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# The activity of research organizations as a stimulating factor for the innovative production development in the Southern Federal District of Russia

## La actividad de las organizaciones de investigación como factor estimulante para el desarrollo innovador de la producción en el Distrito Federal del Sur de Rusia

ZUNDE, Victoria V. [1](#); KETOVA, Natalya P. [2](#) & MURZIN, Anton D. [3](#)

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#### ABSTRACT:

The article presents the results of the research of universities, research organizations, and industrial companies of the Southern Federal District of Russia, ensuring the integration of science, education and innovation activities carried out by the authors in 2018 – 2019. A number of conclusions and generalizations on the cooperative interaction of the innovative development participants, stimulation of their activity, and enhancement of the effectiveness of social and economic development of Southern Russia were based on the evaluation of the joint activities of the innovation processes participants implemented for the development of innovative production in large macroregion of Russia – Southern Federal District.

**Keywords:** research organizations, universities, innovatively active companies

#### RESUMEN:

El artículo presenta los resultados de la investigación de universidades, organizaciones de investigación y empresas industriales del Distrito Federal del Sur de Rusia, asegurando la integración de las actividades de ciencia, educación e innovación llevadas a cabo por los autores en 2018-2019. Una serie de conclusiones y Las generalizaciones sobre la interacción cooperativa de los participantes del desarrollo innovador, el estímulo de su actividad y la mejora de la efectividad del desarrollo social y económico del sur de Rusia se basaron en la evaluación de las actividades conjuntas de los procesos de innovación que los participantes implementaron para el desarrollo de la producción innovadora. en la gran macroregión de Rusia - Distrito Federal del Sur.

**Palabras clave:** organizaciones de investigación, universidades, empresas innovadoras

## 1. Introduction

The activity of research organizations operating in the context of the modern state imperatives for the speedy achievement by Russia of both sustainable and breakthrough economic growth is possible only with the implementation of large-scale modernization of the entire system of stimulating innovative production.

It is this system that represents the framework without the strengthening and development of which it is impossible to achieve a complete solution to the problem of improving the efficiency of modernization processes on an innovative platform.

In recent years, the legislative and organizational initiatives of the Russian state have been focused on the development of innovative production, as evidenced by the developed, adopted, and quite successfully implemented software solutions (Strategiya innovatsionnogo razvitiya Rossiyskoy Federatsii na period do 2020 g. [Strategy for innovative development of the Russian Federation for the period until 2020]; Razvitiye innovatsiy v Rossii [Development of innovations in Russia]; Bezpалov et al., 2019; Pogodina et al., 2019; Dudin et al., 2019).

The main goals of the state innovation policy in the Russian Federation are as follows: promoting innovation, improving the competitiveness of domestic products based on innovative solutions and updating production; focus on full support for fundamental innovations; a combination of innovation with the effective functioning of the market mechanism of competitive innovation, the protection of intellectual property; promoting innovation in Russian regions, and protecting the interests of national innovative entrepreneurship.

To solve the issues of increasing the innovativeness of production in Russia, the regulatory framework for the development and implementation of innovations has been improved, and participation in financing the budgets of startups, technology parks, innovative platforms, etc. of various levels has been provided, the public procurement of high-tech products and advanced technologies has been organized to ensure their guaranteed distribution, and favorable conditions have been created in accordance with the legislation to stimulate Russian and foreign investors, directing funds to innovative programs and projects.

Digitalization is one of the promising and vital directions of the breakthrough innovative economy of Russia in the 21st century. The passport of the Digital Economy of the Russian Federation National Program was approved by the decision of the Presidium of the Presidential Council for Strategic Development and National Projects in December 2018 (National Program "Tsifrovaya ekonomika Rossiyskoy Federatsii" [Digital Economy of the Russian Federation]). To implement this Program, five basic and three applied areas for the development of the digital economy for the period up to 2024 were identified. This program is the leading national project "The Future of Russia", the basis of new information technologies.

Among the research information platforms, programs, and projects implemented by professional developers, a certain place is occupied by the studies based on advanced modelling methods (Gupta and Gupta, 2017, p. 1472), which allow to both formulate model concepts, and to develop and replicate the most serious projects in the unity of activity of research organizations, universities, and innovation-oriented manufacturing companies.

However, the conceptual justification and recognition by the scientific community of the leading role of the scientific research organizations as a stimulating factor in the development of innovative production, in practice often run into limitations associated with the influence of various factors of the external and internal environment of scientific and educational institutions and their limiting effect. The activities of scientific and production alliances that are currently being formed, as well as those created earlier, but which have been rebuilt in recent years, require theoretical understanding and development of proposals adequate to the current circumstances and future trends for their effective cooperation and transfer of shared knowledge between partners. This defines the relevance of the study presented in the article.

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## 2. Materials and methods

The theoretical and methodological basis of the study was formed on the generalization of the results of fundamental and applied domestic and foreign studies of scientists on the analyzed problematics. At the same time, institutional, synergetic and ontological approaches were implemented; theories of innovations, evolution and modernization of the national system of research and development and university education, the triple helix, innovation and entrepreneurial university, and territorial innovation clusters were used as a methodological base.

In studying the innovative activities of research organizations in the context of the improvement thereof, the general scientific methods of systemic, synergetic, comparative analysis, as well as private methods of economic research were used, namely: subject-object, economic and sociological method, empirical research, and logical modelling.

The information and empirical basis of the study was shaped by the authors' selected empirical economic studies, systematization and processing of official statistical materials of the Federal

State Statistics Service, information from Russian and international organizations in the field of economic analysis and statistics, official websites of a number of universities, research organizations and innovation-oriented manufacturing companies of the Southern Federal District, the empirical data from monographic studies, reports, and other materials.

The object of the research was the innovative activity of several research organizations, manufacturing companies and universities of the Southern Federal District, integrated into its innovative ecosystem and interacting with national, regional and industry-specific innovation systems.

The subject of the research is a model of the organizational and economic mechanism, methods and tools to support the effective functioning and strategic development of the interactions of the research organizations, manufacturing companies and universities of the Southern Federal University selected for the study. The Southern Federal University (Rostov-on-Don, Taganrog) was a model research object (Rossijskoe obrazovanie). Several research divisions of the Southern Scientific Center of the Russian Academy of Sciences, a regional division of the Russian Academy of Sciences, uniting research groups from different cities of the Southern and North-Caucasian federal districts, were selected as the basic complex of research organizations (Rusnanonet). Among the innovation-oriented companies, the activities of the following companies operating in the IT market were analyzed: LLC VC "GANDALF Service", Novye Tehnologii LLC, as well as the high-tech Rostvertol Rostov Helicopter Plant JSC (Russian Helicopters) and others.

### 3. Results

When studying the problem disclosed in the article, it has been taken into account that for sustainable innovative economic growth it must be continuously replenished by new ideas, products of fundamental developments, as well as creative workers ready to create promising technological solutions focused on the production of competitive products. To maintain the innovative nature of the Southern Russia economy, the stake is on quite numerous organizations that carried out research in the macroregion: in 2017, there operated 302 such organizations (in 2019 their number decreased by 3 %); universities whose task is to become the basic centers of innovative development and the personnel base of innovative development. Institutes and other units of the Southern Scientific Center (SSC) play a significant role in ensuring the innovative breakthrough of the economy of the Southern Federal District. It consists of more than 500 people, including five Academicians and five Correspondent Members of the Russian Academy of Sciences, about 100 Doctors and about 250 Candidates of Sciences (Rusnanonet).

The following areas have been declared as priority areas of fundamental and applied research at the SSC RAS: multiprocessor systems; theory of molecular computers; methods for predicting and preventing natural and man-made disasters; ecosystem and environmental engineering studies of the southern seas; socio-political, economic, humanitarian problems of the densely populated and multinational South of Russia, including the North Caucasus, etc. The SSC RAS has close ties with the Kuban, Stavropol, and Volgograd State Universities, technical universities in Taganrog, Astrakhan, Rostov-on-Don, Volgograd, Stavropol, and Novocherkassk, based on which laboratories and basic departments have been created.

There are also dozens of research organizations operating in the Southern Federal District that are not members of the SSC RAS.

However, as evidenced by the data in Table 1, in recent years, there has been a reduction in the number of organizations performing research and development in the regions of the Southern Federal District. In 2015 there were 337 organizations, in 2017 – 302 organizations, and in 2018 – 2019 the reduction continued.

**Table 1**  
The number of organizations performing research and development  
in the regions of the Southern Federal District, in 2005 – 2017

Regions	2005	2010	2015	2016	2017	2017 in % to 2005
Republic of Adygeya	3	6	12	10	10	333.3
Republic of Kalmykia	8	7	6	6	6	75.0
Krasnodar Territory	62	53	106	105	100	161.3

Republic of Crimea			23	21	20	-
Astrakhan Region	21	23	25	24	24	114.3
Volgograd Region	45	42	53	46	44	97.8
Rostov Region	100	100	100	86	89	89.0
Sevastopol			12	8	9	-
Southern Federal District, total	239	231	337	306	302	126.4
Share in the indicator for the Russian Federation, %	6.7	6.6	8.1	7.6	7.6	113.4

Source: Compiled by the authors according to the Federal State Statistics Service of the Russian Federation (*Regions of Russia*, 2018, pp. 900-944)

A positive trend, reflected in the data presented in the table, is that in 2017 – 2018 the number of research organizations had remained substantially higher than in 2005 (there existed 239 such organizations). Also, the proportion of the Southern Federal District in the indicator "The number of organizations engaged in scientific research" in the Russian Federation is increasing (7.6 % versus 6.7 %). This is confirmed by the increase in the importance of the Southern Federal District on this indicator since the number of research organizations in Russia is declining even more rapidly. Along with the decrease in the significance of the indicator analyzed above, in recent years there has been a reduction in the number of personnel engaged in research and development in the Southern Federal District, which is reflected in the dynamics of the indicators of recent years (Table 2).

**Table 2**

The number of personnel engaged in research and development, including those with advanced degrees, in the regions of the Southern Federal District, in 2005 – 2017 (people)

Regions	2005, total	2010, total	2015, total	2016, total	2017, total	2017 in % to 2005, total
	incl. with the degrees	incl. with the degrees	incl. with the degrees	incl. with the degrees	incl. with the degrees	incl. with the degrees
Republic of Adygeya	163 ----- 42	330 ----- 71	279 ----- 76	282 ----- 77	283 ----- 68	173.6 ----- 161.9
Republic of Kalmykia	221 ----- 77	203 ----- 74	175 ----- 79	184 ----- 75	158 ----- 56	71.5 ----- 72.7
Republic of Crimea			1,676 ----- 311	2,096 ----- 305	2,113 ----- 401	- ----- -
Krasnodar Territory	7,000 ----- 873	6,256 ----- 1,039	9,265 ----- 2,450	7,532 ----- 2,230	6,916 ----- 2,053	98.8 ----- 235.2
Astrakhan	1621	917	933	692	653	40.3

Region	----- 227	----- 202	----- 287	----- 217	----- 199	----- 87.7
Volgograd Region	4,157 ----- 416	4,001 ----- 424	3,958 ----- 457	4,026 ----- 429	3,869 ----- 430	93.1 ----- 103.4
Rostov Region	15,713 ----- 1,156	16,402 ----- 1,335	12,556 ----- 1,394	12,102 ----- 1,378	11,846 ----- 1,417	75.4 ----- 122.6
Sevastopol			1,288 ----- 360	1,097 ----- 270	1,084 ----- 275	- ----- -
Southern Federal District	28,875 ----- 2,791	28,109 ----- 3,145	30,130 ----- 5,414	28,011 ----- 4,981	26,922 ----- 4,899	93.2 ----- 175.5

The data provided confirm the reduction in the number of personnel engaged in research and development – in the Southern Federal District, the decrease in 2017, compared to 2005, amounted to almost two thousand people (from 28,875 people to 26,922 people). However, there is a positive point in the form of the increase in the number of researchers with the degree of Doctor and Candidate of Science (an increase from 2,791 to 4,899 in the Southern Federal District). This indicates a relative increase in the "steadiness" of researchers. However, this trend is combined with several negative points.

Thus, the ageing of scientific personnel is the most acute problem in science in the South of Russia (as well as in the country as a whole). Currently, the average age of researchers is 47 years. At the same time, the age of Candidates of Sciences is 52, and that of the Doctors of Sciences – 63 (Chichkanov et al., 2015, p. 262). Moreover, each second scientist is above 50 years old, and every fourth is above 60 years old.

In order to solve the "age" problem in the field of research and development, the following actions seem to be necessary:

- ensuring the work of scientific organizations on modern equipment with appropriate information support;
- maintaining a personnel policy that stimulates the "entry" of young people into science, including the allocation in a special way of additional rates for hiring young researchers;
- forming and consolidation of the attractive status of a scientist, creating the "career elevators" system that ensures their growth and worthy advancement on the career ladder;
- financial support for the young people working in research institutions and universities in the form of special scholarships, targeted payments, etc.; and
- stimulating and supporting young researchers applying for grants, special youth projects, etc.

The strategic objectives of the development of the economy of the Southern Federal District, focused on the real use of the potential of knowledge in the "university – research organization – innovative production" system, make high demands on the professionalism of the modern specialists with higher education, the level of their ability and willingness to efficiently solve scientific, technical, informational, managerial, and other tasks. One of the ways to train such specialists is postgraduate and doctoral studies, and training highly qualified personnel, including those with scientific degrees.

The analysis of the indicators characterizing the processes of such training, the results of which are presented in Table 3, indicates the ambiguity of the situation in this area. In several regions of the Southern Federal District (the Republic of Kalmykia, Krasnodar Territory, Astrakhan and Volgograd Regions), the number of organizations providing training for graduate students and doctoral students increased. In the Republic of Adygea, it remained unchanged. However, in the

Rostov Region, which is the leader in the number of graduate and doctoral students, their number significantly decreased – from 42 in 2005 to 35 in 2017.

**Table 3**  
The number of organizations conducting training for graduate and doctoral students in the regions of the Southern Federal District, in 2005 – 2017

Regions	2005	2010	2015	2016	2017	2017 in % to 2005
Republic of Adygeya	4	4	4	4	4	100.0
Republic of Kalmykia	1	2	2	2	3	300.0
Republic of Crimea			6	5	5	83.3
Krasnodar Territory	29	38	37	34	32	110.3
Astrakhan Region	8	8	9	9	9	112.5
Volgograd Region	18	24	20	21	20	111.1
Rostov Region	42	43	42	38	35	83.3
Southern Federal District, total	104	116	112	113	108	103.8

Source: Compiled by the authors according to the Federal State Statistics Service of the Russian Federation (*Regions of Russia*, 2018, pp. 900-944)

In 2018 – 2019, the downward trend, unfortunately, has continued. As a result, in the Southern Federal District, the number of organizations providing training for graduate and doctoral students in 2017 was significantly less than in 2010 (at that time their number was 116).

Unfortunately, the number of organizations providing the training for graduate and doctoral students is accompanied by a reduction in the number of students and graduates, and, accordingly, those defending candidate and doctoral dissertations. A significant negative role in this process is played by the reform of the Higher Attestation Commission, which has been implemented in Russia for several years. It covers the activities of dissertational councils, changing training programs in graduate and doctoral studies, and several other very serious issues that do not find a positive solution.

The personnel problems in the Russian science, which are predetermined also by these conditions, significantly affect its effectiveness and innovative development of the country and its regions as a whole. The slow growth in the number of advanced technologies developed and used is one of the manifestations of the lag in this regard. Table 4 shows the dynamics of this indicator.

**Table 4**  
Developed and used advanced production technologies in the regions of the Southern Federal District, in 2005 – 2017

Regions	2005 developed ----- used – total, including developed in previous years	2010 developed ----- used – total, including developed in previous years	2015 developed ----- used – total, including developed in previous years	2016 developed ----- used – total, including developed in previous years	2017 developed ----- used – total, including developed in previous years	2017 to 2005 (times) ----- 2017 to 2005 (times)
Republic of	-	-	-	-	-	-

Adygeya	----- - -----	----- 120 -----	----- 187 -----	----- 230 -----	----- 277 -----	----- - -----
Republic of Kalmykia	----- 9 -----	----- 6 -----	----- 49 -----	----- 85 -----	----- 90 -----	----- 10 -----
Republic of Crimea			----- 75 -----	----- 102 -----	----- 86 -----	----- - -----
Krasnodar Territory	----- 2 ----- 1,098	----- 6 ----- 2,159	----- 35 ----- 4,460	----- 16 ----- 5,163	----- 25 ----- 6,184	----- 12.5 ----- 5.6
Astrakhan Region	----- 4 ----- 118	----- 11 ----- 551	----- 6 ----- 524	----- 4 ----- 587	----- 6 ----- 533	----- 1.5 ----- 4.5
Volgograd Region	----- 1 ----- 1,603	----- 1 ----- 2,243	----- - ----- 2,400	----- - ----- 2,511	----- 2 ----- 2,502	----- 2 ----- 1.6
Rostov Region	----- 14 ----- 1,890	----- 9 ----- 2,664	----- 22 ----- -3,047	----- 25 ----- 3,114	----- 15 ----- 3,368	----- 1.1 ----- 1.8
Southern Federal District, total	----- 21 ----- 4,718	----- 27 ----- 7,743	----- 63 ----- 10,742	----- 45 ----- 11,792	----- 48 ----- 13,040	----- 2.2 ----- 2.8

Source: Compiled by the authors according to the Federal State Statistics Service of the Russian Federation (*Regions of Russia*, 2018, pp. 900-944)

The data provided confirm that in 2016 and 2017, the number of developed production technologies in the Southern Federal District was 45 and 48, respectively, while in 2015 it had been 63. Relative to 2005, in 2017, the growth was 2.2 times. A significant increase in the developed production technologies in the Southern Federal District is accompanied by an increase in the number of used technologies of this kind, including those developed in the past years. Of course, it is necessary to be critical of the statistics given, showing an almost "explosive" growth in the technologies used, because the increase in their number over the analyzed period, according to statistics, was 2.8 times.

These indicators undoubtedly reflect the positive processes of the past years. In recent years, dozens of new and reconstructed industries have appeared in the Southern Federal District, the work of which is based on the advanced production technologies. Among them are companies operating in the manufacturing sector, as well as in trade and services, logistics, energy, housing and communal services, etc. It is very positive that such industries (especially construction) are successfully developing in the republics of the North Caucasus neighboring with the regions of the Southern Federal District, the Chechen Republic, and Ingushetia that in the 2000s were the "flaming" regions. In these countries, hostilities were ongoing, stopping which was a big problem. The country's leadership was able to very successfully solve this difficult task.

The scientific studies not claiming world leadership but devoted to the most pressing problems of the macroregion are important for the regions of the Southern Federal District. Science and the new knowledge it produces are the central core on which practically all aspects of the modern economy, which is called the knowledge economy, are "strung". At the same time, intangible

assets – organizational and intellectual resources (R&D, patents, competencies, etc.) are playing an increasingly important role.

In these conditions, for the Southern Federal District, it is necessary to harmoniously include research and development in the system of state administration of the socio-economic development of territories, fields, and sectors of the economy. This trend may result in the growth of innovative activity of organizations using advanced manufacturing technologies. Table 5 reflects such activity, defined as the share of organizations implementing technological, organizational, and marketing innovations in the total number of organizations surveyed.

**Table 5**

Innovative activity of organizations of the regions of the Southern Federal District in 2006 – 2017 (calculated as the proportion of organizations implementing technological, organizational, and marketing innovations, in the total number of organizations examined)

Regions	2006	2010	2015	2016	2017	2017 in % to 2005
Republic of Adygeya	11.5	10.0	7.9	4.2	6.3	54.8
Republic of Kalmykia	-	-	2.4	2.0	2.5	-
Krasnodar Territory	7.5	6.2	6.5	9.1	12.2	162.7
Republic of Crimea			5.1	2.8	3.8	-
Astrakhan Region	3.7	12.8	12.1	9.1	7.7	208.1
Volgograd Region	10.8	8.4	6.3	4.9	4.6	42.6
Rostov Region	10.7	7.3	9.9	8.4	8.2	76.6
Sevastopol			-	3.3	3.2	-
Southern Federal District, total	8.6	6.2	7.6	7.1	8.4	97.7

Source: Compiled by the authors according to the Federal State Statistics Service of the Russian Federation (*Regions of Russia*, 2018, pp. 900-944)

The results show a significant dispersion of the innovative activity of the organizations in the regions of the Southern Federal District. With the existing confidence of the authors of the article in the data of state statistics, these results to a certain extent reflect statistical errors. In 2005, in the Republic of Adygeya, Volgograd and Rostov Regions, the share of innovative organizations was estimated at ten or more percent, with a decrease in this indicator to 6 – 8 % in 2017, which indicates a clear correction of reporting in recent years towards truthful information. At the same time, the stable growth of this indicator in the Krasnodar Territory by more than 60 % in 2017 can be accepted as reliable. Such growth in the innovative activity of organizations in this region is fully justified due to a large number of facilities built for the Olympics in Sochi in 2014, using innovative and often unique technologies. Moreover, during the period analyzed, it was in the Krasnodar Territory that more than 100 companies included in the Expert-400 Rating of the Largest Companies in Russia were built and reconstructed on a new technological basis (Rating of the largest companies in Russia in terms of sales volumes, 2018). They include Magnit retail chain, Neftegazindustriya, Caspian Pipeline Consortium-R, Slaviansk-Eco, SBSV-Klyuchavto state company, Krasnodarzernoproduct-expo, etc.

Thus, the study allows for implementing a multifaceted discussion of the research and formulating the correct conclusions.

## 4. Discussion

The results of scientific research make it possible to ensure the dissemination and development of knowledge through the educational system, to stimulate an increase in the general intellectual



potential of the Russian regions, including such a specific, densely populated and large Southern Federal District. At the same time, according to V.N. Ovchinnikov and N.P. Ketova, the system-supplementing effect of the interaction of innovative potential and factors of the institutional environment of the region is very important (Ovchinnikov and Ketova, 2016, 537). The leading role of science requires relevant approaches to forecasting and knowledge management, in terms of the necessary resource support. The results obtained in this case are expressed in the number and significance of the developed and used advanced production technologies, the increase in the innovative activity of organizations, the growth in the number of research units performing scientific development. Their activities result in the introduction of new technologies into production processes, the growth of labor productivity, the formation and development of a full-fledged institutional and innovative infrastructure that has direct impact on the activation of innovative activities of regional economic entities, as well as the implementation of new strategies, the importance of which was emphasized by M. Porter (2002).

This ensures the implementation of the entire innovation chain – the reproduction of knowledge through basic research – conducting applied research and development – introducing scientific and technical results into production, the service sector, logistics, etc. – production of competitive innovative products, implementation of marketing technologies, and innovatively-oriented management strategies.

The study has shown that science affects not only the economy by implementing new ideas and developments, the necessary conditions, and factors of economic growth. U. Fratesi and L. Senn emphasize that it transforms all spheres of social progress, ensures the formation and increase of human capital (Fratesi and Senn, 2009).

In this regard, it is obvious that any containment of the process of obtaining new knowledge, a decrease in the effectiveness of the use thereof, a decrease in the innovative activity of organizations operating in the economy of the Russian regions are reflected in the economic dynamics indicators, the level and quality of life of the population, the activity of research structures acting as a stimulating factor in the development of innovative production in the Russian regions.

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## 5. Conclusion

1. To address the challenges formulated by the results of the research, in the Southern Federal District it seems necessary to implement a new model for organizing an innovation chain, which includes fundamental and applied research and development oriented to people and their needs; direct implementation of scientific and technical results; the organization of competitive, innovation-oriented companies capable of developing the production of marketable products and services. For its implementation, it seems necessary to popularize this model, increase the efficiency of the interaction among government bodies, professional communities, working groups in the field of the development of science and technology in the Southern Federal District.

2. In market innovation systems, science is a critical factor in economic development and not just an industry for the production of knowledge as a public good. At the same time, the market alone, without appropriate regulation, is not able to provide the necessary level of financing for science and the effective functioning thereof. This actualizes the role of the state both in providing direct financial support to science, and in stimulating a continuous transfer of knowledge and technology to the economy. In this regard, it is the state that is responsible for the functioning of the relevant institutions and mechanisms that support the development of science and at the same time create conditions for increasing its economic return.

3. The organization of a new model of stimulating innovation activity should be oriented towards a network of spaces for collective work among universities, research organizations, business and government, whose activities are aimed at improving the quality of human capital in the Southern Federal District through fundamental changes in the approaches to own educational and scientific activities, and the introduction of communication formats and models that stimulate the development of innovative production.

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1. South Russian Humanitarian Institute, Russia. E-mail: [victoria-zunde@mail.ru](mailto:victoria-zunde@mail.ru)
  2. Southern Federal University, Russia
  3. Southern Federal University, Russia
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