

Supply Chain Management as a Resource for Innovative Development

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Abstract—In modern economic conditions, innovation is a prerequisite that can ensure competitiveness in the long term. Intellectual resources are the crucial factor in the innovative development of the economy, which determines the relevance of studying supply chain management and the processes associated with it. The goal of this research was to assess the prospects for innovative development in the Republic of Mordovia. For this purpose the authors analyzed the theoretical and methodological aspects of supply chain management formation and explored the scenario-based approach that allows identification and assessment of possible risks when developing a regional policy. The subject matter of the study was the scientific, technological, and innovative development of the region on the example of the Republic of Mordovia. The authors applied factor and system analysis, expert survey, planning, forecasting, and a comparative method. The research was carried out using the data of Rosstat, Rospatent, and Mordoviatstat. The authors determined the specifics of the supply chain management development in the region. In addition to this, the authors applied the scenario approach to analyze the current conditions in fundamental and applied science, the infrastructure of scientific, technical, and innovative activities, which allowed assessing the possible risks in the development of regional policies. The article proposed a long-term forecast for the development of science in the Republic of Mordovia. The assessment of the scientific and technological development of the region with a focus on intellectual potential allowed forecasting the impact of supply chain management on innovative development and sustainable economic growth. The research results can be used in the development of strategies and tactics of the regional policy.

Keywords— supply chain management, innovative development, scientific and technological development, innovation, strategy, innovative activities.

1. Introduction

Supply chain management (SCM) is an area of increasing importance among enterprises and of growing academic interest [1]. It is based on the

concept of firms as part of multiple organizations oriented to the provision of goods and services for the final customer. Over the past decade, Russian science has experienced massive institutional changes aimed at overcoming the technological lag of the country and ensuring a scientific and technological breakthrough.

Officials consider innovation and the knowledge economy as top priorities. What is more, they are currently becoming the only scenario of social development. This laid the basis of the so-called May Decree of the President of the Russian Federation, V. V. Putin, who named science, technology, and innovation the key areas of the national policy.

Obviously, planned indicators can be achieved only by consolidating the entire scientific and research community, which means going to great lengths in all areas – from staff training to the practical implementation of advanced production technologies. All this necessitates radical changes in the system of Russian science, including the regions.

The research goal was to explore the dynamics and prospects of the scientific and technological development of the Republic of Mordovia.

For this purpose, it was necessary to meet the following objectives: to consider the supply chain management of the Republic of Mordovia as a necessary factor in the innovative development of the region; to analyze the current situation in fundamental and applied science, as well as the infrastructure of scientific, technical, and innovative activities; to make a forecast for the development of science in the Republic of Mordovia using the scenario approach with three scenarios: the best-case (maximum support at all levels leading to a scientific, technological, and innovative breakthrough); probable (the slow pace of processes with continuing support), and the worst-case (support is minimal or not provided).

2. Methods

The subject matter of the study was the Republic of Mordovia. The information for the research was provided by [2], as well as legislative and regulatory acts.

The analysis methods applied enabled us to draw general conclusions on the phenomena under study and to consider their relationship and interdependence. The comparative and graphical methods of analysis were used to present the quantitative results of the study.

The method of system analysis allowed us to assess the possibility of achieving the goal, taking into account the influence of various factors. Using this method, we studied the development of science and technology in the innovative economy and the innovative potential of the region, as well as analyzed the possible growth of scientific and technological potential.

The planning methods were applied to substantiate the main directions and scale of innovative development in accordance with the forecast, the goals set and available resources. The planning method allows forecasting scientific, technological and innovative development in the long term.

2.1 Literature Review

At present, along with the modernization of the economy, one can witness a change in the attitude towards resources used in production. The significant depreciation of fixed assets and the depletion of natural resources have led to the fact that more attention is being paid to other sources of increasing production and meeting the growing needs in innovative development. This necessitates the development of people, their abilities, knowledge, and intellect.

Considering the increasing role of supply chain management in the production and creation of competitive products, the theoretical and methodological foundations of supply chain management as a resource for innovative development must be further explored and clarified.

[1] can rightfully be considered the founder of the research on supply chain management. He claimed that “economic science faces up to a difficult task – to develop the best possible social policy of investment in the production of knowledge and methods for setting the information price for its users”.

In their classical theory, [3] about the importance of intellectual resources. Later, [4, 5] substantiated the critical importance of knowledge in production and paid special attention to the economic value of acquired human abilities and skills.

[6] laid the basis of the modern understanding of supply chain management, highlighting its connection with the innovative development of society. A. [7- 9] explored in detail the essence of the category of “supply chain management”.

[7] interprets supply chain management as intangible assets that increase the competitive advantages of a company. [8] defines supply chain management as the totality of the company’s knowledge, its experience, processes, discoveries, innovations, and market presence. [9] regards supply chain management as “the internal and external structures and competencies of the staff, which include education, qualifications, skills, abilities, experience, general culture, the ability to act in various situations, and the attitude to work, partners, and clients”.

Supply chain management has become the subject of global research since the 1980s. The intellectual potential was explored in the works of [10-16]

[11] defines supply chain management as “the product of knowledge and mental work; supply chain management is the accumulated useful knowledge, intellectual material that is formed, assigned to the company and used to produce more valuable property”. [12] notes that “the sphere of supply chain management, or the so-called intangible sphere, is becoming a new area of creating value in the new economy” [10].

Among modern Russian scientists who analyzed the theoretical approaches to the formation of supply chain management, we would like to mention

According to [17], supply chain management is “a collective brain storing scientific and everyday knowledge of the staff, intellectual property and accumulated experience, communication and information structure, information [18-29].

Works and the image of the company” [18] defines supply chain management as the value of intellectual assets, namely intellectual property, intellectual skills, and abilities.

Theoretical publications have explored in detail the importance of developing supply chain management and the specifics of its conceptual apparatus. However, along with significant theoretical innovations, these papers do not pay due

attention to the role of supply chain management in the regions and the country as a strategic resource for innovative development, nor do they highlight the applied issues of this research area.

All of the above confirms that various theoretical and practical issues of supply chain management as a source of innovative economic development require further study.

3. Results

Currently, supply chain management is a priority area of investment that accelerates the modernization of the economy. As a rule, it is

assessed on the basis of intangible assets maximizing the performance such as patents, databases, and software.

In the Republic of Mordovia, 982 people worked in research and development in 2018, or 0.24% of the total number of labor force (Fig. 1).

The scenarios built implied the further growth in this group, even with minimal government intervention. This is immediately due to the scientific ethos, which represents a set of affective values and norms that is considered obligatory for a researcher and that emphasizes self-regulation.

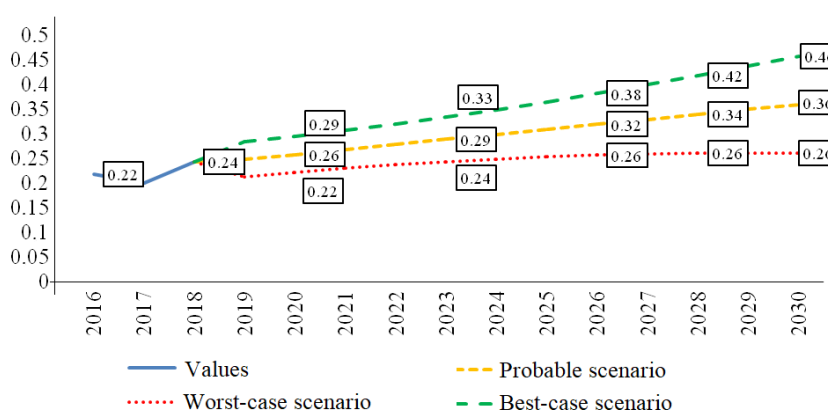


Figure 1. The share of research and development staff in the average annual size of labor force, %

The situation in fundamental and applied science and the effectiveness of research and development are directly influenced by the development of supply chain management. An important indicator in their assessment is the cooperation between businesses and scientific organizations and the practical implementation of theoretical developments. The indicators of inventive work expressed in the number of patents and utility models represent the link between them. The achievements of individual scientists and research teams are reflected in scientometric evaluation of

their activities based on the number of publications and/or citations [30-35]. In 2018, the share of organizations implementing technological, organizational, and marketing innovations amounted to 12.3% in the total volume of innovations (Fig. 3). A probable scenario allows maintaining the stability of this indicator over time; the best-case scenario can take place due to the cumulative effect of the implementation of scientific projects and the development of digital technologies included in the National Program “Digital Economy of the Russian Federation”.

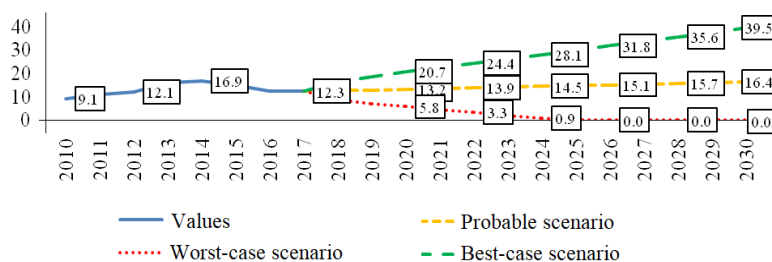


Figure 2. The share of organizations implementing technological, organizational, and marketing innovations in the total number of organizations, %

The worst-case scenario primarily takes place not only because of the lack of systemic support for fundamental and applied science, but also the low demand for some scientific, technological, and innovative developments of universities and research institutions in the real sector of the economy, as well as the impossibility of introducing high-tech products and technologies to the Russian and world markets.

For instance, over the past few years the proceeds from the export of technology per 1,000 rubles GRP has tended to zero, although, according to the Mordoviastat, in 2018 seven advanced production technologies were developed in the region, three of which possessed novelty that could interest potential investors. At the same time, 288 units of

new technologies and software for the same period were acquired outside the region, including nine abroad.

Another factor in the implementation of the worst-case scenario is the stagnation of inventive work in the research and development sector. According to the Rospatent report for 2018, the number of filed applications for inventions per 10,000 people in the Republic of Mordovia was significantly lower than not only the average values for the Russian Federation, but also for the Volga Federal District (Fig. 3). Compared to 2017, it decreased by 0.9 points, which is due to the general negative trend in our country regarding the registration of intellectual property.

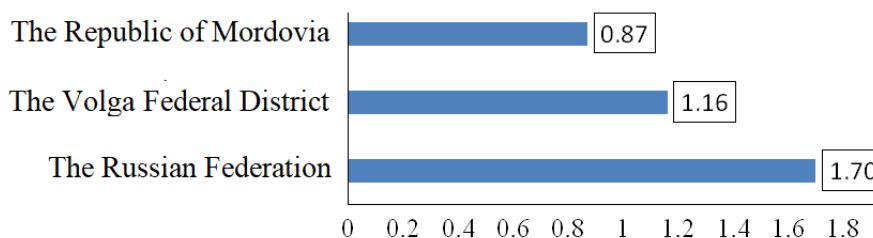


Figure 3. The coefficient of inventive work in 2018, points.

By the end of 2019, the share of researchers from the Republic of Mordovia in the database of the Russian Science Citation Index (RSCI) in the total number of Russian researchers was only 0.5%.

The representation of regional researchers in the global science remains a problematic issue, despite the objective set by the President of the Russian Federation to increase publications in international databases. For instance, in 2013 there were only nine publications in scientific journals and research patents from the Republic of Mordovia in abstract

and citation database Web of Science (WoS), or 0.02% of all publications in scientific journals and patents of Russian researchers in general, in 2018 there were 155 publications (or 0.19%). At this rate, each of the scenarios shows a positive trend, which manifests itself in more than a twofold increase in the indicators by 2030 (Fig. 4). It should be noted that currently the representation of regional researchers in the Russian Science Citation Index (RSCI) is significantly higher.

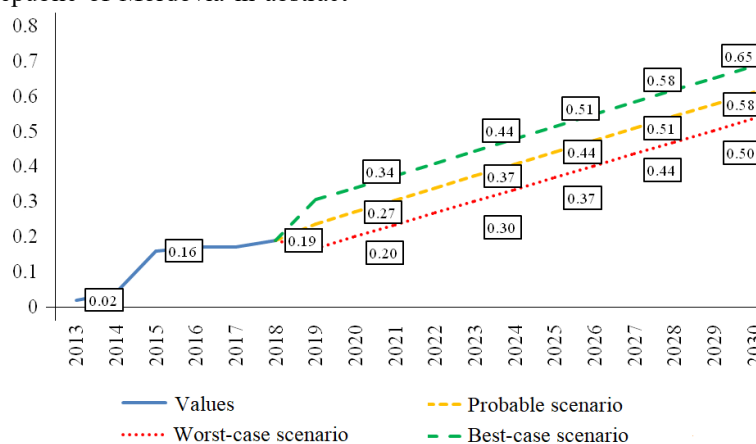


Figure 4. The share of publications in scientific journals and patents of Mordovia researchers in the total volume of all publications of Russian scientists in abstract and citation database Web of Science (WoS), %

The indicators in a similar abstract and citation database Scopus look a bit more optimistic: in 2013 there were 58 items (or 0.12% of all publications in scientific journals and patents of Russian researchers in general), in 2018 – 257 publications

(0.25%). A two-fold increase in the current indicators can be achieved only with the realization of a probable or the best-case scenario (Fig. 5). The worst-case scenario implies growth, but not significant one.

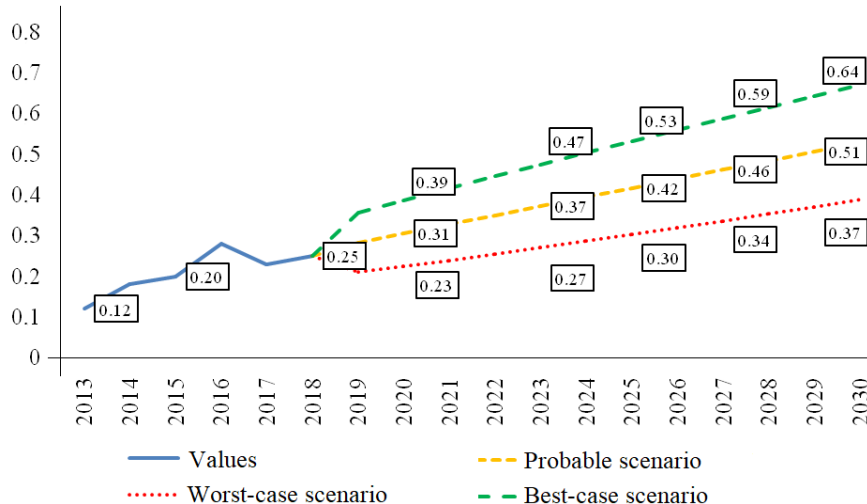


Figure 5. The share of publications in scientific journals and patents of Mordovia researchers in the total volume of all publications of Russian scientists in abstract and citation database Scopus, %

The Republic of Mordovia has built an infrastructure of scientific, technical and innovative activities which includes scientific organizations, higher educational institutions, a technology park that creates high technologies, and manufacturing enterprises. The region is a territory with high scientific, technical, and innovative potential, with initiatives for developing innovative infrastructure facilities. For instance, in 2008 the Republic of Mordovia ranked the 70th, and in 2018 – the 13th in the Russian regional innovation index of the constituent entities of the Russian Federation

developed by the Institute for Strategic Studies and Economics of Knowledge of the National Research University Higher School of Economics, which characterizes the region as a mid-range innovator. The high scientific, technical and innovative potential of the region is due to a fairly large share of innovative goods, works, and services in their total volume. Apparently, the role of such technologies in the Russian and regional economies will continue to increase; therefore, each of the proposed scenarios implies the growth of the indicator in the long term (Fig. 6).

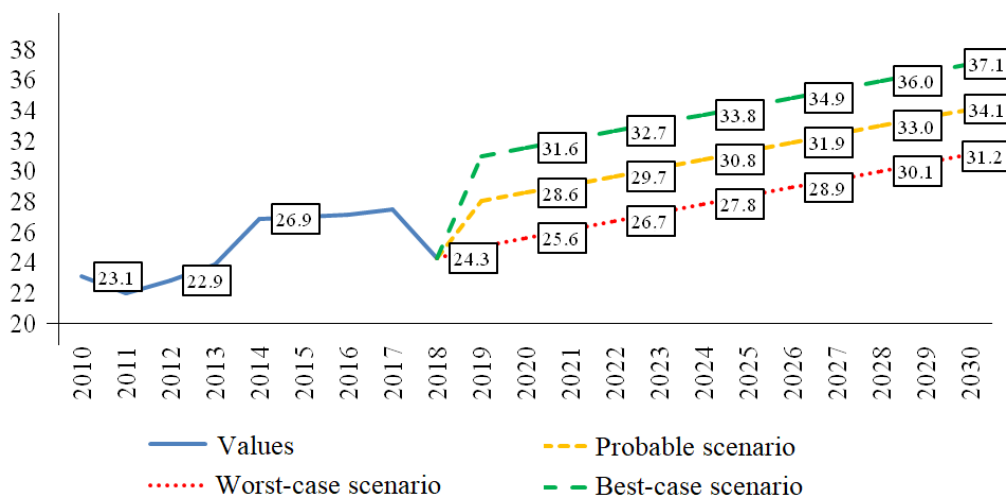


Figure 6. The share of innovative goods, works, and services in the total volume of goods shipped, work performed, and services

However, successful scientific, technological, and innovative development requires more than just the developed infrastructure. Individual researchers and research teams should have the opportunity to use it, since knowledge and technology in the modern world tend to quickly become obsolete and lose their competitive advantages. To assess the availability and relevance of scientific and innovative infrastructure, we proposed a special index. In 2018, the value of this index was 0.18%. Compared to 2012, there was an almost two-fold

increase, primarily due to the commissioning of the technology park creating high technologies and the increase in the number of its residents, as well as improving the facilities and infrastructure of the leading universities of the republic. Having performed the scenario analysis, we found a gradual increase in the availability and demand for scientific and innovative infrastructure that took place regardless of external influences (Fig. 7). Both science and the real production sector benefit from greater openness.

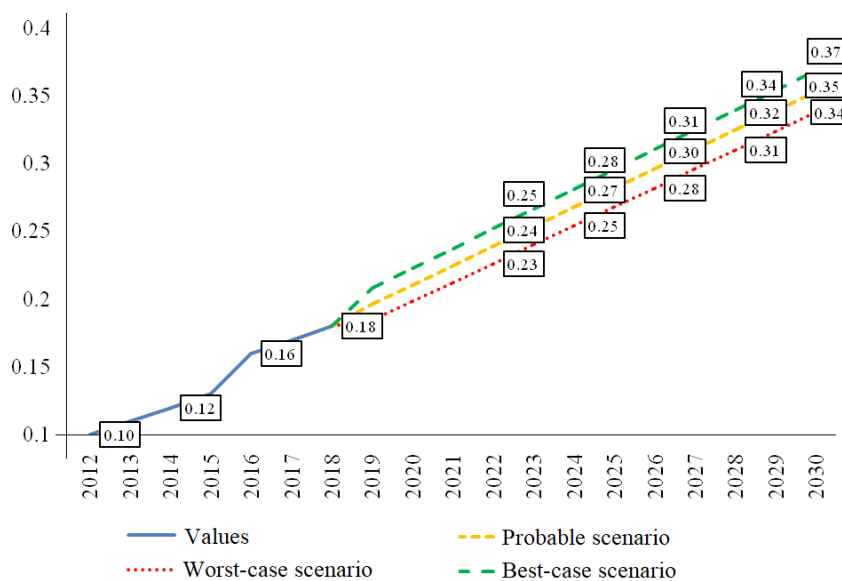


Figure 7. The index of accessibility and relevance of scientific and innovation infrastructure, %

4. Discussion

The strategies for declining products are that the supply chain of product is in decline. The company should first follow strategies to boost sales and not resign themselves to the innovative strategies in Supply Chain Management is in the declining stage. We can manage our impacts not only in our own business but in its reach across the complete value chain of product, process and Supply Chain

Management. Having performed the scenario analysis of the selected indicators of scientific, technological, and innovative development of the region, we could build a forecast for their development for the period up to 2030 (Table 1). In general, this forecast takes into account the support measures at the state level, as well as positive (high innovative activity) and negative (the demographic situation) trends in the region.

Table 1. The forecast of indicators of scientific, technological, and innovative development of the Republic of Mordovia for the period from 2019 to 2030, %

Indicator	The indicator value, year											
	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
The share of the research and development staff in the average annual size of the labor force	0.21	0.22	0.23	0.24	0.24	0.25	0.25	0.26	0.26	0.26	0.26	0.26
The share of researchers under the age of 39 in the total number of researchers	41.5	42.2	42.6	42.9	43.1	43.1	43.2	43.1	43.1	43.0	42.9	42.7
The share of organizations implementing technological, organizational, and marketing innovations in the total number of organizations	12.9	13.2	13.6	13.9	14.2	14.5	14.8	15.1	15.4	15.7	16.1	16.4
The share of innovative goods, works, and services in the total volume of goods shipped, work performed, and services	25.1	25.7	26.2	26.8	27.3	27.9	28.4	29.0	29.5	30.1	30.6	31.2
The index of accessibility and relevance of scientific and innovative infrastructure	0.18	0.20	0.21	0.22	0.24	0.25	0.27	0.28	0.30	0.31	0.32	0.34

Source: The forecast calculations were carried out using the data from the Scientific Center for Social and Economic Monitoring of the Republic of Mordovia (<http://ncsem.e-mordovia.ru/>).

In general, under the present social and economic conditions, the current level and prospects of scientific, technological, and innovative development of the Republic of Mordovia in the period up to 2030 look fairly optimistic. Nevertheless, the region needs a qualitative and quantitative increase in the effectiveness of research, which manifests itself in inventions and publications. As a rule, innovations in the real sector of the economy are introduced through patented developments, which are primarily based on the results of fundamental and (or) exploratory research that has been evaluated by the international scientific community.

5. Conclusions

Having conducted the research, we explored the theoretical and methodological aspects of supply

chain management with a focus on its relevance and significance as a resource for the innovative development of a economy. We determined the specifics of the supply chain management development in the Republic of Mordovia, the conditions for the functioning of fundamental and applied science, and analyzed the infrastructure of scientific, technical, and innovative activities. In this study we applied the scenario approach, which, despite its complexity, allowed us to identify and assess possible risks in the design of regional policies aimed at supporting scientific, technological, and innovative development. We made a forecast describing the development of science in the Republic of Mordovia in the long term, which enabled us to conclude that it is necessary to increase the effectiveness of research work in the region. Having evaluated the scientific and technological development in the Republic of

Mordovia, we established that supply chain management can facilitate innovation, which eventually increases the effectiveness of the regional policy in the long term.

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