Research Article

The Role of Federal Research Centers in Implementing the Strategic Priorities of Scientific and Technological Development of Russia

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Abstract. The image of Russian science will change with the adoption of the new state program: Scientific and technological development of the Russian Federation. This paper discusses the reasons for such a significant transformation of science, and defines the tasks of federal research centers in the new system. Three federal centers of the European North of Russia were chosen as the objects of the study including Karelian, Kola and Komi Federal Research Centers. The paper briefly describes the history of the creation of a regional network of scientific organizations and their tasks. It also gives some examples of successful complex interdisciplinary cooperation between these three scientific organizations during the Soviet period. The attention is focused on the challenges facing the scientific organizations at present and the tools proposed for solving these. The tools primarily include a project approach and mechanisms for organizing complex interdisciplinary research, such as federal scientific and technical programs, integrated research programs, scientific educational centers at the international level, and the strategic academic leadership program Priority-2030. These aim to concentrate the efforts of researchers on the priority tasks of developing science and the most important sectors of the country's economy. Federal research centers have a number of advantages over ordinary scientific organizations when science begins to concentrate in large 'regions of knowledge'. Due to redistribution of internal reserves, they can initiate new research trends, points of growth, and joint research within the framework of integration projects.

Keywords: federal research centers, project management, grand challenges, networking tools

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1. Introduction

In October 2021, the new state program "Scientific and technological development of the Russian Federation" designed to change the image of Russian science was adopted. The changes will affect both education and science. The reformation of Russian science has been going on at different rates since 2006. The most significant events of the reformation include the withdrawal of all academic institutions from the

control of the Russian Academy of Sciences, the creation of the Federal Agency of Scientific Organizations (2013-2018) and federal research centers on the basis of several hundred academic organizations. In this work, we will outline the reasons that required new significant changes in the key priorities of science in Russia and will predict what place federal research centers will take in the new system. The objects of the study are three federal centers of the European North of Russia including Karelian, Kola and Komi Federal Research Centers. They have a very similar history and develop in the same way as all regional scientific centers. Programs of further development proposed for these organizations can be generally applied in other scientific organizations.

2. Historical review

First, I would like to say a few words about how the regional network of academic institutions was formed. The Imperial Academy of Sciences was a club of scientists who discussed the results of scientific research of its members obtained at the main place of work: at the departments of universities, state committees and departments. With the formation of the USSR, complex expeditions became the main form of activity of the Academy of Sciences in remote regions of the country. They made a great contribution to the economic and cultural development of undeveloped regions, including the Union Republics. New mineral deposits were discovered, and schemes for the economic development of the regions were adopted. At the same time, the leadership of the country became convinced that it was impossible to plan the industrial development of the regions only by expanding the number of complex expeditions. In 1928, the June Plenum of the Central Committee of the All-Union Communist Party of the Bolsheviks pointed out the importance of engaging science in solving the problems of the national economy and adopted the resolution “On the organization of the institutions of the Academy of Sciences at local level in the shortest possible time”. By 1941, 18 branches and bases of the Academy were organized, including the Kola base of the USSR Academy of Sciences. The Great Patriotic War and the subsequent evacuation had a serious impact on the development of academic regional institutions. Central scientific institutions along with scientists and equipment were evacuated to remote areas, mainly to the places where branches and bases of the Academy of Sciences had already existed. As a result, the tasks, which included study of the regions, search for and stocktaking of mineral resources, and study of the culture of the outskirts, were carried out at a qualitatively new level [1].

It is not surprising that during the war and immediately after it, seven more branches and bases were organized, including the Base of the USSR Academy of Sciences in the Komi ASSR and the Karelian-Finnish base of the USSR Academy of Sciences. It is interesting to note that at first the structure of most of the bases was uniform, i.e. there were institutes of a biological and geological profile and institutes of language, literature and history. Therefore, the main tasks set by the Presidium of the USSR Academy of Sciences for the branches were fulfilled, including help to local governing organizations in identifying and studying natural resources in order to mobilize them for the needs of the national economy, and development of issues of language, literature and history of the peoples of the national republics.

The history of the three northern scientific institutions was very similar. At one time, the bases were reorganized into branches. They equally had to defend the right to organize new institutions in the structure of the branches in the 1950s. In 1960, when a decision was made to liquidate the network of the branches of the Academy, a difficult period of struggle for the preservation and restoration of the scientific potential began. Common territories and tasks led to the need for scientific cooperation. In 1971, the chairman of the Kola branch of the USSR Academy of Sciences, Corresponding Member G.I. Gorbunov suggested the Komi and the Karelian branches to consider the possibility of joint economic work in the European North. Since the European North brings the Murmansk region, the Karelian ASSR and the Komi ASSR closer together in terms of the availability of mineral, fuel and energy raw materials, forest and fish resources, the three branches of the USSR Academy of Sciences decided to prepare a scientific and technical report “Problems of increasing the efficiency of social production and the main directions of the development of productive forces in the European North up to 1980 and with a forecast up to 1990”. The following year, it was presented to government bodies, the Arkhangelsk and Murmansk regional party committees, and the Councils of Ministers of the Komi ASSR and the Karelian ASSR [2].

In the future, it was decided to systematically and constantly coordinate scientific research both in the sphere of mineral resources and in the sphere of economic and social problems. This coordination resulted in a socialist competition between the three branches. In the process of cooperating and competing, the branches achieved a significant success. Each branch obtained substantial results, which were later implemented in the real sector of the economy. The joint work was based on elaboration of the prospects for the development of the productive forces of the European North, which received state recognition and was singled out as a sub-region of the Russian Federation. The following projects were carried out in the process of joint work: 1) a complex program of

scientific and technological progress for the period up to 2005 in five-year plans; 2) a comprehensive geological atlas of the North of the European part of the USSR in order to assess the prospects for the mineral resource base of the territory; 3) the main directions of the development of productive forces and the increase in production efficiency; 4) a program “Integrated Development of Natural Resources and Development of the Productive Forces of the European North of the USSR for the Period up to 2000”; 5) “The scheme of development and distribution of the productive forces of the Murmansk region for the period from 1976 to 1990” and others [3]. In the late 1980s and 1990s, in the conditions of the formation of new socio-economic and political relations, the system of socialist competition became an anachronism and withered away. However, the present international and national scientific agenda requires complex interdisciplinary projects and new mechanisms of network interaction.

3. Results

The fourth industrial revolution is starting [4]. The explosive development and spread of new technologies, their penetration into all spheres of human activity lead to rapid and profound changes in the architecture of markets, business models, and organizational structures. The abundance of natural resources and the cheapness of labor are no longer the main drivers of growth. Participation in this new technological revolution is one of the main socio-economic and historical challenges for Russia [5]. This can be achieved only through the development of new science-based industries and sectors of the economy. Therefore, science in Russia should also undergo changes, get ready to respond to major challenges, and transform itself in the same way as the Chinese Academy of Sciences, which undertook a critical self-analysis and came to the conclusion about a gap between its scientific structure and research areas and the innovative potential on one side and the needs of the market on the other side [6].

The current state of the national scientific and technological complex of Russia is characterized by both significant reserves and a number of unsolved problems which interfere with the long-term sustainable development of the country and with ensuring its presence among the global scientific and technological leaders. Today, scientists in Russia are likely to be focused on the scientific schools and the preservation of traditions when choosing research topics. Researchers are more motivated by creative work and environment than by the search for prestigious topics or by the current situation, and new topics are not predicted at all. This interferes with the rapid response of science

to the solution of significant problems within the framework of the priorities of scientific and technological development (new science-based industries and technologies).

In his public addresses, President Vladimir Putin has repeatedly spoken about the importance of the transition to a new development model using high-tech industries based on scientific knowledge and innovative technologies. “I believe that without delay, we should develop specific practical tools that will take into account global trends and challenges, flexibly respond to the needs of the society and the economy, to new technologies, scientific knowledge, and educational competencies [7]. Countries that can develop them will have a long-term advantage and the opportunity to receive huge technological rent. Those who fail to do so will find themselves in a dependent, vulnerable position.” [8].

The executive authorities have repeatedly revised funding mechanisms to fulfil the President’s instructions. Project financing of science was chosen as the best one . Although the President has regularly spoken about the need for these steps since 2007, [9-12] the first practical results are becoming noticeable only now. Previously, there were no practices of using project financing in Russia. The situation changed with the launch of national projects. The experience of their implementation in the state management system (at the federal, regional, and departmental levels) is accepted as a successful example of project management. Therefore, the ways the Ministry of Education and Science of the Russian Federation is currently implementing the project ”Science and Universities” (including competitions for conducting large-scale world-class scientific research, events within the framework of Federal scientific and technical programs, etc.) are variants of project management, and the Ministry will continue to introduce such mechanisms actively. Only those organizations that accept the new rules of the game, form research topics in accordance with national challenges, are ready to transform themselves to fulfil new tasks, successfully perform scientometric indicators and, are ready to guarantee their stable growth in the coming years, can participate in such projects as Federal scientific and technical programs, Integrated research programs, Scientific educational centers of the international level, Scientific centers of the international level, the strategic academic leadership program “Priority-2030”, and other similar projects. Most organizations blindly implement scientometrics without understanding the global goals and objectives for which these indicators were set. This results in overestimation of the indicators and a lack of progress in many areas of knowledge. At the same time, the academic science defends its right to follow its ususal path. In these conditions, the state relies on the development of fundamental

science in universities. It encourages the affiliation of research institutes to universities, but not vice versa.

Let me give you an example of scientometrics. There have been heated discussions that scientometrics is a dead end, that the number of articles is increasing at the expense of their quality, that Russian scientists are developing foreign journals thereby killing their own ones, etc. Here it is appropriate to recall a proverb saying that a dog bites a stick, and a lion bites a hand that holds the stick. In this metaphor, the stick is scientometrics. Perhaps we should not be like this dog and struggle for an increase in scientometric indicators, but understand what this tool is used for. Scientometrics is a stimulus (including the meaning of a whipping stick) for scientists to work according to the priorities of the strategies of scientific and technological development of the Russian Federation and the Grand Challenges leading them to the global level. If we conduct research on the issues of the international scientific community concern, then there will be no problems with publications in the leading journals, and scientific events will make a significant contribution.

4. Discussion

When the Ministry of Education and Science of the Russian Federation offers us certain programs, they act according to a certain logic. They set certain frameworks, requirements, and restrictions for organizations, which ultimately should help research and educational institutions to find themselves in the right problem field from the viewpoint of the state. To implement the strategies for the development of scientific organizations, these organizations need to consider these frameworks when forming research plans and strive to fit into them.

The first framework is an international one. Any scientific research, even if in some way, must correlate with global scientific problems. It would be ideal to find quick appropriate responses to the Grand Challenges, to ensure the country's long-term positioning among the world leaders, and to formulate fundamental problems in the scientific and technical sphere, the solution of which can be accelerated by coordinated scientific research due to the emergence of new knowledge and technologies. There are certain difficulties here, which we have already discussed.

The second framework is a federal one. In the conditions when there is an inverted pyramid of science financing in Russia (the state provides 70% of all funds for fundamental research and 30% comes from business [13]), there will be a shortage of funds for the development of the country's scientific and educational complex. As a

result, the entire budget for science in Russia is comparable to the budget of one or two universities in the USA. There is not enough money to create and maintain an advanced infrastructure capable of conducting research at the international level in every scientific and educational organization. Stimulation of competition and cooperation is inevitable in these conditions. The projects of the Ministry of Education and Science of the Russian Federation will strengthen these processes, and organizations that form effective consortia earlier will gain a significant competitive advantage.

As it has already been mentioned, the fourth industrial revolution will change the structure of the real sector of the economy and high-tech industries will come to the fore. In Russia, the economy and society remain insensitive to innovations, the supply of research and development results does not match the demand for them from the real sector of the economy, and the level of this demand is unacceptably low. Orientation of the research and development sector to the needs of innovative business is an important task in these conditions.

The third framework is a regional one. It is impossible to work in a region and to be separate from this region. Regional authorities always want three things from science:

– Participation in the formation of regional development strategies;

– Assistance to the socio-economic development of the region;

– Substantiation of the creation and development of new industries.

Modern science is impossible without the introduction of research results into the real sector of the economy, which means that it should not work in isolation from production and without the business or corporations. Therefore, the fourth framework is industry. The global trend of recent decades is that R&D is improving largely due to the growth of research activity in the corporate sector, as well as the commoditization of research activities. In Russia, the business usually does not need anything from science. Therefore, scientists need to make significant efforts in order to interest the business. In this case, the interest of the business can be characterized as three trends:

– Creation of new technologies and innovative products;

– Formation of new markets;

– Optimization (reduction in cost) of production processes.

All projects and programs previously implemented by the Ministry of Education and Science of the Russian Federation aimed at fulfilment of the international and federal agenda. The federal budget is the source of funding for the majority of organizations engaged in R&D, therefore, we consider all other tasks through the federal framework. At the same time, the results of scientific research presented in the form of WOS and

Scopus articles are hard to understand and uninformative for the business and the region. Industry to a greater extent and regional authorities to a lesser extent think in terms of TRL (Technology Readiness Level), but TRL correlates little with the state assignment for scientific organizations. As a result, the entire existing system of financing science is aimed at solving federal and international problems, while regional and sectoral problems are rather optional. Such projects as Scientific educational centers of the international level, the strategic academic leadership program “Priority-2030”, etc. are intended to unite all these things. The tendency to form consortia will only strengthen. Currently, the preparation of a new version of the state program for the scientific and technological development of the Russian Federation is being completed. Its task is to systematize all available events of any format (from national projects to individual programs). In the first place, the funding will be designated for full-cycle research (focus on end products, services, and technologies), or breakthrough research that solves key scientific problems in the global scientific agenda, or predicting the transformations taking place in the world, recognition of new threats and prospects.

Under these conditions, federal research centers have an advantage over ordinary scientific organizations. Today, the tendency to organize regions of knowledge is more and more clearly traced in the world science (following the example of Levin, Grenoble, Shenzhen). The effect of Mathias ”the poor get poorer while the rich get richer” is clearly seen in science as well as in other spheres, which means the overflow of personnel and finances from the periphery to the Center. Science in the regions is already forced to look for mechanisms to resist this process. Federal research centers have more opportunities to initiate new research trends, points of growth, and temporary creative teams using their internal reserves. If we manage to structure our research in such a way as to comply with all of the four frameworks, it will not take long to see positive results.

5. Conclusion

Summarizing all of the above, I would like to note that the northern federal research centers share a rich history. We are working only in one direction of research. The future belongs to joint research in the form of integration projects. Today the federal research centers are united in the framework of the Scientific educational centers of the international level “The Russian Arctic”. There are also other projects where we can effectively complement each other and work on major tasks, such as, for example, permafrost, carbon footprint, and socio-economic development of the Arctic, using the

collaboration mechanism of the Federal scientific and technical programs and Integrated research programs.

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