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**"Global Challenges and Prospects of the Modern Economic Development"****INTERACTION OF DIGITAL ECONOMY AND HIGHER**  
**EDUCATION AT THE MODERN STAGE**

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*Abstract*

The authors consider the problems concerning the interaction of the digital economy and higher education in accordance with the Strategy of Information Society Development in the Russian Federation until 2030, which requires improving the learning process, developing new pedagogical technologies and methods that are oriented to modern conditions. The analysis of digital economy levels and their impact on the development of higher education is presented. The difference between modern university education and the previous model is revealed, expressed in the possibility of receiving it throughout life. The main feature of the technological base of production and higher education in the era of the digital economy is given. Universities are assigned the role of centers of innovation territorial clusters that provide a link between higher education institutions and production. Opposite trends of combining software and hardware systems into a single system and diversification of higher education are noted. The criteria for assessing the interaction between business and higher education in the digital economy are listed. The features of educational results (products) created in modern universities are briefly characterized. The development of massive open online courses and the division of universities of various sizes by the creation and use of software products are called the main factors that positively affect cost savings for university education. As conclusions, the authors represent the criteria for assessing the interaction of the digital economy and university education, including economic and institutional indicators, as well as the methodology for their processing.

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## 1. Introduction

The Strategy of Information Society Development in the Russian Federation for 2017-2030 defines the digital economy as an economic activity, in which the key factor in production is digital data, the processing of large volumes and the use of analysis findings which can significantly increase the efficiency of various types of production, technology, equipment, storage, sale, delivery of goods and services compared with traditional forms of management (The Strategy of Information Society Development ..., 2017). In the digital economy, information, as a commodity, is an object of the market, and the information market is of paramount importance, since the digital economy is five-factor and information becomes the main factor in production.

## 2. Problem Statement

The digital economy is represented by 3 levels: 1) markets and sectors of the economy; 2) platforms and technologies to form competencies required at the 1st level; 3) environment that creates conditions for the first two levels and involves regulatory regulation, information infrastructure, human resources and information security (The program “Digital Economy of the Russian Federation”, 2017). If the first level is fundamental for the classical economy, then it changes places with the third one in the digital economy.

The main constraints to the development of the digital economy are the lack of personnel and the insufficient level of specialist training. In this regard, the importance of higher education in forming relevant competencies of specialists and IT developers is growing. Agency for Strategic Initiatives, which is the center of competencies in the framework of the development and implementation of the digital economy, grouped the competencies of specialists into three blocks: 1) digital; 2) initiative and entrepreneurial; 3) and the so-called soft skills - the ability to build network communications, learn and improve (Kozlova, 2018).

As noted by Bardashevich (2017) information technologies have made education individualized when “the content and the learning process are tailored to students’ needs and their individual characteristics (learning speed, preference for the form of training, etc.)” (p. 190). It is more difficult to do it in the classroom, but it is easier, more expensive and less socialized to do it remotely (if this is not a webinar). Both for university students and adults, education has become more substantive and practice-oriented than before: real projects of students are put at the center of the educational process, including business plans that provide for all stages (steps) of business planning, its organization, implementation and monitoring of implementation.

There is a problem of discrepancies between the digital economy and higher education. Computer networks, platforms and other hardware and software systems to increase labor productivity should be integrated into a single super system. At the same time, under the conditions of democratization of public life, in other words, the self-determination of society in the field of life, the role of a highly developed, humanistically oriented personality is increasing. This means that higher education should become a really effective institution, shaping the worldview of the individual, free from dogma and prejudice,

combined with the mentality of society, in which there is a place for the intellectual, and cultural (value), and moral and ethical component.

### **3. Research Questions**

When describing issues that need to be addressed in the framework of this study, it is necessary to consider the features of higher education in the digital economy. We should rely on the results of studies in the field of economic digitalization and university education conducted by leading economic universities of the Russian Federation and foreign countries (Sukhomlin, 2011). It is necessary to highlight the criteria for assessing university education and the digital economy, which are necessary for a more detailed study in this area.

### **4. Purpose of the Study**

The main purpose of this study is to consider the interaction of the digital economy and university education at the present stage of development of the world community. In addition, it seems necessary to develop students' competencies in the field of the digital economy. It is also necessary to consider criteria for the effective interaction of the studied institutions.

### **5. Research Methods**

While studying the problem under consideration, the multivariate analysis of the effective interaction of the studied institutions was used. The interdependence of educational results of higher education and the technological component of the educational process was established using the method of historical and logical analysis. The study involved students of various specialties and areas of higher legal and economic education institutions and students of various continuing education courses (Andreeva, Abrosimov, & Grevtsev, 2019).

### **6. Findings**

In principle, modern higher education differs from the previous model - it has ceased to be a "privilege" of youth and has become continuous in the process of all life. Due to subject orientation of education, students, graduate students and specialists understand that the engine of economic growth is information that helps gain knowledge and apply it in technology (Skinner, 2019; Henderson et al., 2019). The knowledge-based economy gets that name - "knowledge economy" (Bardashevich, 2017). This is due to greater mobility of labor resources because of the dying off (robotization) and the emergence of new types of activities, including the maintenance of appropriate equipment. But if the knowledge economy is connected with the intellectual nature of delivered goods, then in the digital economy the goods presented in the digital form with the help of the intellectual component have a material nature (Fingramota, 2017).

This difference was revealed in a series of studies of domestic and foreign experts. Researchers concluded that the state should create a kind of "incubators" in which education institutions and business structures could create high-tech products. In law schools of law enforcement agencies (the Ministry of

Internal Affairs, the Federal Penitentiary Service of Russia, etc.) these are the means of search technology, in particular, control. In these universities, as well as in Universities of Economics, such products should be 3D-printers for printing the necessary components for all kinds of devices.

It should be borne in mind that economic digitalization is taking place in the context of the fourth industrial revolution, which is based on increasing the competitiveness of industrial production and technology through enhanced integration of “cyber-physical systems” into production processes, such as autonomous robots, production models using them and local networks, as well as simulators (Bardashevich, 2017). This requires sufficient development of a technological base that makes it possible to disseminate systematized knowledge outside spatial limitations with minimal time and labor. It is the material basis for the digital economy and higher education in its era.

In order to facilitate the search for electronic resources and the application of designed technologies, innovative territorial clusters (ITCs) are created, which include higher education institutions and manufacturing enterprises. The university is the center of public-private and research-and-production partnership. Within the framework of ITC, this partnership is connected with direct and feedback communication with regional authorities and municipalities, specialized enterprises of business community, research institutions and centers, other vocational education institutions (higher education institutions of the same or a different profile in other regions, secondary education institutions of the same profile in this region), as well as with individual consumers of digital services (Ilyukhina & Musatova, 2014).

Such a worldview and mentality should be based “on achievements of civilization, on the best national and local traditions, on democratic principles of respect and protection of the rights of citizens of all groups” (Yezhov & Goloshumov, 2012, p. 58). All these areas should be economically ensured through the support of traditional local industries and crafts, as well as trade, transport, communications and other infrastructure elements. Thus, the integration of hardware and software to accelerate the speed of the digital economy should be combined with diversification of education.

The types of activities (professions), associated with the implementation and support of the educational process, also gain greater diversity (Andreeva, Abrosimov, & Grevtsev, 2019). The labor market acquires such an independent segment as the labor market of educators. The nomenclature of workers related to it should expand to include designers of educational platforms, their moderators, software and hardware teaching assistants, etc. (Passey, 2014). Nevertheless, the interaction between business and higher education in the digital economy is possible and measurable in terms of determining its effectiveness. Performance criteria are:

- 1) Organizational and economic criteria: revenue growth, lower costs and investment requirements, improved product quality, increased sales;
- 2) Social and economic criteria: increased satisfaction from the interaction with partners, consumers, employees of universities and organizations, reduction of risks and administrative restrictions;
- 3) Economic and strategic criteria: achievement of planned indicators of the interaction, development of key competence, improvement of competitive positions the subjects of the interaction.

These criteria are ranked depending on the priorities of the interaction. Magnitudes of effects are determined, and the results of the interaction give a comprehensive assessment of its effectiveness (Ilyukhina & Musatova, 2014).

What educational products should be created in universities in the digital economy? Students should be given assignments based on, for example, clips and online magazines to make ready-made material according to a pre-shown sample taken from the Internet. As an additional task, students can independently search for this sample. If it is in the local network or on the teacher's workstation, you need to display it on the screen through the media projector. Students should be able to scroll it up.

Students can create their own texts, images, sound and music on computers or mobile devices. Simulators are aimed to do all these in cases when the first-created information and other educational products are still imperfect and can “block up” the network. First, everyone independently performs the task, and the next step is the creation of the interactive simulator.

The Internet and social networks can be used to publish learning outcomes for individual students or study groups. When publishing collective results, it is preferable to use online magazines - these are journals of training sessions (when students evaluate themselves) and scientific journalism. The prototype of the simplest platform for the joint creation of knowledge may be Google.

Therefore, the creation of digital educational products in higher education, especially various projects, and the training of bachelors and specialists are very expensive activities. However, there is a contradiction between the need for their appearance and development, on the one hand, and the tendency to finance them from federal and “regional sources of budgetary and extra-budgetary funds” (Yezhov & Goloshumov, 2012). The general tendency to outstrip costs of the educational process compared to production costs, noted by Professor Bowen (2015) in the USA in the mid-1960s, is relevant today, when both society as a whole and the economy in this country are already quite “digitized”. It is also characteristic of other developed and developing countries, in which the economy is based on market principles. As a way out of the situation, Bowen proposes a number of measures, specifically aimed at the interaction of the economy and higher education. The main ones are the development of MOOCs (mass open online courses) and the “rational division of labor”, in which universities with the largest amount of resources will create platforms for online learning, and universities that do not have such opportunities will form “user campuses”, a mandatory requirement for which is the ability to adapt their training courses for these platforms.

In the face of reduction in funding from the federal budget, we need to increase funding from the regional budgets (Bowen writes “states”) and private donations (Bowen, 2015). The author does not give specific organizational forms of cooperation. Following the scientists of Novosibirsk State University, the authors of this study proposed innovation territorial clusters.

The interaction of the digital economy and higher education and supplying personnel for it need periodic monitoring. A team of scientists – employees of Samara State University of Economics proposed a methodology for assessing quantitative and qualitative indicators of the regional welfare, as well as (on this basis) a survey of residents of the region. The methodology includes 43 indicators, grouped in three blocks - natural, economic, institutional (Khmeleva, 2018).

To assess the interaction from the second and third blocks, one or several indicators related to the economy and (or) university education should be taken, some of which can be supplemented and corrected. We offer:

- To take the following components from the block “Economic indicators”: production - GRP per capita; profitability – all three indicators, adding to them the “average amount of scholarships assigned” (Khmeleva, 2018); in the property component, the first indicator should be replaced with “The total area of production facilities per average employed per inhabitant” or supplemented with it (Khmeleva, 2018).

- To take the following components from the block “Institutional Indicators”: intellectual – the number of advanced production technologies created (units), internal costs for research and development (million rubles); social and educational components – in full (previously, from the social component we intended to leave only the costs of social policy in the consolidated budget of the constituent entities of the Russian Federation, but the unemployment rate is also important because it correlates with the actual GRP) (Khmeleva, 2018); information and communication component – in full, including the number of PCs per 100 employees (pcs.), and the costs of information and communication technologies (million rubles) (Khmeleva, 2018); an additional indicator “Number of personal computers per 100 students” can be introduced into this component.

All these indicators are reduced to a single scale according to formulas, one of which can be converted if large values of the indicator correspond to the best result of the interaction, and if the lower result corresponds to lower values of the indicator. The survey results on these components are also processed using formulas for determining the objective and subjective components of the interaction of the digital economy and higher education in the region (Khmeleva, 2018). Taking into account the fact that the number of indicators taken or introduced by us is 14, the error in calculations compared with the assessment of the regional well-being will be less.

## 7. Conclusion

Thus, economic digitalization inevitably determines digitalization of education. Firstly, there is a direct connection between the number of trained personnel and employment in different sectors of the economy, and secondly, the movement of resources in both areas (in the first including human, in the second – primarily human) has become so massive that the collection, processing, use and storage of data requires increasingly advanced digital technologies. It is completely difficult to describe the process of their interaction at the present stage. The authors studied the most common problems and trends of this process.

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