



The System of Governance of Scientific and Technological Development in the Russian Federation

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Abstract. The goal of scientific and technological development in the Russian Federation is to ensure the independence and competitiveness of the country. The effectiveness of research and development is primarily determined by institutional environment and design. This paper aims to determine the dynamics of the Russian governance of science and technology in the pursuit of technological sovereignty. The methodology of the research includes a comparative and logical-linguistic analysis of legal acts, an assessment of the management readiness of scientific governance institutions. The method of decomposition, structural and functional analysis allowed us to draw conclusions on the extent of the system's dynamic balance, which is maintained by continual administrative reforms, goals prioritization, and effective allocation of resources. The results of the study can be used by public authorities to improve the state policy in this area..

Keywords: Governance; Science; Scientific and technological development; Technological sovereignty

1. Introduction

Russia has significant scientific and technological potential, especially in such regions as Tomsk Oblast, Moscow, and Saint Petersburg (WIPO, 2021; Byvshev et al., 2021; Marinchenko, 2021). Sanction pressure on Russia may have a negative impact on the prospects of domestic science and technology development (Kuleshov, 2022; Golovina et al., 2021). The loss of technological sovereignty can lead to a decrease in defense potential an increase in socio-economic differentiation both within the country and in comparison with the leading developed countries (Ivanov, 2016).

Governance of science on a national level is a challenging matter due to its dynamism, dissipativity, multi-agency and non-linear interactions, decentralized decision-making (Harkevich, 2013), heterogeneity (Zeng et al., 2017), and complexity (Sovacool et al., 2020): a classic cybernetics "black box" with economic and administrative incentives as inputs, and

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the new knowledge as output (Shepelev, 2020), thus the heterogeneity of factors is a hallmark of scientific governance (Chumnumporn et al., 2022; Fernandes & O'Sullivan, 2021; Pinheiro et al., 2016; Brocke & Lippe, 2015).

Today science, technology, and education are the main factors of economic development (Rahmonaliyevich, 2020; Berawi, 2019; Del-Giudice et al. 2017; Tapscott, 1999; Martin, 1995). In a knowledge-based economy, human life becomes the most valuable asset, and the standard of living depends on the ability to generate and transmit new knowledge (Sørensen et al., 2016), leading eventually to the spillover effects (Carayannis, 2020; Bencsik, 2020; López-Leyva & Mungaray-Moctezuma, 2017).

Among three major types of governance of scientific and technological development, *decentralized* and *transitive* systems (Shepelev, 2020; Dezhina, 2008), Russia represents an example of a *centralized* system characterized by a single decision-making center (the Ministry of Science and Higher Education), vertical integration and coherence of the system elements (Maasen et al., 2012). Such a system effectively solves the issues of R&D financing, evaluation of the research results, and communication.

However, centralized systems may suffer lower standards of public administration of the material base of science, the mismatch between the resource provision and the scale of activity of organizational structures, a weak degree of departmental coordination, and excessive bureaucracy (Rosa et al., 2021; Brattström & Hellström, 2019; Dezhina, 2018), and legislation shortcomings (Chernykh, 2020; Gershman et al., 2018). Another problem is the low efficiency of scientific activity in Russia due to the lack of adequate performance metrics (Emelyanova et al., 2022; Ivanov, 2019).

Russia deals with challenges in the sphere of scientific, technological, and innovative development due to the sanctions of 2014 and 2022, building up its technological independence (Chernyshenko, 2022; Kuleshov, 2022). Statistics show that from 2014 to 2020, the share of innovative goods and services in the total export of goods and services decreased by 5.5 percentage points, and the number of international technology exchange projects fell by 15 percentage points (Shkodinsky et al., 2022). Under the circumstances, Russia needs to reprioritize its high-tech import partnerships. The achievement of this objective will largely depend on the efficiency of the S&T governance system and its ability to adapt to changes. Thus, the Russian case of reconstitution of technological sovereignty is a valuable lesson for countries in the volatile international environment (Aanaes, 2020 ; 'Utoikamanu, 2018).

The difference and novelty of this article is a non-fragmentary approach to spot the dysfunctions of the state S&T regulation (Chernykh, 2020; Ivanov, 2019; Dezhina, 2018), a comprehensive analysis of the institutional environment of scientific and technological development and establishment of functional links between its elements. The originality of this work stems from the consideration of the new research object, formulation of previously unvoiced conclusions concerning the extent of the balance of the S&T governance system in Russia, and its readiness to ensure technological sovereignty.

The hypothesis is that at the moment the system seeks to build a new institutional balance and now is in the stage of active reform to adapt to the changing economic and political conjuncture, especially when 2022-2031 were announced the Decade of Science in the Russian Federation (Council on Science and Education under the President, 2022; The Ministry of Science and Higher Education of the Russian Federation, 2022). The aforesaid reasons define the purpose of this paper – to determine the extent of the balance of the system of science and technology governance in Russia and its readiness to ensure competitiveness and independence of the country from external and internal threats.

To achieve the goal, the following tasks were solved: the systematization of the regulatory framework for the governance of scientific and technological development in Russia, the identification and classification of governing bodies, the formulation of conclusions on the integrity of the system.

2. Methodology

Comparative and logical-linguistic analysis were used as the main research methods because they allowed to extracting, processing, comparing and systematize information about the goals, objectives and functions of the governance bodies. Logical linguistic analysis implies building links between variables based on semantics rather than on mathematical functions (Zhukov et al., 2018). The logical-linguistic analysis provides more opportunities to formalize different administrative processes and to retrieve a semantic value for appropriate scientific assessment. The application of strict quantitative methods is limited by the specificity of the present research, which demands rather qualitative analysis. Decomposition allowed to build of a hierarchy of goals, objectives, and activities to implement S&T Strategy. Governing bodies were also systematized on the basis of their role in the system of strategic planning and the level of the management hierarchy (Ansoff, 1965; Chandler, 1962). The theoretical basis of the article was based on the concepts presented in the classical works (North, 1991; Nikolis & Prigozhin, 1990) and modern studies of Russian and foreign scientists (Carayannis, 2020; Chernykh, 2020; Dezhina, 2018; Ivanov, 2016; Harkevich, 2013). The object of the study is public administration bodies in the sphere of scientific and technological development in Russia. The subject of the study is the functional relations in the system of S&T governance.

3. Results and Discussion

3.1. Russian regulatory framework for the scientific and technological development

The institutional framework of scientific and technological development in Russia is defined by the Federal Law № 127 "On Science and State Scientific and Technological Policy" (Russian Federation, 1996). Over the past 20 years, the number of normative acts on scientific and technological development has increased seven times (Consultant Plus, 2022). Science and technology have become the center of the national agenda, the backbone of long-term socio-economic development. The National Strategy of scientific and technological development until 2035 (S&T Strategy) sets the main goals and vectors of development, and determines the range of problems, long-term challenges, and opportunities. The mechanism for the implementation of the S&T Strategy is the assigned State program.

3.2. Science and Technology Governing Bodies in Russia

The President of the Russian Federation, the Presidential Council on Science and Education, the Science Commission under the State Council, and the Government of the Russian Federation carry out target-setting and act at the *strategic level*. The President of the Russian Federation guides the science and technology agenda through annual Addresses to the Federal Assembly of the Russian Federation. The Decree of the President of the Russian Federation approves the strategy of scientific and technological development of the Russian Federation. The Council on Science and Education serves as a coordinating advisory body for the President of the Russian Federation. It is established to define strategic goals, objectives, and priorities of scientific and technological development of Russia (President of the Russian Federation for Science and Education, 2021a). Since 2021 the functions and powers of the Council have expanded, leading to more active engagement

in the formation of the state science and technology policy through wider control and setting priorities of federal innovation projects and scientific and technical programs (Figure 1).

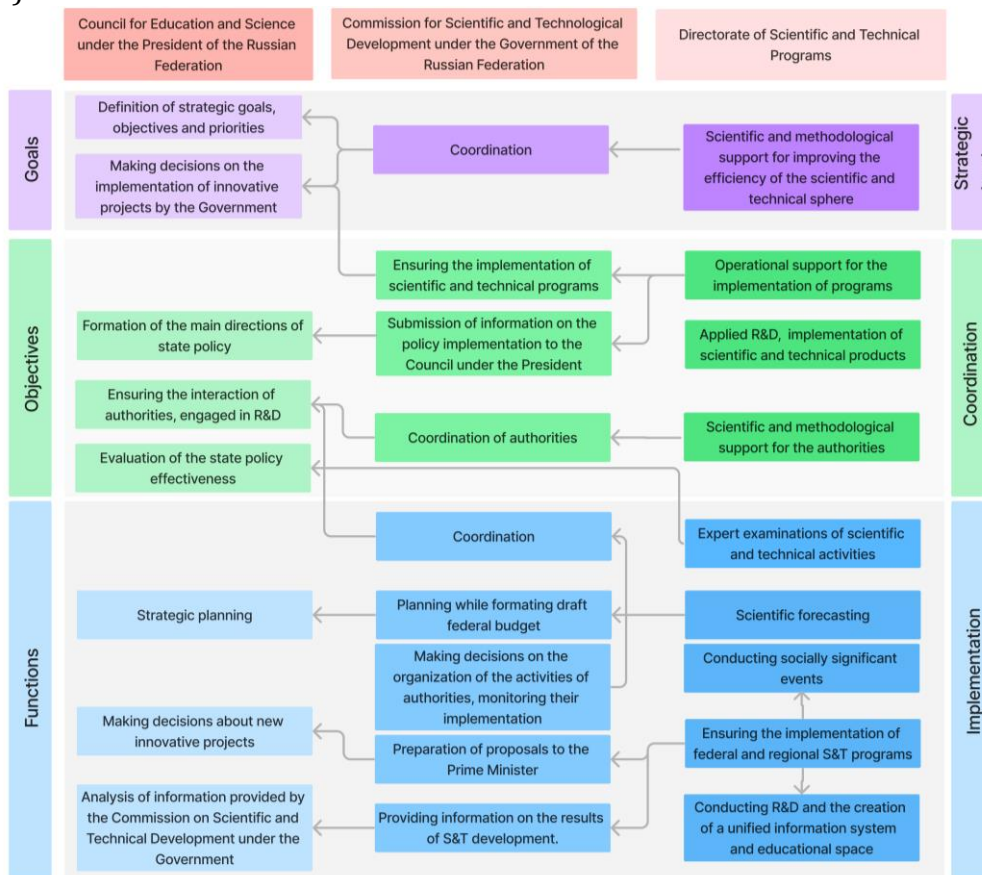


Figure 1 Functional links between the Presidential Council, the Commission under the Government, and the Directorate under the Ministry of Science and Higher Education

The Council on Science and Education under the President of the Russian Federation is reinforced by the Science Commission under the State Council. According to the [Russian Federation, \(2020\)](#), the Commission’s functions are coherent with those of the Council. The Government of the Russian Federation approves the Action Plan to implement the Strategy of scientific and technological development, monitors its implementation, approves the Forecast and the State Program, developed by the Ministry of Science and Higher Education ([Russian Federation, 1996](#)).

At the *tactical level* of public governance, the Commission on Scientific and Technological Development under the Government of the Russian Federation, the Ministry of Science and Higher Education, and the Russian Academy of Sciences operate, achieving medium-term goals of scientific and technological development. In 2021 a new body of state power was established - the Commission for Scientific and Technological Development under the Government of the Russian Federation. It controls and coordinates the state program participants and, distributes resources between industries and major projects ([President of the Russian Federation, 2021b](#)). The Commission acts as a link between strategic to the tactical level: the Government and executive instances. The Ministry of Science and Higher Education of the Russian Federation carries out legal regulation, provides services and participates in implementing the most important programs and projects ([Russian Federation, 2018](#)). The Russian Academy of Sciences plays

a dual role: develops proposals to improve the state S&T policy and directly carries out fundamental and applied research and development (Russian Federation, 2014).

The Federal Service for Supervision of Education and Science, the Directorate of Scientific and Technical Programs, the Republican Research Scientific Advisory Center of Expertise, the Russian Research Institute of Economics Policy and Law in the Scientific and Technical Sphere and the Expert Analytical Center, sectoral ministries and the Institute of Deputy Heads of Science and Technology Development carry out operational management.

In 2022, the institute of deputy heads for scientific and technological development (Chief Scientific Officers) of the federal executive bodies was established to improve the system of science and technology governance (Chernyshenko, 2022). The decision is made based on the successful experience of Chief Digital Transformation Officers. Chief Scientific Officers will be responsible for strategic planning of scientific research, approval of the budget for science, and expertise on existing and newly submitted applications.

Four specialized bodies under the Ministry of Science and Higher Education are engaged in expert-analytical and methodological work - the Directorate of Scientific and Technical Programs, the Republican Research Scientific Advisory Center of Expertise, the Russian Research Institute of Economics Politics and Law in Scientific and Technical Sphere, and the Expert Analytical Center. The purpose of these institutions is scientific-methodological support to increase the efficiency of scientific-technological, educational, and innovative activity, linking the level of planning and implementation of programs (The Ministry of Science and Higher Education of the Russian Federation, 2018).

3.3. Dynamic Balance of the S&T Strategy implementation

The decomposition of the goals of the S&T Strategy, objectives, and bodies responsible for their achievement was built (Figure 2), revealing that the objectives of the executive bodies are directly related to their expected results as part of the implementation mechanism of the S&T Strategy. The executive bodies have sufficient powers to implement all the necessary activities that can be divided into several types: information and analytical, organizational, regulatory, scientific-methodological, and theoretical activities. The consistency of the executive bodies' statutory goals and their functions is reflected in Table 1.

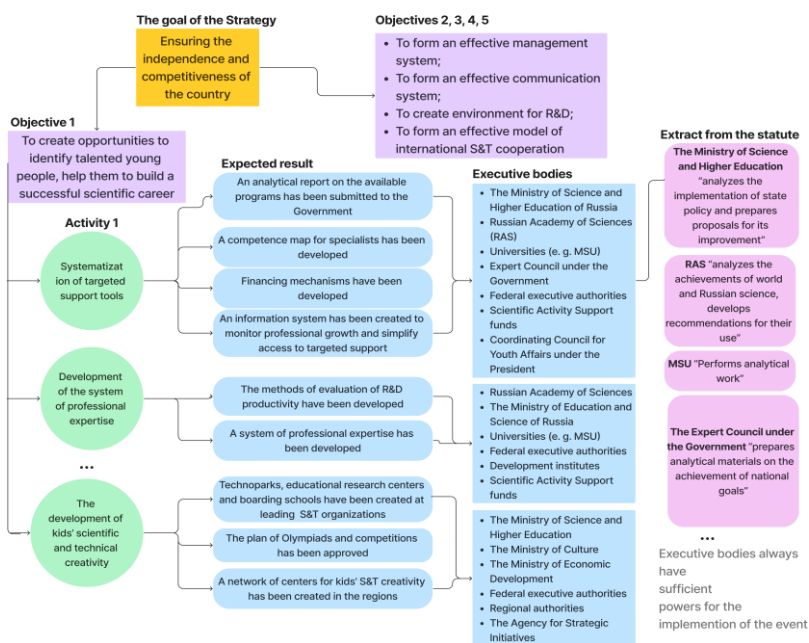


Figure 2 Decomposition of the S&T Strategy based on the example of one of the objectives

Table 1 Major contributors to the implementation of the S&T Strategy (*repeat as header row at the top of each page*)

Executive body	Activities	Expected results
Ministry of Science and Higher Education	Information and analytical, organizational, regulatory and scientific and methodological activities, activities on theoretical support.	Development and implementation of state policy and normative regulation. Generalizes the practice of application of the legislation of the Russian Federation, and prepares proposals for its improvement.
Russian Academy of Sciences	Organizational activities, regulatory and scientific-methodological activities, activities on theoretical support.	Expert scientific support for the government agencies and organizations.
State corporations	Information and analytical, organizational, regulatory and scientific and methodological activities, activities on theoretical support.	Implementation of normative-legal regulation.
S&T development institutions (funds)	Information and analytical, organizational, regulatory and scientific and methodological activities, activities on theoretical support.	Examination of scientific and technical programs and projects, innovative projects. Supports projects aimed at increasing the competitiveness of the economy of the Russian Federation, including in the field of high-tech products.
Moscow State University	Information and analytical, organizational, scientific and methodological activities.	There are no goals directly related to the activities in the charter. But among the types of work that the organization does there are analytical and consulting services.

Thus, the system of implementation of the S&T Strategy is balanced along the vector of "goals - objectives - activities - expected results - goals of the executive bodies - the powers of the executive bodies".

3.4. Discussion

After twenty years of institutional public policy domination in scientific and technological development, there is an evident need to guide the scientific domain to be tightly linked with the national economy's needs. Based on the conducted research, the following conclusions concerning the governance system in Russia were made:

1) Currently, the essence of science as an object of management is studied (Sovacool et al., 2020, Shepelev, 2020; Zeng et al., 2017; Harkevich, 2013), the features of the management of scientific and technological development (Fernandes & O'Sullivan, 2021; Carayannis, 2020; López-Leyva, Mungaray-Moctezuma, 2017; Pinheiro et al., 2016; Brocke & Lippe, 2015) and key trends in this sphere are discussed (Emelyanova et al., 2022; Chernykh, 2020; Ivanov, 2019; Dezhina, 2018; Gershman et al., 2018). However, modern studies do not present a comprehensive analysis of the Russian S&T governance system. Our research fills the gap by focusing on the topic of formal institutions that ensure scientific and technological development in the country.

2) The system of governance of scientific and technological development in Russia seeks to build a new institutional equilibrium. The changes include expanding and improving regulatory framework, creating new and reorganizing existing public authorities (The Council on Science and Education under the President of the Russian Federation, the Commission on Scientific and Technological Development under the Government, and Chief

Scientific Officers). Reforms affect such issues as goal-setting, coordination of governing bodies, accountability, and efficient resource allocation. With sanction pressure, the most important task of the state is to build new S&T priorities and increase the impact of fundamental and applied research and development. Ongoing reforms aimed at improving the system of strategic planning and ensuring the coherence of various elements of the S&T governance system thus contribute to the achievement of technological sovereignty.

3) The system design of the S&T governance in Russia is balanced. Public bodies under the President of the Russian Federation are involved in the goal setting, governmental bodies, including the Ministry of Science and Higher Education, are engaged in forecasting and programming, and executive agencies under the Ministry of Science and Higher Education and other Ministries deal with the implementation of the S&T programs. Public bodies that act as a "buffer", linking all the levels of governance, exist. All in all, strategic, tactical, and operational governing bodies function in concert, complementing each other. Stable functional links are built between the levels of goal-setting, coordination, and execution. The system of the S&T Strategy implementation is also balanced along the vector of "Strategy goals - expected results - the powers of the executive bodies".

4) To improve the system of public administration in Russia, it is necessary to ensure a broader involvement of primary structures –particularly scientists and research groups - in determining the priorities of scientific and technological development with the help of the Unified State Information System of civil research and development accounting. Departments and scientific laboratories of the universities remain principal stakeholders and carriers of scientific knowledge (Rosa et al., 2021; Brattström & Hellström, 2019). It is important that the actions of individual scientists are aligned to the logic of the Strategy of scientific and technological development. Using the Unified State Information System of accounting at different levels of strategic planning will help to reduce transaction costs in interaction between public bodies and scientist. It will also promote building an effective feedback mechanism.

4. Conclusions

The research has analyzed Russia's institutional environment of scientific and technological development. Regulatory framework was described and S&T governing bodies were examined at three levels of the management hierarchy: strategic, tactical, and operational. It was determined that the Russian system of governance in this sphere is balanced. The study showed that the scientific and technological development governing bodies were reformed. The changes contribute to the improvement of the strategic planning system. Accountability increased and connectivity of various elements of S&T governance system improved. Thanks to the reforms of recent years, the current S&T governance system contributes to the country's independence.

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