Russian University and its new role under the conditions of global technological changes

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Annotation. The article analyzes the new requirements for universities in the context of modern global technological changes, implying a radical transformation of their role, mission and objectives. The article contains an assessment of the prospects and problems of the implementation by Russian universities of the National Technological Initiative (NTI) University model - a domestic version of the University 3.0 concept, which has become widespread internationally in the context of the new ("fourth") technological revolution. According to this concept, universities are assigned a “digital code” based on the number of their missions. University 3.0 receives the status of a university, where the third mission is added to the two traditional missions - educational and research - the commercialization of knowledge and technology. Universities of the "third generation" form entrepreneurial ecosystems, promising technology markets and ensure the global competitiveness of the domestic economy.

Keywords: the fourth industrial (technological) revolution, technological development, markets of the future, the concept of University 3.0, NTI University, university missions, knowledge commercialization.

Introduction

At present, the main task of the Russian system of higher education, and first of all university education, is to provide an adequate response to the challenges posed by global changes in the technological environment. The pace and results of Russia's inclusion in the so-called "fourth industrial" revolution, which the advanced countries have already entered, largely depend on the efficiency and speed of response of Russian education to the requirements of the time. In this regard, it is important to correctly formulate the tasks of Russian universities in the new conditions.

The purpose of the study - is to analyze the impact of global technological changes on the goals, objectives, and missions of Russian universities, as well as to assess their capabilities in solving urgent technological and economic problems of the country.

Materials and methods

The study is based on the analysis of regulatory documents governing the implementation in Russia of the National Technology Initiative University model, as well as on scientific publications of domestic and foreign scientists. General scientific research methods are used: analysis and synthesis, induction and deduction, systems approach, comparative analysis, economic and statistical analysis.

Results and discussion

The content of the new technological revolution is the transition to flexible production of an individualized product based on the latest technologies, covering quantum technologies, new and portable energy sources, wireless communication technologies, big data, distributed ledger systems, robotics, neurotechnology, artificial intelligence, virtual and augmented reality technologies. technologies for controlling the properties of biological objects. The use of digitalization, computer-aided design, and platform solutions is already radically changing the functionality of companies and the structure of markets. The release of fundamentally new products will lead to the disappearance of many old markets and give life to the markets of the future based on the principles of a distributed economy, i.e. on a global network of horizontal links between autonomous institutional actors. Among them are AeroNet (distributed systems of unmanned aerial vehicles); such markets MariNet (distributed systems of maritime transport without crew); AutoNet (distributed network of vehicles without a driver); HealthNet (the market for distributed systems of high-tech medical services); NeuroNet (distributed artificial components of consciousness and psyche); EnergyNet (distributed energy); FoodNet (a market for distributed food production and delivery systems). According to experts, the peak of revolutionary technological changes will occur in the 2020s - 2030s. By this time, not only will the structure of the economy be fundamentally updated, but also there will be a sharp polarization of countries, some of which will act as technological leaders, while others will turn out to be technological periphery [1].

At present, efforts are being made in our country at the state and government level to implement breakthrough technological development. For this purpose, the strategic program "National Technology Initiative" is being implemented, designed for the period until 2035, the national projects "Digital Economy", "Science", "Education", "Small Business and Support of Individual Entrepreneurial Initiatives", etc. are being implemented. the priority goals for Russia are the formation of a scientific base and an educational environment capable of responding to new technological challenges in the present and the future, the preparation of centers for generating new technologies and new markets on the basis of leading higher educational institutions, and the implementation of projects to increase the global competitiveness of Russian universities.

The universities of the future are named National Technology Initiative Universities (NTI Universities) and are the Russian model of University 3.0. The concept of University 3.0, which is now widely spread in the international educational space, involves the assignment of a "digital code" to universities, taking into account the number of their missions. So, if a university is engaged only in educational activities, the name University 1.0 is assigned to it. Such a university carries out the transmission of knowledge, training of personnel and provides a social lift. In case of simultaneous execution of two missions, it acquires the status of University 2.0. Its teaching and research functions are the generation of new knowledge through research activities and consulting

services for market players. University 2.0 carries out research and development on orders of the industry and creates technologies "to order".

An even higher status is characteristic of University 3.0, where the third mission appears - the commercialization of knowledge and technology. Such a University manages intellectual property rights, forms an entrepreneurial ecosystem, promising technological markets, turns into a platform for creating the country's economic superiority at the global level. It is these universities that define the face of the modern technological revolution [2,3,4,5].

The concept of University 3.0 is based on the research of J.Wissema, Professor of Entrepreneurship and Innovation at the Delft University of Technology (Netherlands). In his opinion, the content and number of missions of a modern university is changing for the following reasons: the world's leading universities are increasingly in need of alternative government funding sources and are therefore interested in cooperation with high-tech companies; 2) the transition from monodisciplinary to interdisciplinary scientific research; 3) aggravation of the global competition of universities for the best students, teachers, contracts, for leadership in the practical implementation of inventions and know-how; 4) the desire of universities to derive new benefits from the knowledge they create, increasing their role in the implementation of the state policy of economic growth; 5) the need to ensure the economic efficiency of universities in the new increasingly complex conditions; 6) experimenting with the differentiation of mass and elite education programs in modern universities in connection with the massive influx of students [6].

Code 3.0 was assigned to the leading universities in the USA, Great Britain, and China. They form an economic and technological environment that is 5-10 years ahead of reality. It is from this environment that companies grow, which in 10-15 years become the flagships of global business in new industries. In particular, the graduates of such universities created the companies Hewlett-Packard, Yahoo, Google. Universities 3.0 combine flows of human and financial capital, become system integrators of the main processes of technological entrepreneurship within innovation ecosystems, create inter-university networks, hubs and networks for the exchange of technological competencies. Such universities are becoming leaders not only in the formation of startups, but also in determining the trends of entire industries. For example, the American Carnegie Mellon University is currently setting the key directions for the development of robotics. Through the University of Cambridge, joining forces with the business community and the local county, which has become a world center of government, Cambridgeshire was created high-tech industries.

To move to University level 3.0, the university must have higher competencies in understanding markets and the patterns of their development than the corporate environment surrounding it. Only in this case it will, like a magnet, attract the best representatives of the business community for the implementation of joint innovative projects [7].

Formation of the concept of University 3.0 was prepared by the development of the system of university education in the USA and European countries in the XX century in the conditions of rapid scientific and technological progress. The growing business demand for innovation has spurred innovation, and universities have also joined. It should be noted that in the second half of the 20th century, natural mechanisms for stimulating innovation were formed in developed countries, without which the new mission of third-generation universities would have been simply impossible. These mechanisms are based on the activities of venture capital companies and corporate venture funds that finance high-risk projects and startups. Corporate venture funds currently account for 25% of the venture capital economy in the United States. They provide an effective system of interaction between the sphere of inventions and discoveries with the sphere of business, as a result of which all promising technological ideas are quickly implemented in practice. It is important to take into account that innovative activity in modern countries is based on well-developed legislation on intellectual property, where the rights of all subjects of the innovation process, including universities, are clearly defined, the procedure and proportions of the distribution of remuneration from the sale of intellectual property are indicated. It is also important that in the United States about half of the universities are private and do not have any restrictions on participation in entrepreneurial and commercial activities as intellectual property rights holders.

Let us assess the prospects for the implementation of the concept of University 3.0 in our country, in particular, its domestic version, the NTI University. The system of higher education that has developed in Russia is still focused on the industrial culture of the second half of the 20th century and does not meet the needs of an innovative and technological breakthrough. In our country, an approach has taken root, according to which the competence and development prospects for universities are determined by the state. This condemns Russian universities to lag behind the world leaders in the field of higher education, which, as already noted, have long become "trendsetters" in the field of competencies and the formation of market trends. A significant number of Russian universities correspond to the University 1.0 model, i.e. fulfills only an educational mission. In other universities, thanks to research work, the status of University 2.0 has been achieved. There are practically no 3.0 universities involved in the commercialization of knowledge in Russia, with extremely rare exceptions. Even elite Russian universities do not actually conduct innovative and entrepreneurial activities, which are mandatory for University 3.0. Most of the leading Russian universities operate on the principle of “there are patents, there is no income,” and the patents are mostly Russian; 28 elite universities do not have international patents at all, and 11 have the number of such patents ranging from 1 to 3. Tomsk Polytechnic University is the leader in this area, which received 11 international patents, but its average annual income from intellectual property management does not exceed 800 thousand rubles. [8,9,10,11].

In the state priority project "Universities as centers of innovation creation space", which was approved on October 25, 2016 by the Presidium of the Council under the President of the Russian Federation for Strategic Development and Priority Projects, it was planned to ensure sustainable global competitiveness in 2018 at least 5, and in 2025 year - at least 10 leading Russian universities; create in the constituent entities of the Russian Federation in 2018. at least 55, in 2025 - at least 100 university centers for innovative, technological and social development of regions.

Currently, according to the prestigious international rankings (RUR, THE, QS, Shanghai), the positions of Russian universities have improved significantly, from 10 to 20 of them, according to various rankings, entered the TOP-1000. Among them are Moscow State University, MIPT, MAI, Tomsk State Polytechnic University, Novosibirsk State University, Bauman State Technical University, RUDN, Russian State University of Oil and Gas, ITMO University. It is they who are currently making active efforts to become universities of the "third generation", or NTI Universities.

Within the framework of the National Technology Initiative program, the creation of University Advanced Development Areas is recognized as a key area of training specialists for the markets of the future. The program stipulates that the NTI University should carry out fundamental and applied research on NTI topics; to form an innovative infrastructure (technology transfer centers, business incubators, technology parks, etc.); train professionals as drivers of future development; to carry out for the STI markets, i.e. work with talents effective management of intellectual property, commercialization of developments and generation of new businesses in the NTI markets. According to the plan, the NTI University should become the center of ecosystems focusing on them the resources of promising technological development programs. It should provide interactive interaction between the market and inventors, stimulate creativity at the personal and organizational levels [12,13,14].

However, the creation of the NTI University in Russia requires overcoming many barriers, the main of which are:

1) low demand for innovations on the part of Russian business;

2) the lack of an effective mechanism for interaction between consumers and suppliers of innovations, which leads to the export of intellectual property from the country, the drain of scientists, highly qualified specialists, capital against the background of the import of technological solutions;

3) a shortage of scientists and specialists capable of implementing complex interdisciplinary projects, acting as market leaders in the field of competencies, integrators of science-intensive processes;

4) insufficient coordination of the action plan for the implementation of the National Technology Initiative program ("NTI roadmaps"), which prevents the formation of a holistic picture of technological development;
5) limited opportunities of Russia in meeting the demand for fundamentally new areas of knowledge and profession, which also leads to the outflow of gifted youth from the country;
6) inconsistency of Russian legislation with the tasks of NTI: in accordance with the Law on Education, an educational organization in our country has the legal status of a non-profit organization, so it can only carry out income-generating activities, but has no right to engage in entrepreneurial activities;
7) insufficiently developed legislation on intellectual property;
8) high academic load on teachers of Russian universities, which condemns universities to 1.0 status and hinders active scientific and innovative work, participation in cooperation with business entities [15, 16].

The legal problems of the implementation of intellectual property deserve special attention. It seems that the lack of legal certainty about the rights to intellectual property objects is one of the main obstacles to the innovative activity of Russian universities, their commercialization of knowledge and technologies. This is the main obstacle to innovation in the country as a whole, the creation of corporate venture funds and venture companies. After all, for both domestic and foreign investors, when deciding whether to invest in research and development or in the purchase of new technology, it is important to clearly understand in what order and in what proportion rewards from the sale of intellectual property will be distributed. Otherwise, the interest of both business and universities in the commercialization of patents, inventions, and discoveries is sharply reduced. Without resolving the issues of the legal nature of intellectual property and its rightholder as a subject of legal relations, it is impossible to provide an effective mechanism for the interaction of business with the sphere of inventions and discoveries, which means that a single “innovation chain” in which universities would participate will not develop [17, 18].

Conclusion

Thus, the inclusion of Russia in the new technological revolution urgently requires the modernization of the activities of the leading Russian universities in accordance with the concept of University 3.0, the Russian model of which is the University of the National Technology Initiative. Ensuring the global technological competitiveness of the Russian economy is impossible without deep institutional transformations aimed at transforming leading universities into centers of entrepreneurial ecosystems, leaders in the formation of technological and market competencies, and drivers for the development of future markets.

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