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## Development of National Production through Integration of Machine Building Enterprises into Industrial Park Structures

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**Abstract:**

*The article studies organizational & economic peculiarities of functioning of domestic industrial enterprises which consist in transformation of corporate vertically integrated structures into inter-company production associations. It is suggested to create industrial parks, as a main tool of development of territorial inter-company productive networks in machine building complex. Expedience of creation of industrial parks on the basis of large machine building enterprises is substantiated. Such initiatives are aimed at development of production of component base for structural industrial enterprises. Principles of creation of industrial parks are based on identified motivating and suppressing factors of integration of machine building enterprises into network production structures. Targeted indicators of monitoring of effectiveness of industrial parks functioning are offered. It suggested to use the following indicators as basic ones, for conduct of monitoring of indicators: level of import substitution of component production for enterprise-integrator; growth of total investments at enterprises-residents of park; indicator of growth of production of innovational products in total volume of products manufactured by park; indicator of growth of jobs in park's structure; indicator of growth of the number of SME in park's structure.*

**Key Words:** *Production Development, Enterprises Integration, Industrial Parks, Regional Development, Investments*

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**JEL Classification :**

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## **1. Introduction**

Preservation and development of Russian machine building complex are an important strategic task before the Russian economy. Possibility of its realization is predetermined by a large number of machine building enterprises, including the ones with unified engineering infrastructure and connected technologically to OEM – productions. Integration of machine building enterprises into structures of industrial parks, located on specially created and controlled industrial area, allows structuring and developing innovational productive activities of car assembly enterprises and suppliers of car components; forming and systematizing investment support for the sphere; attracting audit companies, expert associations, and educational and scientific centers for work. Changes in the system of production management by means of integration of machine building enterprises solve the problem of recovery of general chain of product value creation (provide productive cooperation of scattered privatized enterprises).

Territorial inter-company productive networks, formed within structures of industrial parks, allow reducing resource intensity of production process; ensuring development of the network of small and medium economic subjects (industrial parks residents), which take part in development and production of final products and located in controlled industrial area. Integration of enterprises into structures of industrial parks is also viewed as an effective tool of development of Russian machine building industry, which allows localizing manufacture of high-tech products in Russia [Panov, 2010].

Issues of formation of organizational & economic relations on integration basis are studied in works of many foreign researchers, among which it is possible to distinguish: R. Akoff, P. Drucker, T. Konno, E. Mansfield, K. McConnell, R. Nielson, M. Porter, B. Santo, V. Launhardt, B. Twiss, J. Schumpeter, S. Winter, R. Foster, J.C. Van Horn, E. Jantsch, etc. Methodological developments in the sphere of formation and development of industrial parks are given in the works of such authors as A.N. Asaul, V.V. Akberdin, M.P. Voynarenko, Y.G. Lavrikov, M. Porter, S.I. Sokolenko, M.V. Chuchkevich, S.N. Parinov, S.A. Puzanov, O.A. Romanova, A.I. Tatarkin, G.R. Khasaev, etc.

At the same time, according to the consolidated opinion of most economists [Ammenberg, J. Börjesson, B. & Hjelm, 1999; Lalkaka, 2002], the process of acquisition of procedures and methods of formation of integration entity under the new conditions led to objective necessity for solving a range of problems of scientific & methodological and practical nature. Despite significant contribution, performed by the researchers into theory, issues of formation of methodological basis of development and realization of strategy of development of industrial parks

under the conditions of transformation of organizational & economic relations in the sphere are not sufficiently studied. Along with that, there is a necessity for study of changes of the structure of basic principles of management of integrated system members under modern conditions and formation of methodical and practical base/instrumentarium, aimed at adaptation of network subjects to conditions of their development.

The purpose of the research is to develop theoretical foundations and methodological instrumentarium in the sphere of realization of the mechanism of formation of Russian industrial parks.

The article suggests: 1) substantiating principles of creation of industrial parks, based on identified motivating and suppressing factors of integration of machine building enterprises into network production structures; 2) developing methodical approach to creation of industrial parks, based on realization of regional investment projects; 3) offering indicators of monitoring of effectiveness of regional industrial parks functioning, based on analysis of economic and innovational development of enterprises-residents.

## **2. Analysis of Research Results**

Industrial park is treated in the research as an agreed inter-company production network of economic subjects-residents, located in a specially created and controlled industrial area with unified engineering infrastructure, and technologically connected to enterprise-integrator which performs development and manufacture of final products [Eremin, 2008]. Main subject of industrial park is an enterprise – systemic integrator, around which industrial park structure is created [Garina, 2013]. Functions of industrial park, as an integrated structure which is capable of intensifying industrial production, are realized through:

- import substitution of component base for manufacture of competitive products of machine building enterprises. This problem is especially topical with car building clusters;
- development of small and medium production business. Use of mechanisms of financial support for residents of industrial parks will stipulate creation of new small industrial enterprises;
- increase of investment attractiveness of car building sector. According to consolidated opinion of experts [Garina, 2013; Halder, 2002], attraction of

investments into such technologically complex spheres as machine building is restrained by insufficient development of modern production infrastructure;

- creation of new well-paid jobs for real sector of economy. Creation of a large number of small and medium industrial enterprises within industrial parks will allow creating new jobs, which is not only an important economic but social problem for territories, in which machine building is a structural sphere – primarily, in so called mono-cities;

- transfer of innovational technologies from large machine building holdings to independent suppliers of components.

Studying global experience of formation of organizational & economic relations which emerge during integration of machine building enterprises into structures of industrial parks [Harding, 2000; Marjolein C.J. Caniels and Henny A. Romijn, 2001], it is possible to conclude that:

- unlike vertically integrated organization, inter-company production network, created on the basis of industrial parks, supposes use of contract agreements during conduct of production activities between suppliers of components and systemic integrator which performs the issue of final products and management of all production chain.

- creation of industrial parks is a special form of outsourcing, so that enterprises-members could concentrate on their main activities and, thus, receive profit in competitive struggle – for example, by using the effect of synergy and scale in structure of capital-based infrastructure, and reduce tied resources for necessary services. At that, Developer Company seeks a goal, using positive factors of park location, in order to increase its attractiveness and reduce additional expenditures for it (for example, by placing new productions).

At the same time, practical building of integrated inter-company production network on the basis of development of industrial parks is possible with the use of the range of functional & planning models which differ as to initial terms if use and as to motivating factors of integration. It is necessary to conclude that each of them reflects its philosophy of business management; that created system in each specific case adapts to internal and external environment of members and each specific territorial entity which has certain conditions and level of sufficiency of resources supply, etc. Therefore, none of the known models can be applied in pure form under other economic conditions. That's why, as to domestic practice, creation of industrial parks should be based on identified motivating and restraining factors of integration of domestic enterprises into network production structures. For example, at initial stage of formation of main elements of organization & economic mechanism of industrial park development, as an element of car building cluster of

Nizhny Novgorod Oblast, a complex of measures for analysis of factors which motivate or demotivate economic subjects for such integration was realized. This research was conducted on the basis of expert survey in Nizhny Novgorod Oblast and several oblasts of the Volga Federal District in March-April 2014. Volume of quota selection constituted 103 respondents, and survey was conducted among managers of industrial enterprises of different sizes (from small business to large corporations); representatives of executive power; analysts of expert associations; scientists of educational and scientific profile centers. Selection of experts was conducted on the basis of attestation of potential experts by their colleagues. Results are shown in Tables 1 and 2. For the purpose of confirmation of authenticity of results, coefficient of concordance was calculated, which stays within normal limits ( $W = 0.773$ ).

**Table 1. Analysis of factors which motivate enterprises for integration into industrial parks [Kuznetsov, 2014]**

Factor name	Significance of factor in weight coefficients	Ranking
Availability of infrastructure	0.31	1
Provision of sales channel	0.24	3
Economy of logistics	0.25	2
Technological support for enterprise – integrator of industrial park	0.08	5
Reduction of bureaucratic load on business	0.12	4
TOTAL	1	

**Table 2. Analysis of factors which hinder enterprises in their integration into industrial parks [5]**

Factor name	Significance of factor in weight coefficients	Ranking
Technological dependence on company-integrator	0.31	1
Reluctance to be in situation when company-integrator becomes a monopolistic buyer of products (monopsony)	0.24	3
Impossibility for diversification of business	0.25	2
Projects of many industrial parks have declarative nature	0.08	5
Availability of unstructured industrial areas near large enterprises (most companies have their own successfully	0.12	4

working production areas)		
TOTAL	1	

Then, special attention was paid to main factors of territory selection [Semenov, 2015]:

- level of engineering design of territory;
- transport accessibility;
- presence and quality of labor resources;
- property form and category of land plot;
- proximity of administrative & business centers and sales markets;
- availability of large anchor investors (residents);
- engineering & geological conditions of territory;
- availability and level of development of social infrastructure.

Based on realization of these conditions, most of domestic industrial parks were established in the European part of the country and in the South. In the European part of Russia, leaders as to successful development of industrial parks are Kaluga, Ulyanovsk, and Lipetsk Oblasts and the Republic of Tatarstan. As to the number of industrial parks, the leaders are Moscow, Leningrad, Tula, and Tver Oblasts, and Stavropol Krai (Table 3).

**Table 3. Association of industrial parks [Kuznetsova, 2013]**

Industrial park	Organizers	Region	Area, hectares	Status	Specialization
Kapital	Managing Company Idea Kapital OJSC	Tatarstan	181	Brownfield	Chemistry and polymers processing
Ozery	Flagman LLC	Moscow Oblast	42	Brownfield	Many-functional
Zavolzhye	Corporation of development of Ulyanovsk Oblast	Ulyanovsk Oblast	500	Greenfield	Many-functional
Rodniki	Corporation Nordtex OJSC	Ivanovo Oblast	370	Brownfield	Light industry
Vorsino	Corporation of development of Kaluga Oblast	Kaluga Oblast	1000	Greenfield	Consumer goods
Rosva	Corporation	Kaluga	472	Greenfield	Car components

	of development of Kaluga Oblast	Oblast		d	
Grabtsevo	Corporation of development of Kaluga Oblast	Kaluga Oblast	730	Greenfield	Car components
Orel	Severstal-Metiz OJSC	Orel Oblast	120	Brownfield	Metal processing
I-Park	Lemminkiaynen-Invest LLC	Kaluga Oblast	134	Greenfield	Many-functional
Greenstate	UIT Lentek CJSC	Leningrad Oblast	115	Greenfield	Many-functional
Master	Kamsky industrial park Master OJSC	Tatarstan	11	Brownfield	Machine building
Sheksna	Industrial park management	Vologda Oblast	2000	Greenfield	Metal processing, construction materials, car components
Nevinno myssk	Management company of investment and innovational development of Stavropol Krai	Stavropol Krai	200	Brownfield	Construction materials, polymers
Tagil	Khimpark Tagil CJSC	Sverdlovsk Oblast	142	Brownfield	Chemistry

During creation of national industrial parks, a key decision was determination of the pool of companies-integrators. In Russia, this status was acquired by large industrial enterprises which have a need for formation of the network of competitive components, necessary for manufacture of final products. The members of integration network are [Garina, 2014]: 1) suppliers of R&D technologies; 2) suppliers of components and specialized services; 3) suppliers of second and next levels. For example, company-integrator of Kamsk industrial park Master is car manufacturer KAMAZ OJSC, which distributes up to 70% of manufacture of components and units between Russian and foreign suppliers (ZF, Steyr, WABCO, Knorr Bremse, RBL, Webasto, GWB, Bosch, Borg Wagner, Schwitzer, etc.). The main item of terms of cooperation between company-integrator and network

members is correspondence of products to international standards of quality ISO 16000.

Then, a necessary term of functioning of national industrial park is creation of starting possibilities for selection of the system members – industrial enterprises and small and medium business. In this case, indicators of realization are:

– growth of the share of product supply from resident to integrator in the total volume of products manufactured by resident. For reference, a critical level of production-sales dependence of supplier from company-integrator in the practice of industrial enterprises is 25%;

– increase of the level of technological dependence between enterprise-resident and company-integrator. It is recommended to determine this indicator in the basis of ten criteria, and for correspondence to each of them, 1 point is assigned (Table 4).

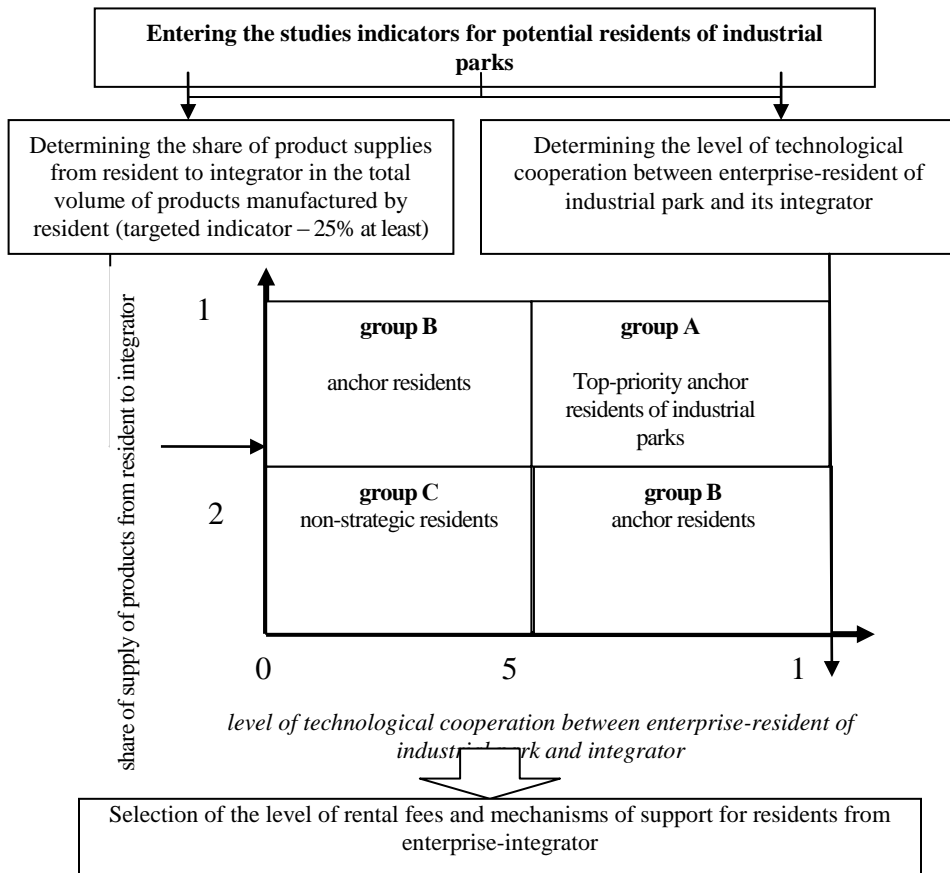
**Table 4. Evaluation of the level of technological cooperation between enterprise-resident of industrial park and its integrator (by the example of the project of creation of industrial park on the basis of GAZ Group and its potential resident – Nizhny Novgorod Industrial Company OJSC) [Kuznetsova, 2013]**

No.	Studied characteristics	Evaluations as to criteria: yes - 1 point; no - 0
1	Joint financing of R&D	0
2	Transfer of technologies from integrator to potential resident (transfer of technologies)	1
3	Joint R&D projects	0
4	Programs of joint training of personnel	1
5	Integrated IT-technologies of design	0
6	Joint marketing research	1
7	Unified production standards	1
8	Unified standards of product design	0
9	Functioning of unified logistics system “just in time”	1
10	Similar elements of organizational culture	1
TOTAL		6

The variables used are built in analytical matrix “share of supply of products from resident to integrator – level of technological cooperation between them” (Figure 1).



Figure 1 – Methodological approach to selection of anchor residents of industrial parks [Kuznetsov, 2014]



In particular, this methodological approach was approved during development of perspective pool of anchor residents of industrial park Doskino in Nizhny Novgorod Oblast in the basis of GAZ Group. Results of selection of residents are presented in Table 5. This approach allows determining not only the pool of anchor residents of industrial park but determining their need for logistics, consulting, educational, and engineering services, and form the base structure of industrial park.

**Table 5. Formation of perspective pool of anchor residents of industrial park Doskino in Nizhny Novgorod Oblast on the basis of GAZ Group [Kuznetsova, 2013]**

Potential residents of Doskino industrial park in Nizhny Novgorod Oblast	Studied characteristics of activities of potential residents of industrial park with integrator		Belonging of potential resident to group of potential residents
	Share of product supplies from potential resident to integrator of industrial park, %	Level of technological cooperation of potential resident of industrial park with integrator (max – 10 points)	
Nizhbel LLC	7	6	Group B
Nizhny Novgorod Volga	17	2	Group C
Magna-Tekhnoplast CJSC	26	6	Group A
Nizhny Novgorod Industrial Company LLC	5	1	Group C
Avtokomponent Group	60	8	Group A
Avtodetal LLC	35	3	Group B
Soteks CJSC	17	4	Group C

Due to necessity for large investments into creation of industrial parks, such projects should be implemented within the mechanism of public-private partnership with involvement of long-term commercial credits. At that, regional authorities provide investments in the form of land plots, development of project documentation, and provision of engineer and transport infrastructure on the territory of industrial parks. It is expedient to view industrial enterprises-integrators in the role of private investors. Functions of industrial parks infrastructure management should be delegated to the managing company, specially created by regional authorities. Effectiveness of functioning of industrial parks should be achieved on the basis of constant monitoring. The main indicators are [Kuznetsov, 2014]:

- level of import substitution of components production for company-integrator

$$(P_{imp}) P_{imp} = \frac{V_{components}}{V_{imported\ components}}$$

- growth of total investments at companies-residents of industrial parks

$$P_{invest} = \frac{\sum_{k=1}^n V_t}{\sum_{k=1}^n V_{t-1}}$$

- indicator of growth of manufacture of innovational products in total volume of

products manufactured by industrial park.

$$P_{innov} = \frac{\sum_{k=1}^n VI_t}{\sum_{k=1}^n VI_{t-1}}$$

- indicator of growth of number of jobs in structure of industrial parks.

$$P_{jobs} = \frac{\sum_{k=1}^n HR_t}{\sum_{k=1}^n HR_{t-1}}$$

- indicator of growth of the number of companies of small and medium business in

structure of industrial parks.

$$P_{small\ business} = \frac{SB_t}{SB_{t-1}}$$

- growth of total cost of companies after their integration into structure of industrial

parks

$$ED_{IP} = \frac{PV\ k\ viewed\ period}{PV\ k\ basic\ period}$$

where:

$I_{imp}$  – indicator of import substitution at enterprise – integrator of industrial park;

$V_{components}$  – volume of components used by company-integrator of industrial park, in monetary form;

$V_{import\ components}$  – volume of import components used by enterprise-integrator of industrial park, in monetary form

$I_{invest}$  – indicator of growth of total investments at enterprises-residents of industrial parks;

$PV$  – volume of attracted investments in companies  $k$ ;

$I_{innov}$  – indicator of growth of manufacture of innovational products in total volume of products manufactured by industrial park, in monetary form;

$VI$  – volume of manufactured innovational products in company  $k$ , in monetary form;

$I_{jobs}$  – indicator of growth of the number of new jobs in structure of industrial park;

HR – number of jobs at enterprises of the industrial park structures;  
 $I_{\text{small business}}$  – indicator of growth of new enterprises of small and medium business in the structure of industrial parks;  
 SB – number of small and medium enterprises of industrial park structures;  
 EDip – indicator of economic development of regional industrial park;  
 PV – current cost of company k;

Evaluation of effectiveness of functioning of industrial park can be conducted on the basis of analysis of deviation of indicators achieved during the analyzed period, as compared to the planned indicators. Periodicity of evaluation should cover operative plans (annual evaluation), tactical plans (every 3 years), and strategic perspective (every 5 years). Model of structural-qualitative transformations of industrial park Doskino, which is created in Nizhny Novgorod Oblast, is reflected in offered indicators in Figure 6.

**Table 6. Model of structural-qualitative transformations of industrial park Doskino, created in Nizhny Novgorod Oblast, [Kuznetsova, 2013]**

Directions of structural-qualitative transformations	Structural-qualitative transformations of Doskino industrial park – Nizhny Novgorod Oblast (targeted indicators)			
	2014 (year of industrial park setting into operation)	2015	2016	2017
1. Level of growth of import substitution at enterprises of industrial park ( $I_{\text{imp.}}$ )	-	0.10	0.20	0.50
2. Growth of total investments at enterprises of industrial park ( $G_{\text{invest}}$ )	-	0.05	0.20	0.30
3. Growth of manufacture of innovational products in total volume of products manufactured by industrial park	-	0.03	0.10	0.15

$(G_{\text{innov}})$				
4. Growth of the number of jobs in structure of industrial park ( $G_{\text{jobs}}$ )	-	0.01	0.05	0.10
5. Growth of the number of new enterprises of small and medium business ( $G_{\text{small business}}$ )	-	0.01	0.05	0.15
6. Indicator of economic development (EDpp)	-	0.10	0.30	0.60

As other directions of evaluation of effectiveness of functioning of industrial park, apart from indicators of economic effectiveness, which are used in methodology of monitoring, the following ones should be viewed:

- budget effect: increase of total tax revenues and non-tax revenues into budgets of various levels [Marjolein C.J. Caniels and Henny A. Romijn, 2001];
- social effect: development of social infrastructure in city-forming districts of industrial parks, reduction of unemployment level, and improvement of material well-being of employees of companies-residents of industrial parks [Tornatzky, L.G. and Fleischer, M, 1990].

### **3. Conclusions**

Industrial parks should be viewed as an effective tool of development of Russian industry, which allows localizing mass serial manufacture of high-tech products in Russia. Integration within structures of industrial parks also ensures growth of effects from production scale and allows reducing volume of indirect losses and improving technical and economic characteristics of product. The conducted research allowed determining that it is necessary to perform the following actions in domestic practice in near perspective:

- for reduction of period of coordination of industrial parks creation – formulate criteria of evaluation of implementation of measures, including by the territory's administration, at all stages of the project;
- implement the practice of budget co-financing of project works for creation of mixed companies;
- create legal mechanism of involvement of intellectual property into economic turnover, conversion of budget debt into shares and property nationalization;
- transfer the management rights of industrial parks members to main companies for the purpose of provision of functioning of integrated associations as comprehensive entities;
- implement into the practice the process of monitoring of resources of enterprises-members of integrated structures and initiate optimization of distributional processes.

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