Evaluation of innovation potential in Russian clusters

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Abstract. A system for evaluation the level of development of cluster innovation potential in Russia is presented in this article. The formation of a complex system of interacting elements of an innovation environment providing innovation development of a socio-economic system in the interests of the society and the individual is seen as an innovation environment cluster. The main prerequisites for emergence of an innovation environment is availability of social connections and networks for exchange of ideas and information. The article identifies the need for creating a cluster advisory body with the function of coordinating activities of the innovation cluster. To ensure the effective functioning of an innovation cluster an information infrastructure is necessary. Management formation and development of innovation potential through application of tools designed for cluster development the cluster management company’ work creates a particular mode of doing business, favorable institutional conditions and aims to achieve synergies. To evaluate the level of formation of a cluster innovation potential basic indicators are needed.

A growing interest to the phenomenon of clustering has occurred since the 90s of the last century almost in all developed and in some developing countries. The well-known cluster conception by Porter (1990, 1998) was developed further and adapted to the conditions of different countries by Freeman (1995), Rabelloitt (1999), Giuliani (2002), Malmberg (2002, 2003). The cluster approach is used at different levels of economic system development and is included to innovation policies, socio-economic strategies both at the national and territorial levels. The first country to experience cluster approach was the USA (Silicon Valley), then it was introduced in Europe (Italian industrial districts). A successful realization of cluster policy encouraged the governments of developing countries to apply it to their economic policies and strategies. China (Xingqi, Hongle 2008), Mexico (Lyra, Garcia-Sánchez, Olarte, Rangel, Quintana, 2015), India (Okada, Siddharthan 2007), Brasil (Rodrigues, La Rovere and Carvalho, 2007), Chile (Guiliani, Bell 2005) joined the clustering process to achieve international competitiveness.

The Russian Federation joined this process in 2012. Clustering is included in the Program of Social and Economic Development of the Country by 2020, the Strategy of Social Economic and Innovation development by 2020. In 2012, the Russian government determined the criteria to provide financing cluster innovation development. Through a careful selection procedure, the government commission recommended 25 pilot innovation clusters for funding.

This paper presents the results of the Russian clustering experience, clarifies the problems and weaknesses of innovation clusters development.
The attempts made by (Porter, 1990; Saxenian, 1991) to design the unique environment for the clustering success in Silicon Valley and to find special instruments to create a special environment for clustering by Brusco (1982), Beccattini, 1991, Strinle, Schiele, 2002 did not give expected results.

Specific knowledge in particular fields and technological dynamism in industrial clusters are important factors of cluster development (Albu, 1999; Gant, 1996; Ramus, 2002). In modern economies, knowledge has become a key resource (Muži, 2016). Academic and business organizations understand the importance of knowledge as a factor of competitive advantages (Grant, 2015). It can be noted, that an innovation cluster is the most advantageous structure for creation, storage, application and transfer of knowledge (Roper, Love, Bonner, 2017; Kesidou and Snijders, 2012). The structure of an innovation cluster integrates business organizations, academic institutions and innovation infrastructure, and stimulates economic growth by increasing the rate of innovation (Feldman, 2003).

A creative environment and successful collaboration between academia and industry allow distributing knowledge across a number of cluster participants, achieving joint competitiveness (Pohjola, Puusa, Iskanius, 2016). For some scholars, high performing clusters are networks based on specialization and rapid flows of information (Aharonson, 2008; Robinson, 2007; Stuart and Sorenson, 2003). A successful cluster environment impacts knowledge transfers due to the network strength and openness (Eisinghright, Bell, Tracey, 2010). Eisinghright, Bell, Tracey noted that a successful clusters performance is increased due to environmental circumstances of a network and the fact that the environmental uncertainty is decreased.

We examined the approaches to cluster formation and discovered a gap in the literature concerning start-up conditions for clusters formation. The above mentioned scholars researched the clustering process in developed and developing countries and in the ir regions, but they didn’t focus enough on the fact that innovation environment is different due to economic, technological, geographic, political and legal conditions. The question remains how to direct cluster initiatives and why or when the government measures are successful.

The start-up conditions of environment for cluster formation and their further development differ for innovation cluster firms, which work in the same sphere (such as IT, biotechnology, automobile, tourism). The start-up conditions of innovation environment in different countries cause the success or failure of clusters formation. The research question is how to explain the influence of the innovation potential to cluster formation and what indicators should be considered to evaluate the level of development of an innovation potential. The aim of the paper is to develop an integrated and systematic assessment procedure for monitoring the innovation environment in Russian clusters.

At first, we considered to collect the data, which illustrated the innovation development of economic systems. We selected “The Networked Readiness Index”, to which the most scientists referred. “The Networked Readiness Index” is calculated for purpose to determine whether it possible to develop clusters at a particular territory. The World Economic Forum publishes this Index annually (Figure 1). The index includes quality criteria of political and legal environment, business and innovation climate. In 2015 this index for Russia is 4.16 according to Global Information Technology Report (2015) and the position is 46 out of 144 countries (in 2012 it was 56 position out of 144 countries, in 2011 - 77th out of 138, and in 2010 - 80th place of 133).

It is obvious that the domestic statistical analysis methodology in Russia is not entirely appropriate for evaluation of innovation processes and as a result it is not suitable for making informed management decisions [1]. This is largely due to the vagueness of the conceptual nomenclature that forces researchers to use common criteria of the product for different subjects and stages of innovation activity.

The body of scientific knowledge and innovations at various stages of scientific production cycle forms the basis of the innovation potential of an innovation system. Beljakova G.J. and Krasnov G.I. took into account such potential opportunities:

- unused reserves of techniques, technologies, human resources and organizations of production structure;
• unused inventories of new technical and technological means, collective creativity potential [1].

The methodological approaches to the innovation potential evaluation are given below [2]. The main purpose of developing a comprehensive and systematic evaluation of innovation potential is to create a set of specific practical recommendations to stimulate cluster innovation activity. Being aware of the fact that the data provided by the Russian official statistics. The evaluation of the innovation potential in clusters is to be based on the following groups of parameters.

1) Material:
• total expenditure on the creation, acquisition and dissemination of innovations;
• total expenditure on technological innovation;
• expenditure on specific technological innovation.

2) State support:
• government funding of R & D and R & D (% of GRP);
• granting tariff preferences and financial support for innovation enterprises;
• the number of patents granted;
• share of regional budget for innovation.

3) Infrastructure:
• innovation sphere;
• indicators of a saturation of region financial institutes, including the enterprises of the joint venture industry;
• small innovation enterprises; information network;
• specific innovation structures (“naukograd”, “innograd”, business parks and business incubators, innovation centres, couching centers, specific funds etc.).

4) Human resources:
• number of employees with higher education;
• employment in the field of science and high technology;
• number of employees with higher education.

5) Information:
• expenditure on acquiring information resources
• number of enterprises, supplied with personal computers, etc.

6) Effectiveness:
• growth number of innovation enterprises;
• growth of innovation products, including export-oriented products;
• increasing share of innovation products in the regional economy;
• growth the effectiveness of innovation active enterprises (growth of profit, profitability, turnover, productivity, renewability equipment etc.);
• indicator for innovation social utility (income growth, the impact on the region budget occupancy, rising social security rating among regions of RF).
The formation and development of Russia’s innovation potential should take into account specific features of innovation development of particular regions. A set of regional innovation systems, united by a common goal (sustainable development of the country), and operating under the state economic policy and legislation forms a state innovation potential.

The level of regional infrastructure is crucial for cluster formation and development. According to the methodology of integrated design, research of innovation potential should be complemented with the evaluation of the regional innovation infrastructure.

Functioning of organizational infrastructure allows innovation active enterprises to have a small staff, to compensate for the lack of many components needed for successful work through the services provided by specialized organizations. These infrastructure functions may be performed by a small organization created based on existing scientific and educational institutions, as well as specialized organizations with their own material and human resources basis. An integral part of a regional innovation infrastructure should be a small businesses support infrastructure.

The purpose of this sector is to create an effectively functioning infrastructure to facilitate the rapid development of innovation activity in the regional innovation clusters. To evaluate the state of innovation infrastructure the system of indicators was established by the Ministry of Economic Development of Russian Federation in 2012. This system includes quantitative characteristics of the activities of production and processing facilities, information, consulting services and financial infrastructure. It is recommended to monitor these indicators annually till the 1st of January of each current year.

Determining the value of the indicator will allow determining the innovation infrastructure state, to reveal negative and positive development trends in the innovation activity of a region for the purpose of taking necessary actions to remove problems and maintain further development of an innovation system and create the environment and favorable institutional conditions for cluster development.

Our study attempts to clear up the intensity of particular factors that are able to improve clusters environment. We selected the Russian Federation pilot clusters for case study because of the unique environment and enormous opportunities for innovation development. The Russian Federation joined clustering process only in 2012, though developed countries have had successful experience since 1990. It was the Program of Russian pilot innovative clusters support issued by the Russian government (Oder N 514 dd 04.11.12 Ministry of economic development). It should be noted that clustering is included in the Program of social economic development of the country, the strategies of social economic and innovation development until 2020. To realize the clustering component of the program, the Russian government through a selection procedure recommended 25 pilot innovation clusters for budget financing of innovation cluster activity. The author presented the results of the Russian clustering experience, and attempted to define the problems and weaknesses of innovation clusters development in the country.

The research revealed that in 2013 the federal financing for pilot innovation clusters was 1.3 billion rubles for the first 13 clusters that passed through the first stage of the competitive selection. In 2015, the government invested 3 billion rubles. As a result, the productivity of innovation clusters increased to 403 billion rubles. That means for each 1 ruble of the federal investments 310 rubles refunded. We identified two great innovation products producers:

- Kamskiy territorial innovation cluster - 219 billion rubles,
- St. Petersburg innovation cluster - 131 billion rubles.

Another 8 clusters produced innovation products in amount of 15 to 40 billion rubles, the rest - up to 15 billion rubles.

**Key indicators of the 25 pilot clusters development in Russia**

In addition, we were able to identify the key indicators of the development for each of the 25 pilot clusters in 2014-2015. The important of these criteria is that they allow clarifying the level of clustering in the country:
• number of employees of participating organizations (thousand people);
• number of high-performance jobs created or as a result of modernization of existing jobs (units);
• average output per employee in organizations participating in the cluster (million rubles per person per year);
• volume of investment by organizations participating in the cluster (billion rubles);
• total amount of investments in cluster development, including budgetary and non-budgetary sources (billion rubles);
• scope of works and projects in the field of research and development carried out by participating organizations (million rubles);
• volume of innovation products of their own production shipped by the organizations participating in the project, innovation works and services made by own forces (billion rubles).

We are keenly aware of the fact that our sample of twenty-five Russian clusters is unlikely to be representative of the clusters in different countries. It is also necessary to extend the list of indicators to be able to monitor the level of cluster innovation environment. Changes in innovation statistics will improve the quality evaluation of economic systems’ innovation activity and innovation potential. In this respect, it is recommended to choose the right criteria, which allow evaluating cluster innovation activity and the state of cluster innovation potential [8].

The aim of this paper was to develop a more comprehensive understanding of cluster the formation process in Russia and the influence of the environment on the process of innovation cluster formation. It was difficult to use the indicators of innovation system activity to measure the level of innovation environment of an innovation cluster. We developed certain measurement instruments that helped to distinguish startup conditions for cluster formation and improved an integrated and systematic assessment of innovation potential in Russian clusters to monitor innovation cluster development.

Our findings indicate that the levels of network strength may help to explain why certain clusters decline while others adapt to environmental changes. The integration of environmental conditions provides a unique perspective for cluster performance. In the case of Russian clusters development, we found that financing was not the only instrument for innovation cluster development. The article results open up a new discussion on the influence of innovation environment on clusters development and what measures should be planned and implemented for successful clusters innovation potential development.

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