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ON THE FORMATION OF NEW METHODOLOGY FOR SCIENTIFIC LEGAL RESEARCH IN THE FIELD OF NANOTECHNOLOGY AND NANOINDUSTRY

A. O. Inshakova

Volgograd State University
100, Universitetsky prospekt, Volgograd, 400062, Russia

ORCID: 0000-0001-8255-8160

ResearcherID: D-2673-2016

e-mail: ainshakova@list.ru

D. P. Frolov

Volgograd State University
100, Universitetsky prospekt, Volgograd, 400062, Russia

ORCID: 0000-0002-7873-2725

ResearcherID: F-6298-2013

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Introduction: resolution of the most acute problems of the 21st century (such as depletion of energy resources, climate changes, food safety, population aging, etc.) depends on the efficiency of development and introduction of new technologies and materials, which is one of the ways to increase living standards of population and an important factor for economic development of any state. Proceeding from those facts, the authors of the article draw attention to the need for thematic scientific research based on new methodological approaches and having a complex interdisciplinary nature. **Purpose:** to identify legal methods and tools, as well as conceptually new research approaches, to get the most objective results from scientific interaction between different branches of science. **Methods:** the authors provide an example of their scientific research in the field of nanoindustry based on a new methodological framework with the use of institutional approach in the context of interaction between economic and legal structures, aimed to compensate unilateral scientific studies on the system phenomenon under consideration by overcoming the problem of limited methodological arsenal. **Results:** it is

proved that application of the new non-traditional methodological potential, which denies unilateral approaches, offers great opportunities to get objective results from such special and system study of the processes of formation of nanoindustry, which has a fundamentally interdisciplinary nature due to the very essence of nanoscience. **Conclusions:** the nanoindustry is fundamentally interdisciplinary by its nature due to the very essence of nanoscience. Thus, clear determination of its sectoral structure should be recognized objectively impossible both in economics and law. The methodological tools described in the article are first of all relevant for co-operation of economists and specialists in the field of private law regulation of economic activity in the course of scientific research on the formation of innovative economy of knowledge and high technologies, especially nanotechnology and mass standardized production of results in nanotech activities.

Keywords: innovative economy; innovative activity; nanoindustry; nanotechnology; nanoindustrialization of national economies; legal innovation; legal regulation of nanoindustrialization; interdisciplinary research in the field of nanoindustry; research methodology in the field of nanoindustry; institutional approach to research

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О ФОРМИРОВАНИИ НОВОГО АРСЕНАЛА МЕТОДОЛОГИИ НАУЧНЫХ ПРАВОВЫХ ИССЛЕДОВАНИЙ В СФЕРЕ НАНОТЕХНОЛОГИЙ И НАНОИНДУСТРИИ

А. О. Иншакова

Доктор юридических наук, профессор, зав. кафедрой гражданского и международного частного права (базовой кафедры ЮИЦ РАН)

Волгоградский государственный университет

400062, Россия, г. Волгоград, просп. Университетский, 100

ORCID: 0000-0001-8255-8160

ResearcherID: D-2673-2016

e-mail: ainshakova@list.ru, gimchp@volsu.ru

Д. П. Фролов

Доктор экономических наук, профессор, зав. кафедрой маркетинга

Волгоградский государственный университет

400062, Россия, г. Волгоград, просп. Университетский, 100

ORCID: 0000-0002-7873-2725

ResearcherID: F-6298-2013

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e-mail: ecodev@mail.ru

Введение: исходя из того, что разрешение самых острых проблем XXI века, таких как истощение энергоресурсов, изменение климата, безопасность продуктов питания, старение населения и других, зависит от эффективности развития и внедрения новых технологий, что

является одним из путей повышения уровня жизни населения и важным фактором экономического развития любого государства, авторы статьи обращают внимание на необходимость проведения тематических научных исследований, основанных на новых методологических подходах и имеющих комплексный междисциплинарный характер. **Цель:** определить правовые методы и средства, а также концептуально новые исследовательские подходы, позволяющие получить наиболее объективные результаты научного взаимодействия различных отраслей наук. **Методы:** приводится пример реализованного авторами на основании нового методологического комплекса научного исследования в области наноиндустрии с использованием институционального подхода в контексте взаимодействия экономической и правовой отраслевых структур, направленного на компенсацию односторонних научных изысканий, посвященных данному системному феномену, посредством преодоления проблемы ограниченности методологического арсенала. **Результаты:** обосновывается, что использование нового нетрадиционного методологического потенциала, отвергающего односторонние подходы, открывает широкие возможности для получения объективных результатов такого специального и системного исследования процессов формирования наноиндустрии, имеющей принципиально междисциплинарный характер, обусловленный самой сутью нанонауки. **Выводы:** наноиндустрия имеет принципиально междисциплинарный характер, что обусловлено самой сутью нанонауки, поэтому как в экономике, так и в праве следует признать объективно невозможным четкое определение ее отраслевой структуры. Описанные в статье методологические средства актуальны, прежде всего, для сотрудничества экономистов и специалистов в области частного правового регулирования хозяйственной деятельности в процессе осуществления научных изысканий по вопросам формирования инновационной экономики знаний и высоких технологий, главным образом нанотехнологий и массового стандартизированного производства результатов нанотехнологичной деятельности.

Ключевые слова: инновационная экономика; инновационная деятельность; наноиндустрия; нанотехнологии; наноиндустриализация национальных экономик; правовая инновация; правовое регулирование наноиндустриализации; междисциплинарные исследования в области наноиндустрии; методология исследований в области наноиндустрии; институциональный подход к исследованию

Introduction

Modern socio-economic development of the world shows a steady underlying trend of the transition effects from a postindustrial economy to an innovative economy only with a different degree of the desired achievable [11, pp. 341–342; 6, p. 36].

The generally accepted definition of “innovative economy” in science does not exist. Bureau of statistics of the European community (The Statistical Office of the European Communities) (here and after – Eurostat) in Oslo Direction defines innovation as “the introduction into use of any new or significantly improved product (goods or service) or process, new marketing method or a new organizational method in business practices, workplace or external relations”. In accordance with the Frascati Direction (adopted by the Organization for economic cooperation and development – OECD in 1993 in the Italian city of Frascati) innovation is

defined as the final result of innovative activity, embodied in a new or significantly improved product, implemented in the market, new or improved technological process used in practical activities or a new approach to social services.

In its turn, innovation activities include all scientific, technological, institutional, financial and commercial steps which actually, or as intended lead to implementation of innovations. Some of these activities may be innovative in nature, whereas others do not withhold novelty, but it is necessary for them to implement innovation. So it follows logically that innovative activity is an activity on the development and implementation of innovations, and bringing these innovations to the stage of commercial use and distribution on the market in the form of a new product or the process, of its implementation in daily life.

Innovative activity is an effective tool of commercialization of scientific and technological pro-

gress and becomes the defining element of the international competitiveness of the country.

The development and introduction of new technologies gives hope for the resolution of the most acute problems of the XXI century (the depletion of energy resources, climate change, food security, ageing population etc.), and it is one of the ways to improve the standard of living of the population and an important factor of economic development of any country. Academician V. I. Zhukov in his work “The World Crisis: Economics and Sociology of Global Processes” after analyzing in details the totality of the causes of the current economic crisis, in addition to financial, lists the highlights the main reasons for the change in technological structure and the transition to the so-called sixth stage. The scientist said: “Currently almost all branches of production has reached the highest point of its development. Now the progress is impossible without the technological revolution in energy, materials science, genetics, medicine, computer science and other fields” [2, p. 21].

The new growing economic crisis in 2015 proves that only in the conditions of reorientation of production, the redistribution of markets and means of production it is possible to withstand common to all mankind problems.

The Russian Federation still continues to be a “commodity donor” of the Western world and developing economies of the Asian region. Such role does not correspond to the capacity and functions of the Russian state on the world stage.

Today one of the key areas of sharp rise at the global economy is involving in economic circulation the results of scientific and scientific-technical activities. National economic development of any country at its core is characterized by the leading role of scientific and technical progress and intellectualization of major factors of production [13, p. 100].

It is obvious that Russia needs to completely revise of the state policy in the field of economic development, to carry out the displacement of the main emphases from the extraction of raw materials and minerals, with subsequent export in favor of increasing subsidies in high-tech industries. Only under this condition possible The real competition in the world markets with the purpose of selling and

the introduction of Russian developments and their subsequent mass production is possible only under this condition.

In this regard, the creation of comfortable conditions for research activities, ensuring cooperation between the scientific institutions and the financing of innovative projects is an important task for the state. The Russian government is not indifferent to the decision of objectively caused by the world economic development tasks and in the recent years has increasingly focused on the development of science and new technologies [10, p. 38].

The most important duty of the state to related to exclusive jurisdiction of the Russian Federation, is the regulation, of science-intensive technologies, which include high technology and innovative technologies, including nanotechnology.

The concept of nanotechnology and nanoindustry

In accordance with the Decree of the RF Government dated 23.04.2010 № 282 “On the national nanotechnology network” nanotechnologies aimed at the creation and practical use of nanoobjects and nanosystems with predetermined properties and characteristics.

One of the most promising sectors of production becomes nanoindustry, which is aimed at creating new, conceptually different from previous generations of products and materials.

National nanoindustry is one of the key directions of innovative development of the country economy and its competitiveness on the international arena. The wide spread of nanotechnology, mass and standardized production of results of nanotechnology activities will allow multiple units to increase greatly the efficiency of the existing industries and to create the clusters of new industries.

Nanotech is an interdisciplinary complex organizations, as well as the multidisciplinary complex organizations (the complex organizations, operating in the framework of different scientific disciplines on the basis of the unified approach to the consideration of the matter at the atomic-molecular level), providing and carrying out the purposeful work on the development and commercialization of nanotechnology.

According to the forecasts of leading researchers and expert organizations, the global development of the nanotechnology industry in the medium term will cause a radical change in the

structure and extent of the “commodity world”, leading to the restructuring of traditional markets and the rapid formation of new segments and niches, the restructuring of the configurations of competitive forces and yield to a qualitatively new level of customer needs.

In modern law understanding, reflected in scientific literature, nanotechnology is the purposeful human activity for production and use (including mapping, measurement, modeling and control of materia) materials with intentionally embedded features close to the atomic or molecular scale, sized from 1 to 100 nm [3, p. 94].

It was noted in the message of the President of Russia to Federal Assembly on December 12, 2013, that “today we have from the average of 265 obtained scientific results only one just one that becomes the object of legal protection. The contribution of the added value, which is formed from the turnover of the intellectual property in Russia’s GDP is less than one percent. It’s not just a little, it is very small. In the US is figure is 12 percent, in Germany is 7–8 and in our neighbor Finland is 20. Therefore technology platforms must be focused on concrete results, getting patents and licenses, on the practical introduction of developments”. Also, the Russian President drew his attention to the necessity of formation of the domestic demand for high technology, the serious inventory of development institutions, which activities are scattered in many disparate projects, sometimes directly not related to innovation, at the same time created to support innovative development of the economy. Vladimir Putin stressed the need to restore their work “the strategic direction for the technological gap”.

The course on the need for the creation of new technologies and competitive products, forming additional margin of safety in the industry, in the financial system, in the training of personnel was continued in the Message of President RF to the Federal Assembly on 4 December 2014.

The decree of the President of the Russian Federation dated 7 July 2011 № 899 “On the approval of priority directions of the development of

science, technologies and technics in Russian Federation and the List of critical technologies in the Russian Federation” approved the priority directions of the development of science, technology and engineering in the Russian Federation that include the nanosystem industry, the information and telecommunication systems, the promising types of weapons, military and special equipment, the transport and the space systems energy efficiency, the energy conservation, nuclear energy and others.

The specified direction can be traced in subsequent policy documents.

The characteristic feature of modern world economic development is the transition of the leading countries to a new stage of formation of an innovative society, building the economy, based predominantly on the generation, dissemination and use of knowledge. The intensification of the production and the use of new scientific and technological results has determined the drastic reduction of the period of the innovation cycle and the accelerating pace of product and technology. The global challenges dictate the need to advance the development of certain specific areas of scientific research and technological developments (clean energy, genomic medicine, new technologies in agriculture and a number of other areas), many of which there are no significant backlogs in our country.

The Chairman of the Government of the Russian Federation on 3 January 2014 approved the Forecast of scientific and technological development of the Russian Federation for the period up to 2030, which is formed in the context of priority directions of development of science and technology in the country, which include the related “new materials and nanotechnology”. “In recent years, nanotechnology is becoming more accessible both from the economic and from the technical point of view; there is the possibility to model, implement, and monitor processes on nanoscale. The development of this area stimulates the growing demand for new materials which is due, on the one hand, the depletion of raw

material resources, and on the other hand active implementation of nanotechnology in the production of products with fundamentally new properties” stated in the forecast.

The need for systematic study of the formation of nanotechnology

Taking into consideration the foregoing the main factor of neoindustrialization of national economies becomes the real indicator of the integration of nanotechnology with the economy. This requires the implementation of achievements of economic sciences. The problems of the study of the characteristics and the laws of innovative development of economy and the problems of the economic policy, associated with the formation of the innovative nature of Russian economy, the impacts of any future nanotechnological way of production on the national economic system look out at the forefront. The study of the institutional economists focused on the analysis of the factors and the ways to minimize the transaction costs the table interactions of agents and their organizations in high-tech world, the institutional forms and the mechanisms of technological evolution and the key problems that hinder effective institutional regulation of nanotechnology highly relevant. The evolutionary approach to institutional regulation of neoindustrialization is extremely current.

All the above arguments about the importance and the priority of development of modern economic science in the field of nanotechnology relate fully the law summoned to streamline the process of neoindustrialization. Today legal expert community has got a difficult task not just to improve the legislation, ensuring the development of innovation activities in the field of nanotechnology, but at this stage, to establish for the legal sphere, the economic issues of particular relevance. First of all, for the simple reason that the States need adequate regulatory framework resolving relevant economic transformation. Certain legal rules providing for the regulation of this relationship undergo changes under the influence of the innovation economy. All these processes are aimed at finding, implementation of

production, efficiency of the satisfaction requirement public needs and ensuring improvement of conditions of society. Institutional policies in the field of nanotechnology needs to be systematic, evolutionary, and proactive nature, to combine liberal and regulatory regimes, to use the differentiated set of methods and tools to be based on interaction with expert communities and the general public through the persuasion and the discussion of draft laws, to stimulate voluntary initiatives and rely actively on the customary law.

Meanwhile, we have to admit that a the whole range of issues related to legal regulation of relations in the field of innovation in general and nanotechnology in particular, to the present time has no unique solution. These include insufficient research in the definition of the theoretical foundations of the nature and characteristics of innovation. It is required the scientific justification and the clarification of the conceptual apparatus in the field of innovation in general. In the regulations there is no uniform terminology, conceptual legal tools. The status of subjects of nanotechnology, the mechanisms of their support are not quite determined. The general “fuzziness” of state policy in nanotechnology and the multiplicity of organizations, including fictitious which perform their public support and claim this support, entail the risk of inefficient spending of budget funds, underfunding of research, and the impossibility of coordinated work between the public authorities and the subjects of this kind of innovation.

In addition, there is no single, consolidated law “On innovative activity” at the Federal level. The developed legal situation contributes the destabilization of the development of a new direction in the sphere of the economy, commercialization of nanotechnology results in the Russian Federation. The lack of legal regulations of process of innovative entrepreneurial activity in terms of commercialization of the objects arising through its implementation complicates the process of promoting innovative products from the producer to the consumer with the purpose of generating profit and achieving social effect.

In this connection it is necessary to consider that the development of innovation activity, increasing innovation activity in the country will depend primarily on the supportive legal security through the effective legislative framework [18, p. 95].

Economic sciences experts have concluded that the widespread use of nanotechnology should be accompanied by the advanced development of the regulatory framework and proactive marketing, the neglect of which became a key reason for the commercial failure of the technology engineering of the genetically modified organisms.

In addition, it is impossible to implement innovative trends in any of the areas of people management without the legal innovation. In this regard, it should also be determined with the formulation of the concept of “legal innovation”, at least for the purpose of the case studies and possibly subsequent doctrinal consolidation. We believe, under the “legal innovation” in the context of this article, it should be understood developed, doctrinally grounded conceptually new theoretical models of the legislative law and the doctrine of rights with the regard to the contemporary socio-economic transformations in the conditions of the priority of innovation, including the nanotechnology and the economic development.

The difficulty, complexity and interdisciplinary nature of the nanotechnology activities make it impossible special and systematic study of the formation of nanoindustry when using the unilateral economic or legal approach.

Therefore, for the scientists interested in the issues of innovative development, the formation and formation of domestic nanoindustry need to be a clear the necessity of interdisciplinary research, especially in the context of the economic and the legal research of the interaction.

This kind of research is already being implemented. In one of these monographs, entitled “The institutional analysis of nanotechnology "revolution", the synthesis of Economics and law” [9, pp. 455–456] jurists and economists from the perspective of different disciplines, different academic schools and the wide range of methodological arsenal tried to approach to the definition of the ways of transition to the economy knowledge, the subjects of the nanotechnology activity, the priori-

ty sectors of the legal regulation of nanoindustrial, and the problems of neoindustrialization using the results of domestic and foreign researchers and international legislative and practical experience in the use of nanotechnology in the development strategy of the science intensive industries, state regulation of innovative activities in developed countries.

The conceptually new methodological approach, allowing fully aware of the essence and the completeness problems of legal support nanotechnology business activities in such scientific research should be an integrated approach to its study based on existing and prospective-demand legal principles and regulatory mechanisms at all levels: supranational, universal, national and regional.

Results

The main methodological flaw, in our view, the emerging modern legal researches in the field of nanotechnology comes out to insufficient attention to the problems of unification and harmonization of the related training for the relevant field of legal regulation, as objective methods of legal integration in the emerging global economic system. In our opinion, it is not currently possible to make adequate conclusions about the trends and prospects of the development of national legislation in the field of nanotechnology without taking into account the influence of the process of economic and legal integration, as the initial start of the necessary legal unification of all levels of legal regulation in the conditions of increasing interaction and mutual influence of international and domestic law. Not the last place in this kind of research should be given to the problems of the choice of adequate methods of legal unification. Indeed, the legislation in the field of innovation in General and nanotechnology in particular is developing quite fragmentarily, without taking into account the priorities and the diversity of the legal possibilities of the methods of unification of legal regulation of corresponding social relations. The lack of a unified regulatory act of the Federal importance in the field of innovation makes us think about the problem of selectivity and the need for systematization of its legal regulation. Available at the national level an array of strategic and policy documents, development concepts and other instruments of “soft law” is a

reference of a declarative nature and therefore is not able to enter the subjects of domestic innovative entrepreneurship within strictly defined by law and to make a significant impact on the legislative process. The standards of sub-federal law have the low level of legal technology, the duplication of norms, contrary to current Federal law of categorical apparatus. In this connection, is the problem of organizing and creating a uniform regulatory support of innovative economic activities from the development of General conceptual and categorical apparatus prior to the adoption of a uniform Federal law deserves the most careful research attention.

It should be noted that the interdisciplinary approach in the study conducted at the intersection of economic and legal science can assume the divergence of views of authors on the nature and scope of regulation of relations in this sphere, and the methodology of its formation and the practical application, which in itself, according to the authors, does not carry risk, but on the contrary, it will ultimately come to understanding, consistency worked out the scientific position and, as consequence, increase the efficiency of scientific collaboration.

For example, the representatives of the economic theory consider inappropriate excess “nanotechnological” of the current legislation and do not consider the need for separation as a separate type of legally protected intellectual property developments in the field of nanotechnology [17, p. 58].

However, the representatives of contemporary economic science consider necessary the development of special legal acts in the field of nanotechnology at the regional and municipal levels [17, p. 60]. The scholars see a contradiction, indicating the different understanding by economists of the hierarchy of different levels of legal regulation and the ways of details of working out in its legal mechanisms, which exclude the conflicts and inertness the collision and the inertia of normative acts in favor of flexible, centrally oriented regulation.

The representatives of the economic and the legal science also understand the institutional approach to the research in different ways. The implementation of this methodological approach for economists means the study of the influence of various institutions on economic processes in the aspect of the level of transactional expenses are

analysed (cost of interaction of economic entities). Institutions are understood in the economy as fairly wide range of phenomena. In generalizing classification the institutions are understood as models of organizing of economic relations and they are divided into four groups: functional (institutions, i.e. the status functions of subjects, objects and processes in economic systems), structural (enterprises, organizations, institutions, authorities, networks, clusters, etc.), regulatory (formal and informal norms) and mental (sustainable ways of thinking – ideas, beliefs, stereotypes, values, etc.) [5, p. 15; 7, p. 47; 8, p. 69; 4, p. 155]. The result of the interaction of these groups of institutions is institutionalized as an intangible productive force which order transformations and transactions. In this context, neoindustrialization is considered as an interdisciplinary form of institutionalization of the macroeconomic system, and nanotech as intensive emerging as a heterogeneous conglomerate of various institutions, yet ambiguous impact on the level of transaction costs in the field of high-tech.

The term “institutional” is derived for lawyers from the concept of “institution”, which represents in the law, first of all, legal matters, codes of the norms and customs of behavior in society, as well as the concept of “institutions”, which implies the consolidation of norms and practices in the form of laws, organizations and institutions [14, p. 133; 12, p. 240; 16, 194]. In addition, the “Institute of law” is understood by legal scholars as some kind of separate group of legal rules governing the uniform social relations that constitute the most frequent topic of one branch of law, but which can have cross-sectoral nature [15, p. 101; 1, p. 344]. Accordingly, to such understanding in the legal research to its necessary study the institutional legal framework of the nanotechnology industry as the legislative bodies of norms in the international legal and domestic acts framework program policy documents and other sets of legal states of the documents of soft law and customary law. In addition, it is useful the implementation of approach to the study of the law of nanotechnology and nanoindustry with the point of view of priorities in this sphere of civil, entrepreneurial and international private law, such as intellectual property law, competition law, law of corporations, investment law.

Insights

We believe that the nanotech is a fundamentally interdisciplinary in nature, due to the essence of nanoscience (imaginative name of all the areas of research of nanotechnologies and nanomaterials in various fields of scientific knowledge), so it should be recognized objectively impossible a clear definition of its branch structure in the economy, and in the law. Thus, interdisciplinary research, covering primarily economic and legal aspects, intended to serve the cause at least partial compensation for unilateral scientific research devoted to this systemic phenomenon, by overcoming the problem of limited methodological capacity of any one science in which we study the formation and development of national nanoindustry.

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