Science Popularization as an Element of Innovative Communications

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Abstract—Current problems in popularizing science are considered in their relationship with the building of the national innovation system (NIS) of Russia. It is shown that for the creation of effective innovative communications in society, an innovative culture should predominate, contributing to a positive, constructive, and active perception of new knowledge, discoveries, and inventions. The activity of popularizing science is a significant factor in the formation of an innovative culture, along with education. The contemporary tasks of popularizing science are identified and analyzed, digital tools for its implementation are presented. The role of information centers as organizers of science communication and their potential for influencing the development of the innovative culture of society is shown.

Keywords: popularization of science, science communications, national innovation system, innovative communications, innovative culture, information, knowledge, digitalization, information technologies
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INTRODUCTION

The development of an innovative economy is a global trend based on the increasing role of knowledge and human capital as factors of economic growth. The basis for such development is the creation of a national innovation system (NIS), framework conditions that provide a favorable institutional climate and a business environment with a sufficient level of competition.

An NIS is a system for the reproduction of knowledge, in which knowledge goes through a complex cycle from the emergence of a new idea to its practical implementation. It consists of the following main subsystems: the production of new knowledge (fundamental science or R&D), the use (embodiment) of new knowledge and its commercialization (business environment), the subsystem that creates the framework conditions for its functioning (the state). The integrity of the NIS is ensured by the interaction between its main subsystems [1].

The formation of the theory of the NIS began in the 1980s [2–5], and its development continues due to implementation in practice of models of various configurations in different socio-economic conditions, which are determined by the specifics of the historical, cultural, and psychological context of the development of national economies [6]. The triple helix model, which is based on horizontal, network interaction between the subjects of the NIS (state, science, and business), has proved to be the most promising and viable today. Moreover, the subjects in this model enter into collaboration interactions, taking on some of each other’s functions.

Models of the triple helix are developed by clarifying the composition of the subjects of the NIS. Additionally, it is possible to add a fourth element to the model in the form of civil society [7] or education as an independent element [8]. In the first case, we are talking about countries with strong institutions for the influence of society on the policy pursued by the state, which is generally typical for the developed countries of the world. Education is proposed to be singled out in the model of the Russian NIS to reflect the historically established division between science and education. The requirement for close horizontal interconnections between the elements of the system remains the same for all modifications, which is due to the very process of reproduction of innovations.

According to the definition given in the Oslo Guide to the collection and analysis of data on innovation [9], innovation is a new or improved product or process (or a combination of these) that is significantly different from previous products or processes produced in the organization and is available to potential users or to put into operation.

In the modern world, the process of reproduction of innovations is nonlinear. The source of innovation is a synergistic effect resulting from the interaction of participants in innovation [10]. It is the close interaction of the elements of the system that leads to the fact that it is not an additive sum of the qualities of its constituent elements. New knowledge can arise in different subsystems of the NIS, and for the effective operation of the system as a whole, they must find the shortest path to their implementation in terms of time.
and other costs. This path is the result of the interaction of the subjects of the NIS; therefore, to a large extent, its effectiveness depends on the effectiveness of these interactions.

In the system of classifications of currently functioning innovation systems, the domestic NIS refers to mixed-type models, which are based on the traditional model [11, 12] implemented in Western European countries. In models of this type, the state, through the mechanisms of public-private partnerships, grants, and stimulation of the creation of research centers, provides support for the production of innovations at all stages of its cycle [13].

In the NIS of Russia, the whole set of elements necessary for a full cycle of knowledge reproduction can be found; however, the qualitative and quantitative characteristics of relations between the state, science, business, education, and society in our country do not meet modern requirements for the continuous creation of innovations and their use to ensure economic growth and improve the welfare of society. Among the problems of the interconnectedness of the elements of the NIS of the Russian Federation, the inefficiency of innovative communications is noted [14], which, in this context, will be understood as the processes of transferring knowledge and information between participants in the innovation creation cycle. An analysis of the practice of innovative communications in our country has made it possible to identify the following problems:

- availability of information for participants in the innovation process regarding the developments and technical and technological capabilities and competencies of each;
- the transfer of the knowledge and technologies themselves that are associated with the imperfection of our legislation in the field of intellectual property, as well as with the fragmentation and uneven development of regions, industries and enterprises, higher educational institutions, and scientific organizations in our country;
- mutual understanding caused by differences in motivations, different directions of goals and objectives, different planning horizons, ideas about the final result of the activity, and different languages of communication of the participants in the innovation process.

The effectiveness of innovative communications depends on the characteristics of the relevant tools for transferring knowledge and information, as well as the systems that perceive them. It seems that to form effective innovative communications in society, an innovative culture should prevail, contributing to a positive, constructive and active perception of new knowledge, discoveries and inventions by society. Along with education, a significant factor in the formation of an innovative culture is the activity to popularize science. In the context of the formation of an economy based on knowledge and innovation, the popularization of science acquires a new meaning and a new toolkit.

**INNOVATIVE CULTURE AS AN ENVIRONMENT FOR FORMING INNOVATIVE COMMUNICATIONS**

The problems of a positive and constructive attitude of society to the achievements of science, breakthrough discoveries and inventions have long been the subject of attention of scientists. K.E. Tsiolkovsky, in his works *Genius among People* (1918) and *Motors of Progress* (1927), discusses a large number of discoveries and inventions that did not resonate with contemporaries and were not accepted by the scientific community at the time of their occurrence, although they subsequently became the basis of views and technologies that provided mankind with access to a new level of scientific and technological progress. Discussing the reasons that did not allow society in general and the professional community in particular to assess the prospects and value of brilliant discoveries, the scientist seeks to form a vision of the necessary measures to increase society’s susceptibility to the new [15].

Awareness of the need to purposefully form not only a loyal but also a creative, active attitude to new knowledge, as well as to the changes that will follow the emergence of new discoveries and inventions, was first officially reflected in 1995 in the Green Book of Innovations of the European Commission [16]. In this and subsequent documents, one of the strategic resources [17] to create an innovation system of the European Union, it is proposed to consider such a concept as an innovative culture of society. In addition to measures to disseminate an innovative culture in the areas of education, production, and government agencies, these documents substantiate the need to raise awareness of the general population in the field of scientific and technological progress and the implementation of its achievements in practice.

In Russia, in 1999, following the initiative of the Institute for Strategic Innovations, scientists, artists and culture workers, and representatives of state organizations signed the National Charter of Innovation Culture, which formulated the goals and objectives of the development of an innovative culture in Russian society and ways to solve these problems [18].

From our perspective, the most complete definition of innovation culture is as an area of general cultural process that characterizes the degree of susceptibility of a person, group, society to various novelties, ranging from a tolerant attitude to readiness and ability to turn them into innovations. This definition was given by B.K. Lisin in [19], where he considers this concept in its relationship to other characteristics of society and the possibilities for the development of the knowledge economy, noting that an innovative culture...
contributes to the discovery of new ways to create value. Showing the level of development of innovation processes and participation of people in them, as well as the degree of satisfaction of the participants, the author believes that innovation culture is a key component of the general culture and therefore has national specificity, expressed in the fact that the ratio of innovation and traditional in a particular culture can help or hinder innovation. This statement coincides with the conclusions that were drawn as a result of the study of the relationship between the innovative culture of society and the characteristics of the national mentality [20]. It is considered to have been already established that innovations should not only be created and implemented but also institutionalized in society, and this requires a rational combination and balance of traditional and innovative [21]. Ignoring the experience and values traditionally established in society in the process of introducing innovations leads to the rejection of the new or its deformation and implementation in an inefficient form [22]. However, the predominance towards the traditional also hinders the perception of the new by society and its implementation.

We can give an example of a retrospective analysis of the innovation culture in Russia that allowed researchers to assert that for almost three centuries, our country has been characterized by a tendency towards the predominance of strong schools of fundamental science and sectors of generating new knowledge, combined with a low ability to implement and commercialize the new knowledge created [22]. This trend continues to this day [20] and is confirmed by both Russian and foreign studies.

Where the production of new knowledge is being carried out, there are difficulties with its transfer to the next participants in the innovation process, who must perceive it, determine how to use it in practice, and as a result, obtain a new value. The problem of the act of transferring new knowledge to work is explained, among other things, by the cultural characteristics of our scientists and innovation managers. Among these features, the following are noted: enthusiasm for the creative side of the work and neglect of its practical implementation; the propensity of managers to make investment decisions in favor of projects with a short payback period; and a preference to provide competitive advantages through non-economic relations, including building innovative ties, regardless of economic feasibility [23–25].

In Russia, a traditional social attitude is seen toward entrepreneurship, that it is not an entirely worthy occupation, which was first determined by following the old European tradition during the collapse of feudalism and then by socialist ideology: after the collapse of the socialist system, it stems from the corrupt behavior of oligarchs and “unrighteous” sources of capital accumulation in the post-Soviet period [20, 26].

As a result, our innovation culture is not conducive to establishing reliable channels of communication between creators of new knowledge, developers of ways to use it, and consumers of innovative products.

The solution to this problem can only be a set of measures to develop an innovative culture within the entirety of society, since it is culture that is the environment on which the characteristics of innovative relations depend: the level of receptivity to the new, the level of trust between the participants in the innovation process, and the target and value settings of the participants in the innovation process. More active mutual penetration or collaboration of the areas of production, dissemination, implementation, and consumption of knowledge is needed. One of the main factors of this penetration is the possibility of using a common language that would be understandable to all participants and a comparable level of understanding of the subject areas in which new knowledge is produced. An objective obstacle to mutual understanding is the problem of the specificity of the scientific language, as well as the often high level of abstraction of tasks that are solved by scientists. Overcoming the complexity of the perception of scientific knowledge by participants in the reproduction of innovations is facilitated by the practice of popularization of science, which has a fairly long history. However, in today’s rapidly changing world, there is a need to search for new forms and improve the tools of scientific popularization, as well as updating views on its place in the development of society and innovative culture, in particular.

POPULARIZATION OF SCIENCE—A FACTOR OF FORMATION INNOVATIVE CULTURE

Considering the history of the popularization of science, researchers proceed from the fact that it develops in parallel with the history of science itself [27]. It is believed that the popularization of science as an independent activity begins to stand out in Europe in the 15th and 16th centuries, when educational and applied literature appeared, which was associated with the need to spread professional knowledge among the growing class of artisans and workers in manufactories, as well as with the invention of the printing press and the spread of papermaking technology throughout Europe. In the 17th century during the period of intensive development of science, the first scientific organizations and the first scientific journals appeared, which became the main instruments of interaction between scientists. More popular sources of information about the achievements of science were almanacs and encyclopedias, which began to appear from the middle of the 18th century. The Industrial Revolution of the late 19th and early 20th centuries contributed to the emergence of an audience that needed scientific knowledge for their application in practice. During this period, a number of popular sci-
ence journals appeared, such as Nature, Scientific American, and National Geographic. There were also special organizations involved in promoting the development of science and its popularization, such as the British Association for the Advancement of Science and the American Association for the Advancement of Science. In the 20th century, along with a large-scale increase in the number of printed publications, other mass media appear, which made it possible to further expand the audience and use various forms of popularization to disseminate scientific knowledge [28, 29].

In Russia, the beginning of the history of the popularization of science is associated with such names as Peter I, under whom the first newspaper Vedomosti was printed, M.V. Lomonosov, A. Kantemir, N.I. Novikov, and L. Magnitsky, whose works were addressed to a wide range of readers and aimed not only at presenting knowledge in the subject area but also at forming a worldview in accordance with the scientific achievements of that time. The first full-fledged Russian popular science publication is considered the Monthly Writings, Serving for Benefit and Joy, which was published (1755–1764) in St. Petersburg by the Imperial Academy of Sciences. The mission of the journal had not only scientific but also applied purposes in the “economy, in the merchants, in mining, in manufactories, in mechanical needlework, in architecture, in music, in painting and various arts” [30].

The development of capitalist production in the 19th century, as well as the reforms of Alexander I, which resulted in some liberalization of the press, coincides with the birth of the British Association for the Advancement of Science and specializations (for example, the British Association for the Advancement of Science and the American Association for the Advancement of Science). In the 20th century, along with a large-scale increase in the number of printed publications, other mass media appear, which made it possible to further expand the audience and use various forms of popularization to disseminate scientific knowledge [28, 29].

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The development of capitalist production in the 19th century, as well as the reforms of Alexander I, which resulted in some liberalization of the press, contributed to the creation of new periodicals with different specializations (for example, the Journal of Manufactory and Trade, the Journal of Ways 101 Communications) aimed at a matter of enlightenment and increasing interest in science. Publications such as Russkoe Slovo, Delo, Europeets, and Teleskop began to be printed, in which articles of a philosophical, natural science, and applied nature were published. In the same period, encyclopedic popular science journals are published: Obschestvennataltnoe Vestnik and Vokrug Sveta, the journals Priroda, Priroda i Lyudi, and Priroda i Zhizn, as well as several medical publications. In the journal Nature and People, for example, Ya.I. Perelman, published many popular works that formed the basis of the subsequently developed “entertaining science,” which, according to researchers on this subject, “coincides with the birth of the phenomenon of state scientific and technological policy against the backdrop of world wars” [31].

In the Soviet period, the popularization of science was given great importance, and a systematic approach was implemented to the dissemination of scientific knowledge throughout the USSR. The mobilization of the economy, the tasks of accelerated industrialization, losses in the Great Patriotic War, the closed economy, and ideological isolation—all this required literally total enlightenment. To solve such large-scale tasks, the Knowledge Society (Znanie) was created in 1947, which had a clear structure and was represented in all republics, territories, regions, national areas, cities, and districts on the territory of the USSR. In its activities, the society used the entire arsenal of mass communication tools available at that time: it organized public lectures, reports, readings, consultations, and conversations throughout the country, published high-quality popular science journals, participated in the creation of scientific and popular science films, broadcasts on radio and television. The Society had such venues as the Central Lecture Hall, the Planetarium, the Polytechnic Museum, the Central Polytechnical Library, the Experimental Factory of Visual Aids and Demonstration Equipment, as well as lecture halls, planetariums, houses of scientific and technical propaganda in many large cities of the Soviet Union [32]. In addition to the Knowledge Society, the state provided the work of circles and sections of a scientific, technical, and artistic, in the broad sense of the word, orientation for schoolchildren and youth, and it also promoted scientific thinking and a positive image of scientists.

The change in the ideological orientation and priorities of economic development during perestroika led to a decline of the sphere of scientific popularization in our country. However, today, we are witnessing a gradual revival of domestic scientific popularization in forms that are relevant to the modern technological, socio-economic, and world level.

A brief retrospective review shows that each era was characterized by its own tasks, methods, and tools of popularization, which corresponded to the technological, socio-economic, political, and cultural structures of society at that time, as well as the goals and objectives that society sought to solve. One can trace the trend, which lies in the fact that reaching a new level of technological development is accompanied by an increase in activity in the field of popularization of science. It seems that this is due not only to the need to train personnel with new competencies—here, the primary role, of course, belongs to the education system—but also to the need to raise an innovative culture to a new level, which is a nourishing and connecting environment for the spread and rooting of a new technological order, and also for the emergence of new approaches to the application in various areas of the possibilities of advanced technologies. It is for this reason that society as a whole and its constituent people must achieve a certain level of knowledge, the potential to perceive and produce innovations, and a positive attitude toward change, in short, all that is called an innovative culture. In this sense, the popularization of science plays an important role, since in an accessible form it presents to a wide audience both the knowledge that has already become fundamental and the most advanced discoveries, inventions, achievements, and even controversial issues of science. Thus, the popularization of science contributes both to the pres-
vation of the traditional and the development of the innovative component of the culture of society, the balance of which is important for the innovative development of the national economy.

MODERN TASKS AND DIGITAL TOOLS FOR POPULARIZING SCIENCE

The features of the current stage of development of human society that determine the goals and objectives of popularization, are seen in such trends as an increase in the frequency of technological changes, a significant increase in the amount of heterogeneous information that can be processed by an individual person and an increase in the rate of its change, as well as the digitalization of most production and household processes. Technologies are quickly replacing each other and spreading at high speeds across all spheres. This leads, on the one hand, to a blurring of the boundaries between science and society, as people seek to master new technologies in everyday life and in their professional activities to avoid being excluded from modern civilization. The need to master new technologies and positively respond to rapid changes is an integral part of not only professional, but also general cultural skills. On the other hand, there is a complication of the scientific language and, accordingly, the difficulty of communication between the scientific world, the sphere of practical use of knowledge, and its consumers. At the same time, experts observe the fragmentation of the scientific language and its terminology within even one subject area of research or sections of one scientific discipline [33].

In response to current trends, the popularization of science is transforming its approaches and tools to solve problems that are in tune with the needs of society. All over the world, the term science communication has become generally as referring to this area of activity (science communication). The field of research on issues related to science communication has developed over the past 20–30 years based on the practices of science popularization, sociology, mass communication theory, journalism, PR, museology, and a number of other activities [34]. There are internal and external types of science communication.

Internal scientific communication describes the exchange of information and knowledge within a scientific community [34]. Through internal science communication, newly created scientific knowledge is transferred from its author to a professional environment [33] that examines it for possible inclusion into the category of the true [35]. On its basis, further research can be carried out in this and in related branches of science. The tasks regarding this type of communication include the removal of conceptual barriers within and in the interdisciplinary space and the search for opportunities for cooperation with scientists from other countries and other subject areas. The traditional instruments of internal science communication are scientific publications, peer review of articles, scientific events of various formats, joint research and projects, and informal contacts between scientists.

External science communication is the transfer of scientific knowledge from scientists to the external environment. This external environment is society, the state, business, and education, i.e., participants in the further transformation of the new knowledge obtained by scientists. The tasks and methods of external communications, in some cases, will depend on the counterparty for communication, mutual expectations and ultimate goals. However, the task of presenting scientific knowledge in a form accessible to non-professionals remains universal. Traditional means used for external scientific communication include publications in popular science journals, public lectures, consultations, television programs, exhibitions, museums, and so on.

New tasks for the popularization of science (science communication) are not only the acceleration of processes and the increase in the spread of scientific knowledge, but also the need to establish communications to obtain a reverse flow of information, knowledge, and skills for joint participation in solving problems facing society with representatives of the state, business, education, and the public [33]. Note that this corresponds to the strategy of innovative development, which implies the creation of a network of horizontal interactions between the participants in the reproduction of innovations.

It seems that the task of disseminating scientific knowledge among all age and social groups of society is acquiring new relevance. This is due, first, to the need to include a large number of fundamentally new devices, technologies, business, and logistics schemes in everyday and professional life; second, with an increase in the availability of information, including of dubious quality, for all members of society. Thus, there are problems with respect to public awareness of various types of threats and an increase in the volume of low-quality knowledge, including pseudoscientific, anti-scientific, fake, and other kinds of unreliable information. The flow of false information gives rise to incorrect reactions, overcoming the consequences of which requires additional expenditures of a large amount of resources from society. Here, we again returned to the need to increase the innovative culture of society, based on true knowledge and allowing it to be applied for the benefit of people.

The impact of information technology (IT) on the methods of the popularization of science, according to researchers, is direct and indirect [36]. The direct impact of this is that these technologies allow, first, traditional forms to be transformed into a digital format. For most people, e-books, journals, popular science programs, popular lectures, and even virtual tours of museums on the Internet have already become
familiar. Digital forms of familiar sources of knowledge allow not only significant expansion of the audience but also increased visibility and comprehensibility of the material presented through the use of visualization and animation of illustrative materials. Videoconferencing and other forms of remote communication have been actively used in internal scientific communication. This format began to be used most intensively due to the onset of the COVID-19 pandemic; however, it seems that the best practices of remote communications will be in demand even after the retreat of this threat, as they allow the overcoming of spatial and temporal barriers and significantly expanding the audience of communication. Second, fundamentally new forms of popularization arise on the basis of IT, such as websites, portals, educational computer programs, augmented reality applications [37–39], robotics [36, 40], databases, and digital platforms.

The indirect impact of IT is represented by the formation of the information society, in which an increase in the amount of information is accompanied by qualitative changes in its perception [42]. A person is no longer able to deeply and systemically process all of the information received [43], so he turns his attention to those sources that allow for the greatest coverage in the shortest time. In other words, they provide information in the most understandable and memorable way. In this regard, the forms of popular materials should be competitive in the stream of other sources and use the entire arsenal of modern technologies and knowledge about the psychological aspects of information perception by diverse audiences.

THE ROLE OF INFORMATION CENTERS AS ORGANIZERS OF SCIENCE COMMUNICATION

Science communicators face complex challenges, including technical, humanitarian, pedagogical, psychological, sociological, and philosophical aspects. Because these tasks are multifaceted, today, they are addressed by different forces: scientists, science journalists, libraries, universities, and information centers. Of course, scientists themselves are engaged in science communication, both the internal and external types. Moreover, the importance of this work for scientists is growing, and the demands of the society that finances research and development for the information provided by scientists are increasing. Today, scientific journalism has already become a separate type of activity and has formed its own special apparatus, which, in the perspective we are interested in, is expressed in the concept of “communication in the field of innovation” (innovation communication: InCo) [45]. This concept uses the possibilities of scientific journalism to promote the need for innovation, the practice of identifying and maintaining talent, developing communication skills in innovation processes at various levels, creating opportunities for communication of all participants in the reproduction of knowledge and innovation in different formats, and so on [1].

From the point of view of science communication, it is interesting to consider the activities of scientific and technical information centers, which in many countries form the basis of national systems of scientific and technical information. If we consider the growth of information flows and the number of parties interested in this information, then information centers play an important role in the dissemination of scientific and technical knowledge. In such centers, not only are databases of scientific and technical information formed, but also this information is also structured and systematized for further distribution in the relevant areas of business, government, education, and society as a whole.

In Russia, the leading center of scientific and technical information is the All-Russian Institute of Scientific and Technical Information of the Russian Academy of Sciences (VINITI RAS), which has since 1952 been monitoring the world flow of scientific and technical literature, generating and developing a polythematic data bank on natural and technical sciences, organizing access to it for domestic and foreign users, and also carries out publishing activities, publishing the Abstract Journal on Natural and Technical Sciences and other information products [43]. The institute conducts research work, “aimed at developing technologies that ensure the optimal integration of various information systems and resources,” as well as “development of information retrieval systems in order to overcome language and semantic barriers, intellectualization of information systems” [44]. The given information from open sources gives an idea that the activities of the institute to a large extent consist in the collection and redistribution of various information flows and the “overcoming” of language and semantic barriers, which are the direct functions of communication in general and scientific communication in particular.

An even wider range of functions in the field of internal and external science communication can be seen, for example, in the activities of the Japan Science and Technology Agency (JST) [45]—an advanced network research institute that implements and finances R&D programs and science communication, promotes the development of human resources in science, technology, and innovation, and develops information platforms. Today, one of the most strategically important areas of activity that JST participates in is the international cooperation in the field of R&D, as well as the organization and use of global resources of scientific and technical information. As a separate task, JST considers the education of project managers who will be able to professionally transfer not only information but also academic values to society. An
important activity of this agency is cooperation with universities to create unique innovations and develop talents.

Since 2006, JST has been publishing the quarterly English-language scientific and educational journal *Window to Science*, to which about 39000 public and private schools in Japan have a free subscription, and 50 Japanese schools in the United States receive the journal from the office of JST in Washington. The journal presents many simple, useful, and interesting scientific topics in a wide range of fields of science and technology [43].

Attention should be drawn to the fact that JST demonstrates a willingness not only to create innovations for tomorrow, but also to discuss ethical, legal and social issues related to new technologies, together with various stakeholders, also declaring that the diversified nature of its activities leads to the creation of new values with the help of scientific and technical information. At the same time, the agency actively participates in the reforms necessary to achieve this goal.

Thus, the activities of JST are aimed not only at the processing of scientific and technical information, at the implementation of effective science communication but also at the development of an innovative culture of society, which is one of the most stable and advanced in Japan, incorporating great traditions and significant achievements; however, we see that its maintenance and development requires constant attention, perspicuous analysis, and application of new, modern methods.

**CONCLUSIONS**

It is impossible to overestimate the importance of science popularization activities for the innovative development of society. In the culture of Russia, the traditional component prevails over the innovative one, the prestige of scientific activity has been lost due to socio-economic and political transformations, and the ability to function as a competitive economy lies only in the plane of accelerated innovative development. In this regard, the issue of forming a systematic approach to the promotion of new knowledge from its creators to the whole society, including all subjects of innovation production, would seem to be especially relevant. The development of the innovative component of culture in the modern world means that the audience for the popularization of science should be all strata and age categories of citizens. This is important for expanding the circle of consumers of innovative products, ensuring continuity and feedback between generations, which will increase the amount of information flow between them and lead to the emergence of new combinations and ultimately to the creation of new unique knowledge and technologies. In addition, it is important to overcome the one-sidedness of the flow of information from science to its partners in the innovation process and form practices for sustainable mutual exchange of it.

The presence of Russia as an equal participant in the creation and processing of flows of scientific and technical information at the world level depends on the use of all the opportunities provided by progressive technologies. A new toolkit can be created not only on its own, but also on the basis of already existing institutions, the functions of which have not lost their relevance.

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**CONFLICT OF INTEREST**

The author declares that she has no conflicts of interest.

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