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Article

Managing the transition to a research-type university: Experience of Moscow Polytechnic University

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Abstract: The article analyzes the process of formation of research universities as one of the elements of a strong innovation economy. The formation of a new university model is a global trend, successfully implemented in English-speaking countries. In Russia, the educational system is not yet ready to ensure the country's effective competition in the innovation market. The Strategic Academic Leadership Program "Priority-2030" is designed to carry out the functional transformation of the entire infrastructure of human capital reproduction in a short period of time in Russia. The article presents an analysis of the main conditions for the development of a university with a research strategy, as well as an assessment of the implementation of this strategy by Moscow Polytechnic University. The methodological basis of the study was formed by qualitative methods: included observation and benchmarking of universities' activities, which allowed to generalize the current global trends and best practices in the field of education. For the analysis we used the data of monitoring the activities of higher education organizations, data of official statistics, as well as data from reports and presentation materials of universities and online publications participating in the "5-100" and "Priority-2030" programs. The results of the study may be useful for researchers and practitioners engaged in the transformation of the Russian higher education system.

Keywords: academic revolution; massification of education; research university; University 3.0; knowledge economy; liberal education; project-based learning; academic postgraduate study; imitation of science; development management; university brand

1. Introduction

The desire to create world-class universities has become a global trend in recent decades around the world. The key task of the world's universities is to become active participants in the formation of the innovative economy of the country, to contribute to its competitiveness at the global level by reproducing and improving the quality of human capital and commercializing the results of academic science. The new university model in Russia is being formalized within the framework of the large-scale national education program "Priority-2030". However, despite the state support of institutional transformation of higher education, in Russia the process of transformation of classical universities into research universities is delayed, covering mainly the leading universities of the country, and occurs mainly through the development of innovation infrastructure and to a lesser extent—through changes in educational and research strategies of the university.

Given the real need for the development of research potential of Russian universities, we consider it appropriate, based on the analysis and generalization of the

experience of modernization of research universities, to identify the conditions and factors that actualize the research transformation of universities in the conditions of modern Russia, to give a conceptual description of the state and trends of transformation of Moscow Polytechnic University in the context of practical implementation of the model of a modern university for Industry 4.0. The presented experience of university modernization can be useful for other Russian universities in developing their own strategic solutions and development tools in the transition to the model of a research-type university.

2. Materials and methods

The classic country of research universities is the USA. The best research universities, according to the Shanghai ARWU rating, for many years have been Harvard, Stanford, Massachusetts, and Berkeley Universities. In the 40s of the XX century the USA relied on universities as a basic element of the linear model of the innovation process, originating in fundamental research and leading to the introduction and commercialization of scientific knowledge in the form of innovations. The ideal model of the research university was a "specialized and advanced research laboratory" (Flexner, 1994). This approach Clark (2019) called organizational innovation. In 2004, the Russian Federation also set a course to form a network of research universities, using foreign experience of creating world-class universities. At the same time, to date, university science in Russia still cannot be called an industry focused on the development and implementation of new generation technologies, despite the financial support from the state. Our main objective in this article was to identify the essence and strategic solutions in creating a new model of a world-class research university and the peculiarities of the implementation of foreign experience in the Russian reality. To achieve this goal, the methodological basis of our research is interpretive research, the main components of which are the collection, analysis, systematization and interpretation of data on the stages of formation and principles of building a new model of research university based on the analysis of scientific publications of foreign authors, development strategy programs, reporting and presentation materials and Internet publications of leading universities in the United States and Russia. Based on the analysis of foreign experience, the authors of the article present the principles of building a model of research university in Russia on the example of Moscow Polytechnic using modeling and case study methods.

3. Results and discussion

3.1. Theoretical and methodological framework of research

In the modern world, the market of educational services has a special role of a regulator in the macroeconomic system. Universities, forming the demand for transformation of the infrastructure of human capital reproduction, should fulfill it taking into account global trends and the interests of the national economy. The main trend in the transformation of the modern university is its transition from the model of University 1.0 to the model of University 3.0 (research university), which fulfills the traditional educational and research functions in combination with the third function

of supporting technological and innovative development of the economy both locally and globally by training specialists with innovative technologies and capable of producing expert knowledge and innovations.

This circumstance makes it relevant and significant to reflexion in relation to a new model of the modern university, which will allow it to become a driver of innovative, economic and socio-cultural development of society.

Our research was focused on analyzing the model of creating universities that claim to achieve world leadership in education and research. The research was based on the method of analyzing cases on evolutionary and meaningful creation and development of world-class universities. Important for our study were the works of them. (Altbach and Salmi, 2011; Bok, 2009; Bronstein and Reihlen, 2014; Clark, 2019; Etzkowitz and Leydesdorff, 1997; Gibb and Hannon, 2006; Kirby, 2006; Readings, 1996; Wissema, 2009).

The author of the University 3.0 concept, Wissema (2009), Professor of Entrepreneurship and Innovation at Delft University of Technology, distinguishes three stages in the formation of a modern university: the first-generation university corresponds to the model of a medieval university, the second-generation university corresponds to the model of a classical (Humboldt) university, and the third-generation university (3G) corresponds to the model of a modern, or entrepreneurial, university. At the same time, the modern stage of university development is characterized by him as “transitional” in relation to the formation of the “third generation” model. Only some of the leading universities in the world today, in addition to the educational mission, form a mission to develop scientific research, a belt of innovative companies, entrepreneurial activity and participation in the socio-economic development of territories.

In the strategy of transition to the University 3.0 model Karpov (2017). proposes to focus on three main components: “1) social-academic—changes in the university structure, academic environment, learning process and pedagogical activities; 2) scientific-innovative—formation of centers of research and technological excellence, development of the open innovation system, implementation of the concept of “university at the center of innovation-entrepreneurial ecosystem”; 3) economic—flexible response in labor markets (dialogue with industry)” (Karpov, 2017).

Neborskiy (2017) considers a modern university as an institutionally complex entity in which the model of education is built with a reliance on business structures and industry. The axiological basis of the University 3.0 is the competence model, in which business structures and industrial enterprises are involved in the educational process, the main goal of which is to train innovative-type specialists with competencies for the transition from research to development with their subsequent commercialization.

When conducting research in the direction of analyzing the essential characteristics, the mechanism of formation and development of University 3.0, Russian and foreign scientists often use the terms “innovative”, “research”, “entrepreneurial”, “post-non-classical” or “third-generation university”. For example, a leading expert in the field of global tertiary education Jamil Salmi calls it a “world-class university” and gives the following definition: “a university that makes a significant contribution to the development and dissemination of knowledge through

advanced research, teaching with the most innovative programs and pedagogical methods; it introduces research activities as an integral component of the educational process; trains competitive specialists who achieve significant achievements in the field of higher education. These specific achievements, combined with international recognition of the university's successes, place the university at the level of a world-class university" (Salmi, 2009).

Calrk in 1998 introduced the concept of "Entrepreneurial University" for the first time in relation to the University 3.0 model. By entrepreneurial university he means a university that develops a comprehensive culture of entrepreneurship and innovation, building mutually beneficial relationships with enterprises for effective knowledge and technology transfer, which contributes to strengthening its competitiveness and generating internal sources for self-development. In an article (Clark, 1998) he first formulated a set of conditions (characteristics) to be met by such a university: "The minimum required includes five elements: a strengthened steering core; an enhanced development periphery; a discretionary funding base; a stimulated academic heartland; and an integrated entrepreneurial culture" (Clark, 1998). In his opinion, an important condition for the effective functioning of an entrepreneurial university is a management style that provides flexibility of the organizational structure and strategic interaction with the external environment.

A number of Russian researchers (Efimov and Lapteva, 2017; Kalinina et al., 2017) consider the transformation of higher education in the context of the University 4.0 model, characterizing it as "cognitive". From these positions, the key activities of University 4.0 (education, innovation, know-how, commercialization, expertise, consulting, design) are moving into the virtual space (Efimov and Lapteva, 2016).

The conducted literature review on the issues of conceptualizing the innovation perspective of Russian universities turned out to be less elaborated and highlighted than the American model of University 3.0. In this regard, it seems relevant to provide a conceptual characterization of the state and trends of transformation of Moscow Polytechnic University in the context of practical implementation of the model of a modern university for Industry 4.0, which will allow Russian universities to adjust their strategic decisions and development tools in the framework of the transition to the University 3.0 model.

3.2. Results

3.2.1. Global educational trends global educational trends

Industry 4.0, the elements of which are actively beginning to be introduced into our lives, prioritizes technologies and innovations, which require the development of new skills, mastering new competencies. As a result, on the one hand there is a growing demand for intellectual elite capable of generating knowledge, technologies and innovations, and on the other hand for specialists with higher education capable of using innovative technologies rather than creating them.

In the context of globalization, modern universities, fulfilling the request to transform the infrastructure of human capital reproduction, do so taking into account the global trends of the academic revolution: global knowledge economy and mass-marketization (Altbach, 2016; Kovalev and Falchenko, 2017). This involves the

creation of universities with different missions and different goals, targeting mass and elite enrollment.

In the world, the growth of the share of young people receiving higher education began from the middle of the last century, but after the beginning of the new century the dynamics slowed down significantly. Thus, before the Second World War, about 150 thousand people studied at universities in Great Britain, Germany, and France in the aggregate, which amounted to 0.1% of all residents. Between 1955 and 1985, the number of students in universities in Spain increased 15 times, Sweden and Norway - almost 10 times, France 6–7 times, Greece, Germany, Ireland 4–5 times (Evplova et al., 2019). In the period from 2000 to 2012, the growth of students in these countries was at the level of 1%–5% (Evplova et al., 2019).

In Russia, massivization began to gain momentum at the end of the 20th century, which is confirmed by statistical studies, according to which the number of students in 1939 fluctuated within 3%–7% of the population, and in the postwar period the contingent of part-time students increased 3.6 times, full-time 2.6 times. New areas of training, new faculties and universities were opened—about 70 new universities. In the period from 1998 to 2006, the number of students increased another 3 times, which had a significant impact on the number and structure of universities. In 1995/96 academic year statistics recorded 193 non-state and 569 state universities, five years later there were already 358 non-state universities, and ten years later 413. In 2020, there were 724 higher education institutions in the Russian education system: 495 state and 229 privates, with about 4 million students (Gokhberg, 2020). Today, there are 1058 higher education institutions in Russia. They are scattered in 344 cities of our country. There are 855 state universities and 203 non-state universities available to enrollees.

In the opposite direction from mass higher education is the global knowledge economy (Altbach, 2011), which has served as a catalyst for many countries of the world in setting tasks for the development of world-class research universities that train specialists capable of producing modern expert knowledge and innovations. Transformation of a classical university into a modern research-type university changes the very approach to the content and organization of the educational process, including the development of critical interdisciplinarity as an indispensable quality of a university, teaching meta-skills in cooperation (collaborative learning), the use of modern technologies, project and problem-based learning, research methods, methods of organizing group discussions, game technologies, blended learning formats (blended learning). In the context of the global knowledge economy, it is critical for research universities not only to seriously change academic formats, but also to reach a new level of research and development, while maintaining a high speed of change. A first-class management team capable of developing a critical consciousness and a new identity is also a prerequisite. Kerr (2001) coined the term “multiversities” for modern universities because they combine teaching, research and services that “intermingle” and produce complex organizational forms in higher education.

3.2.2. Transformation of Russian university education

In Russia, the transformation of higher education institutions towards the global knowledge economy began in 2004 with the Federal University project; in 2008, the

National Research University project was launched, and in 2016 a program to create core universities was launched. As a result, today Russia has 10 federal universities, 29 national research universities and 33 core universities. In the future, it is planned that the number of research universities will be reduced to 25, and the number of core universities, including those with the new status of national core universities, will be almost doubled. The program of strategic academic leadership "Priority-2030", which in 2021 replaced the project of increasing the competitiveness of leading Russian universities among the world's scientific and educational centers "5-100", is designed to change the position in the hierarchy of universities. Being a logical continuation of the "5-100" project, but at the same time radically changing the main priorities of development, the "Priority-2030" program is focused on the transformation of as many leading Russian universities as possible in the direction of the model 3.0. and further 4.0, according to which the transfer and commercialization of scientific discoveries become one of the main areas of university activity.

As a result of the implementation of strategic initiatives, the structure of Russian university education looks as follows (**Figure 1**).

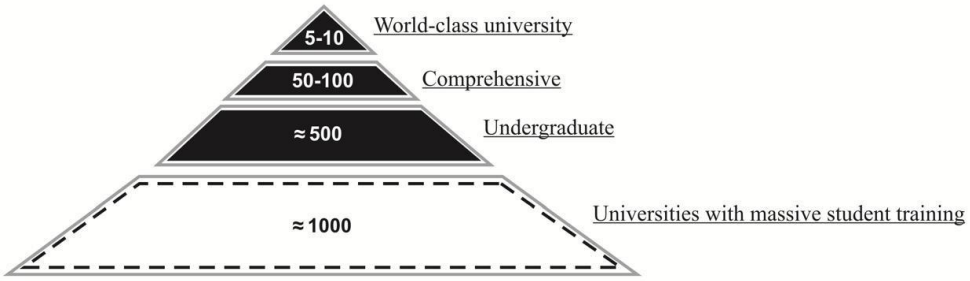

Figure 1. Structure of Russian university education (Volkov, 2023).

In modern conditions, the main elite resources redistributed by the state within the national education system are concentrated in the top-level flagship universities. According to A. Volkov, regional universities are in the most difficult situation, as they find themselves "torn" between two opposite trends of the global academic revolution (Volkov, 2023). The main task for regional universities to move to the upper level becomes the choice of an effective strategy and genuine development management. In order for systemic changes to take place, Russian universities need the implementation of the Humboldt model, when the educational process is based on advanced research conducted at the university, as well as a fundamental change in administrative, managerial and campus infrastructure.

3.2.3. Transition to a research-type university: Experience of Moscow Polytechnic University

Let us consider the experience of Moscow Polytechnic University in the context of practical realization of the transformation process into University 3.0.

According to the structure of Russian education proposed by A. Volkov's structure of Russian education, Moscow Polytechnic University takes the place of a so-called regional university (comprehensive university), which, being a participant of the Priority-2030 Strategic Academic Leadership Program, strives to acquire new skills of globalization, digitalization, commercialization and marketization.

Transformation of a regional university into a world-class university requires building a vision and a unique target model of development, with a clear focus on strategic projects and their "showcase offerings" for the external environment. At the same time, the university's strategic projects should have development leaders with forward thinking, capable of conducting large-scale multidisciplinary scientific research and packaging them into products in demand for commercialization.

The main experimental zone of Moscow Polytechnic University's transformation was chosen as the Advanced Engineering School (AES) of electric transportation (strategic project "Affordable Electric Vehicle"), built on the model of a scientific and educational greenfield. The creation of such an experimental zone helped the university to concentrate human and financial resources on breakthrough research and educational projects.

However, true transformation of a university into a 3.0 or 4.0 university implies not just systemic transformation, but a high speed of systemic changes in cycles of adaptation and refocusing on other strategic projects when necessary. In the case of Moscow Polytechnic University, the strategic project "Affordable Electric Vehicle" contributed to the emergence of new priority areas of development (**Figure 2**).

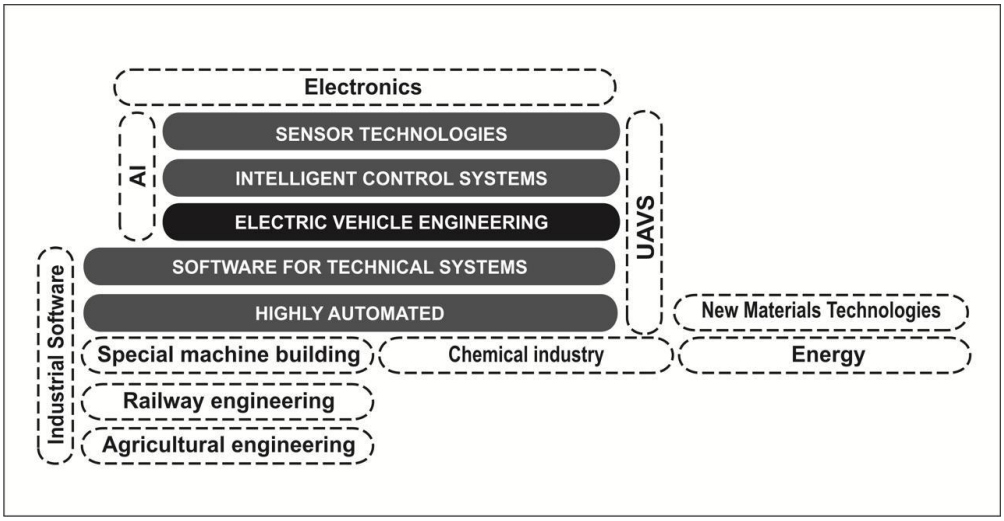

Figure 2. New priority areas of development to which "Affordable Electric Vehicle" contributed.

Source: Rector's report at the Academic Council "Report on the activities of the University in 2023 and the work plan for 2024", 25 April 2024.

The main course of development within the framework of strategic projects is aimed at complete modernization of the content and organization of the educational process—changing the post-Soviet model of "educational pipe" to the American model of "free education" aimed at training specialists with soft skills and hard skills competencies that are so valued by progressive employers today. Moscow Polytechnic University is trying to change the linear format of "pipe" education through the introduction of a system of distributive requirements, within which the training of highly qualified personnel is carried out in the format of continuous and sustainable interdisciplinary interaction and project-based learning with the possibility of introducing flexible educational trajectories. Employers and industrial partners are considered to be full-fledged subjects of interdisciplinary interaction when

interdepartmental project teams are formed to work on a real project - departments that unite teachers and students from several faculties, laboratories, and research centers. These teams include representatives of IT, engineering, as well as creative specialties: journalists and designers. For example, the university, within the framework of the interdisciplinary project "Design Thinking 4.0", involves students of the Department of Design in the work on engineering projects to develop the design of vehicles.

Undoubtedly, the new format of knowledge delivery is a serious challenge for the university, requiring large financial and human resources, as classroom training implies the absence of lecture streams in the format of active and interactive dialog between a teacher and a group of students of 10–12 people.

Moscow Polytechnic University, building a new format of training, gradually stimulates the faculty to self-development and healthy internal competition, as well as to the regular use of non-classical teaching methods in the educational process - from simulation and gamification to debates and creation of a real project under the order of an industrial partner. As a result, the university produces a graduate packed with universal competencies, who knows languages, can think systematically, critically and creatively, has communication skills, can gather a team of like-minded people around him and lead a project, but at the same time has very narrow professional competencies, who can work with a specific future technology, in a laboratory and on equipment that only this employer has.

Developing the system of professional research education, Moscow Polytechnic University is developing a pilot project to create an elite educational program "research master's degree—postgraduate studies". The integrated program is a two-level "2 + 4" program aimed at preparing dissertation research, primarily for the needs and objectives of industrial partners. For this purpose, the university immerses 100% of masters in the work on real projects of more than 350 partners-employers. Already today university masters conduct research and work on projects of leading companies in the digital economy, creative industry and automotive industry, such as Bugatti and Pininfarina, LADA, Cyclone, NAMI, Kamaz, Avtotor, Mercator.

The educational trajectory of training future researchers within the integrated educational program is carried out logically and consistently from the first to the second level, which, complementing each other, form the target competencies of the program graduates. The main educational component is realized at the Master's degree level. Within the framework of this module there is the formation of research competencies through familiarization with the cutting edge of science and its content. At the postgraduate level, students study special elective courses aimed at in-depth study of actual scientific problems on the topic of dissertation research and projects implemented under the order of industrial partners. Upon completion of the academic master's program, the graduate student is assigned a supervisor from the university and the partner enterprise, and the research topic is formulated to meet the specific objectives of knowledge-intensive industry enterprises.

The new design of educational programs requires special organization of educational and recreational space. The new educational concept includes inverted classrooms, flat classrooms for project work, digital learning laboratories, transformer classrooms with equipment for hybrid classes, where meta-disciplinary research can be conducted, and always available recreation rooms.

For sustainable development and transformation of the university into University 3.0, it is critical for Moscow Polytechnic University to reach a new level of research and development, starting with the complete eradication of imitation of scientific activities, indigenous scientific schools and eliminating the gap with the basic research protocol (Sokolov and Titaev, 2013). Today, Moscow Polytechnic University still cannot be categorized as a driver of the knowledge economy, as there is a catastrophic lack of research that is implemented in the current global scientific agenda and demanded by industry enterprises. For this purpose, university science should acquire the features of industry through the emergence of new development leaders with a forward-thinking mindset and capable not only of conducting large-scale multidisciplinary scientific research, but also of packaging it into products demanded by the national economy and partners, recruiting and leading a team, and organizing work with industry.

Becoming a modern university is also impossible without creating a campus research ecosystem—expanding the research space of the university to 50%–60%. In 2023–2024. Moscow Polytechnic University spent 775 million rubles on the development of scientific, technological and engineering infrastructure, which resulted in the creation of the Center for Technological Support, the Center for Reverse Engineering and Standardization, the Center for Virtual Testing, the Laboratory of Technical Control in the Optoelectronics Research and Development Center, the Center for Advanced Autonomous Vehicles, the Laboratory of Adaptive Technologies in Foundry Production, the Laboratory of Development, Research and Testing of Materials for Transport Systems, the Center for Engineering Development in the Field of Composites, and the Center for Research and Development in the Field of Composites. All this contributes to the development of new research directions, attracts new development leaders, leading scientists, graduate students and talented students from all over the world, ready to work on innovative products and technological solutions under the order of regional and national companies, which is especially relevant in the conditions of sanctions and implementation of import substitution policy.

The system of financing research activities of universities should be gradually transformed in the direction of reducing state support and expanding non-state sources. Today, Russia retains a centralized model of science funding—mainly at the expense of the state (it accounts for about 57% of the total budget). In 2023, the volume of science funding from the federal budget amounted to almost 706 billion rubles. At the same time, the revenues of Russian higher education institutions from research and development amount to only 7%. For comparison: in the US and Chinese universities the revenues from science are 14 times higher. The main difficulty in successfully building a commercialization system in Russia is that the majority of representatives of industrial enterprises and business structures do not want to invest in Russian technologies and scientific developments, which have a long-term nature and high risks, preferring to buy finished products abroad. Thus, the share of Russian industrial enterprises and businesses in R&D expenditures does not exceed 30%. In the leading countries of the Organization for Economic Cooperation and Development (OECD), 50–60% of funding for research conducted at universities comes from investments by the business sector and industry. As a result, only 5% of R&D results are used in

domestic industrial production, while the rest is not used in practice. For comparison: in the USA and Great Britain—up to 70% of R&D is implemented in production. The level of cooperation between Moscow Polytechnic University and industrial enterprises and businesses in the framework of implementation of applied research and development results is not high enough, but demonstrates growth and development dynamics (**Figures 3** and **4**).

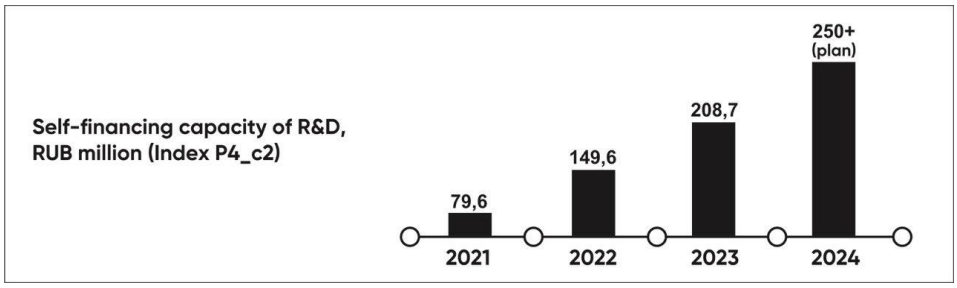

Figure 3. Self-financing volume of R&D, million rubles.

Source: Rector's report at the Academic Council "Report on the activities of the University in 2023 and the work plan for 2024", 25 April 2024.

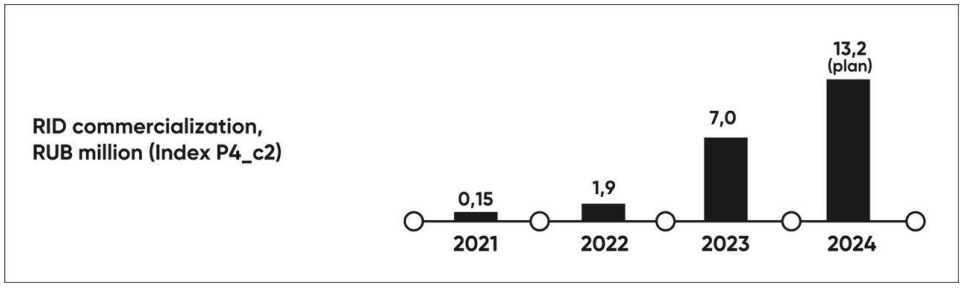

Figure 4. Commercialization of R&D, million rubles.

Source: Rector's report at the Academic Council "Report on the activities of the University in 2023 and the work plan for 2024", 25 April 2024.

Creating universities capable of producing innovations requires reforming the system of university management and decision-making. In the world's leading universities, the system called shared governance—"participation in university management"—is considered effective when all groups within the university feel themselves as partners rather than executors, which stimulates the aspiration of NDP to create new knowledge and develop innovations (Skolkovo, 2023).

Since 2019, Moscow Polytechnic University has been managing its strategic development according to the Dutch governance model (**Figure 5**).

At the same time, it should be noted that, having adopted the "Dutch" model of management as a basis, the university faces some difficulties in its implementation. The main limiting factor is the established organizational culture. This is manifested both at the level of the first person - in the rector's aspiration to keep under control all spheres of the university's activity, and at the level of "old-school" (local) professors and some part of the university administration. The existing university culture is a barrier to the involvement of "non-members" (cosmopolitans) in university management, even if they are formally included in deliberative university commissions. Access to financial and strategic information is limited. All strategic

decisions are made by a narrow circle of people in a closed environment and only later are offered for familiarization to the teaching staff and managers.

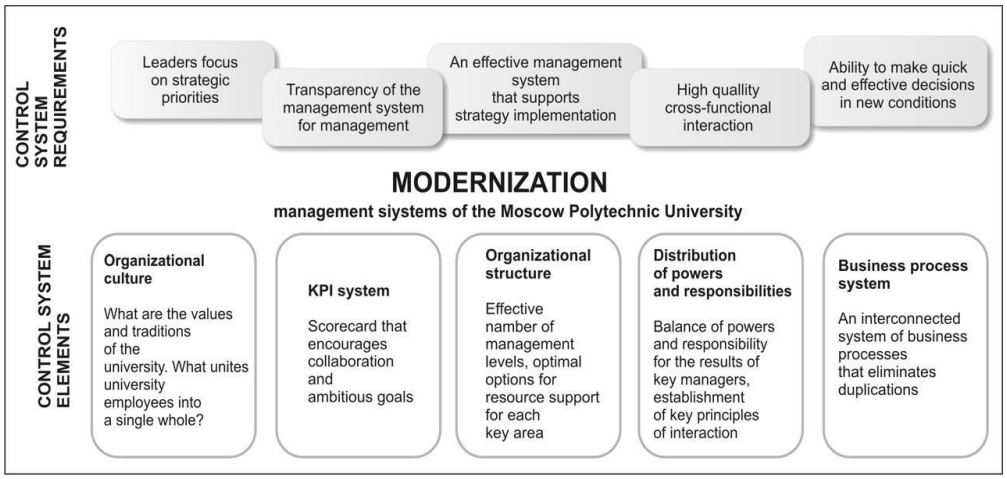

Figure 5. Modernization of Moscow Polytechnic University management system.
Source: Rector's report at the Academic Council "Report on the activities of the University in 2023 and the work plan for 2024", 25 April 2024.

Modern conditions of world-class universities actualize the search for a new identity for regional universities, revealing and emphasizing their unconventionality and exclusivity for external and internal positioning of the university brand. In the process of positioning the university should convey to its target audience its main idea —uniqueness, which distinguishes it from competitors and reflects its mission (who are we?), values (how do we work?) and perspective vision (how do we see ourselves in the future?).

The formation of internal identity and on its basis corporate culture serves as a unifying basis for the university, uniting the staff into a single team for the effective realization of its mission. Building a positive self-identity of employees and their corporate culture requires effective internal corporate communications, internal marketing, organizational and information support for change.

Moscow Polytechnic University, actively implementing strategic development tracks, such as critical interdisciplinarity, the growing demand for creative and existential skills, the spread of online learning technologies, the development of cooperation with industrial partners for applied R&D and technology transfer, has not fully formed an effective system of corporate strategies aimed at building the loyalty of professors and university employees to change, has not built effective channels for receiving and transmitting meaningful information As a result, the image of a collective "we" has not been formed, the majority of faculty members choose an individual trajectory of professional development, and the ongoing institutional changes are supported only by those for whom innovations bring positive prospects for their personal career growth.

The situation is aggravated by the growing bureaucratization, regulation and standardization of university activities. In conditions of universal unification, the system of performance indicators becomes a priority, and the main figure in the university becomes an administrator who controls the implementation of KPIs.

Bureaucracy, lack of personal initiative and interest of the university staff in changes lead to elimination of the value content of activity, refusal from reflection and strategic action, avoidance of changes, especially if they are carried out in large numbers, as required by the program "Priority-2030".

The external positioning of the university brand is connected with the market positioning (for the university it is the labor market, educational services, intellectual property, scientific products and technologies) and is designed to ensure the conquest of a certain competitive position. The competitive advantage of the university is expressed through its mission, which incorporates the values shared by the university staff and transmitted to the external target audience. The key problem of positioning of modern Russian universities is that most universities do not consider branding as a strategic task of higher education institution development, aimed at finding distinctive and unique features of the university. As a result, most Russian universities follow the same rhetoric of positioning with a claim to uniqueness.

4. Conclusion

In conclusion, we would like to emphasize the main actions necessary, in our opinion, to transform a regional university into a world-class research university:

- modernization of the educational process aimed at the implementation of individual student learning trajectories;
- development of a project environment for research and engineering activities, ensuring the realization of multidisciplinary projects;
- reduction of organizational barriers between academic teams structured by subject areas;
- eradication of imitation of scientific activities, "indigenous" scientific schools, establishment of a basic research protocol;
- organizing the teaching, research and recreational space of the campus;
- utilization of new forms of collegial governance;
- formation of internal identity and corporate culture and on its basis building the external positioning of the university brand, designed to ensure the competitive advantage of the university in the national and global market.

It is important to note that Moscow Polytechnic, following the path of creating and implementing an effective model of a world-class research university, not only effectively implements a new approach to modern research and the mechanism of obtaining new knowledge, which consists in the cooperation of scientists, teachers, students and partners of the university to conduct joint research and subsequent commercialization of the results obtained, but also builds a new management system of the university. The experience of modernization of Moscow Polytechnic presented in the case study will help Russian universities in forming their own model of a research-type university.

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SAB; project administration, VKN. All authors have read and agreed to the published version of the manuscript.

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