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RUSSIAN TECHNOLOGY PARK STRUCTURES AND THEIR FOREIGN ANALOGUES: THE COMPARATIVE ANALYSIS OF AVERAGE FEATURES*

This paper presents the results of a comprehensive research conducted by the author to identify the key features of technology park structures in Russian Federation and abroad. The conclusions were obtained using the questionnaire and based on the study of official Internet resources and reports of technology parks worldwide. The author discusses the differences in indicators and activity features of technology parks in different countries. The differences identified in the research should be the basis for improving the public policy in the field of innovations as well as benchmarking of effective decisions at the microlevel.

Keywords: technology park; innovative infrastructure; innovation.

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РОСІЙСЬКІ ТЕХНОПАРКОВІ СТРУКТУРИ ТА ЇХ ЗАРУБІЖНІ АНАЛОГИ: ПОРІВНЯЛЬНИЙ АНАЛІЗ СЕРЕДНЬОСТАТИСТИЧНИХ ОСОБЛИВОСТЕЙ

У статті наведено результати комплексного дослідження, проведеного з метою виявлення основних особливостей технопаркових структур у Російській Федерації та за кордоном. Матеріали було отримано з використанням анкетування, на основі вивчення офіційних Інтернет-ресурсів та звітів технопаркових структур. Результати дослідження надають можливість виявити відмінності в показниках і характеристиках діяльності технопаркових структур у різних країнах. Ці відмінності повинні стати основою для розробки напрямків вдосконалення державної політики у сфері інновацій, а також бенчмаркінгу ефективних рішень на мікрорівні.

Ключові слова: технопарк; інноваційна інфраструктура; інновації.

Табл. 1. Літ. 17.

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РОССИЙСКИЕ ТЕХНОПАРКОВЫЕ СТРУКТУРЫ И ИХ ЗАРУБЕЖНЫЕ АНАЛОГИ: КОМПАРАТИВНЫЙ АНАЛИЗ СРЕДНЕСТАТИСТИЧЕСКИХ ОСОБЕННОСТЕЙ

В статье приведены результаты комплексного исследования, проведенного с целью выявления основных особенностей технопарковых структур в Российской Федерации и за рубежом. Материалы были получены с использованием анкетирования, на основе изучения официальных Интернет-ресурсов и отчетов технопарковых структур в мире. Результаты исследования дали возможность выявить различия в показателях и характеристиках деятельности технопарковых структур в разных странах. Эти различия должны стать основой для разработки направлений совершенствования государственной политики в сфере инноваций, а также для бенчмаркинга эффективных решений на микроуровне.

Ключевые слова: технопарк; инновационная инфраструктура; инновации.

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Problem statement. Knowledge-based economy development is becoming the priority direction in the development of contemporary society. The "Strategy-2020" accepted by Russian Federation on 08.12.2011 has put in the forefront the ambitious tasks of achieving the world economic leaders and integrating into the global innovative space that should be ensured with the direct support from the state as the initiator and guarantor of innovative systems development at all levels.

Nowadays keeping and strengthening the position of Russian Federation many researchers and analysts associate with the dominant of innovative socioeconomic development. The leading role in generation and transfer of innovations belongs to the state as the key economic partner which has the ability to form effective environment for all stages of innovation process and results commercialization.

Innovation system with all of its infrastructure elements is the basis for forming such environment and it is created at macro-, meso- and microlevels taking into account the specific features of socioeconomic systems' development.

Analysis of the successful experience of different European countries (Hornych and Schwartz, 2009; Maxwell and Levesque, 2011) having stable and high dynamics of innovative development, can become the basis for designing our own decisions which aimed at the formation of the support system for the processes of generation and transfer of innovations at all levels.

Creation and development of science and technology parks, innovative business incubators (hereinafter – technology parks structures) as the integrated elements of innovative infrastructure within innovative systems have been determined with their essential features, which had provided the integrated technical and material, socio-cultural, financial and another services for efficient startups, development and support of small innovative enterprises (Maltseva, 2013).

Such concentration of all main elements of information and organizational infrastructure in one place creates the synergy effect due to their interaction and promoting the generation of a bigger number of small innovative companies (Maltseva et al., 2011).

Defining the role and place of Russian technology park structures as a part of the world system can be based on the statistical data, accumulated from different sources, including associations of science and technology parks.

The study of microeconomic peculiarities of Russian technology park structures' functioning is one of the actual tasks for the applied science at present due to the lack of complex science-based strategic management for such structures and the necessity to identify their role within the global innovation system as the locomotives of growth for some regions in particular and for the state on a whole.

Latest research and publications analysis. Establishment and development of technology park structures have been given a lot of attention in Russian Federation over the last 20 years. However, there is an obvious lack of complexity in this field. The works of the early 1990s (Lurie, 2013; Rogalev, 1997; Shukshunov, 2011) noted the priority of methodical and practical aspects of creation and functioning of technology park structures. O.V. Bildina (2008) analyzed the main directions of state support for technology park structures. T.L. Rusyaeva (2007) considers the issues between interaction optimization of technology parks and universities. I.Y. Bogomolova (2010) creates the theoretical and methodical basis for control and

internal audit of innovative activity in university technology parks. M.A. Bunin (2013) considers the issues of effective innovation environment creation that promotes growth and development of technology parks. One of the main points is the creation of business ecosystem within a technology park as opposed to competition and creating synergy from the interaction of park's participants. The issues of innovative processes activation in a region through science-based organizational and economic mechanisms of regional technology park structures development is considered by T.V. Karatunova (2011).

Research objectives are: the study of the current state of Russian and foreign technology park structures, comparison of the key features of their activities and to identify the potential for growth and improvement of their functioning.

Key research findings. At present there is no unified concept of "technology park structures" in the world science and practice. For example, the term "research park" is more common in the USA, also known as "science park" in Europe, "technology park" is usually used in Asia (Wessner, 2009).

Such etymology is caused by the historical aspects of these structures formation themselves: in the USA they have been formed on the basis of research centers, in Europe (UK, France, Germany) they were created on the basis of leading universities, and in Asia they have been created for the application of advanced technologies in mass production.

There is an increasingly common concept of "R-S-T park" in official foreign sources (AURP, 1998, IASP, 2000, UKSPA, 2003, UNESCO, 2004); it means the united structure, having been created on the basis of public-private partnership including the developed infrastructure services promoting business and science integration and contributing to regional economy growth and development (Wessner, 2009).

Widespread is the concept of "technopark" in Russian Federation, similar to the "Asian" terminology. Legal analysis shows that at present there is no commonly agreed legislative interpretation on this term in our country.

The definition of the concept "technopark" has been given in the following documents: Regulations for the University Technology Park (coordinated by the Ministry of Education of Russian Federation, 20.04.1999), the State Program "Creation of the technology parks in the Russian Federation in the high technologies sphere" (as of 10.03.2006); in the Orders of the Ministry of Economic Development of Russian Federation "On the measures of realization of small and medium-sized businesses' state support"; in normative and legal acts of various subjects within Russian Federation etc.

While systematizing the main concepts of technology parks, having been used in Russian science and practice we have identified their key specific features:

- it is a corporate type structure;
- it has common infrastructure within a separate territory;
- it has different services providing business activity of its residents;
- services for residents are provided on preferential terms;
- small or medium-sized companies can become tenants of a technology park if only their main activity is development and/or production of innovative products or providing innovative services.

To summarize the terminology we introduce the concept of technology park structures (technology park type structures) which include technology, research and science parks and also innovative business incubators.

Statistical analysis of technology parks structures' activities both in Russian Federation and abroad can't be done correctly because there are no unified terminology and a common body to monitor their activities.

Statistical reports and monitoring of such parks all over the world are held by the individual initiative of organizations, the Associations of Science and Technology Parks, for example.

The creation of alliances and associations is an effective mechanism for uniting structures that have similar activities and for successful information, communication and organizational support that managers and specialists of starts up often need.

During the analysis carried out we have been identified the key directions and results of the technology park structures associations' activities in Russian Federation and abroad.

The World Alliance for Innovation (WAINOVA) is uniting 27 associations of technology park structures all over world and according to its Declaration they have a single status, equal rights and responsibilities (www.wainova.org).

This alliance has communication with the world technology park structures, thereby it provides their cooperation and interaction; its mission is to promote economic and social development in the world with the help of the innovation's generation and their transfer within scientific and technological parks.

The Headquarter of the International Association of science parks (IASP) has been chosen as the coordinating Bureau of Alliance, but it doesn't mean that it has some special status or representation within this Alliance. The International Association of Science Parks (IASP) had been established in 1984. It is one of the first associations of science and technology parks in Europe (www.iasp.ws).

At present it has 379 members from different countries and continents, 5 regional offices and more than 250 thousand innovative companies.

The Association of University Research Parks (AURP) is a nonprofit organization, founded in 1986. It is playing an important role in the development of technology park activities in the USA.

Now the Association has more than 170 members, they are mainly university technology parks, located on the territory over 47 mln acres; they have more than 1,880 buildings (www.aurp.net).

The United Kingdom Science Parks Association (UKSPA) was founded in 1984; including 122 science parks, more than 80% of the total number of such structures operating in the country (www.ukspa.org.uk).

Active support from federal and regional authorities for the establishment and development of technology park structures has promoted the innovative breakthrough in Japan, China and South Korea.

Asian Science Park Association (ASPA) (www.aspa.or.kr) has been founded in Japan in 1997 with the aim to form the united information space for Asian technology park structures that would provide knowledge and technologies interchange in the main directions of science, technology and innovations management. The members of this Association are 45 technology park structures in the Asia-Pacific region.

Foundation of technology park structures in Russian Federation on the basis of large universities began in 1990; at the same time the Association of university science and technology parks was established. The results of the Association activities were the development of the main documents, determining the framework for the technology parks functioning, including the regulations of state accreditation of university technology parks and another documents covering science, methodical, organizational and economic issues concerning the foundation and development of domestic parks.

The work has been organized for attracting foreign experts to teach managers and entrepreneurs in science and technology fields, to teach Russian teachers innovations management and marketing for further training of innovators under Russian conditions; providing practical assistance to universities and regional authorities in establishing technology parks; forming the mechanism for small and medium-sized innovative enterprises and business incubators cooperation; development of science and technical programs to support technology parks and other infrastructure elements within higher education (Shukshunov, 2011).

In 2000 the Association has initiated and executed the comprehensive study of Russian university technology parks which showed the results of their activities and identified the problems in their development.

At present owing to special attention of state to infrastructural elements, which are capable to provide comprehensive support to innovative business' development in regions, a specific role is given to technology park structures established according to the Ministry of Communications and Mass Media of Russian Federation' Program "Creation of high technologies parks in Russian Federation".

In 2011 the Association of technology parks in the high technologies area has been established; it is shaping a common policy for all participants of this program, a common information space that will provide effective decisions on management of these structures (Maltseva and Bobkov, 2012).

At the 1st Congress of Russian technology parks, organized by the Association in October 2011, the intermediate results were summarized and the key problems hindering the effective development of technology parks structures were pointed out.

As a result the Regulation on the status of technology park (i.e. the common criteria for a organization, claiming the title of technology park) has been confirmed; agreements on interaction with Russian Venture Company have been signed providing access for residents to venture investments and the Skolkovo Fund gave possibility for effective analysis of innovative projects ready for commercialization. There was a proposal to improve tax legislation in part of reducing the tax burden for technology park structures' residents, especially at the incubation period.

Reports on the activities results of the leading association of technology park structures listed above and online survey of members of these associations have become important sources of information for this study.

The analysis of these sources identified the following key features of the most typical technology park structure (Maltseva and Chevychev, 2012):

- the main specialization fields are: ICT, biotechnology, electronics and micro-electronics;

- it is state (municipal) property;
- located in a large or medium-sized city;
- not geographically tied to a particular university, there may be up to 5 major universities in the direct proximity of it;
- actively uses university services and facilities of research groups and scientific schools;
- the total area is less than 200 ths m², with the build-up area not more than 40 ths m²;
- more than 80% of companies-residents are registered geographically close to the technology park structure;
- the majority of residents are the existing companies which have become tenants of a technology park structure;
- there was a slight increase in the number of residents last year (not more than 10%);
- company staff is less than 5 employees;
- space for rent is available for residents at a cost similar to the average in a region;
- there is a business incubator within the technology park structure where about 10–20% of all the residents of this technology park structure are created;
- 25–50% of the residents have their own patents;
- support provided by federal and regional authorities has declined over the last year;
- the principle of "open innovation" is used.

In its studies the AURP has presented the typical features of a North American technology park structure ("Institute characteristics and trends in North American research parks: 21st century direction", 2007):

- area is about 450 ths m², including the built-up area of about 32 ths m² (about 7% of the total area);
- it includes usually 6 buildings, 95% of which are occupied by residents;
- there is a business incubator area of about 3 ths m²;
- located in the suburb of a small town (500 ths inhabitants);
- has a direct relationship with a university or it is a university technology park itself;
- the residents' structure includes small innovative companies (more than 70%), university centers (about 15%), public service offices (5%);
- the specialization is IT, pharmaceuticals, engineering, scientific and technical services;
- the operating budget is less than 1 mln USD, it is mostly unprofitable or low profitable, receives subsidies from budgets of all levels or parent organization (most often from a university);
- provides a range of business services including: consulting on organization of financing by specialized public programs, private investors; business planning; marketing; technological innovation evaluation.

The comparative analysis of the abovementioned tendencies indicates the presence of common development trends, including the prevailing specialization in the

field of IT industry, the availability of business incubators, low profitability and/or dependence subsidies, lack of built-up area.

At the same time there is a strong link between North American technology parks (despite their significantly larger average size) with universities as generators of innovative projects. And they are often owned or managed by universities.

The analysis allowed identifying the key directions and trends of activities of technology park structures. It was found that in the complex of the dominant of the world leading powers' innovative development creation of integrated elements of innovation infrastructure providing comprehensive support for small innovative enterprises has become the priority state task subject to their efficient design and comprehensive monitoring of their activities.

There is a growing number of such structures (as well as their residents) on all the continents within the Global Innovation System. Incomes of innovative projects realized on their platform have also increased.

The following key features of the current global state of technology parks structures were found: specialization priorities, forms of ownership, residential structure and management activity arrangement.

A detailed analysis of technology park structures functioning is complicated at the present stage because of the lack of a unified system of monitoring of key quantitative and qualitative indicators characterizing these structures. In search of reserves for increasing the efficiency of Russian Federation budget it is necessary to improve the system of state statistics which should provide necessary information to experts and bodies responsible for controlling and coordinating the operation of innovation infrastructure elements contributing to the development of innovative entrepreneurship in the regions and the country as a whole.

For the research of the current state of technology park structures in Russia and abroad and their further development the author had conducted a questionnaire and studied the official documents and Internet sources.

The reason for more detailed research, based on different sources, is the difference in the structures of leading world science and technology park associations and the lack of representativeness of Russian science and technology parks.

In the questionnaire there were 30 questions on the key aspects of technology park structures' functioning; it had been sent out to more than 450 respondents.

Processing and analysis of 120 valid questionnaires have identified the key features of technology park structures in Russia and abroad of today (Table 1).

According to the results of the present study we can identify the following features of Russian technology park structures as compared to the foreign ones.

The analysis has showed the prevailing share of the technology park structures which is in public ownership. At the same time abroad the percentage of structures with mixed and private property is higher.

Data on specialization of Russian and foreign parks correlates with each other, but foreign parks have more service orientation than Russian ones.

Due to low payback of the projects the residents of Russian and foreign technology park structures have ICT as the predominant activity.

A great part of technology park structures abroad is specializing in the field of environmental technologies, medical technologies and biotechnology.

Table 1. The average statistical indicators of technology park structures in Russia and abroad, designed by the author

<i>Classification feature</i>	<i>Russian structure</i>	<i>Foreign structure</i>
Form of ownership	Public	Public
Basic economic activity according to the statutory documents	Leasing real estate	Provision of intermediary services, associated with real estate
Specialization	ICT, medical technologies, instrument engineering	ICT, ecological and environmental technologies biotechnology
Structure's area	Less than 200 ha	Less than 200 ha
Site area	More than 80% of technology park area	60–80% of the technology park area
Share of the built-up area reserved for residents	More than 90%	More than 90%
Number of employees in management	Up to 5	10-15
Main infrastructure objects	Technology transfer centre, conference centre, business incubator	Business incubator, conference centre, technology transfer centre
Office organization	Department on work with residents, administrative and operational department, accounts department	Department on work with residents, administrative and operational department, department of information management
Strategic documents	Business plan, development strategy	Business plan, development strategy, marketing strategy, strategy on work with residents
Evaluation of business services	Services on the rental of office space, consulting on the issues of commercial activities management, telephone services, Internet access services, security services	Services on the rental of office space, telephone services, Internet access services, security services consulting on business development
Cost of business services	Below market cost	Subject to market cost
The level of local competition (structures providing similar business services)	Low	Medium
Support from regional and federal authorities	Financing of infrastructure	Financing of infrastructure, tax remissions
Partnership with universities and science centres	With one university	With 3 and more universities
Participation of management companies in the capital of innovative companies	They don't finance innovative projects of residents	They don't finance innovative projects of the residents
Main sources of attracting investments	Business angels, seed investment funds	Venture funds and companies, business angels seed investment funds
Cooperation between residents	Management company coordinates the work of residents and suggests the directions for their cooperation	Management company coordinates the work of residents and suggests the directions for their cooperation

Continuation of Table 1

Classification feature	Russian structure	Foreign structure
System of innovative projects (companies) selection	Advisory council consisting of employees from management makes a decision	Advisory council consisting of employees from management makes a decision
The average percentage in the total number of selected business plans, represented in the technology park structure	Up to 25%	Up to 25%
Monitoring system in the realization of innovative projects	Controlled as needed (at the conclusion (renewing) the contract of lease with resident)	Controlled by special structures of a management company (expert council) annually
Questioning residents to identify their needs and evaluation of quality of management work	No	introductory questionnaire, every year
Level of profitability of management company	0–10%	0–10%
Management's dependence on external funding	High	Medium
Development perspectives	Low profitability and financial sustainability	In the nearest future stable functioning is forecasted
Key success factors	Strong science and technical, technological and resource potential, which has a competitive edge; technology park infrastructure and adequate technical equipment; stable partnership with industrial companies	Successful experience of scientific and innovative activities of residents; stable partnership with industrial companies; multiplicity of sources for financial support

It may be noted that in their questionnaires foreign respondents have pointed out a greater number of specialization branches showing thereby their variety in contrast to Russian structures.

The analysis shows the prevailing share of technology park structures which is in have more than 200 ha of area. But some foreign respondents mention the structures with the space up to 600 ha.

As a result of this analysis we can note that Russian technology park structures have more site area than the foreign ones. The availability of free space in foreign parks let them develop further.

The majority of the studied structures have a greater part of area reserved by the residents and in this group the percentage of foreign structures is higher.

One third part of the technology park structures in Russian Federation have the minimum number of employees; 25.3% of Russian technology parks have more than 15 employees. At the same time 37.8% of foreign parks have 10 to 15 employees, 25.5% have more than 15.

Majority of technology park structures have a conference-center and a business incubator (foreign parks have such structures more often than Russian ones) and a technology transfer center (Russian structures have such structures more frequently).

There are the following departments (or the structures performing similar functions) in the organizing structures of the majority respondents:

- Residents Services Department.
- Information Management Department.
- Administrative and Operational Department.
- Accounts Department.

It can be noted that diversification of institutional infrastructure in foreign technology park structures is higher than in Russian ones.

More than half of foreign structures have a marketing strategy, strategy on work with residents; majority respondents have a business plan and a development strategy. It is noted that strategic documents are mentioned as available by more respondents abroad, than in Russian structures.

Majority of Russian and foreign parks render services on office space rental, consulting services, telephone and Internet services, security services and parking. It may be noted that Russian technology park structures are more oriented on renting space than the foreign ones. Foreign technology park structures use the mechanisms of outsourcing more than Russian structures, especially in consulting.

Cost of business services in most Russian technology park structures is below the market price and in foreign countries it is similar to market price. The key factor that attracts residents in Russian technology park structures is the a price, while abroad the key factor is the integrated support system for residents.

Russian respondents have drawn attention to the predominantly low level of local competition, while foreign participants of the questioning (more than 50%) have indicated the average level of competition due to developed innovative infrastructure.

Financing of infrastructure is the key factor in government support for both Russian and foreign technology park structures; foreign respondents have pointed out the significant tax benefits for the residents of the parks.

43.7% of Russian and 39.2% of the foreign respondents have partnerships with one university (science center) that defines these structures as the university ones. 12.3% of Russian and 23.7% of the foreign structures have a partnership with 2–3 universities; 44% and 37.1%, accordingly, have a partnership with 3 and more universities.

Majority of both Russian and foreign technology parks are not investors for the residents' innovative projects, but it may be noted that a share of investing foreign structures is higher.

Venture funds and companies, business angels and seed investment funds are the key financial sources for innovative projects (the technology park structures provide assistance in attracting these sources). But abroad venture and seed industry is more developed.

Majority of the technology park structures provide assistance in cooperation between their residents, at the same time a share of Russian companies is higher than that of foreign ones.

A majority share of respondents both in Russia and abroad has an Advisory council consisting of employees from a management company as a main body for innovative projects evaluation. In some technology park structures there a specially formed advisory council, mainly consisting of the enlisting specialists or 1–2 external experts.

It has been revealed that as a result of selection usually in the majority of Russian and foreign technology park structures candidates become residents in no more than 25% of the cases. Statistics shows that the selection in foreign structures is stricter than in Russian ones.

Innovative projects realization in foreign parks is controlled by specialized departments of a management company every year. In Russian Federation controlled if it is needed, mostly when renewing the lease contract.

50% of foreign technology park structures have annual and introductory questionnaires, one third – quarterly questionnaires. Russian respondents have mentioned the introductory questionnaire and only if it is needed; 38.6% of them had none.

The analysis shows that the majority of both Russian and foreign structures have the profitability up to 10%, but 27.3% of Russian structures are unprofitable. The share of profitable foreign parks is 92.2%, and this characterizes their activity as more effective.

Almost half of the respondents in Russian Federation have pointed out high sustainability, more than 12% have characterized it as disastrous. The dependence on external sources of funding in one third of foreign technology park structures is medium, it is normal in one third, it is absent in more than 17%.

More than 80% of foreign technology park structures have pointed out their further steady increase or stabilization of the financial condition; at the same time almost half of Russian structures have noted the presence of negative trends that would require the implementation of organizational and technical measures in the nearest future.

As the analysis shows the key success factors of Russian technoparks are mainly strong science and technical, technological and resource potentials, but foreign tech-

nology park structures have achieved higher results due to the formed brand and successful companies' participation.

The analysis of foreign technology park structures correlates in its results with the reports submitted to leading associations.

The received results can become the basis for more detailed comparison of Russian and foreign technology parks activity in order to develop recommendations on the improvement of technology park activities in Russian Federation according to the experience of more successful foreign structures.

Conclusions:

1. Advanced elements of innovative infrastructure have a stable growth, therefore the integrated structures (technology park structures) are more efficient.

2. It has become evident that there is no unified interpretation of the concept of "technology park structure" in different sources in Russian Federation, which has own specific features and needs legislative grounding.

3. Analysis of the technology park structures' state is complicated due to the lack of methodological and organizational basis.

4. Statistics that the leading associations have can't fully identify the features of Russian structures due to their small representation among the members of these associations.

5. A comprehensive study has identified special features of technology parks activities in Russian Federation in the framework of domestic innovative infrastructure development.

6. Market and price elements in the promotion of the residents' innovative activities are the key differences between Russian and foreign technology park structures. At the same time foreign structures are more focused on forming an innovative environment based on integration, mentoring and coaching by the representatives of successful companies.

7. It seems necessary to form a unified system of data collection and evaluation of the technology park structures in Russian Federation and abroad to systematize the key economic indicators of growth in the integrated objects of innovative infrastructure.

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