

Exploring innovation modes of Russian industrial companies

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ABSTRACT

In paper the empirical assessment of formation of innovative modes is presented to the industries. Relevance of research is caused by need of development of new tools of the analysis and stimulation of innovative development as industrial companies and national economy as a whole.

Research objective – an assessment of the factors influencing innovative behavior of the company and allocation of innovative modes in the industry. Authors for the analysis of factors have used a method of the regression analysis of 627 Russian industrial companies given questioning, for allocation of innovative modes the clustering method is used with the help to – averages. In research factors are analysed: investments of the companies in researches and development, orientation to grocery and technological innovations, orientation to marketing innovations and creation of value, orientation to organizational and administrative innovations. Results of research show that in the Russian industrial sector it is possible to allocate innovative modes: “simulators”, “founders of valuable innovations”, “effective producers”, “technological innovators”, “radical innovators”. The “maturity levels” are developed for the allocated innovative modes depending on characteristics: opportunities the company independently to develop new products (services); improvement existing products, managements of researches and development, including coordination with external developers in network projects, strategic alliances, digital innovative platforms; generation and identification of new ideas; implementation of selection of ideas on the basis of the principles of compliance of strategy and their further development; identifications of new enterprise opportunities (studying of changes of environment and branch market, assessment of influence and identification of threats); providing a susceptibility to new technologies, a transfer of technologies; ensuring rationalization of system of production and management and commercial processes; improvement of operating technological processes; commercial use of objects of intellectual property. It is shown that the companies of higher level of an innovative mode make a bigger contribution to gross domestic product, create more workplaces and provide higher level of a salary, therefore development of the mechanism of stimulation of transition of the companies to more advanced level of an innovative mode is necessary.

KEYWORDS:

innovative behavior, innovative mode, effective producers, founders of valuable innovations, technological innovators, radical innovators, simulators, industrial companies.

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1. INTRODUCTION

Russia has set an ambitious goal of GDP growth through innovation, as other sources are already exhausted or do not have sufficient potential.¹ Innovation is a key factor in the competitiveness of both individual companies and the national economy as a whole. Components of the effects of innovation development are presented in Table 1.

Total factor productivity², which reflects the impact of innovations on the economy, can range from 3.9 to 5.7 percentage points, provided that innovation activity is stimulated in the Russian economy, and primarily in industrial production [Trachuk, 2013].

At the same time, the program for stimulating innovation activity in economic sectors cannot be formed based only on the indicators of the share of new products in the total output, the number of registered patents, published articles and references to them, since The first factor - companies' investment in research and development - reflects the

company's ability to independently generate and select new ideas, develop innovations without outsourcing.

The second factor - the focus on product and technological innovation - indicates the implementation of an innovation strategy aimed at developing and introducing new products to the market or improving existing products in order to maintain or expand market share. Companies also improve their technologies and business processes in order to reduce costs while maintaining or improving the quality of the product.

The third factor - marketing innovation and creating value for consumers - signals the implementation of an innovative strategy aimed at expanding markets by meeting the needs of consumers as best as possible and thereby expanding market share.

The fourth factor - organizational and managerial changes - reflects the implementation of an innovative strategy aimed at changing the organizational structure and introducing new management methods.

Table 1
Effects of innovations implementation

For the state	For the society	For companies
Growth of gross value added	Growth of population welfare	Creating new value for customers
Growth of GDP	Opportunities for creating new jobs Moving away from monotonous work to creative work	Increase in market share and increase in the company's profit
Industry diversification	Better meeting the needs of society	Opportunities to enter foreign markets
Sustainable development	Improving the quality of life	Development of new markets and sectors

Source: compiled by the author.

¹ Innovation in Russia is an inexhaustible source of growth. McKinsey Innovation Practice Center for Innovation. 2018. July. URL: https://www.mckinsey.com/~media/McKinsey/Locations/Europe%20and%20Middle%20East/Russia/Our%20Insights/Innovations%20in%20Russia/Innovations-in-Russia_web_lq-1.ashx

² Total factor productivity is calculated as the difference between total GDP growth and factors of production (capital and labor gains).

To determine the distance between arbitrary pairs of clusters, we use the maximum local distance method. The number of clusters in this case will be equal to the difference between the total number of objects and the sequence number of the step that has the maximum distance. The calculation results are presented in Table 4 (627 companies, 625 steps).

Based on the calculations performed, we can see two jumps in the dynamics of changes in the threshold for splitting clusters at steps 178 and 353 (highlighted in bold), which indicates the possibility of splitting the existing population into two clusters.

We also used the k -average method to divide companies into groups within the selected clusters. The method is based on minimizing the total square deviation of cluster points from the centers of these clusters:

$$V = \sum_{i=1}^k \sum_{x \in s} (x_j - \mu_i)^2$$

where k is the number of clusters; s is the resulting clusters; μ_i – is the centers of mass of the vectors, where i is the number of steps, varying from 1 to k .

Using this method, we get five clusters, so we divide the companies first into two, and then into five clusters. In this

case, clusters 1, 2 form cluster I, and clusters 3-5 form cluster II (Fig. 1).

It should be noted that when dividing into clusters I and II, the division was based on the factor of companies' investment in research and development, the presence of which allows companies to independently generate new knowledge and develop new products and technologies. At the same time, clusters I and II do not represent any models of innovative behavior, do not have common components and combine different models of innovative behavior. The main difference between these clusters is that companies have the ability to independently generate knowledge, while cluster I unites companies that independently conduct research and development and in most cases are engaged in product and technological innovations, while cluster II includes companies that do not independently develop new products and do not generate new knowledge. This division is due to the focus on the possibility of introducing radical innovations and the transition to a higher level of the innovation regime [Trachuk, Linder, 2017].

The division of companies into five clusters is determined by the general characteristics of the innovation process and

Table 2
Descriptive statistics of study variables

Variables	Number of companies	Average value (1 - the answer is "yes", 0 – the answer is "no")	Standard deviation
The company invests in research and development	627	0.28	0.55
The company's investments in research and development are highly intensive	627	0.19	0.38
The company carries out the introduction of product innovations	627	0.54	0.45
The company implements technological innovations	627	0.36	0.39
The company implements marketing innovations	627	0.27	0.55
The company carries out the introduction of organizational innovations	627	0.39	0.44
The company carries out the introduction of management innovations	627	0.51	0.42
The company has the ability to generate and select new ideas	627	0.22	0.48
The company has the ability to independently develop a new product (technology)	627	0.27	0.46
The company rationalizes production and improves business processes	627	0.33	0.49
The company is rationalizing its business processes	627	0.53	0.41
The company is receptive to new technologies, technology transfer	627	0.26	0.44
The company manages knowledge and intellectual property	627	0.17	0.43
The company implements the commercial use of intellectual property objects	627	0.12	0.47

Source: author's calculations.

the innovation strategy of the company. Each of the selected clusters has a set of typical characteristics.

Cluster 1 - technological innovators. The companies included in this cluster implement an innovative strategy aimed at creating and developing new products through the integration of technologies with partners in the value chain. The largest share in the structure of innovation activity costs is research and development costs (from 3 to 10% of gross revenue). The products of such companies have a relatively short life cycle - from 2 to 8 years.

Among the tools for implementing such innovative strategies are the development and professional training of employees, patenting inventions, ensuring the protection of intellectual property, and creating partnerships aimed at accessing global sources of new knowledge and technologies.

This innovative mode is most often found among companies in the following industries: equipment manufacturing, metallurgical production, production of building materials, mechanical engineering.

Table 3
Analysis of the factors for the selection of innovative modes

Indicators	Factors			
	Investments in research and development	Product and technological innovations	Marketing innovation and creating value for consumers	Organizational and managerial changes
Introduction of product innovations	0.62	0.73	-0.14	0.32
Introduction of technological innovations	0.66	0.78	-0.18	0.14
Introduction of marketing innovations	-0.23	-0.12	0.58	-0.04
Implementation of organizational innovations	0.54	0.49	-0.16	0.71
Implementation of management innovations	0.26	0.17	0.24	0.13
The company has the ability to generate and select new ideas	0.73	0.57	0.18	0.11
The company has the ability to independently develop a new product (technology)	0.75	0.77	-0.16	0.09
The company rationalizes production and improves business processes	0.42	0.51	-0.09	0.23
The company is rationalizing its business processes	0.16	0.14	0.31	0.59
The company is receptive to new technologies, technology transfer	0.59	0.48	-0.07	0.25
The company manages knowledge and intellectual property	0.61	0.37	-0.18	0.19
The company implements the commercial use of intellectual property objects	0.63	0.29	-0.05	0.12
Kaiser – Mayer – Olkin Sample Adequacy Criterion (KMO)		0.587		
Bartlett's test of sphericity	Approximate value xi-square	538.815		
	Number of degrees of freedom	19		
	Significance	0.000		

Source: author's calculations.

Table 4
The results of calculating the Hamming distances

Step	Coefficient (d_{ij})
176	0.213
177	0.215
178	0.236
70	0.527
71	0.554
.....	
352	1.532
353	1.565
354	1.576
355	2.512

Cluster - radical innovators. Companies included in this cluster create new products based on the commercialization of basic scientific research. The largest share in the structure of spending on innovation activities is occupied by research and development costs (as a rule, from 10 to 35% of gross revenue).

Since the innovation process in such companies involves conducting fundamental and applied scientific research, it has a relatively long period – from 7 to 20 years. As a rule, companies in this cluster have an extensive network of partnerships in the implementation of innovative projects, and the corporate innovation system is built using open

innovation tools. The success of such innovative strategies depends, among other things, on the implementation of the state policy in the field of innovation: tax incentives, the development of innovation infrastructure, the possibility of commercialization of innovations and the creation of demand for innovations. In addition, important success factors are the work of such companies in international markets, the availability of qualified employees in innovation, and the protection of intellectual property.

This mode is most widely used in pharmaceuticals, chemical and metallurgical production.

Figure 1. Clusters of industrial companies by type of innovative behavior

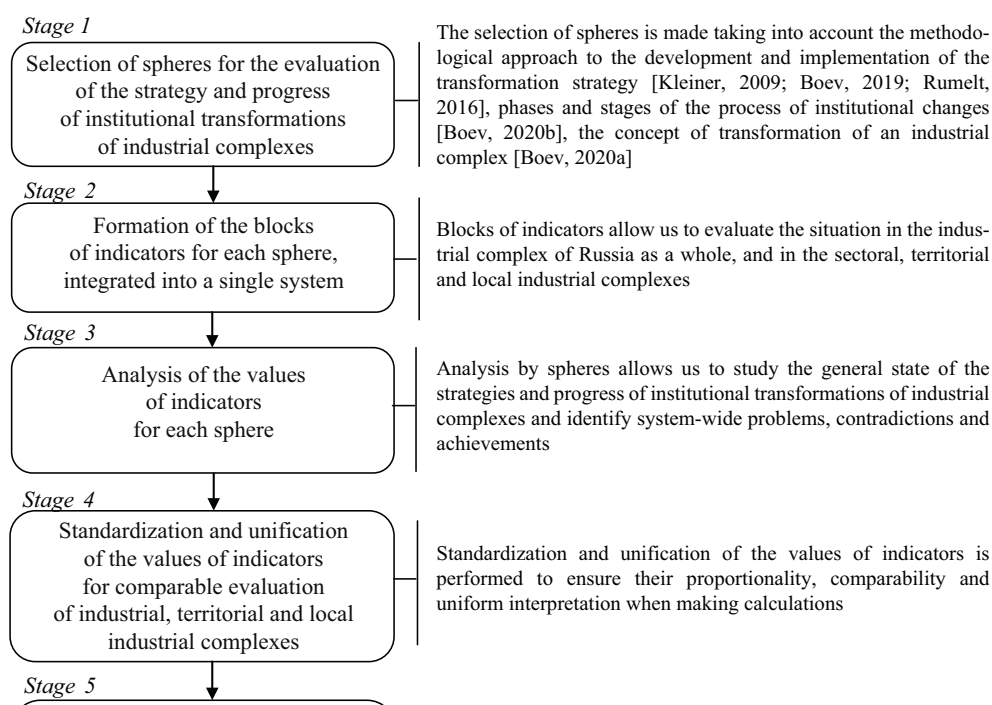
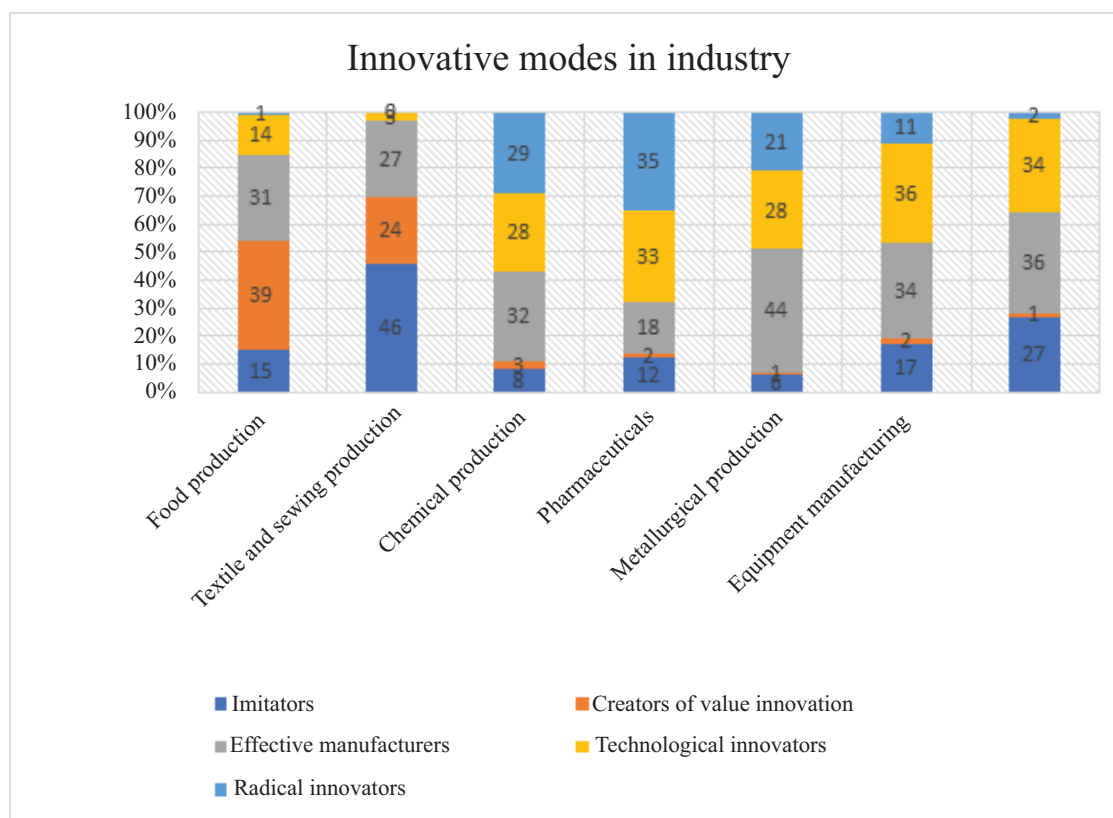


Table 5
Characteristics of innovative modes in industry

Specifications	Effective manufacturers	Technological innovators	Creators of value innovations	Radical innovators	Simulators
The intensity of investment in research and development (R&D)	From 1 to 3% of gross revenue	From 3 to 7% of gross revenue	No	From 15 to 35% of gross revenue	No
Structure of innovation activity costs	Maximum investment in technology upgrades and infrastructure improvements with minimal investment in marketing innovations	Maximum investment in product innovation	Maximum costs for marketing and organizational innovations with no or low costs for product and technological innovations	Development and implementation of new products based on the commercialization of basic scientific research	Cost of training staff
Types of implemented innovations	Product and process innovation	Product and process innovation	Marketing and organizational innovations	Value innovation	Management innovations
Level of novelty of the implemented innovations	New for the local market, new for the company	New for the local market	New for the company/local market	New to the world	Pseudo-innovations
Having own R&D department	Yes	Yes	No	Yes	No
Characteristics of innovation process	Innovation process depends on the depth of changes in production processes and products	Innovation process is aimed at creating and developing new products. Product life cycle of such companies is from 3 to 10 years	Innovation cycle is characterized by a relatively short period of development of new products	Innovation process in companies of this type includes fundamental and applied research and is characterized by a long cycle from the beginning of research to commercialization – from 7 to 20 years	Innovation process is aimed at developing changes to the original innovation or finding a new application, resulting in the creation of a new product, process, technology
Building a corporate innovation system (CIS) and the presence of inter-firm relationships in the innovation process	Closed-end CIS, focused on creating new products through the integration of technologies with partners in the value chain	It is built on the principle of open innovation	Construction of the innovation system and the features of the innovation process are determined by the presence of unsatisfied consumer requests, the presence of undeveloped markets and niches	It is built on the principle of open innovation, that is, there is an extensive network of partnerships with research centers, universities both at the national and international levels	Closed-end CIS or not available

Source: compiled by the author.

Figure 2 shows the distribution of the selected innovative modes among Russian industries.



Источник: составлено автором.

Cluster 3 - efficient producers. Companies included in this cluster are aimed at improving operational activities and, accordingly, introducing process and technological innovations. The cost of innovation activities mainly consists of investments in new technologies, equipment, and infrastructure improvements. Costs of organizational and marketing innovations are negligible.

Innovative behavior of such companies is characterized by an emphasis on the creation and development of new products that reduce the cost of production, administrative and commercial costs. When implementing an innovative strategy, companies in this cluster form a network of partnerships that optimize logistics costs and promote the most effective interaction with suppliers, customers and end users.

This innovative mode is most widely used in the textile industry, metallurgy, woodworking, and the production of machinery and equipment.

Cluster 4 - creators of value innovations. Cluster companies implement a strategy aimed at creating the highest value for customers and optimizing the ways of its delivery, while ensuring the offer of new products, services and the formation of alternative business models. The goal of companies that adhere to this type of innovative behavior is to get to know their customers in order to increase the consumer value of products, reduce the operating costs of consumers, and find new markets.

The innovation cycle of companies in this mode is relatively short, the features of building a corporate innovation system are determined by the presence of undeveloped markets and niches, unsatisfied consumer requests.

The structure of the costs of innovation activity is dominated by the costs of marketing innovations (about 3-7% of gross revenue).

The success of this strategy lies in a deeper knowledge of the market and consumers, as well as opportunities to enter new consumer markets, diversification, and the potential to quickly scale up innovation and refine products after they are put on the market. The presence of domestic demand for innovations and measures to support entrepreneurship also have a positive impact on the performance of these companies.

This innovative mode is more common in the food, textile and clothing industries.

Cluster 5 - simulators. Companies that are part of this cluster do not independently create or distribute new knowledge and products on the market. The basis of this strategy is borrowing. At the same time, there are three types of borrowing: copying products as a whole; copying individual technical parameters, design and brand elements; borrowing innovative solutions (technologies, patents, knowledge, business processes, management principles and business models); creative imitation, when the company

makes changes to the original innovation or finds a new application, as a result of which it creates a new product, process, technology.

The strategy of creative imitation characterizes the ability of companies to self-study, accumulate knowledge and competencies that allow them to critically rethink existing business practices, quickly and effectively respond to changes in the external environment.

This strategy allows companies that do not have the resources for their own research and development to develop and participate in the competition. Companies start with imitation to learn from innovators and market leaders, and over time develop their own innovative technologies and products. Under certain conditions, simulation strategies can also help create a sustainable competitive advantage and improve business performance.

The characteristics of the selected innovative modes in industry are presented in Table 5.

Figure 2 shows the distribution of the selected innovative modes among Russian industries.

5. LEVELS OF MATURITY OF INNOVATION MODES

Model of innovative behavior and corresponding corporate innovation system ensure the implementation of the company's strategy. At the same time, in order to develop an innovative development strategy, it is necessary to analyze the possibilities of companies' transition to a higher level of the innovation regime. Proposed analysis of the maturity level of the innovative behavior model can be a tool for such an assessment. Fifteen key dimensions are identified, each of which is analyzed through the prism of five levels of maturity, which are characterized by certain characteristics. The first level means that the model measurement is at the initial stage of development, and the fifth level indicates high progress in this measurement (Table 6).

In accordance with these maturity levels, the identified models of innovative behavior of industrial enterprises are ranked (Table 7).

Table 6

Characteristics of the maturity levels of the corporate innovation system and the model of innovative behavior of industrial enterprises

Specifications	Level of development				
	low				high
The ability to independently develop new products (services)	1	2	3	4	5
Ability to improve existing products	1	2	3	4	5
Research and development management, including coordination with external developers in network projects, strategic alliances, and digital innovation platforms	1	2	3	4	5
Generating and identifying new ideas	1	2	3	4	5
Implementation of the selection of ideas based on the principles of compliance with the strategy and their further development	1	2	3	4	5
Identification of new business opportunities (study of changes in the external environment and industry market, impact assessment and identification of threats)	1	2	3	4	5
Ensuring responsiveness to new technologies, technology transfer	1	2	3	4	5
Ensuring the rationalization of the production and management system	1	2	3	4	5
Rationalization of commercial processes	1	2	3	4	5
Improvement of existing technological processes	1	2	3	4	5
Knowledge and intellectual property management	1	2	3	4	5
Commercial use of intellectual property objects	1	2	3	4	5
Organization of implementation. Implementation of innovative projects. Integration of technological solutions, market and organizational changes	1	2	3	4	5

Source: compiled by the author.

Based on the analysis of data from 627 industrial enterprises, the level of maturity of their innovative behavior model is analyzed and the innovative regimes of Russian industrial sectors are analyzed (Table 8).

Next, we calculate the contribution of each innovation regime to the development of industry and the country's economy as a whole. Results of calculations showed that enterprises that implement more advanced models of innovative behavior have higher revenue and profit from sales, as well as a higher level of labor productivity (Table 9).

Thus, companies of a higher level of innovation regime contribute more to GDP, create more jobs and provide a higher level of wages, therefore, it is necessary to develop a mechanism to stimulate the transition of companies to a

higher level of innovation regime. However, the development of such a mechanism should be accompanied by an analysis of the barriers to the transition of companies to it.

6. BARRIERS TO COMPANIES' TRANSITION TO A HIGHER LEVEL OF INNOVATION REGIME

To identify the barriers, a survey was conducted with representatives of the management of Russian industrial enterprises responsible for innovation activities. The questionnaire questions were formulated as follows: "How much do you agree with the statements below?", a 7-point Likert scale was used for the answers (1 – "completely disagree", 4 – "I do not know whether I agree or disagree",

Table 7
Maturity levels of models of innovative behavior of industrial enterprises

Maturity levels	Characteristics of the innovative behavior model
I. Simulators	✓ There is no possibility of independent product development and generation of new ideas ✓ It is possible to independently improve existing products ✓ Lack of ability to manage research and development
II. Creators of value innovations	✓ There is no possibility of independent product development ✓ It is possible to identify new entrepreneurial opportunities (exploring changes in the environment and industry market, assessing influence and identifying threats) ✓ It is possible to organize the implementation of marketing and organizational innovations. Integration of technological, market and organizational change ✓ Rationalization of commercial processes
III. Efficient manufacturer	✓ There is an opportunity to ensure receptivity to new technologies, technology transfer ✓ There is an opportunity to ensure rationalization of production and management system ✓ Improvement of existing technological processes
IV. Technological innovator	✓ It is possible to independently develop new products (services) ✓ It is possible to generate and identify new ideas ✓ Identification of new business opportunities (study of changes in the external environment and industry market, impact assessment and identification of threats) ✓ Ensuring responsiveness to new technologies, technology transfer ✓ Improvement of existing technological processes ✓ Organization of implementation. Implementation of innovative projects. Integration of technological solutions, market and organizational changes
V. Radical innovator	✓ It is possible to independently develop new products (services) ✓ Research and development management, including coordination with external developers in network projects, strategic alliances, and digital innovation platforms ✓ Generation, identification and implementation of the selection of ideas based on the principles of compliance with the strategy and their further development ✓ Knowledge and intellectual property management ✓ Commercial use of intellectual property objects

Source: compiled by the author.

7 – "completely agree"), the most significant barriers were measured at two levels: the level of innovation creation and the level of innovation commercialization.

Next, an index was calculated for the main barriers to innovation activity of companies by summing up the mentions of individual items from the questionnaire.

Table 10 shows the rating of factors that hinder innovation activity for enterprises of different innovation regimes at two levels: the level of innovation creation and the level of innovation commercialization.

Results of analysis show that the barriers to innovation activity differ significantly not only from the level of innovation process: the creation or commercialization of innovations, but also from the type of innovation regime.

Thus, at the level of innovation creation, the most significant barriers for enterprises are the lack of their own sources of financing, limited access to financial capital, and the high cost of research and development.

The second most important factor for effective manufacturers and radical innovators was the lack of qualified personnel capable of generating new ideas.

Another significant factor for imitators, creators of value innovations and effective manufacturers was the lack of their own R&D departments, for technological innovators - the lack of opportunities to cooperate with the most attractive partners, and for radical innovators - the lack of intellectual property protection.

At the second stage of innovation process – the commercialization of innovations - the barrier of difficulty in attracting financing for the introduction of innovative products, on the contrary, does not play a decisive role. In the first place there are factors of low demand from consumers for innovative products (for radical innovators), the problems of commercialization (transition from technology to product) for technological innovators, the lack of managerial personnel capable of implementing innovative

Table 8
Characteristics of the maturity level of industrial companies participating in the study

Clusters Company characteristics	Cluster 1 - simulators	Cluster 2 - creators of value innovations	Cluster 3 - efficient manufacturers	Cluster 4 - technology innovators.	Cluster 5 - radical innovators.
	Percentage of companies with this characteristic in the cluster				
The ability to independently develop new products (services);	10	35	75	90	100
Ability to improve existing products	75	80	100	100	100
Research and development management, including coordination with external developers in network projects, strategic alliances, and digital innovation platforms	0	0	45	70	100
Generating and identifying new ideas	0	20	70	85	100
Implementation of the selection of ideas based on the principles of compliance with the strategy and their further development	0	55	75	90	100
Identification of new business opportunities (study of changes in the external environment and industry market, impact assessment and identification of threats)	100	100	100	100	100
Ensuring responsiveness to new technologies, technology transfer	0	10	85	90	100
Ensuring the rationalization of the production and management system	0	0	100	100	100
Rationalization of commercial processes	100	100	65	90	75
Improvement of existing technological processes	0	0	100	100	100
Knowledge and intellectual property management	0	20	65	80	100
Commercial use of intellectual property objects	0	15	45	75	100
Organization of implementation. Implementation of innovative projects. Integration of technological, market and organizational change	35	40	80	85	100

Source: compiled by the author.

Table 9
Assessment of contribution of innovation regimes to the development of industry and the Russian economy

	Simulators	Creators of value innovations	Efficient manufacturer	Technological innovator	Radical innovator
Gross value added (GVA) of innovation-mode companies (by large and medium-sized organizations), billion rubles ^a	2031.0	2074.5	2148.3	2450.0	2700.0
Contribution to GDP (GVA in basic prices) of the economy	0.6	0.7	0.65	0.83	0.97
Dynamics of trade turnover, compared to the previous year	2.35	2.43	2.51	21.1	30.3
<i>The share of innovative mode companies in individual indicators for industry</i>					
In the payroll fund	22.9	21.4	22.2	23.1	25.4
In the average number of employees	20.3	19.8	19.0	20.5	22.0
In fixed capital investments	20.3	17.9	18.9	22.6	23.8
The proceeds from the sale	12.3	12.7	12.6	15.6	16.9
In profit before tax	8.1	9.2	9.1	12.8	14.9
In tax revenues to the consolidated budget of the Russian Federation	15.9	14.8	15.2	23.9	27.5
Ratio of average monthly nominal accrued salary to the average level	98.4	95.7	103.8	120.7	124.5
Return on sales	6.1	6.7	7.8	9.5	12.9

^a Calculated on the basis of the form of Rosstat 5-z "Information on the costs of production and difference between output and material costs".

Source: compiled by the author.

projects for effective manufacturers and imitators, the lack of information about sales markets for the creators of value innovations.

The results obtained indicate the need to use different tools to stimulate innovation and neutralize the identified barriers for companies of different innovation regimes in the industry.

7. CONCLUSIONS AND DIRECTIONS FOR FURTHER RESEARCH

Industrial companies, depending on the industry, the ability to independently conduct research and development, the specifics of the innovation process and the construction of corporate innovation systems, implement a particular competitive and innovative strategy. Objectives of the innovation strategy of sustainable growth of the company's business by improving product competitiveness, increase profitability, improve product quality, maintaining and increasing market share, improving the structure of consumers.

Depending on the type of innovation and competitive strategy being implemented, the type of innovation being implemented, and the characteristics of the corporate innovation system, five types of innovation modes in industry

are identified: imitators, creators of value innovations, effective manufacturers, technological innovators, and radical innovators.

In order to stimulate the innovation activity of industrial companies and their transition to a more advanced level of the innovation regime, a scale for assessing the potential of the innovation system was developed and the maturity levels of the selected innovation regimes were determined.

The analysis showed that companies of a higher level of innovation regime contribute more to GDP, create more jobs and provide a higher level of wages, therefore, it is necessary to develop a mechanism to encourage companies to move to a higher level of innovation regime.

In addition, we have analyzed the barriers to the transition of companies to a higher level of innovation regimes. The results of the analysis show that the barriers to innovation activity differ significantly not only from the level of the innovation process: the creation or commercialization of innovations, but also from the type of innovation regime.

Thus, at the level of innovation creation, the most significant barriers for enterprises are the lack of their own sources of financing, limited access to financial capital, and the high cost of research and development. At the level of commercialization of innovations, the barrier of difficulty in attracting financing for the introduction of innovative products, on the contrary, does not play a decisive role.

Table 10
Rating of factors that hinder the effectiveness of innovation activities for enterprises of various innovation regimes

Rating	Simulators	Creators of value innovations	Effective manufacturers	Technological innovators	Radical innovators
<i>Barriers at the level of innovation</i>					
1	High cost of research and development	Restrictions on access to financial capital	Lack of information about new technologies	High cost of research and development	Lack of own sources of financing
2	Restrictions on access to financial capital	High cost of research and development	Lack of highly qualified personnel capable of generating new ideas	Insufficient protection of intellectual property	Lack of highly qualified personnel capable of generating new ideas
3	Lack of own R&D departments	Lack of own R&D departments	Lack of own R&D departments	Lack of opportunities to cooperate with the most attractive partners	Insufficient protection of intellectual property
4	Lack of highly qualified personnel capable of generating new ideas	Lack of opportunities to cooperate with the most attractive partners	Lack of opportunities to cooperate with the most attractive partners	Lack of information about new technologies	Lack of opportunities to cooperate with the most attractive partners
5	Lack of opportunities to cooperate with the most attractive partners	Lack of highly qualified personnel capable of generating new ideas	High cost of research and development	Restrictions on access to financial capital	High cost of research and development
<i>Barriers at the level of commercialization of innovations</i>					
1	Lack of managerial personnel capable of implementing innovative projects	Lack of information about sales markets	Lack of managerial personnel capable of implementing innovative projects	Problems of commercialization (transition from technology to product)	Low consumer demand for innovative products
2	Low consumer demand for innovative products	Difficulty of attracting financing for the introduction of innovative products	Problems of commercialization (transition from technology to product)	Low consumer demand for innovative products	Lack of information about sales markets
3	Problems of commercialization (transition from technology to product)	Low consumer demand for innovative products	Low consumer demand for innovative products	Lack of information about sales markets	Difficulty of attracting financing for the introduction of innovative products
4	Lack of information about sales markets	Problems of commercialization (transition from technology to product)	Problems of commercialization (transition from technology to product)	Difficulty of attracting financing for the introduction of innovative products	Lack of managerial personnel capable of implementing innovative projects
5	Difficulty of attracting financing for the introduction of innovative products	Lack of managerial personnel capable of implementing innovative projects	Difficulty of attracting financing for the introduction of innovative products	Lack of managerial personnel capable of implementing innovative projects	Problems of commercialization (transition from technology to product)

In the first place there are factors of low demand from consumers for innovative products (for radical innovators), the problems of commercialization (transition from technology to product) for technological innovators, the lack of managerial personnel capable of implementing innovative projects for effective manufacturers and imitators, the lack of information about sales markets for the creators of value innovations.

The obtained results will allow managers of the companies in more detail to develop a strategy of innovation based on the analysis of such corporate innovation system, as the development of new products (services); the improvement of existing products (services); the management of research and development, including coordination with external developers in network projects, as well as in strategic alliances, identify new business opportunities (the study of changes in the external environment and industry market, impact evaluation and detection of threats); the generation and detection of new ideas; the possibility of selecting ideas based on the principles of compliance strategies and their further development; ensuring receptivity to new technologies, transfer of technologies; organization of the implementation of technologies, innovative projects, integrating technological, market and organizational change, improving existing technological processes; ensuring policy of streamlining production and management; opportunities to streamline business processes; knowledge management and intellectual property commercial exploitation of intellectual property.

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