Starting from 2021, the implementation of digital transformation of education and science is one of the priority areas of work of the Ministry of Education and Science (MES) of Ukraine. It has been determined that *digital transformation in the field of education and science* is a comprehensive work on building an ecosystem of digital solutions in the field of education and science, including the creation of a safe electronic educational environment, provision of the necessary digital infrastructure of educational and scientific institutions, increasing the level of digital competence, digital transformation of processes and services, as well as automation of data collection and analysis [9]. In accordance with these tasks, the Ministry of Education and Science of Ukraine developed the Concept of digital transformation of education and science of Ukraine, which noted that the digital transformation of higher, professional higher and professional education (e-university) contains the following components [10]:

1. *Introductory campaign to obtain professional and higher education* - the submission and the corresponding accounting of all applications in electronic form ;
2. *Introductory campaign to obtain professional and higher education* - the creation of an electronic cabinet of the applicant and modules, taking into account these applicants in a Unified state electronic database on education issues (USEDE).

3. *Preliminary preparation of foreigners* - the creation of a new module for making information about foreign students of preparatory departments, taking into account these data upon admission to universities

4. *Ordering documents on education* - implementation by universities of the registration of diplomas by Doctor of Philosophy/Art, Doctor of Sciences with the appropriation of a registration number in USEDE

5. *Introduction of European applications into documents on higher education*

6. *Electronic licensing in the field of education (E-licensing)* - display Licensed Expertise in USEDE, generation of reports on verification of compliance with the university requirements with licensing requirements in accordance with the new edition of licensing conditions.

7. *Exchange of USEDE data with external systems* - expanding the interaction of EDEBO using automated systems and information resources, including the integration of additional services and customers in the USEDE

8. *Interdepartmental platform for the enrolling of foreigners* - the organizations of training of foreigners and stateless persons by using a unified interdepartmental information system for the recruitment of foreign students in higher educational institutions of Ukraine

9. *Professional Education Management (EMIS)* - automation of the processes of collecting, verification, analysis, storage, distribution, and use of non-adult data for qualitative and quantitative indicators

10. *Monitoring the employment of graduates* - the creation and modernization of a single electronic system for monitoring the employment of graduates to inform interested parties about the paths of the careers of graduates.

Thus, Ukraine is at the stage of creating and improving the legislative environment for building a digital university.

The formation of an innovative, digital university depends not only on the efforts of the state but also on the university. Many higher educational institutions in Ukraine are currently implementing digital transformations to maintain a competitive advantage. The basis is that today's students have a huge number of training options, and educational institutions should become more flexible and affordable to satisfy the growing requirements of customers and the environment.

Digital transformation offers higher education institutions exciting opportunities to improve teaching and learning. It refers to the organizational changes carried out with the help of digital technologies and business models to increase the efficiency of the institution's activities. In other words, it is the transformation of the entire business model with the help of digital technologies for better customer service and optimization of business processes. This is manifested in the following:

- using more digital channels and tools such as websites, social networks, chatbots and email marketing to educate students;

- collecting, connecting and activating data from all business processes and activities of the university to make informed decisions, for example, creating and maintaining the effective operation of the university's corporate educational and scientific system;

- providing students with the opportunity to independently perform tasks such as

registering attendance in classes, requests for video lectures and practical/laboratory classes for independent study of the academic discipline, communication/feedback with the lecturer/teacher by using cloud services, requests for various issues of e-library of the university, dean's offices and public organizations.

That is why the transformation of a traditional university into a competitive digital university is a key task of university management. Fig. 3 presents a three-component scheme of the methodical approach to building a university.

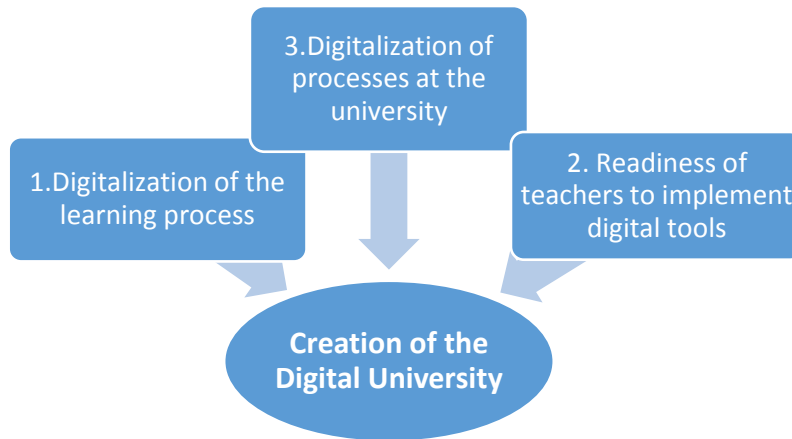


Figure 3. Methodical approach to building a digital university

Table 1 shows the tasks that must be solved within each component of the proposed methodological approach.

Table 1.

Objectives and components of the methodological approach

Component name	Objectives
1. Digitalization of the learning process	1. Updating standards and educational programs based on the public discussion from stakeholders: employers, students, graduates, representatives of business structures, representatives of the national and academic community by using digital tools 2. Development and updating of personal training systems 3. Digitalization of the educational process - the use of D-learning, E-learning, M-learning, B-learning
2. Readiness of teachers to implement digital tools	1. Development of systems for assessing digital skills of teachers or implementation of the European structure of digital competence of teachers (DigCompEdu) [12] 2. Formation of a system of motivation for updating the digital skills of teachers 3. Development of plans for advanced training, internships (national and international)
3. Digitalization of processes at the university	1. Formation of the digital culture of the university 2. Creation of a digital university environment in the form of an information corporate scientific and educational system [11]

Thus, the formation of a digital university is an urgent task at the current stage of transformation of the higher education system and is considered as a factor in strengthening the innovative activity of higher education institutions. All this justifies the need to continue research in this direction, to develop new methodological

approaches, strategies and effective means of digitalization of the main activities of national HEIs.

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