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CURRENT STATE OF UNIVERSITY INNOVATIVE INFRASTRUCTURE OBJECTS IN RUSSIAN FEDERATION

The paper presents the results of complex research on university innovative infrastructure objects in Russian Federation. The most successful operating practices have been selected according to the developed system of indicators, which can become a basis for management of similar structures in Russia and abroad.

Keywords: *innovative infrastructure; science and technology park; university; innovation; clustering; business services.*

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СУЧАСНИЙ СТАН ОБ'ЄКТІВ УНІВЕРСИТЕТСЬКОЇ ІННОВАЦІЙНОЇ ІНФРАСТРУКТУРИ В РОСІЙСЬКІЙ ФЕДЕРАЦІЇ

У статті наведено результати комплексного дослідження університетських об'єктів інноваційної інфраструктури в Російській Федерації. Відповідно до розробленої системи показників виділено найбільш успішні з існуючих структур. В результаті дослідження виявлено кращі практики створення і розвитку інноваційної інфраструктури університетів, які можуть стати основою для управління подібними структурами в Росії та за кордоном.

Ключові слова: *інноваційна інфраструктура; технопарк; університет; інновації; кластеризація; бізнес-послуги.*

Рис. 6. Табл. 1. Літ. 10.

Анна А. Мальцева, Михаил Л. Мишарин

СОВРЕМЕННОЕ СОСТОЯНИЕ ОБЪЕКТОВ УНИВЕРСИТЕТСКОЙ ИННОВАЦИОННОЙ ИНФРАСТРУКТУРЫ В РОССИЙСКОЙ ФЕДЕРАЦИИ

В статье приведены результаты комплексного исследования университетских объектов инновационной инфраструктуры в Российской Федерации. В соответствии с разработанной системой показателей выделены наиболее успешные из существующих структур. В результате исследования выявлены лучшие практики создания и развития инновационной инфраструктуры университетов, которые могут стать основой для управления подобными структурами в России и за рубежом.

Ключевые слова: *инновационная инфраструктура; технопарк; университет; инновации; кластеризация; бизнес-услуги.*

Problem statement. The possibility for creation of new mechanisms for financial stimulation of regions to solve that problem at the federal level was announced in the Message of the President of Russian Federation to the Federal Assembly on December 12, 2013.

For commercialization of research and development the universities create integrated objects of innovative infrastructure (science parks, technology parks, business incubators, innovative and technological centers etc.) and their elements (transfer technologies centers, centers for commercialization of developments, centers of col-

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lective using of hi-tech equipment, engineering centers, prototyping centers etc.) (Maltseva et al., 2013).

There is no uniform terminology of main types of innovative infrastructure objects and their distinctions, the reason lies in the absence of federal laws regulating creation and functioning of such objects in Russian Federation (Monakhov and Dorofeyeva, 2013).

At present, the official statistics doesn't keep records of units of innovative infrastructure and this situation complicates the analysis of the specified problem within the region and the country in general.

Recent research and publications analysis. Creation and development of science and technological structures of various type are considered in the works by E.A. Lurye's (2013), R. Mainer's (2009), V. Malinin's and V. Tishkin (2011), A. Kharin's et al. (2009), A. Shchegolev's (2009) and others. All of them have noted the insufficient attention to monitoring of university innovative infrastructure objects.

University innovative infrastructure is created according to the Government resolution No. 219. The Federal public budgetary scientific institution "Research Institute – Republican Research Scientific Advice Centre of Examination" carries out the monitoring of this process only in 78 higher education institutions that does not provide the full-scale statistical supervision over the development of all innovative organizations subordinated to the Ministry of Education and Science in Russia.

There is the National center for monitoring of innovative infrastructure of scientific and technical activity and regional innovative systems in the structure of this Institute (their official site is www.miiris.ru) which has general information on all registered organizations in its list. At the same time the center doesn't study neither the contents, nor the key indicators of innovative infrastructure objects' activity.

Since 1998 the Tver InnoCenter under the direction of E.A. Lurye (2013) monitored university science and technology parks and as a result the Catalogue of university science and technology parks had been published. It was the first study of this kind in Russian Federation. Using the previously developed method to study of the dynamics of these structures in 2011 a new monitoring of university science and technology parks was fulfilled and the second issue the Catalogue of university science and technology parks has been prepared (Belotserkovski and Kaplunov, 2013).

Research objectives. Research objective is the identification of the key trends in the development of university innovative infrastructure objects in Russian Federation at the present stage.

Key research findings. A questionnaire has been developed for this research; it contained the following questions:

- general information on science and technology park;
- research and production specialization of residents of science and technology park;
- competitive production of science and technology park;
- types of services, service forms;
- innovative infrastructure formed on the basis of science and technology parks within the university environment;
- dynamics of the development of science and technology park;
- key indicators of the development of science and technology park.

The questionnaire was sent to the universities of Russian Federation and on the basis of the answers received from the respondents 100 best objects of innovative infrastructure of universities were allocated.

Distribution of science and technology parks in the federal districts of Russia is presented in Figure 1.

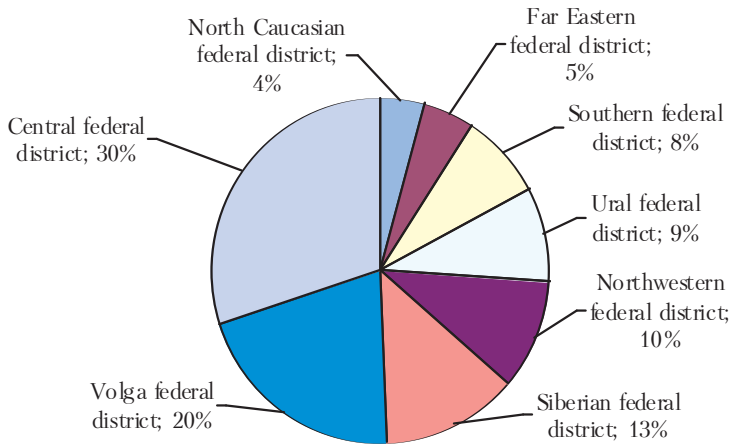

Figure 1. **Number of university science and technology parks in the Federal districts of Russia,** *% in total number* (Tver State University, 2013)

The presented data show that the overwhelming number of science and technology parks is created in Central and Volga federal districts (31% and 20% of the total number accordingly). Science and technology parks in Siberian, Northwest and Southern federal districts (13%, 10% and 8% accordingly) are created and developed. Science and technology parks in the Far East and North Caucasian federal districts are presented to a smaller extent (5% and 4% respectively).

From the position of organizational and legal results of the analysis the following conclusions may be done: at higher school science and technology parks are formed and developed as structural divisions; business incubators and innovative and technological centers form a separate group in university innovative infrastructure.

Recently the technology park complexes began to form; they provide a wide list of different innovative services and unite some innovative structures of various type.

The most important direction in the analysis is classification of science and technological parks depending on their research and production specialization (Figure 2).

The data analysis allows making the following conclusion: primary activity of university science and technology parks is the information and computer technologies (54%), that is explained by a short payback period of such projects and rather small investments. The greater part belongs to energy (43%), ecology and natural resources (41%) as the priority directions of science development and innovations in the country.

The analysis of the main organizational and legal forms (Figure 3) which have been used when creating science and technology parks in 1998 and 2012 demonstrates considerable changes in recent years: in 2012 there was an increase in the share of science and technology parks in the form of structural divisions of higher educa-

tion institutions because of the need for full support of science and technology park at the initial stage of its creation and development (75% in 2012 instead of 36% in 1998) but, on the contrary, the number of science and technology parks in the form of non-profit organizations and joint-stock companies was reduced from 13% instead of 29% and 12% instead of 33% accordingly.

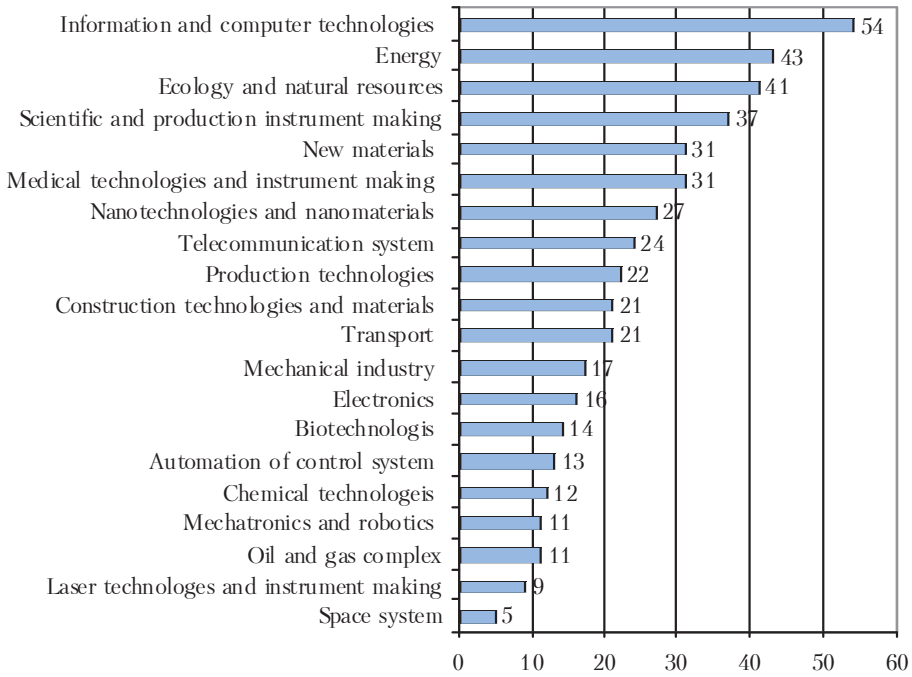

Figure 2. **Number of university science and technology parks by their research and production specialization,** *% in the total number* (Misharin et al., 2013)

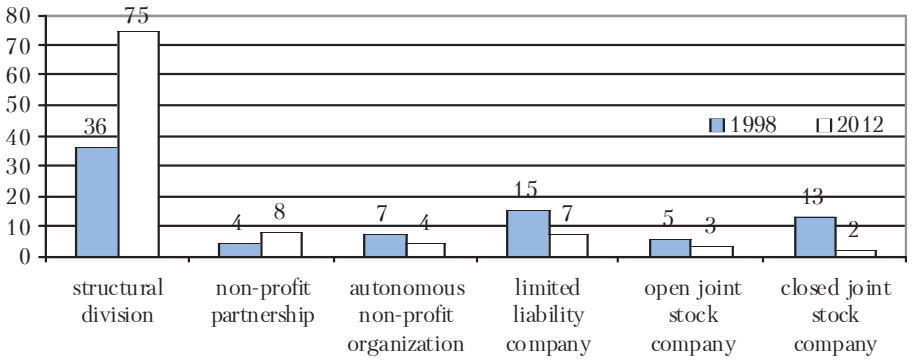

Figure 3. **Organizational and legal forms of university science and technology parks in 1998 and 2012,** *% in the total number, designed by the authors*

Indicators allow estimating the efficiency and scale of activity of science and technology park, its contribution to the development of economy and innovative system in the region.

The first group: volume of innovative activity; the number of samples of new hi-tech products presented for realization at domestic and foreign markets; data on innovative projects that are ready for development under certain conditions; the volume of scientific and technical, information and other types of services provided to small innovative firms and creative staff of science and technology parks.

The second group: small innovative enterprises and services sector firms.

The third group: buildings, industrial premises, offices at various conditions reserved for science and technology parks to perform their main functions; creation of new jobs reflects the efficiency of every park.

The fourth group: volume of funds attracted from various sources for the solution of innovative tasks. It confirms the recognition of science and technology park as a business partner, achievements in realization of new competitive, best-selling production, mastering managers of science and technology parks and directors of small firms with economic mechanisms of innovative activity in the market economy.

A rating score of science and technology parks is presented in Table 1 (first 5 places for each indicator).

Table 1. **Rating score of the university science and technology parks** (Tver State University, 2013)

Indicator	*Science and technology park (the volume indicator)*
Volume of innovative activity	1. Moscow State University Science park (5000000 ths RUB). 2. "Stavtechnopark" SKFU (3812967 ths RUB). 3. Students' business incubator "Druzhba" TUSUR (2000000 ths RUB). 4. "Technopark MAI" (1480000 ths RUB) 5. "Sokolinaya Gora" MSTU MIREA (1450461 ths RUB).
Number of produced samples of high-tech products	1. "Orel-Technology park" State University-UNPK (220). 2. ITC "Intech-Don" YURGUES (120). 3. "Stroitel" KazGASU (102). 4. "Taganrog" TTI YUFU (100). 5. "Technopark YUZGU" (85).
Number of innovative projects presented for development	1. Technology park complex NIU VSHE (116). 2. Technology park complex MGTU "STANKIN" (101). 3. "Technology park YUZGU" (85). 4. ITC BGTU named after V.G. Shukhov (84). 5. Technological business incubator TPU (77).
Number of jobs	1. Moscow State University scientific park (2500). 2. ITC "Intech-Don" YURGUES (1000). 3. Students' business incubator "Druzhba" TUSUR (700). 4. Technology park in Moskvorechie MIFI (400). 5. "IntelNedra" UGGU (380).
Number of small innovative enterprises	1. Zelenogradsky ITC MIET (69). 2. ITC BGTU named after V.G. Shukhov (67). 3. Technology park complex NIU VSHE (66). 4. "Technology park KNITU" (65). 5. Moscow State University Science park (53).
Number of firms in the services sector	1. Technology park MAI (56). 2. Technology park complex NIU VSHE (18). 3. Technology park KNITU (16). 4. Technology park KGTU (16). 5. Daltechnopark DVFU (15).
Office and industrial premises, sq. m	1. Technology park MAI (235000 sq.m). 2. Technology park ERAvia RGATU named after P.A. Soloviev (60997 sq. m). 3. Orel Technology Park State University – UNPK (43210 sq. m). 4. Technology Park MAMI (32824 sq. m). 5. "IntelNedra" UGGU (30000 sq. m).

Continuation of *Table 1*

Indicator	*Science and technology park (the volume indicator)*
Amount of attracted funds	1. Technology park complex MGTU "STANKIN" (1101307 ths RUB). 2. Technology Park MAI (913500 ths RUB). 3. Moscow State University Science park (413800 ths RUB). 4. Technology park SPbNIU ITMO (350000 ths RUB). 5. Orel-Technology Park of State University – UNPK (294400 ths RUB).
Volume of services provided	1. Technology Park Complex SPbGAU (267000 ths RUB). 2. Technology Park AGTU (99540 ths RUB). 3. Moscow State University Science Park (75968 ths RUB). 4. Technology Park GGNTU (48000 ths RUB). 5. Technology Park ZabGU (42000 ths RUB).

Among other indicators used in monitoring are the level of international cooperation and foreign economic relations; extent of influence on the development of small science-intensive sector of region's economy; development of telecommunication networks; forms of participation in educational process and attracting students to innovative tasks' solution; the achieved level of intellectual property protection; number of publications on a problem; participation in regional, all-Russian and international exhibitions, competitions and contest regarding new products development etc.

Another important component is the formation of business services companies to create the most favorable conditions for development and mastering high technology products at all stages: from new idea to its introduction at domestic and international markets.

In the structure of business services 3 groups are selected: organizational, consulting and technological.

Organizational services: organizational and innovative management, support of residents' innovative projects, advertizing, office services, project expertise, training of heads of small firms and managers in the fields of innovative projects management and mechanisms for technology transfer.

Technological services: evaluation of markets, using unique scientific equipment, the mechanism and conditions for entering international markets of science intensive products, certification and other services.

Consulting services: financial management (including risk financing), investment planning, insurance of projects, services in the field of leasing and logistics, cooperation of residents in production of new products etc.

Figure 4 shows considerable differentiation of business services, provided by science and technology parks.

The most widespread types of services are the traditional parks functions: incubation of small firms (93%), commercialization and technology transfer (87%), intellectual property management (82%); the share of services in organization of conferences, seminars and business meetings (more than 93%). Organizational and technological services are widely presented: PR (79%), business planning (77%), services in the sphere of ICT and the Internet (72%), organizational management (67%), evaluation of markets (66%), technological management (55%), office services (55%). Such services as logistics (11%), consultations on financing (10%) and leasing services (6%) are not well presented.

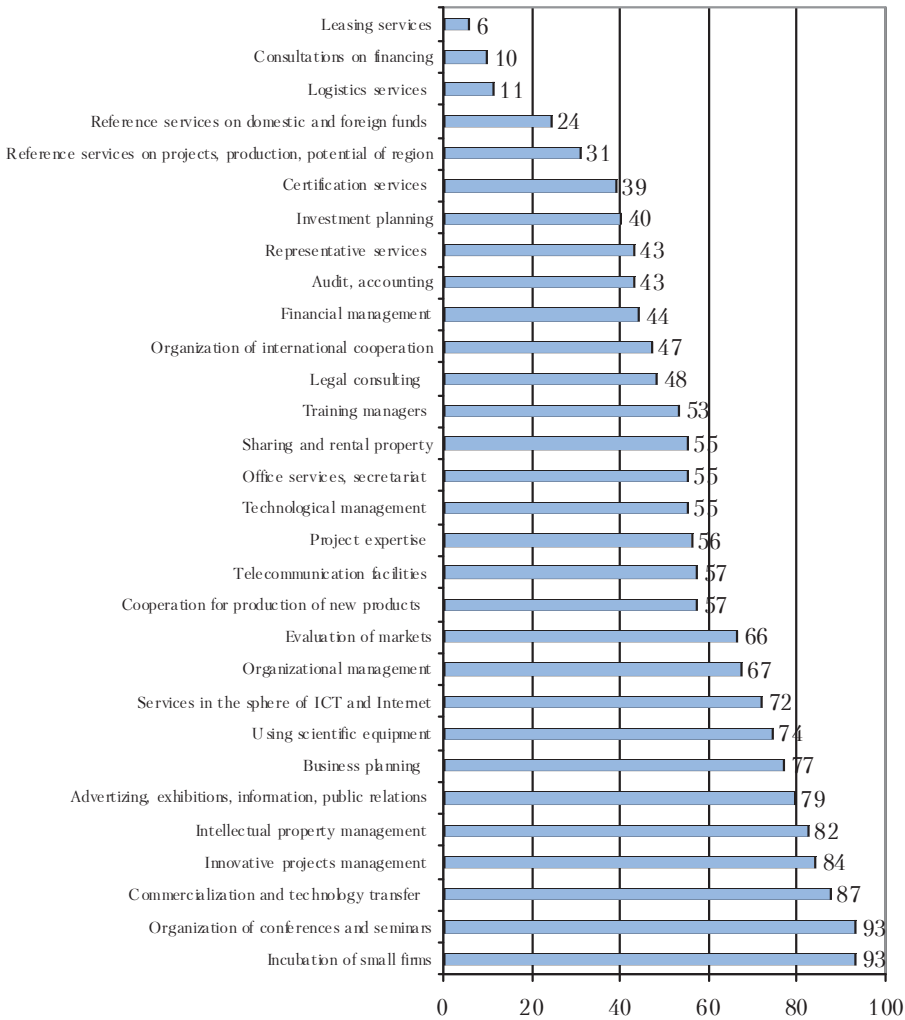

Figure 4. **Structure of business services provision in university science and technology parks,** *% in the total number* (Misharin et al., 2013)

Usually traditional divisions of science and technology parks are the following ones (Figure 5): incubators of new firms and projects (83%), centers of technology transfer and commercialization (77%), students' business incubators (75%) and centers for protection of intellectual property (71%). Technological incubators (53%), educational centers for innovative management (53%) and consulting centers (52%) are not so widely spread in science and technological parks.

Some science and technology parks have branches (4%), regional innovative centers (4%) and leasing centers (3%).

For the purposes of objects classification within the university innovative infrastructure on the basis of the studied quantitative indicators clustering into 3 groups was carried out by means of SPSS.

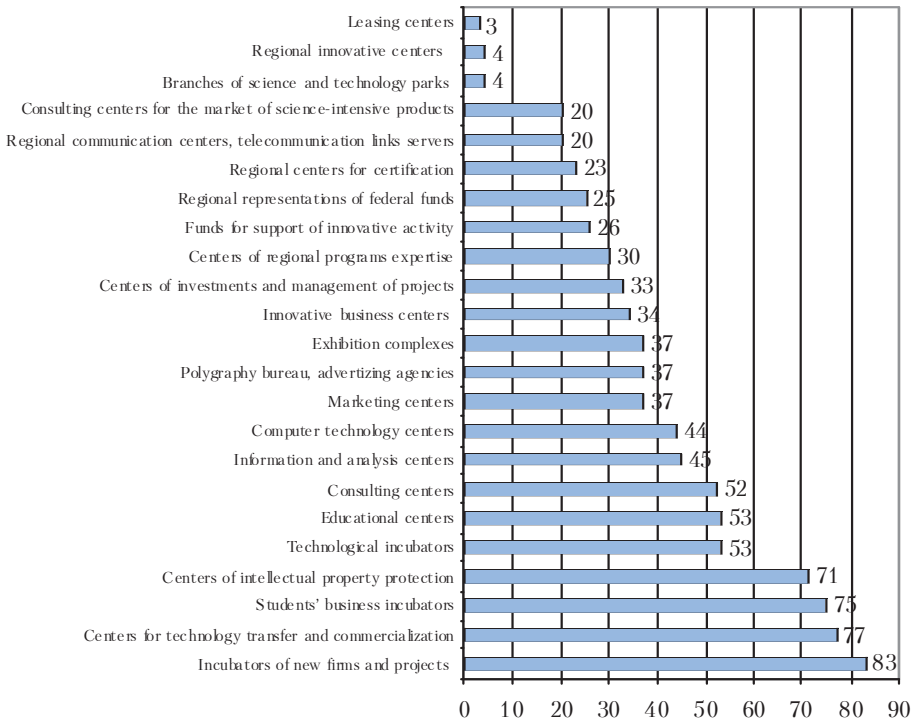

Figure 5. **Infrastructure of university science and technology parks,** *% in the total number, designed by the authors*

Base-relief measure of connectivity and separate clusters was 0.6 and the quality of clustering was defined as good. The most important indicators in the framework of clustering program allocated the amount of attracted funds from various sources, the number of small innovative enterprises, production and readiness for implementation of science intensive products.

The scatter plot of objects of innovation infrastructure shown in Figure 6, provides a graphical interpretation of the research results and allows locating each structure in two-dimensional space. It is determined by a system of indicators characterizing efficiency of residents' activity and the efficiency of innovative infrastructure object management.

In accordance with the results of clustering investigated objects of innovation infrastructure were divided into highly developed (5%), developed (19%) and developing (76%).

Among highly developed, based on the results of data processing the following ones were identified as objects of innovation infrastructure: Lomonosov Moscow State University, St. Petersburg Agrarian University, Moscow State Technological University "Stankin", National Research University "Moscow Aviation Institute", National Research University "High School of Economy".

The clustering results allow not only defining the place of the object of innovation infrastructure in the aggregate of the surveyed sites but also highlighting the main

directions of efficiency increase on the basis of benchmarking for structures in higher positions.

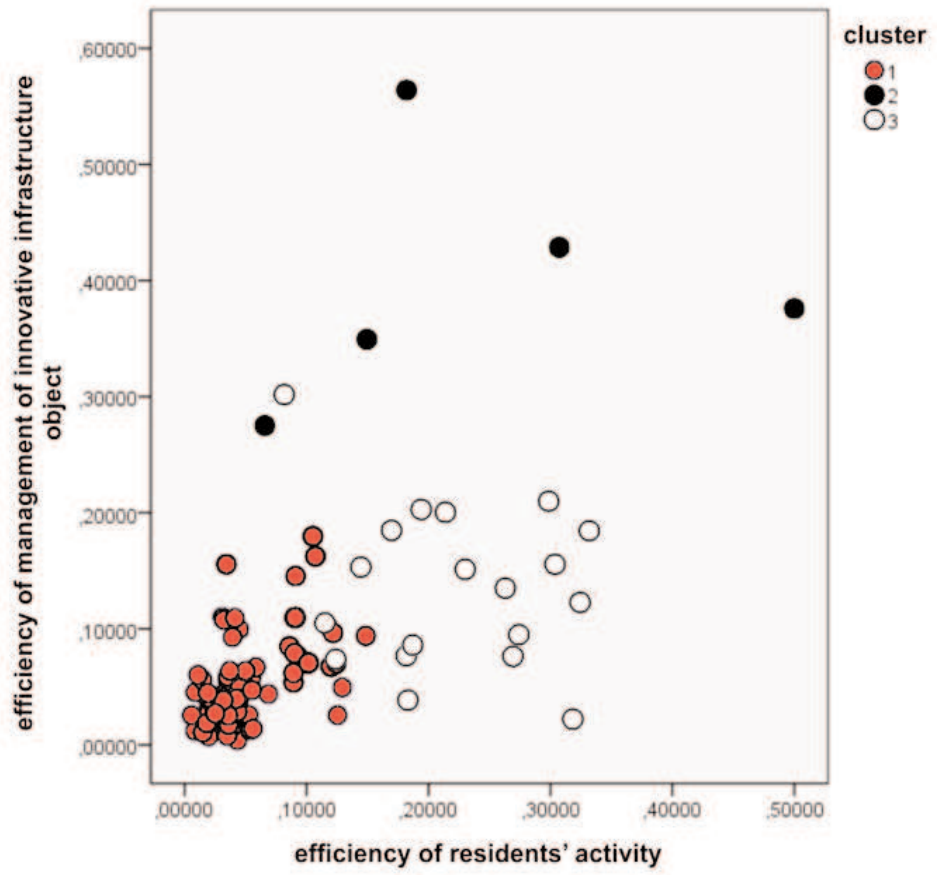

Figure 6. **Results of clustering of object of university innovative infrastructure,** *author's*

Conclusions. The analysis revealed the key trends in the development of the university science and technology parks the Russian Federation at the current stage of development and determined the most effective directions of their activity.

University science and technology parks and structures that were created on their basis become the so-called "generators" of innovative activity development in regions. Among further directions of science and technology parks development and attracting business to their activity actions may be different: development of standards, legal and organizational framework, certification and licensing of their activity. These directions might provide an increase of science and technology parks efficiency and contribute to the purposeful solution of innovative development problems in every region and in the country as a whole.

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