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**EVOLUTION OF INDUSTRIAL COMPLEXES: FROM  
INDUSTRIAL PARKS TO SCIENCE AND TECHNOLOGY PARKS**

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***Abstract***

Nowadays the world economy is on the way to the sixth technological way to which continuous innovative process is peculiar. Each technological period forms a certain set of innovations directed to the sustained economic growth. In the developed countries from 40% to 90% of the growth of the gross domestic product is formed due to high technologies. For Russia, which is in the sphere of political and economic sanctions, one of the main forces in formation of sustainable development there have to be science and technology parks. Their main objective is creation and advance of scientific and technical business. Diversification and new technologies are very important for Russia which is in rather dense technological dependence on a number of foreign countries today. It is on the basis of the retrospective analysis of emergence and development of science and technology parks in country aspect, the qualitative analysis of changes of the comparative characteristic of the technological processes accompanying development of territorial and industrial complexes and creation of the knowledge-intensive competitive production. Having studied the criteria and practice of formation and functional development of territorial and industrial complexes in the developed countries, it is obviously possible to make the conclusion that nowadays Russia has to provide serious breakthrough in the scientific and technical sphere, relying on experience of the developed countries and considering features of the national industry and economy as the scheme "fundamental science - applied science - production" is broken off.

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**Keywords:** Territorial and industrial complex, industrial park, science and technology park, production infrastructure, innovations, start-ups.



## **1. Introduction**

Modernization of the Russian economy assumes transition from the use of foreign technologies to creation and application in the country and abroad domestic ones. Realization of this purpose must be promoted by special territorial industrial complexes, and first of all industrial parks.

The industrial manufactured park is the complex providing to the resident companies the industrial platforms equipped with utilities, additional services, including design and construction of new rooms, financial, consulting, logistic, etc. and a full set of infrastructure services, including protection that allows the resident to reduce costs significantly.

Manufacturing enterprises at the independent maintenance of utilities and maintenance about 20% of expenses of the company whereas in the industrial park these expenses are distributed among a large number of residents incur costs.

## **2. Problem Statement**

The authors set the following problems:

- collecting, analyzing and data processing about tendencies of education and development of territorial and industrial complexes of the internal and external sources of development which are a complex system and is reflecting the unity.
- allocating the key points reflecting the problems of formation of the structures in Russia;
- forming a system model of cooperation of various regional educational, research establishments to science and technology parks, providing a short and effective innovative cycle.

## **3. Research Questions**

From the moment of emergence of the first science and technology parks in Russia not a lot of time has passed, but the question of the organization, functioning of the results of their activity has attracted a keen interest in a scientific community, studying it from the position of the neoclassical theory, covering institutional and basic aspects of mechanisms of the organizing science and technology parks, integration processes. Scientific works in the sphere of management of innovations, development of industrial and territorial complexes, data of the Ministry of Industry and Trade of the Russian Federation have made information basis of a research.

## **4. Purpose of the Study**

Due to the said information it is necessary to develop a model of cooperating various regional institutions from the universities to technical and industrial parks for development of innovative business in the region, ensuring sustainable development and investment attractiveness.

## **5. Research Methods**

In the article the methods of the system, logical, structural, comparative analysis and expert poll were used. It is on the basis of the retrospective analysis of emergence and development of science and technology parks in country aspect, the qualitative analysis of changes of the comparative characteristic

of the technological processes accompanying development of territorial and industrial complexes and creation of the knowledge-intensive competitive production.

### **5.1. Theoretical and general scientific methods of the research**

Industrial parks (industrial estate) in Europe have arisen more than 100 years ago – in 1896 in Great Britain, near Manchester there was Trafford-park in which unlike Manchester, the textile industry was concentrated, conditions for work of national and foreign businessmen of other branches were created – steel, electrotechnical, food industry, automobile building (the first foreign plant of G. Ford, outside the USA was placed in Trafford-park). The park has turned into a regional cluster thanks to high transport availability, favorable cooperation communications (accessories were made for G. Ford's factory in Manchester) and the qualified labor (Mamedyarov, 2016).

If creators of the British industrial park chose the principle of diversification of production companies, the German parks were established by the principle of specialization of branches metallurgy, chemical production, the industry of building materials, etc.

In the middle of the XX century industrial parks appeared in the majority of the developed countries of the world, and regional approach to placement of industrial production was complemented with urbanistic planning. In similar industrial and territorial complexes the synergetic effect of mutual interindustry use of technologies and organizational and administrative decisions by the resident companies of the park, close cooperation ties of major companies with small and medium-sized enterprises in the field of sharing of innovative potential of the nation was reached. Placement in parks of the multinational companies and foreign producers has sharply lowered transactional costs of all residents localized in parks (Aerts, Matthyssens, & Vandenbempt, 2007); Claver-Cortes, Marco-Lajara, Manresa-Marhuenda, & Garcia-Lillo, 2018)

Industrial parks promoted the increase in employment rate in places of dislocation, the appearing new jobs usually have more high efficiency of work, than in general in the national economy, more effective management, both domestic, and foreign concentrates in parks (Aportela-Rodriguez, 2014). Industrial parks became attractive to investors thanks to special tax regulation (Belenov, Smolyaninova, & Shurchkova, 2013).

In the Samara region, the largest industrial center of the country it was created the Togliatti SEZ and the industrial parks "Preobrazhenka" and "Chapayevsk" which anchor residents were foreign companies "LLC Robert Bosch Samara, the KNAUF company, LLC Ying Park-Samara, etc.

Industrial parks provide to residents tax benefits, the particular administrative treatment, the free customs area and ready infrastructure providing economy to 30% of capital expenditure during creation of new production (Agafonov, 2010).

The city of Togliatti has been given the status of the territory of the advancing social economic development that allows the investors creating new jobs to get advantages in the taxation (reduction in tax for profit, release from land tax and property, decrease in insurance premiums).

Parks became the driver of investment development of regional infrastructure as production (municipal and transport network), and social, providing fixing in parks of highly qualified personnel (Shepelev & Gavrilova, 2016).

Since the 70s in the world high-tech industrial parks have been created, their residents developed a high tech, advanced financial technologies in the international economic space, and later NIOCR and services providing access of external providers that improved a serial portfolio of the companies, optimized management of life cycle of a product. At last, in the 1990s ecoindustrial parks in which ecological harm of industrial activity was minimized therefore more and more parks began to be placed directly in the cities.

Industrial parks are created in half of regions of the country, and often regional authorities become not only partners, but also operators of the park. More than a half of industrial parks are located in the Central Federal District-75 units, and in the Volga Federal District there are 48 industrial parks.

The forward growth of number of industrial parks in Russia is visible. According to the data of 9/1/2018 176 industrial parks are created and function, however, the present indicator is small in comparison with Germany where there are 400 similar territorial units. At the same time with adoption of the national standard "Industrial parks. Requirements" industrial parks have gained the accelerated development in the last three years.

Unlike the first parks which were placed on about 1000 hectares, in the last three years parks have been created at the area about 10-20 hectares as for achievement of profitability Greenfield -parks need to provide fullness of the area of the park for 80-90%, it allows parks to finance development of the area from the arriving rent and redemption payments. The efficiency of the small areas is confirmed more in the activity of the Brownfield -parks occupying premises of earlier operating enterprises.

Industrial parks, optimum on the area, at a certain stage pass from the budget funds to their own funds received for the account of rent and sale of the land plots for development of infrastructure.

A key role in development of industrial parks is played by the state as it not only provides them financial support by budget funds but was the owner of 50% of industrial parks in 2016. The regional authorities seeing an important priority of work development of infrastructure support of business form regional standard and legal bases of support of industrial parks. Successful state parks show the greatest efficiency, quickly cover at the expense of tax revenues from residents the allocated credit resources on creation of infrastructure of parks. Besides, since 2015 from the federal budget subsidies are provided for partial costs compensation for construction of industrial parks infrastructure and also for compensation of an interest rate for the credits on the state projects, that is private parks are in unequal conditions with state, in respect of receiving subsidies.

## **6. Findings**

There are public-private partnerships during creation of industrial parks when the state at the first stage of construction becomes the co-owner of the park along with the private investor. Further the state refuses property when the project reaches profitability. Parks can solve a number of serious problems, such as involvement of small and medium-sized enterprises to participation in production chains of the large enterprises, formation of attractive conditions in those branches of economy where the investments realizes all advantages of restructuring and modernization of economy (Novikova, 2008).

So, the KIP Master park in Naberezhnye Chelny has been created from 50% by participation of the government of Tatarstan on the areas of KamAZ for placement of productions of suppliers of the automobile enterprise there. Later, at achievement of profitability by the park the republic left property.

Other task which the regional authorities can solve by means of industrial parks is formation of places of creation and development of the innovations equipped with institutions of engineering, prototyping, certification and standardization for development of product lines by the innovative enterprises on the basis of modern technologies (Kogan, Papanikolaou, Seru, & Stoffman, 2017).

Industrial parks promote development of new territories in that case when residents are able to use the sales markets represented by the territory, raw materials, the qualified personnel, auchny potential, technical colleges or business climate and provide to residents basic (internal networks, cost of rent or the earth, housing and communal services) and additional services (service in the mode of "one window", including in contacts with external contractors, support of residents in interaction with authorities, suppliers and the financial enterprises) (Dudin & Lyasnikov, 2014).

For comfortable conditions of activity of businessmen in parks business centers, customs posts are created, hotels, housing, dining rooms, etc. are under construction. As a result, on the territory of the country complex projects as with a production part, and modern housing and public utilities, recreational and scientific facilities, institutions of social infrastructure forming more modern and convenient habitat in before depressive territories extend. In this sense creation of brownfield-parks in small settlements is extremely effective as there is a set of the abandoned squares. In the long term the industrial park can become base of creation of the branch or innovative cluster in the region providing synergy between the large, small and medium-sized enterprises creating components for a wide range of consumers and the innovative firms capable to provide mass application of technological innovations.

Development of industrial parks towards innovative activity happens owing to entry into number of residents of the companies having unique technologies, the rights for production of essentially new production and own innovative projects and also the venture funds and other financial intermediaries ready to finance developments.

Recently the agro-industrial parks tied to places of production of agricultural production for the purpose of implementation of its deep processing began to arise. Such parks allow Russian producers in the conditions of the growing export of food to keep a considerable part of value added that wouldn't be at direct export abroad of raw products. So, residents of the private agroindustrial park Rogachevo, Dokagenny Technologies, carry out production of the unique complexes of the equipment allowing to grow up plants according to their physiology which automatically support conditions for each stage of development of plants. The same firm is engaged in independent selection, and around it the group of companies was created, researching the viral and bacterial diseases of the plants including affecting them in storage period conducting a research from accounting of concrete grades, the area and farms. These companies make means of plants protection of biological origin (bacteriophages) which are not only cheaper than chemicals, but also are ecologically safe. Residents of Rogachevo conduct as basic researches on removal of grades a plant with the set properties, and applied, for example, bioenrichment of fruits and vegetables iodine that is especially important for the consumers living in the regions having deficiency of this microcell in food products.

Strengthening of an innovative component in formation of a circle of residents of industrial parks leads to functional rapprochement of this form of territorial industrial complexes with technical parks (Mironov, 2017).

Technical parks in Russia appeared quarter of the century ago, and the purposes of their formation repeatedly changed. The first science and technology parks in essence were the industrial (industrial) parks intended to restore production on the empty production sites. At the same time Russian HIGHER EDUCATION INSTITUTIONS began to create science and technology parks from which so far there is only a science and technology park of MSU.

In science and technology parks there are close mutually advantageous operational ties between residents. In versatile parks most often there is a cooperation on raw materials (large producers of raw materials, metals, chemical production, etc.), cooperate with small and medium-sized processing enterprises, providing mutual economy on logistics when the client and the supplier are on one platform. Formation of the large-scale centralized order for raw materials can be followed by discounts from the supplier (Sampson, 2016).

In versatile science and technology parks of the enterprise, not releasing the competing product, often use service of the trading house which is carrying out services in marketing and the organization of sales. Accepting "The strategy of innovative development of the Russian Federation" and "The program of development of science and technology parks in the sphere of high technologies", since 2006 science and technology parks has begun to appear which format providing not so much existence of the buildings and areas leased to the industrial and technological companies, but a set of facilities which are provided to residents, including the qualitative Internet, necessary machines and devices for prototyping, soft-infrastructures (consulting on legal questions, the relations with financial intermediaries and investors, marketing, etc.). In the last 5 years in Russian regions "science and technology parks of the high technologies" having new cases with office laboratory and production sites began to appear.

Continuous change of a purpose during creation of an industrial and territorial complex science and technology park in our country has led to what science and technology parks is called by business centers, and the innovative centers which are the peculiar hubs uniting producers and the firms which are engaged in POKR and innovations. The service provided by science and technology park for legal and economic support and execution of patents is important for the latter (Cakula, Jakobsone, & Motejlek, 2014).

The resolution of the Russian government of September 26, 2016 includes science and technology parks in the structure of production and technological innovative infrastructure of an industrial cluster. At the same time, the science and technology park can work besides an industrial cluster. Now most Russian science and technology parks are the institutions of the general profile which don't have the accurate specialization characteristic of industrial clusters.

So, the "Zhigulyovsk valley" which has attracted nearly 160 residents in the following directions became one of the science and technology parks, largest in Russia, in the sphere of high technologies: information technologies, energy efficiency, transport and space, housing and new materials, biotechnologies and medicine. On prospect it is important to develop a tendency of close cooperation of

science and technology parks, institutions of the higher school and research centers and venture financiers, for intensive cultivation of high-tech startups (Fang, Wang, & Chen, 2016).

## 7. Conclusion

To our opinion in the city agglomerations, in which there are institutions of the higher school and the scientific organizations, the following model of development of innovative activity in the region is expedient. Developed in university and scientific laboratories research and development products which have taken out patents licenses for use have to be transferred to their startups undertaking to pay a royalty to owners of intellectual property from the moment of receiving profit on implementation of the project (Kogan, Papanikolaou, Seru, & Stoffman, 2017).

The startup has to receive optimum conditions and support in the regional (city) business incubator which is carrying out selection of potential investors among bank structures, funds and angel investors. In turn, business incubators have to make a purposeful search of qualitative start-ups through information networks. Special attention should be paid on the projects which are containing breakthrough innovations and having prospects for entry into the international market. The business incubator must help with selection of design teams, recommending necessary highly qualified specialists, first of all, from among living in this region and capable to realize the project.

After creation of the enterprise capable to realize own business plan, grocery and marketing strategy, it can use services of the regional industrial park or science and technology park. The similar model is based on complex use of unique own competences of the region and promotes practical use of its personnel, scientific and technical and organizational and administrative potentials.

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