Assessing Level of Interaction between Subjects of Innovative Systems within Russian Regions

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Abstract:

The article is devoted to the problem of improving the efficiency of the interaction between the subjects of regional innovative systems of Russia. It also deals with forming of the methodological basis of its assessment for working out effective measures of socio-economic policy aimed at innovation fostering.

The objects of this research are regions of the Russian Federation (RF subjects) and their innovative subsystems as an area of the interaction between different participants (business, authorities, scientific-educational and research organizations and institutes, non-commercial organizations etc.) whose efficiency influences the development level of innovative activities in regions.

The article studies main indicators characterizing the interaction between subjects of regional innovative system within the frame of joint projects and technological exchange in the organization implementing technological innovations. It analyses the indicators of organization's innovative activity and exports of innovative goods, works, services, and the level innovation of the regional economies in Russia. The given indicators have become a basis for calculating a cumulative index reflecting the level of the interaction between subjects of regional innovative systems and also two-factor classification of Russian regions, the calculation procedure is also presented in the article.

The authors have made the conclusion that the development level of the interaction between subjects of innovative systems within Russian regions is not high enough and it is necessary to make the authorities pay more attention to the development of modern public-and-private and cluster forms of cooperation.

Keywords: Region (RF subject), regional innovative systems, development level of interaction between subjects of innovative system.
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1. Introduction

The efficiency of functioning regional innovative system depends mainly on the level of the interaction between its subjects that is realized through information exchange and other economic resources while carrying out innovative joint project. In Russian regions the level of such interaction is not developed enough due to the lack of the strong links and developed forms of public-and-private and intra-cluster partnership. It requires carrying out additional research aimed at assessing the level of such interaction and working out an effective regional policy in terms of its development.

It is necessary to assess the level of the interaction between subjects of innovative systems in order to solve the following tasks:
− To define an actual level of the interaction between subjects of regional innovative system in the form of a definite quantitative result, that will allow to compare different regions, identify the regions with high, medium and low level of the interaction;
− To analyse the trend of a regional innovative system over the definite period, i.e. the opportunities of comparing different indicators of the level of the interaction between subjects within the single region in different time periods;
− To design the classification of Russian regions for scientific and educational , and practical purposes of the research and to improve the interaction between subjects of regional innovative systems;

To monitor the efficiency of different measures of regional policy (both intra- and interregional level) carried out in order to foster the development of the interaction between the subjects of innovative systems within Russian regions (Rodionova, 2016a).

The article offers a methodology being approved on the materials of Russian regions. This methodology, 2015 year statistics data refined, based on the cumulative approach allows to receive information about a definite level of such interaction and built on the integral approach. The cumulative index is its basis and it combines main and most significant indicators reflecting different sides of the interaction between subjects of regional innovative system (Rodionova, 2016a).

The two-factor classification of Russian regions has been also designed according to the level of the interaction between subjects of their innovative systems as well as innovative development of economy (Rodionova, 2016b).

2. Theoretical, Informational and Empirical, and Methodological Grounds of the Research

Theoretical foundations of the research are based on the main theories of regional and spatial economy, systems analysis, in particular, underlining the necessity for

main elements of regional innovative systems to interact trough information exchange and resources. This analysis has been applied to examine the problem of insufficient level of interaction in Russian regions. The main methods of the research are methods of index computation and cumulative indicators, linear scaling approach, statistic method, data aggregation method of two-factor classification of the Russian Federation (Akopova *et al.,* 2017; Vovchenko *et al.,* 2017; Mikhailova *et al.,* 2017; Kolchanova and Kolchanova, 2016).

Information grounds of the research are official data of RF Federal State Statistics Service in the area of innovations from a regional perspective and also the authors' calculations made in the process of this research.

3. Results

The analysis of main approaches to computing cumulative indicators while assessing complex economic objects including social-and-economic systems of regional level and their innovative subsystems has revealed the usage of different methods in computing cumulative indicators. One of the options is to form a cumulative indicator on the base of a more extended system of indicators where a few primary indicators are selected. Such method allows taking into account different sides of a complicated phenomenon or a process within the system of regional economy (Rodionova, 2016a; 2016b).

Thus, such method is used in the methodology of comprehensive assessment of the level of social and economic development of the RF subjects developed by the Ministry of Economic development and trade in 2001. The computation of cumulative index is based on a number of indicators reflecting the features of a region: purchasing power index, regional index of capital cost appreciation etc., (RF Government Regulation from 11.10.2001 № 717).

The great drawback of such method is "an extensively-set purpose which suggests identifying the sources of regional reserves in the current and long-term perspective but it does not take into account the specific nature of a region" (Chuvilova, 2008).
To sum up, an excessive amount of indicators cumulated in a total index may show a mixed result. It allows to make the conclusion about the necessity to allocate, if possible, a little number of indicators (not more than 3-4 indicators) used in total end cumulative index.

The second method is to identify firstly a laconic range of indictors of final cumulative indicator, each of which describes different sides of assessed process or phenomenon more detailed (Rodionova, 2016b). Human Development Index and methodology of its computation may serve as an example of such cumulative indicator, it includes "only three equal ranking components: income defined by Gross Domestic Product Index (GDPI) according to purchasing power parity (PPP) in US dollars, education defined by the literacy rate and a share of learners among

children and youth; longevity defined by the length of the coming life beginning with the birth. The total index is calculated as an average sum of indicators of three components" (Report on the development of human potential in the Russian Federation in 2011).

In a similar way for finding Human Development Index Rodionova (2016b) suggests in her research the methodology of computing Development Index of Interaction between Subjects of Regional Innovative Systems ($DIIS_{RIS}$). As main components of $DIIS_{RIS}$ were considered the following individual constituents which may be assessed on the base of official statistic data provided by Federal State Statistic Service (Indicators of innovative activity: 2016; Regions of Russia: socio-economic indicators: 2016; Gross Regional Product on RF subjects in 1998-2015):
- index of organisation's innovative activities – IOIA (it can be calculated on the base of the indicator of organisation's innovative activities);
- index of technology exchange in organisations – ITEO (it can be calculated on the base of the indictor of "technology exchange in the organization realized technological innovation");
- index of organisation's participation in joint projects – IOPJP (it can be calculated with the help of the indicator of "organisation's participation in joint projects on research and development among total amount of enterprise");
- index of exports of innovative goods, works and services – IEIGWS (it is calculated on the base of the indicator of "an export share of innovative products, works and services in GRP") (Rodionova, 2016b).

The stated indexes (on each constituent) are computed on the formula using linear scaling approach:

$$INDEX = \frac{Xifactual – Xmin}{Xmax – Xmin},$$

where Xifactual – an actual value of the corresponding indicator (component) for i-region (RF subject); Xmin – minimal value of the corresponding indicator among all RF subjects; Xmax – maximum value of the corresponding indicator among RF subjects.

Minimal and maximum values for each of them are set and they match with minimal and maximum factual values of the corresponding indicator among all the values of Russian regions. The total cumulative indicator of $DIIS_{RIS}$ is a dimensionless index, and its value may fluctuate from 0 till1. The higher the value is, the higher and more efficient the interaction between subjects of regional innovative system of the corresponding region is.

Using the mentioned approach we have calculated the values of $DIIS_{RIS}$ for all RF regions for 2012-2014 and identified its average values for three years (Table 1) (Rodionova, 2016b). In this article the data is updated taking into account the latest

reliable data of the official statistics constituent entities of Russian Federation for year 2015. Thus the analyzed period was enlarged up to 4 years (2012-2015).

The calculations were carried out without taking into account the data on the autonomous districts comprising the other subjects of the Russian Federation, as well as the data on the city of Sevastopol and the Republic of Crimea due to the lack of comparable ones. Statistical data of the Federal State Statistics Service were used as a statistical base. Calculations are made using MS Excel software.

All regions were arranged into five groups:
- regions with a high level of interaction between the subjects of the regional innovation system - $DIIS_{RIS}$ from 0.8 to 1.0;
- regions with a level of interaction of the subjects of the regional innovation system above the average - the value of $DIIS_{RIS}$ from 0.6 to 0.799;
- regions with an average level of interaction of subjects of the regional innovation system - the value of $DIIS_{RIS}$ from 0.4 to 0.599;
- regions with the level of interaction of subjects of the regional innovation system below the average - the value of $DIIS_{RIS}$ from 0.2 to 0.399;
- regions with a low level of interaction between subjects of the regional innovation system - the value of $DIIS_{RIS}$ from 0 to 0.199 (Rodionova, 2016b).

The results of the calculations show that the whole situation in the distribution of Russian regions according to the level of interaction between the subjects of regional innovation systems considering updated data has hardly changed and it is the following (Table 1).

Table 1. *Classification of Russian regions by the level of interaction between the RIS subjects and share of innovative goods, works, and services in GRP, 2012-2015*

Groups of regions	Threshold indicators	The number of regions	The regions included in the group
1. Regions with a relatively high level of interaction and the share of innovative goods, works, services	$DIIS_{RIS} > 0,360$ The share of volume of innovative goods, works, and services in GRP > 10 %	6	Nizhny Novgorod, Sakhalin, Tula regions; Perm region; Republic of Mordovia, Republic of Tatarstan
2. Regions with a relatively high level of interaction and a low share of innovative goods, works, services	$DIIS_{RIS} > 0,360$ The share of volume of innovative goods, works, and services in GRP < 10 %	16	Moscow, Saint-Petersburg, Republic Of Karelia, Chuvash Republic; Krasnoyarsk region, Primorsky, Khabarovsk territories; Irkutsk, Kaluga, Magadan, Penza, Ryazan, Sverdlovsk, Tomsk, Yaroslavl regions; Chukotka Autonomous Area
3. Regions with a relatively low level of interaction and a high share of innovative goods, works, services	$DIIS_{RIS} < 0,360$ The share of volume of innovative goods, works, and services in GRP > 10 %	3	Vologda, Lipetsk and Samara regions

4. Regions with relatively low levels of interaction and low share of innovative goods, works, services	$DIIS_{RIS} < 0,360$ The share of volume of innovative goods, works, and services in GRP < 10 %	55	Republic of Kabardino-Balkaria, Republic of Karachaevo-Cherkessia, Udmurt Republic, Chechen Republic; Republic of Adygeya, Altay Republic, Republic of Bashkortostan, Buryat Republic, Republic of Daghestan, Republic of Ingushetia, Republic of Kalmykia, Komi Republic, Republic of Mari El, Republic of Sakha (Yakutia), Republic of North Ossetia – Alania, Republic of Tuva, Republic of Khakassia; Amur, Arkhangelsk, Astrakhan, Belgorod, Bryansk, Vladimir, Volgograd, Voronezh, Ivanovo, Kaliningrad, Kemerovo, Kirov, Kostroma, Kurgan, Kursk, Leningrad, Moscow, Murmansk, Novgorod, Novosibirsk, Omsk, Orenburg, Orel, Pskov, Rostov, Saratov, Smolensk, Tambov, Tver, Tyumen, Ulyanovsk, Chelyabinsk regions;Altai, Trans-Baikal, Kamchatka, Krasnodar, Stavropol territories, Jewish Autonomous Region

Source: *Calculation is based on the official data of the Federal Service of state statistics*

Such secretion of region groups on the basis of equal intervals of meanings of the index of the Interaction between Subjects of Regional Innovative System is conditioned by comparatively equal distribution of regions according to its meaning. We see that the difference of meanings of two regions situated nearby makes thousandth parts on average. This permits us to distinguish equal intervals of their meanings to determine the region groups (Rodionova, 2016b).

For a more profound analysis of the level of the Interaction between Subjects of Regional Innovative System on the grade of economy innovation in Russian regions their two-factor classification is formed. As factors we consider the level of Interaction between Subjects of Regional Innovative System and a part of the volume of innovative goods, works and services in the Gross regional product (GRP). At present time the data are easily obtained through the information officially given by the statistics (Rodionova, 2016b).

For the purposes of our typology, the regions have been divided into two groups: those with a share of volume of innovative goods, works, and services in GRP above and below 10%, i.e. with relatively high and low shares of innovative products accordingly.

Also for the purpose of two-factor classification the previous gradation of regions by the level of interaction between subjects of regional innovation systems it is advisable to implement by a simple division of regions: regions with a relatively high level of interaction (the indicator value is higher than 0.36) and with a relatively low level of interaction (the indicator value is from 0 to 0,359)

(Rodionova, 2016b). The results of the classification considering the data of the year 2015 have changed slightly and allow differentiating the following groups of regions (Table 2).

Table 2. *Classification of Russian regions by the level of interaction between the RIS subjects and share of innovative goods, works, and services in GRP, 2012-2015*

Groups of regions	Threshold indicators	The number of regions	The regions included in the group
1. Regions with a relatively high level of interaction and the share of innovative goods, works, services	$DIIS_{RIS} > 0,360$ The share of volume of innovative goods, works, and services in GRP > 10 %	6	Nizhny Novgorod, Sakhalin, Tula regions; Perm region; Republic of Mordovia, Republic of Tatarstan
2.Regions with a relatively high level of interaction and a low share of innovative goods, works, services	$DIIS_{RIS} > 0,360$ The share of volume of innovative goods, works, and services in GRP < 10 %	16	Moscow, Saint-Petersburg, Republic Of Karelia, Chuvash Republic; Krasnoyarsk region, Primorsky, Khabarovsk territories; Irkutsk, Kaluga, Magadan, Penza, Ryazan, Sverdlovsk, Tomsk, Yaroslavl regions; Chukotka Autonomous Area
3. Regions with a relatively low level of interaction and a high share of innovative goods, works, services	$DIIS_{RIS} < 0,360$ The share of volume of innovative goods, works, and services in GRP > 10 %	3	Vologda, Lipetsk and Samara regions
4. Regions with relatively low levels of interaction and low share of innovative goods, works, services	$DIIS_{RIS} < 0,360$ The share of volume of innovative goods, works, and services in GRP < 10 %	55	Kabardino-Balkar, Karachay-Cherkess, Udmurt, Chechen Republic; Republic of Adygeya, Republic of Altai, Republic of Bashkortostan, Republic of Buryatia, Republic of Daghestan, Republic of Ingushetia, Republic of Kalmykia, Komi Republic, Republic of Mari El, Republic of Sakha (Yakutia), Republic of North Ossetia – Alania, Republic of Tuva, Republic of Khakassia; Amur, Arkhangelsk, Astrakhan, Belgorod, Bryansk, Vladimir, Volgograd, Voronezh, Ivanovo, Kaliningrad, Kemerovo, Kirov, Kostroma, Kurgan, Kursk, Leningrad, Moscow, Murmansk, Novgorod, Novosibirsk, Omsk, Orenburg, Orel, Pskov, Rostov, Saratov, Smolensk, Tambov, Tver, Tyumen, Ulyanovsk, Chelyabinsk regions;Altai, Trans-Baikal, Kamchatka, Krasnodar, Stavropol territories, Jewish Autonomous Region

Source: *it was calculated using official data of Federal state statistics service.*

4. Conclusions and recommendations

The results analysis of the Russian Federation region's DIIS$_{RIS}$ calculations for 2012-2015 years (Table 1) shows that the whole situation of development of the interaction level considering the data for 2015 year has not changed.

According to the results analyses there are no regions with a high level of interaction (DIIS$_{RIS}$ >0.8) I Russia now. As it can be seen from the data presented in table 1, the group of regions with the level of interaction above average, with DIIS$_{RIS}$ values are from 0,6 to 0,799, is small. It includes only two regions - Moscow and the Republic of Tatarstan, which in general are leading innovative developed regions of Russia.

There is also a small number of region –only 8, comprising the group of regions with a medium level of interaction (value DIIS$_{RIS}$ is from 0,4 to 0,599). Although this group is slightly more numerous, however, it should be noted that in these regions the level of interaction between subjects of their regional innovation systems is not a high, but only an average one (Rodionova, 2016b).

Prevailing part of the subjects of the Russian Federation, which contains 57 regions, is characterized as a territory where the level of participants` interaction in innovative processes is below average (DIIS$_{RIS}$ value is from 0,2 to 0,399). For a significant part of these regions it is an extremely low level of export of innovative goods, works, services, and it is a zero level in the others.

Also there is a group of regions with low level of interaction (DIIS$_{RIS}$ value is from 0 to 0,199), which includes 13 subjects of the Russian Federation. At the same time there are only few regions with zero value of all the three elements of the whole DIIS. They are singled out not by one, but by three components of the general development index of interaction between the subjects of the regional innovation system. These are regions where there is not any innovative activity, cooperation, exchange, and at the same time they have an extremely low or depressive nature of economic development. These regions includes: Karachai-Cherkess Republic, Chechen Republic, Republics of Ingushetia and Kalmykia, Tyva. In general, it allows making a conclusion about insufficiently developed cooperation of the subjects of regional innovation systems in Russian regions and the necessity to develop measures for its improvement, in particular through the implementation of projects for the exploration and development of the spatial factors of their networking (Rodionova, 2016b).

Implemented typology of Russian regions according to the level of development of interaction of subjects of innovation systems and the share of innovative goods, works and services in GRP (Table 2) also shows that the low level of interaction leads to insufficient innovation in the regional economies. It is obvious that inefficient interaction of subjects of regional innovation systems is currently one of the main limiting factors for the development of innovations in the Russian regions, because it impedes to efficient exchange of resources and distribution of responsibility between market's participants.

The following groups of regions have been singled out in the result of classification. The first group of regions is the regions with a relatively high level of interaction and the share of innovative goods, works and services where a high interaction potential is effectively realized in the production of innovative goods, works and services. All these factors have a significant proportion of their gross regional product. The favorable conditions for interaction of subjects of innovation systems are made in these regions. And an effective innovation policy is being implemented, enabling them to realize their innovative potential into real products. There are only 6 such regions, that confirms a low potential of subjects' interaction of regional innovative systems in Russia (Rodionova, 2016b).

The second group is the regions with a relatively high interaction level and a low share of innovative goods, works and services. This group is presented by the regions, in which the high interaction potential has not been accomplished fully yet, it is likely connected with the impact of another factors. For instance, it is due to an insufficiently effective investment-innovative and structural policy, the limitations of human resources etc. However, some definite interaction traditions have been already formed in these regions. This group includes 16 regions, while a number of them have not slightly reached the first group (for example, Saint-Petersburg, the Chuvash Republic). These regions are the perspective territories from the point of view of the possibilities of the relatively rapid results of innovative growth with an individual approach to their structural issues and stepping up a policy in the sphere of extra investment funds attraction to the innovative sectors (Rodionova, 2016b).

The 3rd group is the regions with a relatively low interaction level, but with a high share of innovative goods, works and services in GRP. This group is a very limited one and includes only 3 regions (Vologda, Lipetsk and Samara regions). Generally it allows making the conclusion about a high value of a variety interaction forms in the final result of functioning of regional innovative systems, i.e. in the production of an innovative product in the region that is confirmed by the calculations. Also some relativity should be indicated while making boundaries between high and low shares of innovative goods, works, and services in GRP, shown at 10 %.

Considering the 4th group of the regions, which is the most numerous ones, there both analyzed indicators are defined as relatively low, it is seen that it comprises 55 regions, i.e. most of them. This group includes the Rostov region. The innovation policy in these regions should consider not only the available resource potential, but also include interaction development tools of the currently scattered innovation processes participants (Rodionova, 2016b).

The analyses show that the efficiency of the interaction of the subjects of the Rostov region innovative system is affected by the same factors as in other Russian regions. However the most significant among them is the lack of qualified staff, first of all technicians. It's impossible to work put and implement technological innovations without technical specialists. It is the result of insufficient interaction between

educational system and private business sector that leads to disproportion of supply and demand of work force on regional labour market. The second important factor is a high price and longevity of the most innovative projects that limits their implementation under conditions of long-money and clearly defined "rules of the game" for a long period of time. It is also a result of insufficient cooperation of business entities and bank system, uneven bank service in the region. Highly possible the result of it is insufficient cooperation links between subjects of the region innovation system.

Thus it is necessary to ensure the transition to the net organization of the regional innovation system. Innovation net of the region represents a variant of the regional innovation system whose members interact according to the "net" principle. A net structure of the regional innovation system represents a system of governmental and non-governmental institutions working out and implementing of innovation strategy og the region development, interacting on the basis of resource interdependence in order to achieve mutual agreement on dealing with issues of innovation development using formal and non- formal norms (Rodionova, 2016b).

A net structure of the regional innovation system is characterized as follows:
- net approach exploits active and reasonable cooperation of the actors, making the decision and participating in its realization;
- innovation nets are organized in different spheres of socio-economic systems (health care, agriculture, industry, education and etc.) and represent a complex of interactions between institutions of the government and society;
- participants of the net pursue not separate but mutual interests for that cooperative means of activity are chosen;
innovation nets include inter-agent cooperation stakes, supervising structures of program management, complex number of agreements and different forms of governmental-private partnership (Rodionova, 2016b).

The transition to the "net" approach to the management of the region innovation system will help to make for the Rostov region some advantages:
1. Innovation net represents such a structure of the region innovation structure management that connects government with civil society and includes a number of entities of governmental, private, public organizations and institutions with definite common interest (Rodionova, 2016b). It is essential for overcoming the present states of economy where the participants of the above sectors operate at a large extend separately from each other. It will also facilitate the growth of the innovation subsystem as well as the economy on the whole. At present even the information exchange between sectors is ineffective and the process of exchange of other resources is highly limited. Taking into account that the implementation of innovation projects usually involves several participants often from different sectors, it would be unreasonable to expect any perceivable changes unless this practice is accepted.

2.   Innovation net is basically organized for working out agreements during the exchange of the actors' resources, i.e. there is a mutual interest between participants (Rodionova, 2016b).   It should be mentioned that such an interest will not appear all by itself until corresponding institutional conditions are formed. In this regard as an example the practice of giving out the scientific grants in the USA can be mentioned, when the scientific grant is given only under condition that the definite company having ordered the corresponding research implements it. In such a system every part benefits – a found is guaranteed that the research is of practical value and will be implemented; a university is guaranteed financing and science development; a company is guaranteed to share expenses on elaboration and research with external sources. In this situation it is obvious they reasonably make agreements and exchange resources; a company can form demand on scientific research and elaboration. Unlike this in Russia practical value of the scientific research is required to be mentioned though it is not made by a definite customer. As a result the cooperation of companies and universities or other scientific-research organizations in the frame of some scientific-research projects is very low. As for Russian companies the demand on new technologies is high but they prefer to refer to foreign companies for them that are not efficient as foreign technologies can not be easily adapted to Russian conditions.

3.   "There is a cooperative interest, unlike the market, where each participant pursues, first of all, his own interests." (Rodionova, 2016b). To understand what the cooperative interest is, it is necessary for the economy to have the appropriate conditions for its formation. This requires changing the way of thinking of all participants in the innovative market and the economy as a whole, including raising the level of management of Russian companies and government agencies. In particular, it should be understood that competitive advantages should be achieved not at the expense of "crowding out" their competitors from the relevant markets, but by constantly improving their companies (increasing labor productivity, resources, including energy efficiency, etc.) and finding their own Unique niche. This allows companies and non-profit organizations to pool their resources to overcome obstacles that they can not accomplish alone (for example, the limited infrastructure that is typical for many Russian regions, and the Rostov region, including). On such principles, in particular, intra-cluster relations are built, which should be widely disseminated and regional innovative system with a network approach to its management. At the same time, the proposed approach will help to increase the competitiveness of all participants in the region's innovative network at the interregional and international levels by reducing their costs in eliminating common obstacles to the development of their innovative activities that arise in local and regional formats.

4.   "From the point of view of taking specific managerial decisions, all participants in the innovative network are equal; there are not vertical but horizontal relations" (Rodionova, 2016b). This also involves changing the role of public authorities and moving them from the top of the hierarchy to the same area as the rest of the participants, which is reflected in the development of "horizontal" links. All participants of the innovative network are interested in achieving a common goal

- the development of an innovative system, the transition of the region's economy to innovative development trajectories. In this case, each of the participants achieves their own goals in more effective ways through interaction with other actors than if he acted independently.

5.   An innovative network is a contractual structure made up of a set of contracts originating on the basis of consistent formal and informal rules of communication. Innovative networks give rise to a specific consensus culture. (Rodionova, 2016b). Generally it means that the number of joint innovative projects realized in the region will grow. The situation when companies carry out scientific research individually should not prevail, as it is evident from the efficiency perspective that division of labour and specialization on innovative research and implementation will be more preferable.

Thus, the main objective of the Rostov region innovative system development is securing favorable environment for the network communication in the region. Current conditions demand the region to mark out a certain key agent (not necessarily a governmental body) that can promote an initiative in development of integration processes as well as their coordination. Regional authorities can serve as central facilitators of the innovative sphere with the use of all economic resources available in the region (funds, entrepreneurial, natural, labour resources) for their involvement in the regional innovative process and establishment of direct and inverse connections among the system's participants, including cooperation with the federal level offices, especially when legislative changes and federal tools of innovators' support are needed. Private sector is one of the major investment resources for innovative projects. To a large extent its motivation must be supported with a prospect of possible lower expenses as a result of cooperation, as well as additional guarantees provided by direct financial control by the government bodies (Rodionova, 2016b). A regulatory legal framework must also be formed to simplify interaction of small, medium and large business in the innovative sphere. E.g. different legal forms and their taxation systems can sometimes become an obstacle for cooperation of small and large companies making it unprofitable.

Hereby particular importance is attributed to clusterization mechanism as well as development of state-private and municipal-private partnerships that enable exchange of resources among the interested participants for collaboration towards shared goals. The most progressive forms of interaction between subjects of regional innovation systems are clusters and public-private and municipal-private partnerships. However, the development of these forms of interaction in the regions is impossible without the improvement of the vertical interaction system: the federation, the region, the municipalities and the subjects of the local economy. The development of vertical interaction is necessary in order to improve the legislation in the field of clusterization and implementation of public-private projects, to attract additional sources of funding and to arrange for "feedback" from the subjects of local economies vertically upwards.With regard to the Rostov Region, the development of the innovation system should contribute to changing the structure of

the region's economy towards increasing the share of innovative products. Solution of economic restructuring problems is impossible without a developed innovative sector as it should aim at:

- stimulation of investment projects aiming at extension and/or introduction of new capacity in knowledge-intensive, non-energy industries of the region with a large export potential;
- introduction of new capacities with prioritized investment projects on import substitution and substitution of products supplied from other regions of Russia, as well as manufacturing of high-technology products;
- modernization, technological re-equipment and energy efficiency improvement of operating industrial enterprises, including priority of the best technologies available;
- increasing share of innovative products of manufacturing enterprises in total industrial output of the region;
- development of engineering and production infrastructure to ensure cost reduction for industrial enterprises, increased production and growth of the region's investment attractiveness;
- solution of the problems of the areas with accumulated environmental damage (former mining territories) aiming at their secondary involvement in production process.

The main directions of development of such vertical cooperation for the Rostov Region should be as follows:

- involvement and active participation of the region in the implementation of the National Technology Initiative project. At present, it is possible to initiate the creation of new road maps (in addition to those already identified at the federal level). For the Rostov Region, an objective perspective is the creation of road maps in the field of unmanned environmentally friendly river transport, in the system of personal production and delivery of food and water, personal medicine, etc. In this regard, it should be possible to co-finance the region in the preparation of applications for the identification of new markets in the framework of the national technology initiative, as well as financial support for investment and research projects implemented by enterprises of the Rostov Region within the framework of the approved road maps (Shekhovtsov *et al.,* 2017).
- continued active work on the development of cluster projects and initiatives. Despite the fact that the basis for the development of the cluster approach has already formed in the region, it is necessary to strengthen the organizational and consulting support for cluster members in the long term, to create a more effective system of measures to include educational organizations and authorities in existing clusters, and to provide infrastructure support for cluster investment projects, including in the field of innovation, including the solution of problems of the cost of infrastructure services, connection to networks, improvement of tariff policy, including energy (Shekhovtsov *et al.,* 2017).

- active work on the development of public-private partnership and its various forms, in cooperation with Vnesheconombank and federal authorities; at present, despite the serious need of economic agents in this form of interaction, its development is limited by imperfect legislation and weak training of personnel in the field. This leads to the fact that many initiative projects and ideas do not reach the stage of their actual implementation, and require more precise decisions to ensure the safety of investors, state guarantees, allocation of responsibilities and resources between economic partners.

References

Akopova, S.E., Przhedetskaya, V.N., Taranov, V.P., Roshchina, N.L. 2017. Marketing Mechanisms for the Development of Transport Infrastructure of Russia and the EU. European Research Studies Journal, 20(1), 188-197.

Auzan, A.A. and Bobylev, N.S. 2011. Report on Human Development in the Russian Federation for 2011 Under the editorship of. M: UNDP in the Russian Federation; "Design project "Samolet" LLC.

Chuvilova, O.N. 2008. System of indicators for assessing the geo-economic potential of the region // Economic Analysis: Theory and Practice, 4, 32-39.

Decree of the Government of the Russian Federation No. 717 "On the Federal Target Program "Reducing Differences in the Socio-Economic Development of the Regions of the Russian Federation (2002-2010 and until 2015)", Appendix 7 URL: http://www.zakonprost.ru/content/base/part/340911.

Indicators of innovation. 2016. Statistics digest.

Rodionova, N.D. 2015. The economic space of the region in the network interaction of the subjects of regional innovation system // Bulletin of the Rostov State Economic University (RSEU), 1(49).

Rodionova, N.D. 2016a. Evaluation of the level of interaction between the subjects of the regional innovation system based on the integral approach. Issues of Economics and Law, 4, 74-77.

Rodionova, N.D. 2016b. The development of spatial and network interaction between elements of regional innovative systems Ph.D. Thesis. – Rostov-on-Don, URL: http://old.rseue.ru/avtoref/RodionovaND/disser.pdf

Regions of Russia. Socio-economic indicators. 2016. Statistics digest "Federal Service of State Statistics", http://www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/ru/statistics/publications/catalog/doc_1138623506156.

Shekhovtsov, V.R., Ponomareva, A.M., Yaroshenko, G.S., Khaibullin, R.L. 2017. Instruments of Investment Attraction in Order to Fulfill the Structural Priorities of Sustainable Regional Development (Study Based on the Rostov Region). European Research Studies Journal, 20(1), Special Issue "Russia and EU: Development and Horizons", 337-349.

The Gross Regional Product for the subjects of the Russian Federation in 1998-2015. http://www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/ru/statistics/accounts/#.

Vovchenko, G.N., Holina, G.M., Orobinskiy, S.A., Sichev, A.R. 2017. Ensuring Financial Stability of Companies on the Basis of International Experience in Construction of Risks Maps, International Control and Audit. European Research Studies Journal, 20(1), Special Issue "Russia and EU: Development and Horizons", 350-368.