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MANAGEMENT OF SCIENTIFIC AND TECHNICAL PROGRESS

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Abstract

The article studies problems of managing scientific, technical and technological development in accordance with requirements of the market and society. This study develops the previously expressed idea of the interrelated progressive development of science and technology. The subject of this study is determined by scientific and technical progress as a complex category. The authors single out the basics that characterize such phenomenon as scientific and technical progress. The authors point to the close relationship of the STP and the improvement of the productive forces. Moreover, not only interrelation, but also interdependence, since scientific and technological progress today is the main prerequisite for their development. In conducting the study, the authors proceeded from the assumption that the laws governing the development of technology should be considered from the point of view of changing the structure of the needs of society. The authors substantiate the idea that today it is impossible to separate the progressive development of social production from the materialization of scientific and technical achievements in it. Results presented in the article can be used in the development of forecasts of scientific and technological development. Main provisions of the article can be claimed for purposes of further theoretical and methodological substantiation and practical research on problems of scientific and technological development. The authors discuss about the fact that the mechanism of management of scientific and technological progress, modern innovation processes will be effective if it is based on the system interaction of the factors described in the article.

Keywords: Scientific, technical progress, technology transfer, socioeconomic.

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1. Introduction

Considering the issues of economic reform in Russia, we note that the strategy and tactics of reform activities should be built in accordance with the scientific foresight of the development of society, with the adoption of the course of changing the entire socio-economic structure (Akindinova, Bessonov, & Yasin, 2018). At the same time, the development of the individual and society as a whole is a constant desire to meet emerging needs. The peculiarity of human nature is that the needs are inexhaustible, and therefore there is a constant need to meet them. It is done by solving the problems emerging at each stage of development, and certain contradictions that arise between society and nature. The task, in our opinion, is to make the conquest and reproduction of life's benefits the most painless, the management of the economy the most rational and reasonable (Lazareva, 2010). This is possible only in the case when studying and knowing the laws of this economy, we can correctly form the direction of its evolution.

2. Problem Statement

Today, Russian society is confidently moving along the path of market development. No one doubts the need for market transformation. What ways and forms should they have? Forming and predicting the future development of the market, it is possible, for example, to draw up a picture of the "goods distribution" on a global, state, regional, republican, municipal scale, identify consumer niches, predict their filling and the emergence of new ones.Сегодня российское общество уверено двигается по пути развития рынка. To follow and regulate the harmony of such a picture, to transform and modify it depending on changes in social needs, social preferences, depending on the development and growth of a complex social organism, and finally, the development of science. Of course, the transition to full-fledged market relations has affected the field of science, which is also changing significantly and the links between the scientific system and the market economy are unconditional. In modern conditions of market relations, changes in the consumer-supplier relationship of scientific and technical products, different views are needed on the problems of organizing research and development that take into account the specifics of market relations. In other words, we are talking about the need to build a modern effective mechanism for managing scientific and technological progress and innovation processes, based on the systemic interaction of the factors described above. In the development of the analyzed issues, it is necessary, in our opinion, specifically, to highlight the problem of prioritizing research. Recently, it has focused on the economic literature on scientific and technical progress. There is some need in choice of priorities for basic and applied research. (Martynova, 2017; Emelyanov, 2012; Supyan & Babich, 2015; Mindeli & Chernykh, 2011; Mindeli & Chernykh, 2016; Rogov, 2005).

3. Research Questions

In the situation of aggravating internal and external contradictions and the uncertainty generated by it, it is difficult in Russia to predict the prospects for the socio-economic development of the country and its individual regions. The point is that the Russian state is lagging behind in scientific and technological development not only of the lack of scientific groundwork, but also because of the immunity of social production to innovations. Scientific and technical progress as an object of management is an

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algorithm that can include fundamental, applied research, design and technological development, industrial production of samples of equipment for their development and distribution. The interrelated sequence of processes –from research to the introduction and use of the results of scientific and technical developments in production. The problems of managing the science-production cycle are diverse and complex; they require the development and implementation of a unified policy of the regions, territories and the state as a whole (Surnina, 2016). In this regard, a number of questions arise. Does it make sense to talk about progress, the development of science, technology, the consequences of development? What goals should we pursue? How should we define and formulate priorities for technological or scientific and technological progress? For example, it may be the compatibility of technology with a person, their ease for him, "convenience for amateurs", or it may be compliance with environmental regulations, economic fidelity, the formation of a national digital economy, ensuring national interests and the implementation of national priorities (Strategy).

4. Purpose of the Study

The management of scientific and technical progress (STP) is based on the knowledge of the nature of production relations in various production methods, in various technological structures in accordance with a certain level of development of productive forces. Improving the relations of production is determined, among other things, by improving the nature of the division of labor. The improvement of the division of labor; firstly, occurs through scientific and technological progress, selection of existing achievements or potential capabilities of science and technology, their adaptation to the goals and objectives of development; secondly, the formation, on the basis of these goals and objectives, directions, rates and the results of scientific and technological progress.

Scientific and technical progress (STP) is due to the action of objective laws, continuous improvement of all aspects of social production and the service sector based on the development and widespread use of the achievements of science and technology. Scientific and technical progress can be viewed as a certain type of socio-economic development, as a result of the use of the achievements of science and technology. STP has the expansion of production mainly due to increasing economic efficiency. Certainly, scientific and technical progress is, first of all, a process of diverse changes in the means of labor, equipment, technology and improvement of the organization of production, a special form of development of production relations. Another aspect of scientific and technological progress is the process of generating ideas, obtaining and accumulating knowledge, their useful use, and growth of the knowledge pool, which finds expression in new technological solutions, which, in turn, allow us to produce products with new unique characteristics (Rudtskaya, Khrustalev, & Tsyganov, 2009).

The basis of scientific and technological progress is the progress of science, i.e. we can talk about STP only when science turns into an immediate productive force. "The productive development of society is not only the growing power of science, but also the scale in which it is already laid as fixed capital, the size of the breadth of its implementation and the scope of its entire production" (Marks & Engels, 1960, p. 37).

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In other words, if we consider technology as a wide area of purposeful application of sciences in all fields of knowledge with all their material part, then scientific and technical progress, in our opinion, is the development and movement of technology in socio-economic systems.

Summarizing all the above, we can say that the substantive scientific and technological progress is the ongoing development of the productive forces of society in all their diversity and unity. The purpose of the study is to identify, identify, use of adequate methods of organization and management of scientific and technological development at all levels.

5. Research Methods

Criteria for choosing one or another direction of scientific research, determining their "socio-economic price", socio-economic consequences underlie the development of a motivational mechanism that should work to achieve certain goals set for various areas of science and technology. In other words, it is necessary to focus on the final result, on the economic and social effect. Today, first of all, it is necessary to proceed from the socio-economic needs that the natural process of the development of history presents, as well as the objective stage of changing contradictions that need to be solved with the help of scientific and technological progress.

There can be many priorities, depending on what goals we are pursuing, on what scale we act. Prioritization is also a difficult task because the value orientations of society are not amenable to accurate quantitative analysis and measurement. No less difficulty in our opinion, when setting priorities, is the question of the criteria used in their evaluation. Every study has intermediate results, final results, direct effect, and mediated effect. The literature provides many examples of how scientific research in agriculture, construction, mining, chemical industry, etc., which have brilliant results, at first glance, lead to environmental disasters of various sizes.

An example of prioritization is the National Science Foundation data on the expenditures of the US federal budget for research and development on national goals. Fundamental health research is ahead of many budget items. The expenses, according to this article, are 2.5 times higher than the expenses for space exploration (this ratio is rather stable), more than 10 times higher than the articles "energy" and "natural resources". In other developed countries and regions, the expansion of health research is also growing (Table 01).

Table 01. Publications of relevant topics, (thousands)

Year	Engineering			Biological and medical		
	USA	EU	China	USA	EU	China
2003	40	42	26	157	186	23
2004	43	46	37	167	195	30
2005	51	57	51	174	205	40
2006	49	59	59	178	212	46
2007	49	67	67	181	218	52
2008	48	70	78	184	225	59
2009	50	75	85	189	230	64
2010	54	79	92	191	232	66
2011	54	80	100	201	242	70

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2012	53	88	94	209	255	79
2013	54	85	101	212	259	94
2014	51	91	107	217	265	109
2015	51	91	114	213	259	115

Indicators 2018: Recent Trends in U.S. R&D Performance, Chapter 4

The table shows that in the United States, the European Union and China, the number of published results of research on biomedical and engineering subjects is growing. The attractiveness of health care as one of the most promising industries can be explained by the long-term effect of a number of factors: demographic, economic, and political. The economic basis for the growing importance of health care is the sustainable effective demand of the population, drawn up in the insurance system (Makhortova, 2014). In the last 10-15 years, the restructuring of the disciplinary structure of science has intensified: the share of technical knowledge is decreasing, and the share of the "life sciences" complex increases — biology, genetics of all branches of medicine, as well as biochemistry and biophysics. We are talking about interdisciplinary research, creating fundamentally new areas of application. In other words, the structural proportions of the research field must meet the current and future needs of economic growth.

Gross domestic expenditure on R & D by socio-economic objectives in the Russian Federation are as follows (Table 02).

Table 02. Gross domestic expenditure on R & D in the Russian Federation, (%)

Year	**Economy**	**Energy**	**Social objectives, including**		**General science**	**Cosmos**
			Environment	**Public health**		
2006	35.5	4.1	0.9	2.0	21.0	4.8
2010	36.6	4.8	1.1	2.7	19.9	5.2
2012	44.0	4.7	1.1	2.8	16.8	5.4
2013	43.2	5.3	0.8	3.0	17.4	6.9
2014	35.4	5.3	0.9	3.2	16.1	5.8
2015	30.9	5.2	0.8	3.0	15.9	6.3
2016	29.6	5.6	0.7	3.6	14.8	4.9

The table below shows that the structure of domestic expenditure on research in Russia during this period does not change dramatically. A few (1.6%) costs increased under the heading "Health of the population", expenses on "General science" decreased in approximately equal proportions.

In recent years, the federal contract system has become one of the most effective forms of state tactical influence on STP in the USA, for example, through the mechanism of this system, more than 40% of the R & D volume is carried out by the end of the 20th century (Emelyanov, 2012). The overwhelming majority of contracts were concluded by federal departments with private corporations and firms. In 2015, the situation looked a bit different (Table 03).

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Table 03. Indicators of R & D sectors and types of activity: the United States in 2015, (%)

Type of R & D	Non-profit and non-governmental organizations	Universities and colleges	Federal Government	Business
Total R & D	4.11	13.06	10.97	71.86
Fundamental research	12.74	49.10	12.04	26.11
Applied research	6.86	17.98	17.04	58.13
Development	0.97	1.97	8.81	88.24

Indicators 2018: Recent Trends in U.S. R&D Performance, Chapter 4

Gross domestic expenditure on R & D by source of financing in the Russian Federation over the years, from 1995 to 2016 give an idea of the participation of the government, the business sector, educational and other institutions in the total amount of research and development (Table 4).

Table 04. Gross domestic expenditure on R & D by source of financing in the Russian Federation, (%)

Year	State*	Business sector	Universities	Non-profit organizations	Foreign sources
1995	61.5	33.6	0.2	0.03	4.6
2000	54.8	32.9	0.3	0.09	12.0
2005	61.5	33.6	0.2	0.03	4.6
2010	54.8	32.9	0.3	0.09	12.0
2011	61.9	30.0	0.4	0.03	7.6
2012	70.3	25.5	0.5	0.1	3.5
2013	67.1	27.7	0.8	0.2	4.3
2014	67.8	27.2	0.8	0.1	4.0
2015	67.6	28.2	1.0	0.1	3.0
2016	69.2	27.1	1.1	0.2	2.5

Note: Including budget funds, budget allocations for the maintenance of educational organizations of higher education, funds of public sector organizations (including their own).

These data allow judging that the structure of domestic expenditure on research and development is not changed as a whole, with minor fluctuations in the studied period. The overwhelming share of the cost falls on the state, which is radically different from the situation in the United States.

Several other strategic and tactical principles underlie the formation of state policy priorities in Japan. At the present stage in Japan, it is possible to single out the implementation of the following programs based on the cluster approach: “Cluster of knowledge and intelligence” and “Industrial cluster” (Makhortova, 2014). The first program is aimed at the formation of regional systems of concentrating knowledge associated with competitive technological innovations. The second one is more focused on the formation of the infrastructure providing interaction between the business sector, the state and education. The program is focused on research in the field of engineering and computer technology, new energy sources and biotechnology.

Determining the short-term and long-term priorities of scientific and technological development, state management structures should initiate the development of targeted research programs and determine legislative measures for direct and indirect stimulation of their implementation and implementation of

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development results in production. Relevant structures need to initiate multi-purpose research programs aimed at discovering new knowledge that will ensure the development of new technologies in the 21st century. A number of changes are needed in the management of the STP in the country In particular: the parallel implementation of scientific and technical programs, strategic international unions, the creation of telecommunications networks, risk capital and venture capital firms, selective import promotion.

6. Findings

There are several negative trends in the scientific and technical sphere, which are characteristics of Russia. In particular, there is no mechanism for the introduction of new products, poorly organized information work, low susceptibility, and lack of knowledge of foreign experience. Direct methods of state regulation of scientific and technical progress are carried out, as a rule, in two directions: administrative-departmental and program-oriented (Khosroeva & Khosroeva, 2015). For all industrialized countries, the priority direction of the state science and technology policy is the creation of new technologies. Considering the process of creating and mastering new technologies as the basis of economic national policy, the state is striving to create favorable legal, economic and organizational conditions for all participants in this process. It finds expression in a wide variety of forms: direct financing; leasing, transfer of scientific and technical results obtained in state laboratories to private, especially small firms; information support. The real market economy is focused on the production of a competitive product. Building such an economy requires a radical revision of the national science and technology strategy.

7. Conclusion

In conclusion, we note that at the present stage of scientific and technological progress there is a large-scale movement and development of technologies. It is necessary to use world experience in determining priorities and shaping the needs of society. National benchmarks of science and technology policy are manifested in specific models used by different countries. It affects the uneven economic development of countries and regions. The experience of domestic prognostic and theoretical developments in the field of STP is updated. There is a selection of adequate tools and mechanisms for the development and implementation of scientific and technological development programs to follow the “technological vector” of the modern world.

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