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**INTERDISCIPLINARY APPROACH AS THE BASIS OF THE
SCIENTIFIC AND TECHNOLOGICAL POLICY**

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Abstract

The article substantiates and describes the foundations of an interdisciplinary approach, which has become a defining direction in many branches of modern science. The importance of this approach is noted as a principle that provides a comprehensive analysis of the problem and guarantees the possibility of considering the maximum number of its components. Particular attention is paid to the reflection of interdisciplinarity in modern state documents of the Russian Federation, in state strategies for the development of science and technology. The study reveals that in the conditions of globalization of the socio-economic space, interdisciplinarity becomes multidisciplinary, linking the results of disciplinary research and allowing scientists to expand the range of their research and find new characteristics of the studied subject areas. It sums up the prospects and importance of multidisciplinary research carried out in various branches of modern Russian science. It studies the issue of the spontaneous nature of these studies and the need for further understanding of the essence and methods of multidisciplinary research.

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1. Introduction

In the conditions of the scientific and technological revolution of the 60s-70s of the 20th century, which significantly expanded the boundaries of the scientific worldview, science required a deeper, more intensive study of the essence of nature and society laws. This period of time gave rise to new paradigms of scientific knowledge. It placed interdisciplinary knowledge in demand, as well as transdisciplinary and other systemic research approaches to scientific research. The interdisciplinary approach refers to one of the characteristics of scientific approaches in terms of the degree of knowledge of the surrounding world. From this point of view, there is a disciplinary, interdisciplinary, multidisciplinary (polydisciplinary) and transdisciplinary system approaches.

An interdisciplinary approach (in research) can be defined as “an approach practicing research that uses two or more disciplines and leads us to a unification of understanding of the disciplines” (Vershina, 2008, p. 293).

Berger (1972) considers such a combination of understanding of disciplines as an “interdisciplinary interaction, which ranges from a simple exchange of ideas to the mutual integration of entire concepts, methodology, procedures, epistemology, terminology, data from the organization of research and educational activities in a much broader sense” (p. 24)

2. Problem Statement

Currently, there is a need in science to analyze the essence of interdisciplinary research in relation to the Russian Federation scientific and technological policy. Since globalization has become a reality of our time and has affected the socio-economic space of Russia, it is necessary to build a theoretical and methodological basis for interdisciplinary research. These works carried out spontaneously, and every scientist who addresses them acts intuitively. The theoretical justification will allow to systematize and clarify interdisciplinary research in the socio-economic sphere.

3. Research Questions

The subject of the study:

Interdisciplinary research as a new type of scientific research

The Russian Federation State documents that define the strategy of scientific and technological development of the country.

4. Purpose of the Study

The purpose of the work is to provide a theoretical and methodological justification of interdisciplinary as the most important property of scientific research at this stage of development of Russian and world science in the context of globalization and in relation to the socio-economic space.

5. Research Methods

The research is based on modern scientific publications and it considers state documents regulating the implementation of the scientific and technological policy of the Russian Federation at the present stage of its development. The research was carried out using a hermeneutic method that allows interpreting the phenomena of scientific and technological policy in Russia and giving them a philosophical understanding. It uses a pragmatic method, which helps to carry out the analysis of the transformations of science and technology policy and to identify practical prospects of these. Elements of the critical method made it possible to identify the positive and negative aspects of the analyzed phenomena.

6. Findings

Famous researcher of interdisciplinary approach, academician Mirsky (1980) noted that interdisciplinary research can have two tasks. Firstly, it is the methodological analysis of the theoretical knowledge system and historical features of any science' development. Secondly, the identification of methodological tools that can serve to describe the subject of scientific research (p. 20).

Interdisciplinary reflection, according to Vershinina, is a kind of scientific reflection, which not only makes it possible to organize and streamline the knowledge received, but goes to a higher level of abstraction and generalization. It rises above the reflective picture of individual special sciences, "cleans" it of insignificant details to such an extent that it becomes possible to see the relationship of various scientific disciplines, to assess the place of a given piece of knowledge in an integral system of acquired knowledge. It connects a number of disciplines with generalizing ideas, concepts and approaches for the implementation of interdisciplinary projects, ultimately ensuring the implementation of the synthesis of scientific knowledge, which is one of the general programs of modern post non-classical science. However, the implementation of such interdisciplinary projects, according to the author, requires a clear understanding of the specifics of a particular scientific discipline, its capabilities and limitations. Therefore, there is another requirement of interdisciplinary research, which not only studies the individual approaches of each science, but also evaluates its contribution to the study of this problem; clarifies the share of its participation, role and significance, determines the boundaries of its influence, specific opportunities based on the available branch of scientific knowledge, conceptual paradigms and research strategies (Vershinina, 2008, p. 293).

At the same time, the peculiarity of interdisciplinarity lies in the fact that it is possible to directly transfer research methods and means from one scientific discipline to another.

This approach studies the role of interdisciplinarity in the process of cognition in general, and its role in scientific cognition.

Bacon, Galileo, Kepler, as the founders of modern natural science, study the conceptual outlines of the main provisions of ontological, epistemological, socio-cultural foundations for the implementation of interdisciplinary research. One of the conceptual positions of Bacon was that the truth can be discovered through obvious facts, but they must be freed from any prejudices and preconceived ideas i.e. idols (Bacon, 1977, p. 307). Their content is widely known, but an important substantive moment of this idea

should be emphasized. It can be emphasized in the form of a scheme of idols. This scheme presents those obstacles that affect the process of cognition and distort it methodologically and systematically. Thus, Bacon's concept is focused on the fact that in the process of cognition, a situation of lack of freedom associated with delusion. Therefore, a thorough analysis of knowledge is required on the basis of broad inter-scientific interaction, with the obligatory involvement of the humanities, since this process is carried out in the context of language, culture, values, internal motives of the subject's activity, one way or another influencing the process of achieving new knowledge.

As for the current stage in the development of science, this kind of interdisciplinary research reflects its nature and determines its future. Epistemology and philosophy of science confirms that:

The development of new areas of reality and the formation of previously non-existent cognitive means and methods cause a more visible manifestation of differentiation phenomena in science, contributes to the formation of more and more specialized disciplinary areas. Realization of the need to reliably substantiate the constructed knowledge systems leads to the identification of all kinds of connections between them, which contributes to the unification of previously heterogeneous problem approaches and theories being developed into broader conceptual structures (Gusev, 2009, p. 477).

This determines the integrative nature of the knowledge gained and determines one of the leading principles of interdisciplinary research - the principle of complementarity.

Obviously, the difficulties arising in the system of related sciences that seem insurmountable from the point of view of one discipline, can be overcome by going beyond the framework of the usual scientific canons and norms. One should take into account the fact that a significant part of sciences, and natural science (biology, geography and others), according to Kasavin (2006), "retain their diverse origins and represent interdisciplinary interaction more precisely than strict disciplinary knowledge" (p. 7).

Another reason for the strengthening of the integrative nature of modern scientific knowledge is that science is turning from a "disciplinary-oriented" sphere of activity into a "problem-oriented" one. This situation opens the horizons of scientific knowledge, allows to formulate research problems more deeply and broadly, find non-standard and promising methods of solving them.

Modern science defines interdisciplinarity not simply as a desire to expand disciplinary boundaries in the knowledge of complex research problems, but as a hierarchical communication technology. Vasilkova connects this fact with the intensification of integration and exchange processes in modern society in the second half of the 20th century, with the development of the ideology and philosophy of tolerance and social partnership. Therefore, she writes, cognitive practices are characterized by the desire for synthesis, the destruction of disciplinary boundaries and the confusion of subject discourses. This author believes that interdisciplinarity consolidates the practice of creating special teams of researchers united by joint work on a common problem and lists several conditions (methodological principles) for coordinating their interaction (Vasilkova, 2004, p. 70).

The third methodological principle seems to be the most important. To preserve the boundaries of disciplinary frameworks in interdisciplinary research, there must always be a "leading" and "led" discipline. The results obtained are interpreted from the standpoint of the disciplinary approach of the discipline chosen as the leading one. Therefore, an interdisciplinary approach is used primarily for the

study of disciplinary problems, in the solution of which one discipline is experiencing conceptual and methodological difficulties (Institute of transdisciplinary technologies).

Scientific research of an interdisciplinary nature is becoming increasingly important at this stage of the development of science. One of the main trends in scientific development is precisely the tendency towards interdisciplinarity. Drawing parallels between different sciences, building a research method that simultaneously appeals to different scientific fields provide a new vision of the subject of research and create conditions for more effective analysis. Interdisciplinary research is recognized as a promising direction in various scientific fields: in legal science (Lesnova, 2019), in linguistics (Krylova, 2014a), in sociology (Beschasnaya, 2015), in meteorology (Goodsite et al., 2012), in mathematics (Kornilov, 2004), etc. Scientists emphasize that interdisciplinary research contributes to a deeper understanding of complex issues, help to give scientific research stability that is very important in our rapidly changing global space (Miller et al., 2008, p. 58).

The boundaries that characterize the changes in the trajectory of the world system movement within the framework of globalization are well defined by both foreign (Fritdman, 2009; Hirooka, 2006) and Russian authors (Semenenko et al., 2013). They cover general economic, financial and political destabilization and a slowdown in economic growth that began in 2008, by the beginning of the 20s of the 21st century. The most dynamically developing countries overcome crises, and this is happening based on the development of new technologies (multimedia, biocomputers, biotechnology and genetic engineering, as well as clean energy and nanotechnology). As you can see, these technologies are based on interdisciplinary research and became possible only through the integration of different sciences.

Based on the presented forecast of the world future, the Russian leadership chooses the optimal strategy for the country's possible development at the beginning of the 21st century. This strategy includes strategies of advanced development. It is based on the high potential of Russia, which possesses enormous natural and spiritual resources and has a motivated and educated population. The goal of the advanced development strategy is to bring Russia's well-being to the level of the richest countries in the world (USA, Germany, Sweden, etc.) in the shortest historical time (20-40 years) at the minimal deprivation of the population. Many economic factors must be considered. An advanced development strategy is impossible and erroneous if it is based on the priority exploitation of Russia's irreplaceable natural resources. Politician and economist Glazyev (2020) notes that “the strategy of advanced development can be implemented by developing only advanced technologies. Lagging industries should implement a dynamic catch-up strategy, which includes extensive borrowing of modern technologies from abroad and their development with further improvement” (par. 6, 7).

The question of choosing a strategy for future development remains rather difficult in Russia, given the factors that determine the development of the world community now. One of these is a risk factor. Social scientists consider Beck's (2000) statement about the globality and universality of risk and its immense scale a prophetic one (p. 29). In the conditions of accelerating social time, globalization of the world space, openness, instability and disequilibrium, nonlinearity of unpredictability of social changes, the variety and number of dangers threatening humanity is constantly growing. Therefore modern society is often defined as a “risk society” (Rassadina, 2013, p. 84).

Risks cover almost all “pain points” of modern civilization. Among the most common are the following: local wars, interethnic conflicts, extremism and terrorism; political, financial, economic and environmental crises; poverty and hunger; unemployment or constant threat of job loss; demoralization of politics and law, strengthening of authoritarian tendencies, mistrust of the authorities and weakness of civil society; lowering the social status of several social strata at once and social apathy; crime; value-normative disintegration; the crisis of many institutions of the spiritual sphere - family, upbringing, education, art, media. This list can be continued. Depending on the nature of origin and the scope of action, risks are classified as technogenic, natural and sociogenic. However, they become more and more interconnected, acquiring the ability to mutual and manifold amplification.

Russia being integrated into the world community is facing the negative consequences of the transition to a “risk society” just like the rest of the world. Sociological research using survey methods allowed analysts to compile a list of the most important, priority risks and threats that, in the opinion of Russian respondents, the country faces. Among those is the financial and economic crisis, terrorism, extremism, unemployment, disease, poverty. The rating of significant personal risks practically repeats the previous data, only in a slightly different sequence - unemployment, illness, financial and economic crisis, crime, poverty (Rassadina, 2013, p. 85).

Making choices on a future development strategy for Russia, we are talking about an adequate assessment of possible political and social risks, moral challenges and cultural restrictions during the last wave of globalization. Russia must develop a model of behavior on the world stage that would enable it to pursue international policies that meet its national interest. The intermediate geopolitical and cultural-civilization position of Russia makes it extremely sensitive to any major geopolitical and geo-economic shifts in Eurasia. Throughout its history, Russia has been forced to respond simultaneously to challenges emanating from the West and the East, from Europe and from Asia. To determine the optimal strategy for the future development of Russia, realism is currently needed to assess the capabilities and to identify foreign policy priorities. However, only a successful domestic policy, economic prosperity, political and cultural integrity and stability, moral health of the Russian society can guarantee its national security and the return of its high international authority.

To implement all of this, it is important to focus on building a socially oriented economy, on innovative rather than catch-up development.

In order to form a competitive and efficiently functioning research and development sector and to ensure its leading role in the process of technological modernization of the Russian economy by the Government of the Russian Federation (2011). The responsible executor is the Ministry of Education and Science of Russia.

The main objectives of the state program are:

- development of fundamental scientific research;
- creation of an advanced scientific and technological reserve in priority areas of scientific and technological development;
- institutional development of the research and development sector, improvement of its structure, management and financing systems, integration of science and education;
- formation of a modern material and technical base of the research and development sector;

- ensuring the integration of the Russian research and development sector into the international scientific and technological space (Government of the Russian Federation, 2020).

On December 1, 2016, the President of the Russian Federation signed the decree No. 642 “On the Strategy for the Scientific and Technological Development of the Russian Federation” (hereinafter referred to as Strategy-2035). The strategy is intended to outline the main guidelines in the process of improving and modernizing science and technology in our country (President of the Russian Federation, 2020). The document is extensive and ambiguous. His analysis is intended to demonstrate the essence of the integrative approach in modern science. In our opinion, the problem can be most fully described in terms of multidisciplinary and transdisciplinary approaches.

A multidisciplinary approach broadens the scientific worldview by sharing knowledge, methodologies and languages of different scientific disciplines (sometimes in parallel). Scientists from different disciplines are integrated into collaborative activities not by similarity of subject areas, but by a common target context. Several disciplines, in fact, pursuing their own independent goals, work in a common strategic and target direction. Targeting context is not the prerogative of any one discipline and involves consensus and compromises between scientists from different disciplines. As a rule, with this approach, research methods are not transferred from one discipline to another. Nevertheless, the integration of disciplines is carried out at the expense of a common goal setting, which allows us to consider the object (or process) under study as a complex system with a number of identified essential features. The latter are reflected in disciplinary approaches and methods.

An interdisciplinary approach is preferable in those situations when analysis must consider many factors, which are often only determined in perspective. Content is used that cannot be developed by the disciplines themselves and is necessarily updated when analyzing the problem. It is necessary to use interdisciplinarity when accessing the completeness of knowledge. It is clear that with the help of a multidisciplinary approach it is hardly possible to identify general patterns and mechanisms of the functioning and interaction of the subject of research. It may be impossible to place it in a more general semantic context.

We will try to apply this approach to the analysis of the latest documents that determine the development of science and technology in our country.

Over the past 10 years, the state has made considerable efforts to improve the efficiency of science. The Russian Academy of Sciences underwent a reform, it adopted such federal target programs as “Scientific and scientific-pedagogical personnel of innovative Russia”, “Research and development in priority areas of development of science, technology and technology”, “Strategy of innovative development of the Russian Federation for the period until 2020” (Strategy for innovative development of the Russian Federation...) (hereinafter Strategy-2020).

Already in the General Provisions of the Strategy-2020 we find that

The Strategy is designed to respond to the challenges and threats facing Russia in the field of innovative development, to determine the goals, priorities and instruments of state innovation policy. At the same time, the Strategy sets long-term development guidelines for the subjects of

innovation, as well as guidelines for financing the sector of fundamental and applied science and support for the commercialization of developments.

In addition, Strategy 2020 is based on “the results of a comprehensive assessment of the innovative potential and long-term scientific and technological forecast” (Strategy for innovative development of the Russian Federation...). In the text, we find such terms as “innovative development”, “innovation policy”, “and subjects of innovation”, “innovation potential”. Obviously, their meaning and content should be determined. It should be clarified, outside and before the adoption of the Program itself through the prism of social and humanitarian disciplines. One of the objectives of the Program is “the transition of the economy to an innovative socially oriented development model” (Strategy for innovative development of the Russian Federation...). It involves a deeper economic study.

The text of the document also defines the innovation environment as an environment created by joint efforts of business, science and the state to implement the priority areas of modernization and technological development.

In Strategy 2020, we find some types of innovative behavior. “The absolute dominance of the least advanced types of innovative behavior, including the borrowing of ready-made technologies, characterizes the Russian innovation system as oriented toward an imitation character rather than the creation of radical innovations and new technologies” (Strategy for innovative development of the Russian Federation...). This again testifies to the “pre-program” social and humanitarian developments.

Strategy 2020 mentions the “low level of citation of the works of Russian scientists” in international databases (for example, Web of Science). “An increase in the number of citations per publication of Russian researchers in scientific journals indexed in the Web of Science database, up to 4 references by 2020 (in 2010 - 2.4 references per article)” is considered to be the goal of the strategy (Strategy for innovative development of the Russian Federation...). In recent years, the scientific community has been discussing the question of how the effectiveness of scientists' work can be assessed by the number of citations (Krylova, 2014b).

One of the main tasks of Strategy 2020 is “development of human resources in the field of science, education, technology and innovation” (Strategy for innovative development of the Russian Federation...). The mechanism for its implementation cannot be obtained only by the document itself.

The section “Variants of innovative development” highlights the established options: 1) inertial (import-oriented) technological development; 2) catch-up development and local technological competitiveness; 3) achieving leadership in leading scientific and technical sectors and fundamental research (Strategy for innovative development of the Russian Federation...). Obviously, such material is the result of serious disciplinary reflection within the framework of economic knowledge.

In section 5 “Formation of competencies for innovative activities” we find the following competencies:

the ability and readiness for continuous education, continuous improvement, retraining and self-learning, professional mobility, striving for new things; ability to think critically; ability and willingness to take reasonable risk, creativity and enterprise, ability to work independently,

willingness to work in a team and in a highly competitive environment; proficiency in foreign languages, which presupposes the ability to freely communicate in everyday life, in business and in professional communication.

(Strategy for innovative development of the Russian Federation...). This, in turn, testifies to fundamental professional and pedagogical developments and to the fact that it is the multidisciplinary approach, according to the authors of Strategy-2020 that has determined the development of Russian science for many years.

7. Conclusion

Such an extensive citation and terminological analysis in this article are intended to demonstrate the fact that the development and further refinement of the Strategy itself is clearly multidisciplinary in nature.

Has the Strategy been implemented in real life? Not yet. It seems that the question should be put differently: Was this document only one to be implemented? No, but it set a kind of general interdisciplinary, multidisciplinary semantic field and a system of targeted efforts of various social institutions. In fact, Strategy-2020 turned out to be a kind of Program Statement, a kind of “strategic corridor” that predetermined “Strategy for Scientific and Technological Development of the Russian Federation 2035”.

It should be admitted that the expediency of adopting the Strategy-2035 is not entirely clear. It could be defined as a Good Goal, which is not quite (or not at all) consistent with the processes actually taking place in the field of education and science. The reason for this, in our opinion, is precisely this multidisciplinary incompleteness. In addition, “if adopted, the Russian Federation will have two strategies that set the vision for the development of the scientific and technological complex, and the Strategy for Innovative Development is designed for the period up to 2020, and the Strategy-2035 until 2035”.

Multidisciplinary at this stage of the science development is an indispensable feature of promising scientific research. In the context of globalization of the socio-economic space, multidisciplinary research will encompass an increasing number of sciences and spread in an increasing number of countries. This approach is reflected in the most important documents of the Russian Federation and is beyond any doubt for Russian scientists - specialists in various fields of knowledge. However, the exact way of its implementation remains unclear. It is easy to see that advanced modern scientists are moving towards multidisciplinary in many ways intuitively and spontaneously, under the influence of their own ideas about the prospects for the development of a particular science. A more thoughtful further understanding of the essence of interdisciplinarity is needed to help make this movement (undeniably correct) more conscious and organized.

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