ASSESSMENT OF INNOVATIVE POTENTIAL AS A CRITERION FOR EVOLUTION OF THE MESOECONOMIC SYSTEM

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Abstract
Under current conditions of economic development a constant and timely research into the ongoing internal and external changes, affecting the accumulation of innovative potential, as well as degree of its utilization, will speed up the processes connected with upgrading competitive advantages and economic growth rate.

The aim of the work is offer methodological tools employed to estimate the innovative potential of the mesoeconomic system as a criterion which ensures development in a given direction. The results of research proved that the ability and determination to develop innovative activity is determined by the accumulated aggregate potential of the mesoeconomic system as a whole, which can be estimated across the sections including infrastructure and legal regulations, innovation and production, education and research, as well as finance and investment. The results of research were tested based on the analysis of innovation potential of Saratov region as a mesoeconomic system.

Keywords: Innovation potential, infrastructure and law, production and innovation, scientific and educational, investment and finance
JEL classification: O10, O52

1. Introduction

At the present stage of the country's economic development (the Russian Federation did not retain its position in the Global Innovation Index (GIL) ranking, and moved down from No. 43 spot in the GIL 2016 to No. 46 in the GIL 2018, yielding its positions to innovation achievers, including Thailand and Vietnam (Global Innovation Index 2018), it is vital not only to react to the rapid changes in the business environment, but also be prepared for the upcoming changes in order to maintain the competitive advantages and resources of the system revealed through the analysis of the system potential. Recently, there have been numerous scientific publications devoted to the research into commitment and ability to business development. However, determination and ability of enterprises for further growth, including innovation development, is largely determined by the policies pursued by the government of the region.

This includes not only laws adopted by the local municipalities, regulations and programs referred to support and creation of favorable conditions for the development of innovative activities in the region, but, in the first place, the infrastructure, funds, disbursement of money for grants, etc. Additionally, to stimulate development of the regions, it is important to encourage development of the regional strategies related to “smart specialization”. However, these strategies “must be individualized; they cannot be developed exceptionally on the national level” (Carayannis and Campbell 2010), since we must take into account a special character, advantages and potential of a region.

As noted in (Carayannis and Grigoroudis 2016; Carayannis and Campbell 2010; EBRD 2013; Carayannis, Meissner, and Edelkina 2017; Drucker 2014; Carayannis and Grigoroudis 2014; Makarov et al. 2016; Carayannis et al. 2014), it is important to consider intrinsic regional diversity of the business environment, since business conditions even in the neighboring regions can vary considerably. The regions form the meso levels of a country's economic system (the macro level) (Kleyner 2015a; 2015b), whereas a system is "a relatively discrete or stand-alone and stable part of economic time and space continuum, characterized by external integrity and internal diversity" (Kleyner 2015a; 2015b). Thus, the regions represent the mesoeconomic systems characterized by different development rates, and have a direct impact on the performance of a system at the macro level.

Therefore, we assume it is critically important to determine the true state of business in the region, and identify the factors and resources required to improve the region's economic situation and competitiveness, which cannot be achieved without the growth of innovative activity. Hence, there is a need to estimate the level of a region's readiness for development as a mesoeconomic system. Assessment of innovative potential as a criterion for the region's readiness for development was conducted in 2010-2017 in Saratov region. This is the territory with more than 47,000 enterprises providing various types of business activity, about ten universities involved in research and development activities. The given research was based on the methodology developed by the authors, in order to estimate the ability and readiness for development of any region.

2. Theoretical Research

The analysis of numerous scientific articles revealed that many scientists, while doing their research into determination of various economic systems to develop innovation activity, identify this activity with the innovation potential. At the same time, they have not provided an unambiguous definition for the "innovative potential" as an economic category. As an example, K. Freeman considers that the innovative potential ensures advancement of a system due to innovations (Freeman 1995). P. Drucker assumes that the innovation potential is of practical importance and must be analyzed to be used effectively (Golova and Sukhovey 2018). According to O.V. Vasyukhina and E.A. Pavlov, the innovation potential is one of the system attributes of a large and sophisticated socio-economic system, which allows the latter to adapt through commercialization of new knowledge to the changes in the environment (Vasyukhin and Pavlova 2010). In our view, conclusions of the above mentioned scholars totally comply with the principles behind the mesoeconomic system and development of its innovative parameters.

However, in theory the innovation potential should not be limited to a set of financial and economic resources, or objects of intellectual property and staff composition promoting innovations (Nikolaiva 2014). In fact, to facilitate innovation activity we need not only human resources, intellectual property, or financial and economic resources, but a whole set of these resources, including business potential.

A comprehensive approach to the components constituting the innovation potential is presented in the works by A. A. Rudichev, E.A. Nikitina, S.P. Gavrilavskaya, A.A. Getmantsev (Abdrakhmanova et al. 2017), where the innovation potential incorporates the resource, internal and performance components, each based on the framework of its own constituents. Thus, such component as resources includes material and technical, informational and financial constituents; the internal component incorporates the resources of state support and infrastructure; whereas the performance component is based on the growth of efficiency of the economic system. However, we assume that this approach does not take into account other components (such as ability of the economic system to commercialize and promote the results of innovation activity), and secondly, the latter component is the result of innovation activity rather than accumulated capacity, means and terms required for its implementation.

The conducted analysis of scientific papers revealed that the scholars distinguish between three main approaches in assessment of the advancement potential of the mesoeconomic system: the resource-based, performance-based, and target-based approaches. However, they are mainly used to identify and estimate the potential of socio-economic development of a region.

Additionally, the authors highlight various elements within the estimated potential. Thus, E.V. Andrianova and L.V. Konovalova place an emphasis on the component dealing with economy (considering that it implies availability of only natural resources, which, in our view is incorrect, since these are not identical concepts, and secondly, economic potential is a much wider concept), financial and organizational components (Andrianova and Konovalova 2015). M.A. Bochkov and O.P. Salegina assume that to assess the potential of a region, it is necessary to estimate its reserves incorporating the natural, investment, and scientific-technical reserves (Bochkov 2013).

A worth-while approach to assessment of a region's potential is presented in the work by K.O. Vinogradova and O.A. Lomtseva. The authors suggest to distinguish between three sections consisting of specific potentials: material and technical (including manufacturing, economic and geographical, and demographic potentials), financial and economic (including labor, manufacturing, social infrastructure, budget, and export-import potentials), and innovative -institutional (including scientific innovations, investment potential, and regulatory and legal expertise) (Vinogradova and Lomovtseva 2013). However, the authors note that the existing methods do not provide appropriate tools for assessment of highlighted potentials of a region's advancement.

The proponents of the performance-based approach are A. A. Rudichev, E.A. Nikitina, S.P. Gavrilavskaya, A.A. Getmantsev (Rudychev et al. 2015), who interpret the potential as a capability of the economic system to ensure a certain outcome based on utilization of available resources. Moreover, the authors do not investigate the issues related to assessment methodology.

The third, target-based approach to defining the potential is followed by M. Yu. Nikolaeva Nikolaeva, 2014. They consider the potential as ability to achieve the set goals in the face of limited resources. However, the author do not present the ways for estimating the given potential, or show how the given potential should correlate with the ways to achieve the set goals, and accordingly, how to outline the directions needed to utilize and shape the potential.

In our view, determination and ability of a region to develop innovation activity is based on the accumulated aggregate potential, which includes financial, investment, informational, intellectual, logistic, production, marketing, human, research and development, organizational and management potentials of both individual enterprises and the region's economy as a whole. Each potential is associated with its own specific risk types, which requires an additional assessment procedure of the risk rate relating particular and general directions, and ability to confront the risks and vulnerability factors.

Thus, determination of a region to advance innovation activity is a comprehensive phenomenon associated with ability to implement effective innovation activity by the entities of a region, including availability of accumulated resources, performance capacity, ways and methods to encourage the innovation processes. Meanwhile, an effective demand for innovative goods and services is of no small importance in the given process.

3. Research Methodology

It should be noted that the region's determination and ability to develop innovative activity is formed both on the regional level, and on the level of individual enterprises. The first level allows for a comprehensive assessment of the whole set of potentials across the region conducted by four interlinked sections. The second level relates individual enterprises and organizations of a region which implement or have the capacity to introduce innovation projects into various spheres of activity (manufacturing, organizational, managerial, marketing, informational, etc.). This is associated with the fact that enterprises determine the main share of the region's capacity to enhance innovation development.

Building a model for estimation the region's capability to develop innovation activity is based on the fact that present-day model of innovative development of the regions requires interaction between the government, business and universities (Etzkowitz 2008) in order to create an innovation development strategy taking account of the production and technological potential of a region (Golova and Sukhovey 2018).

From this perspective, in order to conduct a comprehensive assessment of the innovation potential as a criterion of capacity of the mesoeconomic system for advancement, we place a special emphasis on the following sections:

- infrastructure and law;
- innovation and production;
- science and education,
- funds and investments.

The first section, dealing with infrastructure and law, is responsible for the readiness of the mesoeconomic system in terms of creation and effective operation of the legal and regulatory framework, innovation and investment policy, advisory centers, market and innovation infrastructure (audit, consultancy, insurance, leasing, and logistics, technology transfer and information agencies, etc.). The components of this section are local/regional governments, as well as departments and agencies. A competent implementation of an innovation policy can encourage innovation activity at the level of individual firms, which, in its turn, can trigger a chain reaction at the macro level. A culmination of this process may become a considerable degree of competitiveness (Carayannis and Rakhmatullin 2014).

The quality of the innovation and investment policy is characterized by such indicators as availability and quality of the regulatory and legal framework for the innovation activity in the region (a strategy for the advancement of innovation activity, particular legislative provisions, development programs, prioritized development areas, clusters, a particular level in the development of a specialized infrastructure).

The organizational and legal support implies availability of a coordination centre for the innovation policy supervised by the regional government, specialized organizations targeting to support the entities involved in innovation activities of a region (funds, agencies, information and advisory centres, etc.).

Business development, including innovative businesses, is largely determined both by the features and development degree of the institutional environment (Marcelin and Mathur 2015; Volchek, Henttonen, and Edelmann 2013; Welter and Smallbone 2011; Yukhanaev et al. 2015), which in our view means that this section should be distinguished as a separate component when assessing the rate of a region's determination and readiness for advancement.

The assessment procedure in this section is conducted using the expert method, where each indicator is given the scores from 0 to 1 defining the outcome index.

The second section, dealing with innovation and manufacturing, ensures accumulation of production, marketing, intellectual and research potentials. The elements of the section include innovative technology parks, incubators, research institutes, R&D and design-and-experimental departments of enterprises, universities, as well as enterprises and organizations engaged in the manufacture and sales of innovation products and services.

The third section, related to the scientific and educational potential, ensures the manpower training (workers, managers of all levels, experts, researchers, scientists, etc.), shaping the intellectual, research and human capacity of the mesoeconomic system. The components of this section are professional colleges, technical schools, and universities.

The fourth section, relating finance and investments, deals with accumulation and availability of financial and investment resources, and includes the following elements: government (within the framework of allocating funds from the regional budget, attracting federal aid to finance innovation programs and projects), departments and agencies (allocating funds for research and development, and supporting innovative entrepreneurship), credit organizations, various investment funds, and private investors (providing funds for innovation projects), enterprises and organizations (using the owned capital to develop innovative activities).

Apart from that, each section forms the types of potentials aimed at increasing the readiness of the mesoeconomic system to develop innovation activities:

- strategic;
- tactical;
- operational.

The strategic potential testifies that the mesoeconomic system pursues an effective innovation policy, the legal framework and infrastructure have been shaped, the results of

scientific research, intellectual property objects and investments have been accumulated; the tactical potential is based on production, human resources, logistics and financial elements, whereas operational potential incorporates informational, organizational, managerial and marketing elements.

A comprehensive assessment of the readiness of the mesoeconomic system to develop innovation activity includes estimation of the accumulated potential within each section and is based on a multi-level hierarchy of indicators revealed using the quantitative and qualitative methods, as well as integrated indicators. This approach might be effective in finding the strengths and weaknesses of the mesoeconomic system, and defining the trends for its further development.

In providing the evidence relating the ability of the mesoeconomic system to develop innovation activity, the integrated indicators which characterize each section receive their weight criteria determined by the correlation and regression analysis method, and taking into account the factors which facilitate the given trend in the development of the system's economy. Additionally, these indicators provide a possibility to find out the closeness of the ties and impact of these factors on the creation and introduction of technological innovations. The estimates suggest that investments and financial support of innovation activity are critically important. Similar results are presented in (Kleyner 2015a; 2015b), where the CGE-models helped to identify that an increase in funding innovation activities, science and education by 30%, compared to the present-day level, due to proportional decrease in the spendings within other economy sectors, is most effective for economic development of a region on a long-term horizon.

The partial assessment criteria can score from zero up to the value of the corresponding weight coefficient, where the minimum value of the complex criterion equals 0, and the maximum value is at 0.298. If the complex criterion is lower than 0.007, then the mesoeconomic system has a low level of readiness; when the scores equal from 0.08 to 0.15, the system has the medium readiness level, with the scores from 0.16 to 0.22 it has a moderate level, and with the scores from 0.22 to 0.298, it has a high level of readiness for the development of innovative activity.

4. Research Results

The proposed methodology employed to assess the innovation potential of the mesoeconomic system as a criterion of readiness for advancement is presented in Table 1.

Table 1. Assessment criteria of the mesoeconomic system readiness level to develop innovation activities

Potentials	Evaluation formula	Characteristic	Entity providing realization
	1. Infrastructure and law-based section		
Organization and management Information	$K_1 = \frac{\sum B_i}{n}$ B_i – scores i- an expert; n – number of experts	Quality of innovation and investment policy in the region	Departments and agencies of a region
Organization and management Information	$K_2 = \frac{\sum B_i}{n}$ B_i – scores i- an expert; n – number of experts	Organizational and legal support of a region	Departments and agencies of a region
Organization and management Information Logistics	$K_3 = \frac{\sum B_i}{n}$ B_i – scores i- an expert; n – number of experts	Logistical support of a region	Departments and agencies of a region
	$K_{01} = 0,165\sqrt[3]{K_1 \cdot K_2 \cdot K_3}$		

Potentials	Evaluation formula	Characteristic	Entity providing realization
	2. Innovation and production section		
Production	$К_4 = \frac{С_a}{С}$ C_a – cost of adopted fixed industrial assets in the region, RUB; C – cost of fixed industrial assets, RUB	Renovation rate of industrial and production assets	Departments and agencies of a region, and enterprises
Production Innovation Human resources	$К_5 = \frac{Z_{ie}}{Z}$ Z_{ie} – number of persons employed in high technology industries; Z – number of persons employed in the economy of a region, pers.	Share of employed at high-tech and medium-tech enterprises	Industrial enterprises
Production Human resources Innovations Information Marketing	$К_6 = \frac{Z_{is}}{Z}$ Z_{is} – number of persons employed in knowledge-intensive services, pers.; Z – number of persons employed in the economy of a region, pers.	Share of employed at knowledge-intensive service industries within the total number of employed in the economy of a region	Knowledge-intensive service-oriented companies
Research and development Knowledge-based Innovations Human resources	$К_7 = \frac{Z_{rd}}{Z_r}$ Z_{rd} – number of persons employed in R&D, pers. Z_e – average annual number of employed in the economy of a region, pers.	Share of employed in R&D within the average annual number of employed in the economy of a region	Universities, R&D institutes, enterprises and organizations, technology parks, incubators, innovation clusters
Knowledge-based Innovations Research and development Information	$К_8 = \frac{P_t}{P}$ P_t – number of industrial enterprises involved in technological innovations, units; P – number of industrial enterprises, units	Share of industrial enterprises involved in technological innovations within the total number of industrial enterprises of a region	Industrial enterprises
Knowledge-based Innovations R&D Information Marketing Organization and management	$К_9 = \frac{P_{nt}}{P}$ P_{nt} – number of organizations involved in non-technological innovations (marketing and /or organizational), units	Share of enterprises involved in non-technological (marketing and/or organizational) innovations within the total number of industrial enterprises of a region	Industrial enterprises

Potentials	Evaluation formula	Characteristic	Entity providing realization
Knowledge-based Innovations Information Production	$К_{10} = \frac{P_{fi}}{P}$ P_{fi} – number of organizations having self-engineered finished technological innovations, units	Share of enterprises with self-engineered finished technological innovations within the total number of industrial enterprises of a region	Industrial enterprises
Knowledge-based Innovations R&D Information Production	$К_{11} = \frac{P_{pp}}{P}$ P_{pp} – number of organizations participating in joint R&D projects, units.	Share of enterprises participating in the joint R&D projects within the total number of industrial enterprises of a region	Industrial enterprises
Knowledge-based Innovations Information Production	$К_{12} = \frac{M_{ti}}{M}$ *Mti* – number of small business enterprises involved in technological innovations, units; *M* – number if small business enterprises, units	Share of small business enterprises involved in technological innovations within the total number of small industrial enterprises	Small industrial enterprises
Innovations Production Funds	$К_{13} = \frac{T_i}{T}$ *Ti* – volume of innovative goods, amount of work and services, RUB; *T* – volume of shipped goods, performed operations and services by industrial enterprises, RUB	Share of innovative goods, works and services within the total volume of shipped goods, performed works and services provided by industrial enterprises of a region	Industrial enterprises
Innovations Production Funds	$К_{14} = \frac{T_{te}}{T}$ T_{te} – volume of newly introduced or undergone significant technological changes goods, works, services, new for the market, RUB; *T* – volume of shipped goods, performed works and services by industrial enterprises, RUB	Share of newly introduced or undergone significant technological changes innovative goods, works and services which are new on the market, within the total volume of shipped goods, performed works and services provided by industrial enterprises of a region	Industrial enterprises

$$К_{62} = 0{,}399\sqrt[11]{К_4 \cdot К_5 \cdot К_6 \cdot К_7 \cdot К_8 \cdot К_9 \cdot К_{10} \cdot К_{11} \cdot К_{12} \cdot К_{13} \cdot К_{14}}$$

Potentials	Evaluation formula	Characteristic	Entity providing realization
	3. Science and education section		
Human resources	$K_{15} = \frac{Ch_{he}}{Ch}$ Ch_{he} – number of population of 25-64 years having higher education, pers. Ch – number of population in the region of 25-64 years, pers.	Share of population under 25-64 years having higher education within the total number of population of the relevant age group in the region	Ministry of Science and Education of the Russian federation, universities, enterprises and organizations (employer-sponsored education)
Human resources	$K_{16} = \frac{S_{he}}{Ch}$ S_{he} – number of students enrolled higher education programs, pers.	Share of students enrolled in higher education programs (bachelor, specialist, and master degree programs) within the total number of population in the region	Ministry of Science and Education of the Russian federation, universities, enterprises and organizations (employer-sponsored education)
Human resources Knowledge-based R&D	$K_{17} = \frac{I_y}{Ch_r}$ I_y – number of researchers under 39 years, pers. Ch_r - total number of researchers in the region, pers.	Share of employed under 39 years in the total number of researchers in the region	Universities, R&D institutes, enterprises and organizations, technology parks, incubators, innovation clusters
	$K_{03} = 0,226\sqrt[3]{K_{15} \cdot K_{16} \cdot K_{17}}$		
	4. Investments and funds section		
Funds Investments	$K_{18} = \frac{Z_t}{VRP}$ Z_m – expenditures on technological innovations, RUB; VRP – gross regional product, RUB	Share of technological innovations within the volume of gross regional product	Regional government
	$K_{19} = \frac{B_g}{Z_g}$ B – regional budget funds directed on financing R&D works, RUB; Z – expenditures on R&D, RUB	Share of regional funds in the total volume of financial expenditures on R&D works	Regional government

Potentials	Evaluation formula	Characteristic	Entity providing realization
Funds Investments	$K_{20} = \frac{S_f}{B}$ S_f – federal budget funds attracted to develop innovation activities and infrastructure of a region, RUB; B – regional budget funds directed for the development of innovation activities, RUB	Share of federal budget funds within the total volume of regional budget directed for the development of innovation activity	Regional government, departments and agencies
Funds R&D	$K_{21} = \frac{Z_{ie}}{VRP}$ Z_{ie} – internal expenditures on R&D, RUB	Share of internal expenditures on R&D within the volume of gross regional product	Regional government, departments and agencies, enterprises and organizations
Funds R&D	$K_{22} = \frac{Z_{fo}}{Z_n}$ Z_{fo} – funds of business sector organizations, RUB; Z_n - internal expenditures on R&D for business sector organizations of a region, RUB	Share of funds of business organizations in the total volume of internal expenditures for R&D	Enterprises and organizations of a region
Funds Investments	$K_{23} = \frac{Z_t}{T_{to}}$ Z_t – expenditures on technological innovations, RUB; T_{to} – total volume of shipped goods and performed works and services of industrial enterprises of a region, RUB	Intensity of expenditures on technological innovations by industrial enterprises of a region	Industrial enterprises
$K_{64} = 0,533\sqrt[6]{K_{18} \cdot K_{19} \cdot K_{20} \cdot K_{21} \cdot K_{22} \cdot K_{23}}$			
A complex criteria of the region's determination to develop innovation activity $K_{cc} = \sqrt[4]{K_{61} \cdot K_{62} \cdot K_{63} \cdot K_{64}}$			

5. Testing the Method

The evolved methodology was tested in Saratov region being as a mesoeconomic system based on the outcome of its development in 2017 (see Table 2).

Table 2. Estimation of the region's readiness and ability to pursue innovative tasks

Section	Indicator characterization	Criterion value
Infra-sstructure and law	Quality of innovation and investment policies of a region	0.1
	Organizational and legal support of a region	0.3
	Logistic support of a region	0.1
	Partial criterion	**0.024**
Investments and production	Intensive renovation of production assets	0.63
	Share of employed at enterprises with high- and medium-technology production level	0.0004
	Share of employed in knowledge-intensive services within the total number of employed in the economy of a region	0.001
	Share of employed in R&D within the average annual number of employed in the economy of a region	0.004
	Share of industrial enterprises involved in technological innovations within the total number of industrial enterprises of a region	0.97
	Share of enterprises involved in non-technological (marketing and /or organizational) innovations within the total number of industrial enterprises in the region	0.01
	Share of organizations having self-engineered finished technological innovations in the total number of industrial enterprises of a region	0.1
	Share of organizations involved in the joint R&D projects within the total number of industrial enterprises of a region	0.002
	Share of small business enterprises involved in technological innovations within the total number of small industrial enterprises	0.048
	Share of innovative goods. works and services within the total volume of shipped goods. performed works and services within the total volume of shipped goods. performed works and services by industrial enterprises of a region	0.082
	Share of newly introduced or undergone significant technological changes innovative products. works and services. which are new on the market within the total number of shipped goods. performed works and services by industrial enterprises of a region	0.05
	Partial criterion	**0.0085**
Science and education	Share of population at 25-64 years having higher education within the total number of population of a relative age group in the region	0.3
	Share of students enrolled in higher education programs (bachelor. specialist and master degree programs) within the total number of population of a region	0.11
	Share of employed under 39 years within the total number of researchers in the region	0.2
	Partial criterion	**0.0423**
Funds and investments	Share of expenditures on technological innovations within the volume of gross regional product	0.12
	Share of the regional budget funds within the total volume of R&D funding	0.02
	Share of attracted the federal budget funds within the volume of the regional budget funds directed for R&D development	0.041
	Share of internal expenditures on R&D within the gross regional product	0.001
	Share of funds of industrial enterprises of a region within the total volume of internal expenditures on R&D	0.143
	Intensity of expenditures on technological innovations by the industrial enterprises of a region	0.012
	Partial criterion	**0.0125**
Complex criterion		**0.0180**

Thus, Saratov region as a mesoeconomic system where innovation activity is conducted primarily at industrial enterprises, small business organizations, academic research organizations and universities, has an average readiness rate for advancement innovative activities.

The infrastructure and law section, having a slight impact on the region's readiness and ability to develop innovative activity, is characterized by low efficiency of the pursued policy. This is despite the fact that Saratov region was one of the first in the Russian Federation to

develop and adopt the Law "On Innovations and Innovation Activity" (1997, amended in 2017), the laws on state support to specialty entities to realize innovative activities. Saratov region was among those that pioneered an innovative scientific-and-technological program encouraging development of high technologies, set up the Governor Council for science and innovations, created clusters on radio electronics and nanotechnologies, initiated development of incubators, technology parks, and technology transfer centers.

The innovation and production section, which has a primary impact on the rate of innovation activities in the region, is characterized by the lowest potential, which is due to insufficiency of the equity funds (section 4) of enterprises needed to revolve funds and introduce innovations. The share of outdated worn-out facilities within the fixed assets in the industry of Saratov region is high. The average wear and tear degree of the main industrial and production assets by the end of 2017 equaled to 54.1% (2009 - 46.3%). The coefficient of assets renewal was at 0.063 (2009 - 0.18), and the liquidity ratio was at 0.06 (2009 - 0.01). The bulk of industrial production assets was introduced to enlarge their volume, but not to replace the worn out ones. The current volumes of renewal and retirement of fixed industrial assets are insufficient to overcome the wear and tear of those under operation.

In 2017 only 4.8% of organizations conducted innovation activities. It should be noted that the number of such organizations is decreasing (in 2009 - 55, and in 2017 - 51) (Saratovstat 2018a; 2018b).

The science and education section, which demonstrates the readiness and ability of the region to pursue innovative activity, is shaped by the university science (represented by nine universities that provide not only training, but also research and development activities linked with manufacturing; three universities set up scientific and technological centres, technology transfer centres, and technology parks), academic science (represented by Saratov Scientific Center of the Russian Academy of Sciences including eight scientific institutions), sectoral science (represented by 51 organizations), and scientific departments at industrial organizations.

However, many industrial enterprises emphasize that there is a shortage of qualified staff and little opportunity to solve the problem due to financial challenges (section 4). A rather favourable situation with highly qualified personnel is observed at mixed ownership enterprises with external assets, where specialists go through retraining at foreign firms or in-house training conducted by foreign experts.

In the recent decade, we observe a tendency to aging and significant reduction in the number of staff members engaged in R&D activity: more than 69 % are aged 40 and older, and about 8 % are under 35 years old (Saratovstat 2018a; 2018b). The main reason for the given situation is the drift of young professionals to other areas of activity, which as a rule is interconnected with low salaries and low status of the profession. The challenges with insufficient influx of young people to the areas of scholarly endeavor have remained relevant for over fifteen years and are becoming critical.

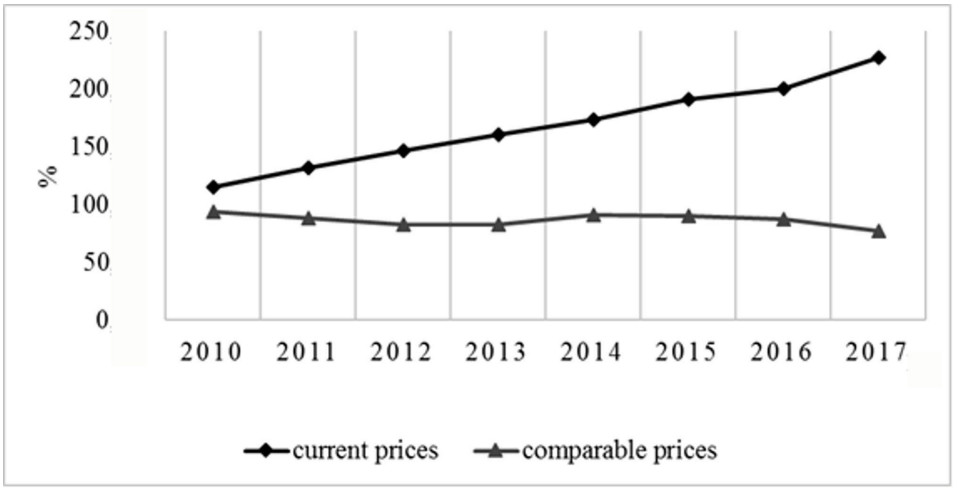
The investment and funds section has a decisive impact on advancement of innovation activities in the region, since conducting scientific research and introducing innovations require considerable resources. Research and innovation funding is primarily provided from the own funds of organizations (44.1%), the federal budget (6.5%), or the regional budget (11.0%).

44.6% of industrial enterprises in Saratov region point out that a decisive factor which discourages development of their innovative activity is insufficiency of equity funds, and 32.5% of enterprises place an emphasis on insufficiency of the government aid. At the same time, 32.8% of enterprises are discouraged by the fact that innovations require high expenditures, and 22.4% of enterprises emphasize high economic risks.

While doing this research using the presented methodology, we estimated the innovation potential as a criterion for the readiness of the mesoeconomic system for advancement within the period of 2009-2017. The calculations were made in terms of two variants of cost indicators: the current prices and comparable prices (Figure 1). The results revealed the opposite trends. Thus, if we conduct an assessment based the comparable prices, then the readiness for development within the estimated period constantly goes up (the integrated indicator increased by almost 2 times), and if estimation is based on comparable prices, then it has decreased by 11.7%.

Therefore, to obtain the real estimates of the innovation potential as a criterion of the mesoeconomic system readiness for advancement, the indicators having a monetary value must be calculated based on the comparable prices, whereas all the indicators must be assessed in dynamics.

Figure 1: Dynamics of the integrated innovation potential index of the mesoeconomic system as a development readiness criterion



Source: calculated by (Saratovstat 2018a; 2018b)

6. Discussion

In their academic papers, economists emphasize that innovations are key drivers of a nation's competitiveness (Carayannis and Grigoroudis 2014). We further agree that the given statement can be regarded acceptable for separate regions, which finally determine the competitive ability of a whole nation.

In order to upgrade the level of economic advancement, stimulate and increase innovative activity and competitive advantages of the regions as mesoeconomic systems, it is important to work out a robust strategy which might be able to ensure a long-term and significant outcome. Stimulating dynamic development of the regions, defining priorities for the future, overcoming uncertainties and growing risks resulting from the global challenges (Kotsemir 2012), all this requires assessment of readiness and ability of the regions to advance in the given direction.

This, in turn, shows the need for development of new methods and tools used to shape the regional strategies taking into account the quantitative and qualitative estimates of a dynamically changing environment and readiness for development, which are determined by the accumulated innovative potential. Despite the growing number of research articles in the field of innovative potential of individual enterprises and regions, so far there has been no single approach to understanding the category "innovative potential of the system", or to the methods and models used to identify and estimate the category. Moreover, the methodology utilized for estimating the innovative potential as a criterion of the region's readiness for development, as well as the ratio scale for assessing the level of readiness, remain ill-defined and insufficient.

The research articles devoted to this problem emphasize that a significant contribution to the development of innovations on the regional and local levels should be made by universities. However, we do not agree with the given assumption (Cervantes 2017). It should be noted that in order to increase the innovation potential as a criterion of readiness of the mesoeconomic system for development, we need to take into account other components. These components include the investment climate, the normative and legal framework, and the infrastructure required for the innovation activity (Crespo Cuaresma, Oberhofer, and Vincelette 2014).

A more comprehensive approach is associated with assessment of the various aspects of regional innovation systems. This approach can be utilized based on the concept of the triple helix, which serves for the analysis and estimation of the existing strategies (Carayannis and

Sipp 2010). However, this approach does not take into account the impact of demand for creation and exposure to the new knowledge areas, technologies and products.

To a certain degree, this makes it possible to avoid extrapolation of a three-tier model to the four-tier one (Virkkala, Mäenpää, and Mariussen 2014), which represents an integrated approach to assessment of the results obtained on the regional level, and development of effective mechanisms for introducing innovations.

Improvement of the monitoring and evaluation systems on the regional level (Carayannis and Grigoroudis 2014; Carayannis and Rakhmatullin 2014) requires application of multi-level techniques, which take into account both the chronological and spatial dynamics.

The readiness of the mesoeconomic system for development using the accumulated innovation potential can and should be based on a comprehensive assessment of existing opportunities and prospects for its advancement with account for the effective demand, accumulated resources, methods and ways needed for the development of innovative processes.

In this research, we propose a method for a comprehensive assessment of the innovation potential of the mesoeconomic system as a criterion of readiness for advancement which has a universal character, since a significant part of indicators are formed with account for international standards. The methodology can be applied for the regions with various degrees of economic activity to identify the "bottlenecks" in improving competitive abilities through innovations. A complex nature of the developed methodology consists in carrying out assessments using four modules that show different perspectives of the component parts of the overall potential. The latter includes: organizational, managerial, informational, logistic, knowledge-based, research, innovative, industrial, workforce, marketing, investment and financial potentials. Each module is evaluated in terms of quantitative and qualitative aspects of the particular criteria. The cost indicators are given in comparable prices, which allows for an unbiased assessment of the innovation potential and, as a result, the ability and readiness of the mesoeconomic system for development.

The weakness of the proposed methodology is connected with unavailability of a unified scale for assessing the level of readiness for development using the innovative potential, since it is based on the values of weight coefficients. Each region has its individual weight coefficients which are identified using the method of correlation and regression analysis of impact of various factors on the innovative potential of a region as a criterion of readiness for development. To develop the given approach used to estimate the readiness of a region for advancement of innovative activities, it important to find the weighing criteria universal for all the regions. Therefore, our further research will involve the analysis and assessment of the rate of an innovative potential, and finding the weighing criteria for the federal districts across the whole Russia.

7. Conclusion

In order to boost economic activity and economic stability, it is vital to identify their factors and reserves, which requires progressive advancement of innovation activities. This, in turn, requires assessment of the region's innovation potential and readiness level for steady growth as a mesoeconomic system. The provided research established that the development readiness level of the mesoeconomic system is a comprehensive characteristic which shows the ability of the system to effectively implement innovative processes using the accumulated resources, possibilities, ways and methods. The accumulated aggregate potential includes the financial, investment, informational, knowledge-based, logistic, production, marketing, staff, research and development, organizational and management potentials of both individual enterprises and mesoeconomic system as a whole.

A comprehensive assessment of the readiness of the mesoeconomic system to develop innovative activities can be based on multi-level hierarchical parameters using the quantitative and qualitative methods, as well as integrated indicators. To justify the assessment data, the integrated indicators should be supplemented by the weight criteria defined by the correlation and regression analysis method with account for the factors which influence the mesoeconomic system advancement, and have their own individual characteristics for each of these systems. The given approach will reveal the strengths and

weaknesses of the mesoeconomic system, and identify the directions for its further development.

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