

Role of Educational Institutions in Shaping the Ecosystem of the Region

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ABSTRACT

The article is devoted to substantiation of the central role of educational institutions in the formation of the region's innovation ecosystem. Modern society is characterized by active transformations in all spheres of life activities; the ranges of production, economic, social, foreign and domestic political activities are expanding. In these conditions, the traditional classical theories of management are no longer justified and do not allow the society to reach the world standards of socio-economic development. This is due to the fact that the mechanisms of functioning of social systems are being improved and modernized, vertical and horizontal connections and structure are expanding, and self-regulation tendencies are increasing. Thus, the formation of the innovation ecosystem of the region is taking place, which includes various sectors and spheres of life. In this regard, there is a need to find new, more effective mechanisms for managing regional innovation ecosystems. The article presents the results of comparative analysis of integration mechanisms and interrelations of educational institutions and management structures of regions with different level of economic and social development. Performance indicators of the innovation ecosystem are highlighted; moreover, we identified the main current trends and priorities of regional economic development. Since the modern world is characterized by global and dynamic information flows, which are used to analyze and process all spheres of life, educational institutions are given an increasing role in shaping the region's innovation ecosystem. Based on the generalization of research data of modern domestic and foreign scientists on the importance of educational organizations in the formation and development of the innovation ecosystem of the city, region, country, the hypothesis that the qualitative and quantitative composition of educational institutions affects the level of economic and social development of the region was formulated. The main aspects of competence, environment, ecosystem approaches in the formation of an innovative ecosystem of the region are considered. The principles of managing the development of the region's innovation ecosystem on the basis of close interaction with educational institutions and expanding the spheres and forms of such integration are highlighted. Data from empirical studies of ecosystem efficiency of several Russian regions with different levels of socio-economic development are presented. Correlation analysis of efficiency of ecosystems in the region, quantitative and qualitative composition of educational institutions and the degree of their interaction with other social institutions was carried out. We note that the leading role in the formation of the region's innovation ecosystem is played by higher educational institutions that, in addition to educational activities, carry out research work, which involves specialists, teachers, students and representatives of other social institutions. This fact contributes to the integration of educational organizations into the core of the innovation ecosystem and socio-economic infrastructure of the region.

Keywords: *innovative development, regional ecosystem, educational institutions, transformation of education, environmental and ecosystem approaches to socio-economic development*

1. INTRODUCTION

In today's world, the number of regional infrastructure components is growing rapidly. New spheres of activity are emerging, productions are expanding, business projects are being developed, etc. Meanwhile, as current research shows, the effectiveness of such processes is often inadequate. This is indicated by uneven economic growth indicators and an increase in the number of social and economic difficulties in a number of Russian regions. This is largely due to the disconnect and incoherence between the education and science, research and development sector on the one hand, and the economic sector on the other. At the same time, the haphazard nature of city, town or district infrastructure development, institutional weakness and uncertainty lead to insufficient interaction between science, economy and industry. In this regard, the theory of innovation ecosystems, based on the evolving links and close interaction between the subjects of economy, science, industry, management, as well as updating the model of their relations with the external environment [1] is becoming increasingly relevant.

The society developing in the conditions of the new socio-economic reality needs enterprising people capable of reflection, self-regulation, self-construction of the vector of own development and self-realization in the society. The development of new technologies is changing people's whole way of life: it requires mobility, flexibility, the ability to work in a team and make balanced, informed, constructive decisions. In this regard, modern authors increasingly argue the existence of the dependence of socio-economic progress of society on the level of knowledge and people's ability to apply it in practice.

Consequently, there is an assumption that the presence and degree of development of a network of educational institutions has a significant positive impact on the economic development of the region. Meanwhile, the nature and degree of influence of educational institutions of different types (schools, institutions of secondary vocational education, higher education institutions, etc.) in the formation of the region's innovation ecosystem remains insufficiently studied.

Thus, we highlighted the main problem of the study, which consists in the need to resolve the contradiction: on the one hand, there is no doubt about the high degree of influence of educational institutions on the formation of the region's

innovation ecosystem; on the other hand, the specificity of influence of educational institutions of different level and specialization, as well as the degree of dependence of the innovation ecosystem of the region on the number of educational institutions is insufficiently described.

2. MATERIALS AND METHODS

The goal of our study was to establish the role of educational institutions of different types in the formation of innovation ecosystem of the region, which can become the basis for the development of effective mechanisms of interaction between the economy and education, as well as improving the management system of these components of the ecosystem.

In order to achieve this goal, we outlined the objectives of the study:

- to describe existing theories, concepts and strategies for regional ecosystem development;
- to carry out a correlation analysis of the relationship between the number and academic level of educational institutions and the level of development of the region's ecosystem;
- to substantiate the place and role of educational institutions of different types in the formation of the region's innovation ecosystem.

The methodological basis of the study consists of the works of foreign and Russian authors on the topic of formation of innovation ecosystems of the region (H.W. Chesbrough, J. Cornford, S. Davenport, Gamidullaeva, I. Mcloughlin, Y. Mcnicoll, O.I. Babina, Yu. Lazarenko, N.V. Smorodinskaya, etc.) and the role of educational institutions in the formation of such an ecosystem (J. Chataway, E. Erdil, J.J. Ferreira, D. Meissner, A.A. Fedorov et al.).

Research Methods:

- theoretical analysis of domestic and foreign scientific literature on the topic;
- analysis of official statistics on regional economic development;
- methods of mathematical statistics.

The indicators of average per capita income of citizens and gross domestic product were taken as criteria for the effectiveness of the ecosystem. The

number of educational institutions and the number of students in them is used as a comparable indicator.

Possible methodological limitations are associated with the inability to cover within the framework of one study full statistics for all regions, as well as to compare individual differences in the directions and specifics of economic development factors other than education and science, influencing the performance indicators.

3. RESULTS

Within the framework of the ecosystem approach, the positions of a number of scientists, who consider the ecosystem of the region as a complex, multi-level system, within which a complex of narrow ecosystems (education, culture, politics, economy, industry, etc.) function, should be noted. The educational ecosystem is understood as a self-organizing, self-developing, self-regulating adaptive environment.

An ecosystem, as generally understood, is an integral natural complex formed by living organisms and non-living nature, within which there are stable interrelationships.

In this case, our study uses the term “ecosystem of the region” implying the set of interrelated industrial, socio-cultural, natural, scientific and educational communities, between which dynamic relationships are established [2-4].

It should be noted that the modern development of society is focused on creating an effective innovation ecosystem that builds the basis for the transformation of all spheres of life, allowing the business community to stimulate innovative development of industries and businesses providing strategic flexibility of regions in the long term. Stable and constructively organized ecosystem not only ensures economic growth of the city, region and country, but also increases their prestige and international image.

As Yu. Lazarenko notes, the model of building an effective ecosystem depends largely on the specifics of the region, its economic development, social policy, development of culture, education, medicine, legal framework, etc. Meanwhile, experts in the field of socio-economic development distinguish a number of basic principles aimed at the innovative development of the regional ecosystem. Among them:

- dynamism of the ecosystem, which implies periodic review of political and economic

approaches to development of the region;

- The uniqueness of each ecosystem, necessitating the consideration of local and national factors;
- The need for an integrated approach to ecosystem building;
- ensuring transparency and communication within the ecosystem [2].

The basis of socio-economic transformations is the desire to achieve sustainable development of society and increase the competitiveness of an individual and a specialist [3]. Technological innovations, the dynamics of transformation in economy and industry, automation, globalization and digitalization, ecologization and network-centric society necessitate expansion and innovative transformation in education. At the same time, in the process of “lifelong learning”, taken as the basis of modern concepts of society development, an individual is included in cultural relations and acquires the experience of independent, innovative socio-cultural activity [4].

Foreign authors note that the priority direction in the transformation of educational institutions today becomes “environment-oriented learning”, which includes the totality and interaction of social, informational, subject and system components [5]. At the same time, the ecosystem approach to education develops the ability to learn and relearn, to adapt to different situations, to make creative decisions in dynamically changing conditions. And practical orientation allows an individual to develop as a professional, increasing the level of development of basic competencies in joint activities with others. Schoolchildren and students learn from masters of a particular profession, implement innovative projects, work in teams, participate in conferences, games, quests, research activities, do what they love, learn to come up with new technical and technological solutions both inside and outside educational institutions.

Thus, the educational ecosystem aims to develop students' meta-competencies required in the new post-industrial economy. Under the conditions of such ecosystem the social and cultural integration of schoolchildren and students into the system of object-spatial, architectural and natural environment, forming a set of necessary specific professional, general professional, personal, social and existential competences takes place [6].

It should be noted that targeted partnerships,

long-term collaborative relationships and effective networking, cross-sectoral interactions create the necessary flow of resources within the region's ecosystem.

Modern ecosystems are complex, multifaceted adaptive systems that include information, production, economic, cultural, educational infrastructure, tools and media, consumers, organizers and management structures [7]. Information and resource flows are constantly moving and transforming, and communications of various kinds are taking place.

As noted by contemporary researchers, it is important to adhere to the modular principle of ecosystem design in order to respond flexibly to the emerging needs of the population and society for automation, modernization, adaptation of a particular component or the system as a whole [8].

In the framework of the theory of renewal of ecosystems of the region "the flow of knowledge creates a landscape of knowledge, which is a space of open access with a large number of databases of scientific ideas" [9]. In other words, modern enterprises and businesses need "innovation intermediaries" whose tasks include developing and implementing some kind of science-based framework that uses the absorption potential of companies to realize scientific and technological knowledge. The main purpose of such organizations is to establish links between different fields of knowledge and to create a mechanism for their implementation by other socio-economic institutions. Thus, the role of educational institutions (as carriers and transmitters of the knowledge system), government agencies (as coordinators of interaction between science and economy), representatives of business and industry (as main implementers) of innovative developments and scientific ideas becomes obvious [10].

N.V. Derina notes that, to date, universities and other institutions of higher professional education have been given a key role in implementing an environmental and ecosystem approach to societal development. First of all, they contribute to the creation of conditions that increase the competitiveness of enterprises, territories and regions [11]. The practical orientation of educational institutions involves the transformation of innovative ideas into a final product or service. At the same time, effective enforcement of this principle implies the involvement of multiple structures: universities, scientific and research centers, entrepreneurs, industrial and business entities, government

organizations, investment funds, etc. Under such cooperation, a mechanism is implemented that allows ecosystem participants to timely and adequately respond to external and internal changes. This mechanism is based on multiple horizontal linkages in the form of science centers, startup schools, innovation platforms, etc.

Technological, social and environmental transformations of society caused by the processes of digitalization and globalization inevitably entail modernization of the education system, which implies not only updating the content and forms of shaping knowledge and worldviews, but also shifting priorities in defining the very role and place of educational institutions.

To date, the factors that have increased the importance of educational and scientific institutions in the process of socio-economic development of the country and regions are:

- institutional association of education, management and business;
- blurring of boundaries between educational institutions and venture practices;
- transition to competency-based approach and "lifelong learning" strategy;
- strengthening the practical orientation of education;
- globalization and cultural integration, on the one hand, and global catastrophes and epidemics on the other;
- network-centric business management models that contributed to the generation of the concept of "innovation ecosystem".

In these circumstances, the environmental approach in economics and education is of paramount importance. The new information environment provokes significant transformations in lifestyles, activities, attitudes, target orientations and values of people. In this regard, the innovative environment of modern educational institutions is developing based on the search for alternative sources and ways of obtaining knowledge, integration with business, science, family and other social institutions. Such an environment acquires the features of an ecosystem, in which each of its participants gets an opportunity to choose a comfortable, highly effective, environmental-friendly educational and professional niche.

Based on the transformation of the concept of ecosystem as a natural complex, sustainable unity of

living and non-living objects in one territory, connected by the transfer of substances and energy and independently regulating all processes, taking into account its adaptation to social life and development of human community, the main features of the innovative ecosystem of the region can be identified:

- versatility and multicomponency;
- independence;
- a high degree of adaptive capacity;
- networking;
- the availability of development opportunities for everyone and for the development of collective intelligence;
- mutual enrichment and mutual development of the environment and its subjects;
- self-organization and self-regulation [12].

Each ecosystem component must contribute to sustainable resource use by reducing inappropriate information and resource release into the environment of human life and activity. In this aspect, it is important to consider the capacity of educational institutions to ensure coherence and productive development of the regional ecosystem.

It should be noted that at the present stage of society development there is a tendency to expand the range of activities in production, services, management, science, etc. Effective development of society can only be achieved by simultaneously increasing the diversity of educational institutions – in accordance with the demands of the population, economy, politics, as well as trends in global integration and cooperation.

On this basis, and also taking into account the criteria underlying the assessment of regional economic development by other authors [13, 14], we have identified the main indicators of regional economic development and analyzed the relationship between these indicators and the presence of extended infrastructure of educational institutions.

The main indicators of regional ecosystem performance were identified as:

- 1) Population (N). This indicator characterizes the demographic situation in the region and the level of availability of human resources for the development of various sectors of the economy, industry and science.
- 2) Average annual number of employees (Nemp). The number of employed people reflects the

availability of jobs, which in turn indicates the level of development and branching of different sectors of the regional economy.

- 3) Average per capita cash income (per month) (APCCI). The level of income of citizens in the region is primarily influenced by the level of stability of economic development of the region, availability of profitable industries, developed financial-economic and managerial structures.
- 4) Gross Regional Product (GRP) reflects the value of all goods and services produced in a particular region. It also shows the degree of competitiveness and resilience of enterprises, which allows to make conclusions about the level of economic development of the region.
- 5) Fixed assets in the region's economy (FA). Development of the economic sector in the modern world requires constant investment, including in new developments and research. In this regard, the presence of this component reflects the prospects of development of the region in various spheres of the economy.

The selected criteria taken together provide a fairly complete picture of the region's ecosystem development. At the same time, these indicators correlate with the evaluation criteria used by other authors and are the main elements of statistical studies carried out at the level of regions and the country as a whole [9, 14, 15].

As a study base, developed regions were chosen (Moscow, St. Petersburg, Moscow Oblast, Leningrad Oblast) and regions with lower economic development (Rostov Oblast, Smolensk Oblast, Vologda Oblasts and Krasnodar Krai). The main indicators of the economic development of the regions and the number of educational institutions (EI) of different levels (higher educational institutions, institutions of secondary vocational education, general education institutions) are presented in *Table 1*.

Generalization of data on economic development indicators allowed to establish the level of development of ecosystems in the regions. The leading positions by all criteria are occupied by Moscow followed by the Moscow Region, then goes St. Petersburg. In fourth place by different parameters are the Krasnodar Krai and Rostov Oblast. Whereas the Leningrad and Smolensk Oblasts have significantly lower indicators, and the Vologda Oblast is in last place by all criteria (*Figure 1*).

Table 1. Indicators of the economic development of regions and the number of educational institutions

Region	Area of the Territory, thousands sq. km	N, thousands of people.	Nemp, thousands of people.	APCCI, rub.	GRP, mln. rub.	FA, mln. rub.	Number of HEIs	Number of VET Institutions	Number of GE Institutions	Total EI
Moscow	2.6	12678	8875	74053	17881516	70029739	203	106	808	1117
Saint-Petersburg	0.4	5398	3182	47169	4193489	20604504	76	83	767	926
Moscow Oblast	44.3	7690	3437	47201	4201768	23768046	34	82	1512	1628
Leningrad Oblast	83.9	1876	738	32306	1104436	5112820	4	29	385	418
Krasnodar Krai	75.5	5675	2623	35673	2344621	13982416	28	113	1243	1384
Rostov Oblast	101.0	4197	919	30752	14462227	6831010	18	120	1169	1307
Vologda Oblast	145.0	1161	521	28334	582630	2824173	4	35	349	388
Smolensk Oblast	50.0	935	411	27388	312857	1063572	7	29	379	415

Source: [15]

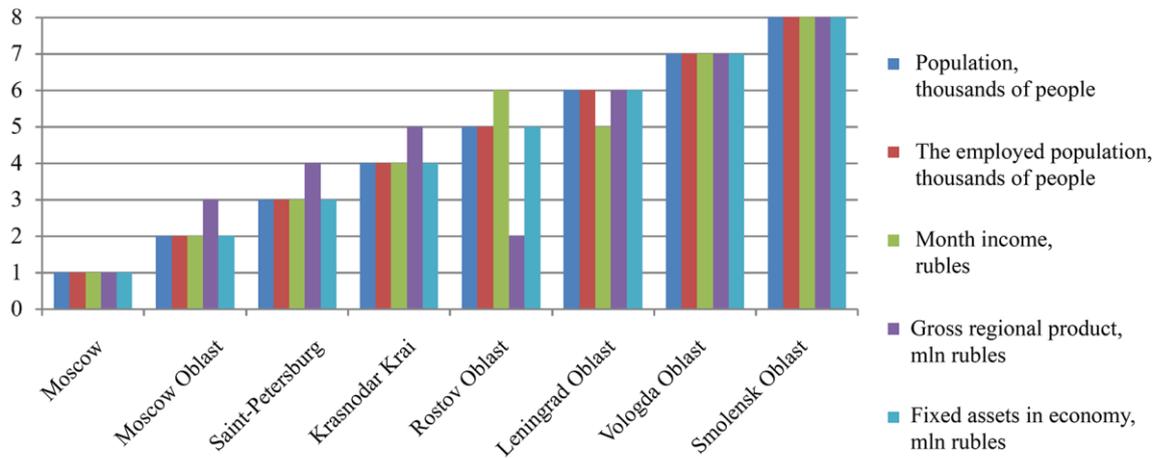


Figure 1. Distribution of regions' positions by the level of ecosystems development

Source: Compiled by the authors on the basis of the data [15]

In order to identify the role of educational institutions in the region in the formation of the ecosystem, we analyzed the data on the number of educational institutions in the regions under study. It

has been established that Moscow and Leningrad oblasts, Moscow and St. Petersburg have a significantly greater number of educational institutions than other regions (Figure 2).

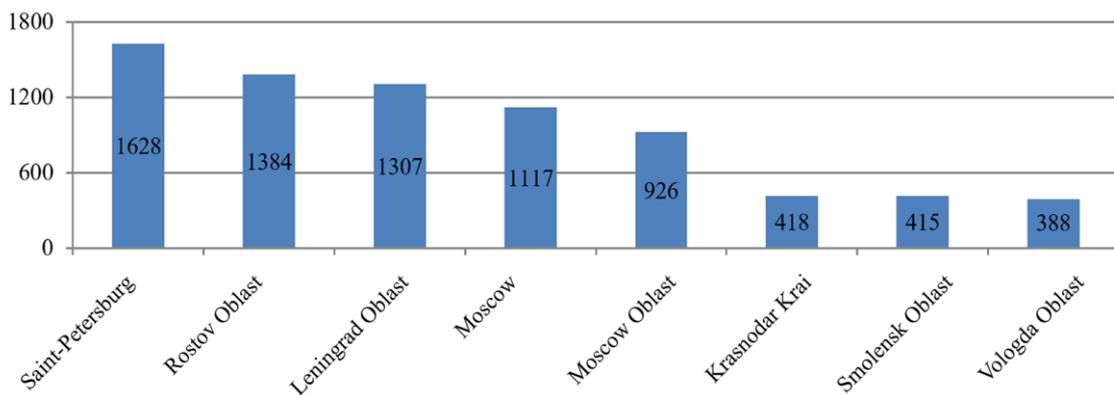


Figure 2. Ranking of regions by the number of educational institutions

Source: Compiled by the authors on the basis of the data [15]

Meanwhile, the conducted correlation analysis showed no significant correlations between economic development and the number of educational institutions, while the dependence on the number of HEIs is direct and significant (*Table 2*).

Table 2. Correlation analysis data

Indicator	Economic Efficiency	Number of HEIs	Total Number of Educational Institutions
Economic Efficiency	1		
Number of HEIs	0.96838	1	
Total Number of Educational Institutions	0.317622	0.15356	1

Source: Compiled by the authors

The data obtained allow us to conclude that the education system does play a significant role in the development of the region's ecosystem. At the same time, higher educational institutions have a special influence, the system of secondary vocational education is somewhat less important, and educational schools and pre-school educational institutions have even less influence. Thus, the efficiency of a region's ecosystem depends not so much on the developed infrastructure of the educational system as on the share of HEIs in it. This fact can be explained from the perspective of research and development activities carried out by higher education institutions, which, in turn, contributes to the implementation of scientific developments and innovations in industry, production and other areas of life in the region. Besides, as a rule, the orientation of HEIs in each city/town, district and regional center corresponds to the leading directions of economic development of this region, which determines close interaction of the sphere of economy and production and the sphere of scientific and educational activity.

4. DISCUSSION

During the practical analysis and comparison of development statistics of individual Russian regions, we have identified a certain correlation between the level of education system development, the number of educational institutions and the nature of economic development of the region.

The data obtained are in general agreement with the theoretical grounds presented in the works of J.J. Ferreira, Yu. Lazarenko, O. Garafonova, V. Marshasova and other researchers. At the same time, the analysis of the role of educational

institutions of different types and levels confirms the leading role of universities in the development of the region's ecosystem, which has been identified in the works of N.V. Derina, L.I. Savva, E.I. Rabin and a number of other scholars.

The most significant correlations of the development of the educational infrastructure and the effectiveness of the region's ecosystem were in Moscow and St. Petersburg, which may indicate the significance of the high density and concentration of universities of different focus within the data of regional centers. At the same time, the number of institutions sharply decreases with the distance from the center, which is reflected in the performance indicators of the region (oblast) ecosystems as a whole. Thus, we can conclude about the need to reorganize the structure of HEIs in the regions in the direction of increasing the number and role of educational institutions away from the center.

Meanwhile, it should be noted that the study revealed an uneven distribution of the level of economic development of the regions by different indicators. At the same time, in some cities/towns and districts with a small number of HEIs one or several areas of economy are sufficiently developed. This fact requires additional research from the perspective of coordinating the directions and strategies of economic development and modernization of the educational system in the region.

5. CONCLUSION

The analysis allows us to conclude that the effective development of ecosystems is significantly influenced by the quantitative and qualitative composition of higher educational institutions. This is due to the orientation of HEIs towards cooperation with enterprises of economic and social sector, as well as the development of educational institutions of this type in accordance with the needs and trends of economic development of society. Consequently, the place and role of HEIs in the ecosystem of the region can be defined as system-forming, since it is through the institutions of science and education that the intermediary link between the system of knowledge, information flows and their implementation in the professional world and the socio-economic sphere takes place. The data obtained correlate with the results of the studies of modern scientists [3, 4, 8], which can serve as a proof of the validity of the assumptions made and provides a basis for more profound and extended research in this direction.

Ecosystem of the region creates necessary conditions for transformation of all components of life activity into competitive environment in national and international space. At the same time, the creation of such an ecosystem requires the processes of modernization of production, socio-economic, political, educational, scientific and innovation processes. Such transformations are possible only in the presence of global, controlled information flows, the system of formation and translation of knowledge and world experience, the implementation of this experience in the practice of professional, social, political, cultural life. In this regard, the issues of improving the quality of education, strengthening the role of educational institutions in the sustainable development of the region and the country become relevant.

In the course of the work, in accordance with the goal and objectives of the study, the essence and functions of the ecosystem of the region were revealed, the principles of interaction between its components were determined, and the role of educational institutions in the formation and modernization of ecosystems was established. The conducted research allowed us to confirm the high impact of a well-developed educational infrastructure on improving the efficiency and competitiveness of the region's ecosystem. The results obtained can be used in the design of ecosystems of the city/town, district, region as a whole and modernization of the system of educational institutions.

AUTHORS' CONTRIBUTIONS

The authors made an equal contribution to the study: collection and analysis of material; definition of goals and objectives, research methods; formulation and scientific substantiation of conclusions, registration of key research results in the form of an article.

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