Trends and Scenarios of Higher Education Development in the Digital Economy

Sofiya F. Sayfullina, Irina V. Burenina, Mariya A. Shkaley, and Marina M. Gayfullina

Abstract

Despite the fact that trends that influence the development of higher education have been sufficiently studied, researchers agree only on the general features of the image of higher education of the future. In this work, the trends are systematized in view of two groups: technological and social trends, which, in their turn, are divided into trends that have influence in the period of pre-school, school, university, and post-graduate education, when person is a full member of labor market. The performed analysis of trends allowed distinguishing the junctions of the two key tendencies: development of labor market with social transformations and development of the system of "human–machine" interaction with development of cognitive technologies. Based on the distinguished key junctions, four scenarios of development of higher education are formulated. The examples of strategic rates of universities are offered for each scenario. The offered scenarios of higher education's development allow understanding which consequences for a university will be brought by various tendencies, and how the technologies of the digital economy influence the education market. The developed approach is an important supplement to the tools of strategic planning of the organizations of higher education.

Keywords

Higher education • Scenarios of development of higher education • Industry 4.0 • Digital economy • Cognitive technologies • Universities • Digital technologies

JEL Code

I23 • I25 • O33

1 Introduction

Development of the digital economy influences the labor market and the demand for various types of activities. Development of digital technologies and their wide implementation require the appearance of specialists who have the corresponding skills. Thus, according to the program "Digital economy of the Russian Federation," Russian universities will be preparing more than 120,000 IT specialists per year by 2024, and the share of population with digital skills will constitute 40% (Abdrakhmanova et al., 2019).

Due to the development of digital technologies, the year 2022 will see the appearance of 22% of new jobs in the global economy (Accenture, The future digital skills needs of the UK economics, 2015). Apart from the change of the labor market structure in favor of the increase of the share of IT specialists and the change of the structure of economy's GDP in favor of the increase of the share of hi-tech companies, the formation of the digital economy envisages the transition from the industrial model of society to the economy of knowledge. Unlike such countries as the USA, European countries, China, Japan, and South Korea, there is no critical mass of demand for knowledge in Russia yet, and the labor market is not very attractive for talents.

Universities from top 100 of world rankings try to determine their role in the digital development of national economy. New strong players from the private sector appear in the market of higher education; EdTech start-ups offer solutions that are based on the use of AI, the Internet of Things, neurotechnologies, and cognitive technologies. Development of the platforms of online education bears a large threat for traditional universities, but it also allows entering new markets.

S. F. Sayfullina (✉) · I. V. Burenina · M. A. Shkaley · M. M. Gayfullina
Ufa State Petroleum Technological University, Ufa, Russia
e-mail: sofia-ufa@yandex.ru

M. M. Gayfullina
e-mail: marina_makova@list.ru

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However, development of the digital economy brings negative consequences for the labor market and the sphere of education—they are connected to appearance of a lot of unemployed people who do not have the required skills (Burenina et al., 2018). Life-long learning turns from a current trend into a vital necessity. The speed of development of new technologies in the digital economy predetermines the necessity for employees to constantly adapt to new conditions and master new skills and approaches.

Development of the Internet of Things, AI, and neurotechnologies is to change the conditions and quality of human life and to influence the spheres of interrelations between people and the capabilities to perceive and process information. The influence of development of digital technologies on human, human mental capabilities, interrelations with people, and life on the whole has not yet been fully studied by researchers.

In this research, an effort is made to determine the key factors that influence the sphere of higher education and to formulate the main scenarios of development for universities, which take into account the possible consequences of the development of technologies, behavioral models, and the nature of social interrelations in the forming digital economy.

2 Materials and Methods

The issues of development of the sphere of education on the whole and universities in particular should be considered in the connection with the issues of technological development and technological revolutions, in view of the regularities of development of the labor market as the main "consumer" for the sphere of education.

The task of evaluating the level of universities, in view of quality of education and the performed research, and the need for graduates is studied by various national and international ranking agencies, in particular MosIUR, Round University Ranking, RAEX, etc.

The level of the system of education in a country and the tendencies that take place in it, as well as its adaptation abilities, determine the development of the national economy (Burenina et al., 2018). Due to this, various national and international research centers and consulting organizations perform their own studies. Among these, one should mention the studies of Global Education Futures, Boston Consulting Group, and Moscow School of Management SKOLKOVO.

Apart from studies of the sphere of education, research of the labor market and human capital under the influence of implementing of technologies of the digital economy are also very interesting:

- the OECD—"Measuring the Digital Transformation: A Roadmap for the Future" (Paris OECD Publishing, 2019);
- PWC—"The future of the labor market. Opposition of tendencies that will form the work environment in 2030" (The Future of Jobs Report, 2018);
- GTCI—"The Global Talent Competitiveness Index 2019: Entrepreneurial Talent and Global Competitiveness" (Lanvin & Monteiro, 2019).

Development of the system of education is considered also by specialists in the issues of implementing innovations, development of new technologies, and technological revolutions.

In the work (Christensen et al., 2004), the authors consider the notion of "explosive" innovations in various spheres, including in the sphere of education. Implementation of innovations, even if they are treated as necessary for survival by a company's management, is not always successful—especially in such conservative organizations as universities. A lot of researchers note that development of online platforms and increase of the quality of products of EdTech start-ups will lead to disappearance of universities in their current form (Johnson et al., 2015).

Certain studies consider the problems of development of AI, the Internet of Things, and robotization not from the point of view of development of production but from the point of view of their influence on human, human's personality, role in the society, intellectual abilities, social, cultural, and political environment, and life of society as such (Kuzminov & Froumin, 2018).

In this research, the tools of scenario planning and case method as the method of studying the practice of the leading world universities are used.

The separate components of the problem investigated in this article have been analyzed by such authors as: 4Evstratova et al. (2018), Burenina et al. (2020), Brown et al. (2018), and Huisman et al. (2018).

In the process of studying, authors used the materials from Digital Leader, PwC, IDC, CROC Reveal (2019), and MosIUR (2019).

The research has been performed in several stages:

(1) analysis and systematization of the global trends that influence higher education;
(2) determination of tendencies that have the largest influence on the changes in the system of higher education and key junctions in the distinguished tendencies;
(3) formation of the matrix of scenarios of the development of higher education and determination of the possible strategic rates of university.

3 Results

Analysis of the trends in the sphere of higher education is considered in a lot of works. Here, the trends are systematized in view of two groups: technological and social trends, which, in their turn, are divided into trends that have influence in the period of pre-school, school, university education, and post-graduate education, when person is a full member of labor market (Fig. 1).

Technological trends influence the life of a university's graduate a lot; the knowledge obtained in the university quickly becomes obsolete, and the key skill is the ability to adapt—quickly and effectively—to new conditions. The need for new skills is satisfied by institutions of advanced training, corporate universities, online platforms, and EdTech start-ups. In the market of post-graduate education, universities face the unusual conditions of competition and make certain attempts to "keep" their graduates after finishing the main educational program, offering them the occupational retraining programs. At the same time, the skill of quick adaptation of human to the new conditions and ability to train and retrain during the whole life is a skill that must be formed in the system of education since the pre-school level. If a human does not possess so-called meta-skills when leaving the system of higher education (which include the ability for life-long learning), the value of higher education will become equal to the advanced training program, during which a person could master the necessary skills. At present, corporate university perform the task of retraining of personnel for the work in the new conditions. The advantages of corporate universities, as compared to traditional universities, are flexibility and speed in the formation of programs for a specific demand.

Large universities provide the national economy with personnel and create new knowledge, implementing the research mission, and influence the urban environment, performing their social mission. The system of education has been historically performing the leading role in the social evolution in humanity. One of the key social trends is connected to the change of the system of social relations and human life in the conditions of development of new technologies. Universities will have the ability to play the leading role in creation of a new sociocultural environment in a city or region. The social mission of university becomes even more important in the conditions of the growth of technological unemployment. University accepts the task of

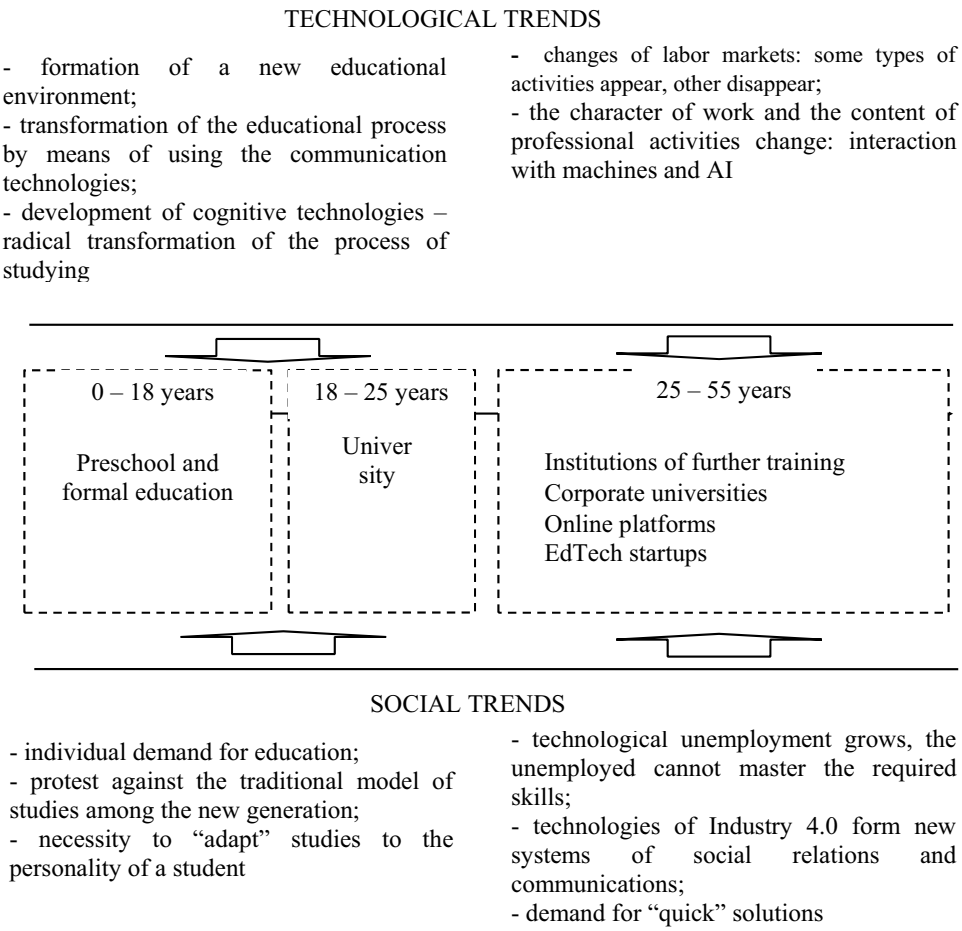

Fig. 1 Key technological and social trends in higher education. *Source* compiled by the authors

integrating the people with "obsolete" professions, including the university's graduates, in the society. Solution of this task could include the program of studies for adults, involvement of people in social design, etc.

The above groups of trends forms an external demand for the system of higher education. Universities could become the leading players in the market of post-graduate education, if they could integrate in the competitive environment in the market that is new for them.

The influence of technological trends on the process of studying is rather obvious—there is a possibility to communication with lecturers around the world, study with students from other countries, participate in real activities via virtual reality, etc.

Development of technologies of Industry 4.0 and cognitive technologies leads to the changes of education in its foundation and influences the models of thinking and cognitive reality (Gayfullina et al., 2019).

A new generation of pupils negatively treats the traditional models of higher education, and they do not want to spend several years on the pro forma program. New pupils form a demand for flexible and quick educational products from a university.

Demands for higher education from the labor market and from pupils require a radical transformation of the educational process and educational products, so universities are very careful in the reforms. This is due to the fact that there is no unambiguous understanding of an image of a higher educational establishment that would conform to all demands.

The performed trend analysis allowed forming several scenarios for development of higher education. Scenarios were formed based on distinguishing the key junctions of the two tendencies: development of labor market with social transformations and development of the system of "human–machine" interaction with development of cognitive technologies.

Various researchers consider the issue of the mutual influence of technological and social trends. Some researchers consider scenario "New industry" or "Industry 4.0" most probable—i.e., more effective technologies are to replace old ones, which, in its turn, will change the human activities and will form a demand for certain competencies. In the short-term, the demand for IT specialists will be very large in the labor market. In the long-term, the structure of basic competencies of a specialist will be dominated by digital competencies. In a general case, it is possible to speak of the preparation of a person for the digital economy and development of the corresponding technologies. Other researchers think that sociocultural transformations that appear due to the transition to the technologies of the digital economy will lead to significant changes of the structure of population's employment (Kuzminov & Froumin, 2018). In particular, formation of a new sector of employment, where people create social capital, and development of communication technologies and Internet platforms will allow a part of hired work to move into the sphere of entrepreneurship. The changes will influence human's social connections and way of life. At such course of events, the focus of attention should be moved from training human for the professional activities to creation of conditions for social adaptation in a new world.

The second junction in the tendencies of development of the system of "human–machine" interaction, together with development of cognitive technologies, is very important in determining the content of education as such. Researchers try to make conclusions regarding this tendency with great care. For example, the issues of using neurotechnologies for increasing the cognitive abilities of human raise a lot of questions, including ethical ones. The results of the study of human brain have not been widely used in the sphere of education yet.

The system of education has a demand for new models of thinking and formation of meta-skills and existential skills, which generally are an ability to learn and retrain during the while life and adapt quickly in the changing conditions (Loshkareva et al., 2018). These skills are especially important, if the human's functions in the "human–machine" system pass to machine. Then, human will have to perceive his existence from the very beginning and to find or create his place in a new world.

Scenarios of development of higher education, which were determined during the research, are presented in Fig. 2.

Table 1 contains a short description of the scenarios of development of higher education and examples of possible strategic rates of universities within the formed scenarios.

The offered scenarios are milestones for universities that help understanding how various technological and social trends could influence the future of higher education.

4 Discussion

As the analysis of development of universities from top 100 world rankings has shown, universities implement the strategies within the scenario "Leader of new industry" most often. Top universities are able to choose the best students, ensure high quality of performed research, and create an ecosystem of start-ups and industrial partners. Such universities have the leading role in creation and development of the digital economy. This scenario allows universities to look for new business models—e.g., form cooperation with corporate universities and produce content for their educational programs.

There is no demand yet for the knowledge economy in Russia, but, using the experience of the leading world

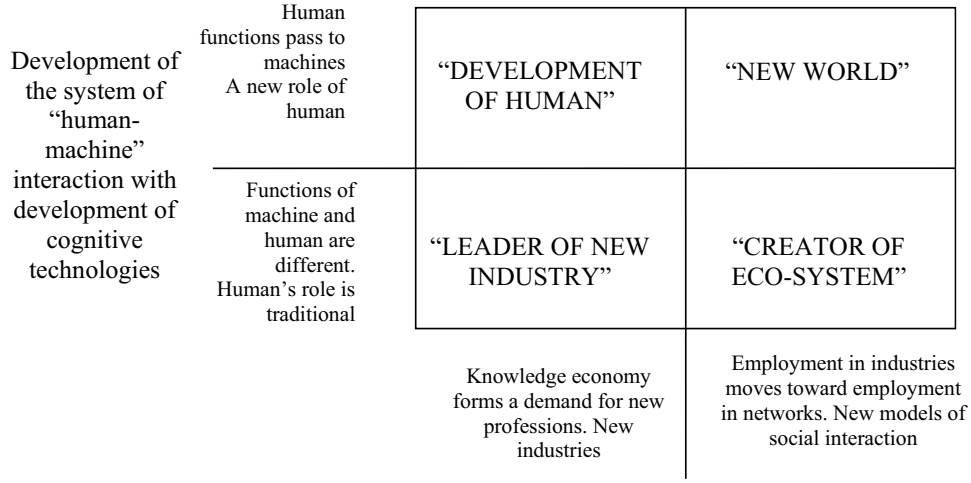

Fig. 2 Scenarios of development of higher education. *Source* compiled by the authors

universities as a guide, Russian universities implement the scenario "Leader of new industry" as the main one (Boutenko et al., 2017). If the structure of economy does not change much due to the development of new industries, the employed from old spheres will be gradually "withdrawn," passing the system of retraining, and the need for new specialists will be covered by means of new educational programs, then the work within this scenario might be rather successful.

However, such suggestions are simplified and could be fair only in the short-term. Most likely, leaders of the global economy will quickly pass from the knowledge economy to a new type of interactions that is based on ecosystems. Universities that wish to preserve their influence in the world will have to compete with platforms and EdTech start-ups and look for their place in the ecosystem. One option could be formation of an urban ecosystem around the university, which will require the change of the business model of work and the forms of studies.

Scenario "Creator of ecosystem" is a logical continuation of scenario "Leader of new industry," if there are no global changes in the system of "human–machine" interaction. The ecosystem approach becomes very popular with researchers, and it is supposed to be used to solve the problem of "increasing complexity" of a human, formation of new types of thinking, and development of existential competencies (Luksha et al., 2018).

The essential difference of scenario "Development of human" from scenario "Creation of ecosystem" consists in technologies on which the university focuses. In scenario "Creation of ecosystems," new technologies create a new living environment, and human has to master existential skills to have a comfortable life in the created environment. In scenarios "Development of human," focus is put on the development of cognitive abilities of human and formation of his "new role"—only after this human is ready for adaptation of the environment of his "new role." Certain examples of work in scenario "Development of human" could be observed with the leading universities of Asia.

Scenario "New world" is too difficult to interpret, and researchers make cautious attempts to predict how the world will change in 15–20 years, if functions of human will pass to machine in the system of "human–machine" interaction. For universities, this will mean that their educational and research function will lose the value for economy, and the production activities will pass from university graduates to machines. It is impossible to predict the speed of such transition, which human's functions will be "indefeasible," and which niches of education will be taken by EdTech start-ups.

5 Conclusion

Despite the fact that trends that influence the development of higher education has been studied in detail, researchers agree only on the general features of higher education of the future.

The performed trend analysis allowed distinguishing junctions of the tendencies and forming four scenarios of higher education's development. Examples of possible strategic rates of universities are offered for each scenario.

Despite the large number of works on the topic of development of higher education, selection of the scenario of development for a university is a complex task. Complexity of the scenario selection is caused by the fact that the influence of social and technological trends leads to unpredictable—in time and scale—changes, and the issue of

Table 1 Scenarios of development of higher education and possible strategic rates of universities

Scenario	Characteristics of scenario	Possible strategic rates of university
"Leader of a new industry"	University becomes an active participant in creation and development of new industries: conducts research, creates start-ups, and trains people, including in the system of post-graduate education Development of cooperative ties with industrial partners In the knowledge economy, university is a creator of new knowledge. University creates high-quality educational content and educational products as per demand of the modern industries (competencies, terms of study, flexibility of programs, and technological level)	(1) Provision of high quality of created knowledge—focus on the work with the best students, lecturers, and researchers (2) Sustainable cooperative ties with companies that are leaders in the new industries (3) Partnership with corporate universities and formation of educational content for them (4) Development of business education and programs of entrepreneurship—active participation in creation of new companies
"Creator of ecosystem"	Scenario is based on the development of networks and platforms, as the basic tool of interaction between humans and companies. University is the core of the innovative and educational ecosystem, which unified knowledge-based, entrepreneurial, and educational ecosystems. Development of the sharing economy	(1) University as a participant of the global educational platform (2) University as a creator of EdTech start-ups for the ecosystem (3) University as a transformer of urban environment/city's ecosystem
"Development of human"	Focus on human, formation of new types of thinking with a human, development of his cognitive abilities, maximum realization of personal potential. University becomes an active participant of developments in the sphere of cognitive technologies, neurotechnologies, and technologies of AI University enters the market of EdTech start-ups with its own products	(1) Development of cognitive technologies, neurotechnologies, technologies of AI, promotion of its own EdTech start-ups (2) University participates in "formation" of human, starting from birth. (3) University creates products for development of human for different age groups
"New world"	Scenario could be implemented in the future 15–20 years. Higher education in the organizational structures in which it is present now will cease to exist. It will be replaced by platforms and networks and EdTech start-ups that use cognitive technologies and neurotechnologies	(1) Search for an EdTech niche in the ecosystem of city/region/world

Source compiled by the authors

development of the "human–machine" system is still debatable in the circle of scholars. Each scenario contains opportunities for development and threats to the existence of university.

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