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DIGITAL TRANSFORMATION OF THE UNIVERSITY: AGRICULTURAL SCIENCE AND EDUCATION MANAGEMENT TRENDS, TECHNOLOGIES

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Abstract

The paper considers the main directions of digital transformation of a modern university (on the example of Omsk State Agrarian University – one of the leading agrarian universities in the country according to the official ranking of the Ministry of Agriculture of the Russian Federation) to compile an effective model, fill it with digital services and projects. The authors study and clarify the concept of digital transformation of the university in the context of existing national projects, established world practices and trends. The authors also give a general model of digital transformation of the university, while emphasizing the development of education and science; specify the list of corporate projects, the implementation of which will increase the efficiency of introducing new and using existing digital technologies. The study of modern practices in the Russian educational field and the directions of digital transformation recognized by the world educational community allowed the authors formulating five trends, thus determining the objects of digital transformation of the university. Special attention is paid to the formation of a digital culture and the management of the content of education and science. The study conducted by the authors serves the basis for strategic planning for the digitization of the university's processes and decisions, design of the general and detailed concept of the university's digital transformation as the basis for program and project documentation, filling educational programs and the university's scientific agenda with digital competencies.

Keywords: Digital competencies, digital ecosystem, digital transformation

1. Introduction

The paper is devoted to the study of trends and directions of digital transformation of the modern university. Educational organizations are currently actively addressing the issue of integration into the digital transformation agenda at the global, federal and regional levels using various technologies and organizational tools and focusing on various age categories. Using the example of Omsk State Agrarian University (Omsk SAU) the authors of the paper identified areas of activity that need to be transformed into digital format, specific areas of digital transformation of the university, developed a model that takes into account the existing ecosystem of external relations, information infrastructure, content of strategic projects and needs of external and internal users.

2. Problem Statement

In order to implement the breakthrough development of the Russian Federation, the Presidential Decree approved the national development goals of Russia until 2030. Within the framework of the national goal "Digital Transformation" it is planned to achieve the digital maturity of key sectors of the economy and social sphere, including education. Under current conditions the absolute leaders of the industry will be those companies that will actively apply the results of digital solutions in the near future. The business representatives consider human resources and training of competent personnel as the main driver for economy digitalization, and their absence is called the main barrier to digitalization. The representatives of the business community working in rural areas are also interested in improving the standard of living of the rural population, which guarantees a highly skilled labor force (Nardin et al., 2018). At the state level, the task of training competent personnel for the digital economy is solved by creating the center of excellence for cross-cutting technologies. Despite this it can be stated that there is no uniform order for all educational organizations that regulates the main areas of digital transformation in general and in key areas of activity – education and science. Besides, it is obvious that even the framework concept of the university transformation involves a change in its strategic and tactical goals of development, organizational structure and basic processes. Universities need digital infrastructure, competent personnel, real production cases with specific management solutions – in fact, a digital ecosystem for the training of competitive personnel and breakthrough technologies, as well as a certain algorithm for action, management decisions – a model used as the basis for the development of program documents, their filling with specific activities and performance indicators (roadmap of the digital transformation program of the university).

This makes it relevant to study the problem of developing approaches to the digital transformation of the university. The authors of the study previously analyzed the digital regional educational platform, its content and significance for the development of the industry (Shumakova & Mozzherina, 2019). The present study will discuss the choice of areas and projects, the implementation of which will allow the effective implementation of digital services to ensure the quality of training of future specialists.

3. Research Questions

The subject of the study includes the relationship between the trends in modern society and the resulting areas of digital transformation of the university – the "supplier" of competent personnel and the scientific results demanded by the agricultural sector. The authors consider their impact on the content of strategic development projects in the following areas:

- university management processes (this is a single window model and a single profile model in all services of the university; model of integration of internal information systems with external information systems; property complex management model based on data, etc.;

- management processes in education: management of individual educational trajectories; application of cross-cutting digital technologies in education management; creation of a student's digital profile;

- science management processes: laboratory and research complex management; accounting of research achievements; integration into large-scale projects.

The possibility of seamless integration of solutions is important here. For example, information systems for recording scientific achievements and publication activity should be integrated with financial and personnel information systems for the accumulation of digital artifacts.

4. Purpose of the Study

The purpose of the study is to develop a model of digital transformation of the university by identifying key trends, main areas focused on creating a single digital ecosystem of the university, and integration into MegaScience projects.

5. Research Methods

The study utilized the following methods:

- sociological methods – surveys when developing a model of digital transformation in terms of managing the content of education, expanding the descriptive capabilities of research;

- pedagogical methods – analysis of human processes to create a digital culture;

- experimental studies of digital tools, services that can be used in science and education.

The authors of the study paid considerable attention to the use of modern information technologies and systems in scientific research. This is caused by the dynamic growth of the research information base and the relevance of its fuller use in scientific research related to digitalization issues in order to obtain new knowledge. The empirical basis of this paper is based on the research findings by scientists and employees of Omsk State Agrarian University. Within the Skolkovo Institute of Science and Technology (Moscow) a delegation of the university, including the authors of the paper, concluded 31 cooperation agreements with large universities, federal research centers, agro-industrial enterprises aimed at applying digital technologies in education and science. The authors of the research are managers of such projects as the "Leaders of Digital Transformation", "A Future Campus", "Digital Herd Double", "Education 4:0" and the scientific publications devoted to the staff training of the future in the conditions of digitalization

of economy, influence of the resource and competent center on multipurpose development of agriculture (Shumakova et al., 2020).

The use of the above research methods and materials made it possible to consider the existing patterns, industry and regional features of the use of digital technologies in education and science, as well as to identify trends and factors that contribute to the formation of a "digital university".

6. Findings

According to Perez (2011), the digital economy is a new fifth technological pattern that restarts competition on a new basis, which means that in this market competition "the last may become the first". Hence, the term "digital transformation" came into common use and almost immediately became widespread, including in education and the scientific sphere. At the same time, the content of the terminology used is important. According to Ryzhkov (2016), the digital transformation of business is "a change in business mindset in the new conditions of the digital economy, the driver of which is the modern consumer and the changing culture of communications" (para. 2). Garifullin and Zyabrikov (2018) defined the digital transformation of the economy as a process of drastic change in the form of the economic system as a result of the search, development, introduction and use of digital technological innovations to increase the efficiency of all its structural divisions. Taking into account the results of the content analysis, we formulated a definition of the digital transformation of the university – a series of profound and coordinated changes in culture, personnel and technologies that involve new educational and operational models and lead to a global restructuring of institutional statuses, strategic directions and value propositions in education and science. And from this we can deduce that digitalization is a process, and digital transformation is a complete path of transformation, when there is an objective need to change the strategy, operations, products, approaches, goals, which allows increasing the level of competitiveness in a changing world today.

In our opinion, the key trends in determining the main directions of digital transformation in relation to educational organizations are as follows:

1. Digital integration: ensuring information system interoperability and scalability, data integrity, security, standards, and management across multiple applications and platforms;

2. Higher education aimed at students: creating an ecosystem of services for students in order to support the entire life cycle of a student from search to enrollment, study, employment, involvement of graduates and life-long learning;

3. Retention and completion of student training: using digital solutions to provide personalized and long-term support to students; developing capabilities and systems to incorporate artificial intelligence into student services to provide personalized and timely support;

4. Accessibility of higher education: expanding the application of adaptive and virtual reality practices to improve the availability and quality of education; aligning the priorities and resources of organizations with institutional priorities and resources to achieve sustainable development;

5. Integrating manager: changing or strengthening the role of appropriate leadership as an integral strategic partner of institutional leadership in support of institutional missions.

We believe that the digital transformation model of the university includes four key blocks (Figure 01): information management systems, digital technologies for managing science and education and digital culture. The transformation of management processes at the university based on the introduction of digital solutions is carried out by the design method.
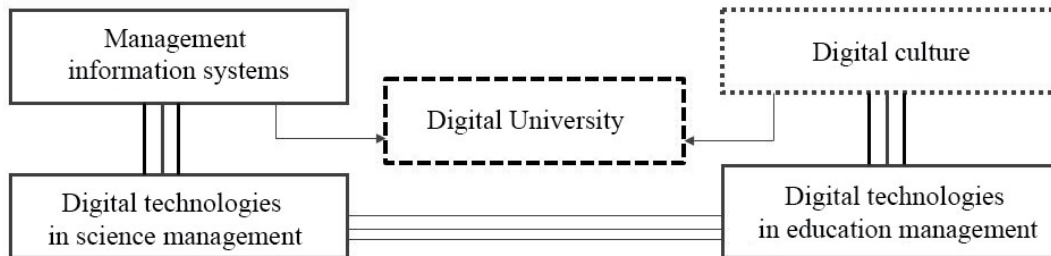

Figure 1. University digital transformation model

The ongoing digitalization and the prospects for its deepening and expansion raise questions about changing not only the organization of education, but also the psychology of attitude towards it (Korechkov & Lezhenina, 2018). In this regard, digital culture is particularly important, i.e. the understanding of modern information technologies and the ability to competently use them in work or life. The ability to use digital technologies to analyze and solve worldview, socio-personal and professional problems and processes that determine life in the digital space is an independent and very important competence for specialists in the economy of the future.

We defined the following areas of digital transformation: university management process, educational and research processes (Figure 02).
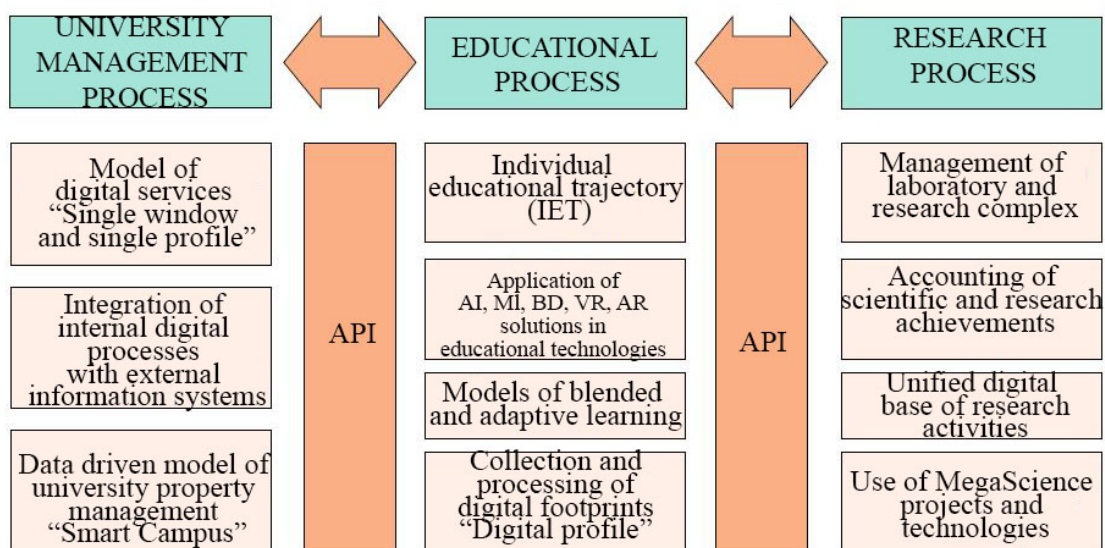

Figure 2. Directions of digital transformation of the university

Digitalization of the educational process involves the implementation of projects together with industrial partners based on the use of modern digital services (Figure 03). Thus, the digital ecosystem of the university is formed.
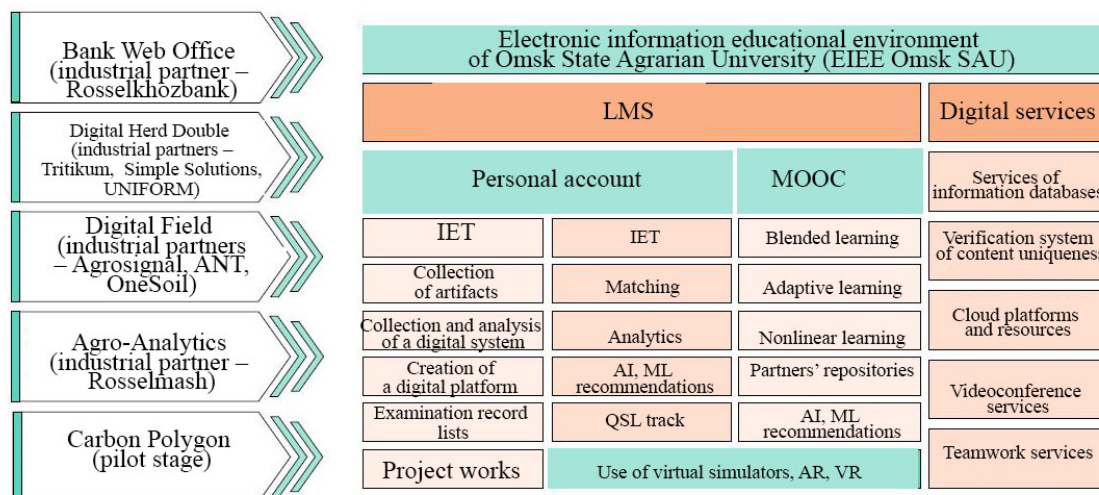

Figure 3. Structure of the Education Management block of the university's digital transformation model

A unique example of a full-cycle project on digital transformation was the creation and development of the Digital Situation Center at Omsk SAU, which is an educational and scientific-innovative platform for real production cases, as well as a platform to gain competencies in big data, predictive analytics, and artificial intelligence. One of the most interesting and promising projects implemented jointly with Tritikum Farm of Omsk Region on the basis of the center was the Digital Herd Double, which is a virtual copy of a real production herd of 500 heads, data on which are received from sensors fixed to animals with an update interval of 20 minutes. The set of special software products allows calculating more than 100 parameters for each animal, and then build forecast models based on them. The digital double is a practice-oriented learning technology through action: by modeling feeding diets, content parameters in a digital double, students see the effectiveness of applying their knowledge in conditions as close to reality as possible; obtain skills of work in expert diagnostic programs.

In our opinion, the digital transformation of research management includes five processes: research, property management, creation of a single digital platform, practices of the future, and integration into MegaScience. The university's efforts should focus on creating and maintaining open data repositories to be shared in collaborations with scientists and business partners. More than 30 research laboratories of various levels operate at Omsk SAU; it is hardly possible to imagine the management of scientific infrastructure without the creation of a unified system to account for resources and track the processes of fulfilling tasks. A particularly relevant task is to build a platform for controlling access and managing the production tasks of the scientific cluster that is understandable and accessible to users.

7. Conclusion

The education system, especially at the secondary level, is quite inertial by nature. But the higher school cannot but respond to the challenges of digitalization (Tulchinsky, 2017). Digitalization of the scientific and educational space is an objective need of all agricultural universities in the country within the framework of the national program "Digital Economy of the Russian Federation", the departmental project "Digital Agriculture", the national tasks of the development of the Russian Federation until 2030.

The results of the studies presented in this paper make it possible to determine the directions of digital transformation and to reveal a set of services, solutions, projects on the example of a specific educational organization, the totality of which will make the scientific and educational process more effective, including through the development of the digital ecosystem. Indeed, as digital technologies are modernized, a set of key digital competencies and skills for using new digital technologies is determined at the state level, the services of the university will change, including those focused on the requests of regulators and major customers – students and business partners. At the same time, at present, the concept of digital transformation of the university should be clearly considered, and the heads of the relevant programs (for example, vice-rectors for digitalization) should be identified.

Acknowledgments

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