



# Technique of Industrial Innovative Positioning on Medium Technological Branches' Example of High-Level

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## ABSTRACT

A comprehensive approach to the implementation of innovative activities gives enterprises and the industry as a whole a number of advantages, due to which the goal of bringing the Russian economy to the innovative path of development can be achieved. Therefore, the most important task in the formation of an innovative economy is the study and identification of the specifics of carrying out innovation activities in industries, which requires special approaches and techniques for assessing the effectiveness of innovative activity. This study is caused by the inadequacy of the methodological and methodical base in the field of assessing the effectiveness of innovative processes at the sector level of the national economy's functioning. As a result of the study, a technique for innovative positioning at the level of individual industries was developed and tested on the example of medium-level high-tech industries, which is sufficiently universal and can be used to conduct an appropriate assessment in any sector of the economy, including in the development of various programs of industry and

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Regional development..

**Keywords:** efficiency of innovative activity, innovative potential, efficiency of innovative activity, medium technological industries of high level

## INTRODUCTION

At this stage of the development of the economy, much attention is paid to the study of management issues in the sphere of organization of innovative processes, the disclosure of methodical and methodological approaches to assessing the effectiveness of innovative activities, the development of models for innovative development, etc. However, there are a number of conditions that hamper the practical application of the theories and models being developed.

Any industry is a set of many enterprises, and the more enterprises function effectively in this industry, the more likely one can talk about the sustainable economic situation of this industry. The basis for the stable development of enterprises in this context is their innovative activity and efficiency and, as a result, the innovative activity and efficiency of the industry as a whole. In turn, it is necessary to understand that any enterprise functions within the framework of this or that industrial branch, which sets the rate of development of innovations, their role, frequency of innovative activity and as a consequence denotes the parameters of the enterprise's competitiveness [1].

A large number of studies are devoted to the evaluation of the effectiveness of innovative activity at the level of individual enterprises, which include the works of S.A. Shevchenko [2], O.V. Sedlukho and N.N. Khmel'nitskaya [3], including using both direct innovative indicators and indirect ones, an example of which is the study by A.N. Kozodaev and A.D. Shmatko [4]. A number of works are devoted to the problems of improving the methodical aspects of the evaluation of the effectiveness of innovative activity at the micro level (for example, the study of S.N. Tributsyn and S.B. Rakov [5]. The branch orientation of such studies can be found in the work of D.N. Lapaev [6]. The fundamentals of the methodology of innovative positioning at the regional level are reflected in the work of M.V. Yegorova [7]. And it is precisely in the continuation of these developments and the development of the methodological foundations of innovative positioning this study was carried out in the sector context.

In addition, we note the significant role of medium technological industries of high level in the formation of a stable economic situation in the country. Enterprises of this type of industry are, as a rule, city-forming, providing a significant number of jobs, stable economic development of a region in which they operate. In this regard, as an object of implementation of the practical side of our research, innovative activity of medium technological industries of high level was chosen.

## MATERIAL AND METHODS

### Research Methods

The theoretical basis of the presented research is the fundamental and applied works of domestic and foreign scientists specializing in the field of research on assessment and improving the efficiency of innovation management at the level of micro- and mezo-systems. The object of

research is the integral characteristics of innovative activity of industrial enterprises' functioning in the sector context. The subject of the study is presented by a set of methodical approaches and tools for assessing the parameters of innovative activities of industrial complexes.

### **Information base of research**

During the research, the following methods were used: theoretical (analysis, synthesis, comparison, formalization, analogy, simulation); empirical (study of official statistical documentation); methods of descriptive statistics.

## **RESULTS**

### **Development of technique for industrial innovative positioning**

In the framework of the classical approach to determining the efficiency of enterprises (industries), the main thing in assessing the totality of characteristics of the company's innovation efficiency is the comparison of the results of this activity with the costs of its implementation.

The innovative potential of the industry will be characterized by the cumulative innovative potential of the enterprises that are part of this industry. The innovative potential of the enterprise, in our opinion, can be considered through quantitative and qualitative indicators that characterize the enterprise's preparedness for the implementation of innovative activities and the fullness of innovative processes. This indicator for the medium technological sectors of high level as a whole will always will be characterized by private indicators of the innovative potentials of enterprises related to the chemical industry, the automotive industry, the production of electrical machines and electrical equipment, the production of machinery and equipment, and the production of other vehicles.

The innovation potential of the industry can include many interacting components aimed at obtaining a single final result in the form of an innovative product. The innovative potential reflects the maximum possible availability of innovative resources, which imply the presence of intellectual, financial and material resources at the enterprises of this branch, which contribute to the effective implementation of the innovation process.

However, not every industry has innovative potential. For its development, it is necessary to carry out a number of measures aimed at the effective and efficient use of the production and technological base, information, finance and human resources; development of scientific and technical potential; increasing the level of the managerial factor through the creation and development of organizational capacity; creation and increase of the level of innovative culture in the industry.

The size of the innovative potential may influence the choice of an innovation strategy of the industry. If a number of the above mentioned measures are implemented in the industry and the necessary resources are available, then this branch can implement a strategy of leadership, in which fundamentally new - basic - innovations are realized. If the industry does not implement the necessary complex of measures to develop innovative capacity or

the industry does not have the necessary amount of resources, it can adopt a strategy of the follower, in which further improvement of existing innovations takes place.

One of the most important resources of innovation activity, in our opinion, is a financial resource. The availability of sufficient financial resources in the industry predetermines broad financial opportunities that allow creating a material, technical, communication, intellectual, human resources base for innovative activities that will characterize the high innovative potential in the industry (in the form of the costs for acquiring these resources for implementation of innovative activity). As a result, we will use the financial component (or financial resources) of the industry as one of the main criteria for evaluating the innovation potential.

The effectiveness of innovative activities of enterprises in the industry implies the active development of processes aimed at creating an innovative product, work or service. In addition to the existing opportunities for further implementation of innovative activities, its effectiveness is also important. It makes no sense to spend available resources on activities that will not bring results. It is determined that the innovation activity is primarily aimed at obtaining an innovative product, which, with subsequent implementation, will bring profit, which is one of the main goals of any commercial enterprise. In this regard, when assessing the effectiveness of innovation, we will take into account not only the innovative potential of the industry, but also the innovative result.

To identify the innovative position of the industry in the context of the effectiveness of innovation, it is necessary to identify the space in which this position will be identified and it will determine the two most important parameters of the innovation activity of the business entity, in our opinion, namely: the effectiveness of innovative activity and the innovative potential of the industry.

We propose the following formula for estimating the result obtained from the implementation of innovative activities in the industry:

$$RI_i = \frac{IP_{ni}}{VIP_i},$$

Where  $RI_i$  - innovative result (the result of innovative activity) in the  $i$ -th industry;  $IP_{ni}$  - the volume of innovative products newly introduced or subjected to significant technological changes in the  $i$ -th industry;  $VIP_i$  - the total amount of innovative products (works, services) in the  $i$ -th industry.

It is necessary to distinguish between the concepts of "innovative product", "newly introduced product" and "subjected to significant technological changes (improvement)", since they have different degrees of novelty. We can refer to newly introduced products those ones which are based on new technologies, where the scope, performance characteristics, and composition of the materials used for these products are significantly different from earlier products and have a high degree of novelty. In addition to newly introduced products, products that have undergone improvement can be present in the total volume of innovative products, which are products based on technologically advanced

methods, methods of production, methods of production organization or their combination and having a degree of novelty below the newly introduced innovative products [8].

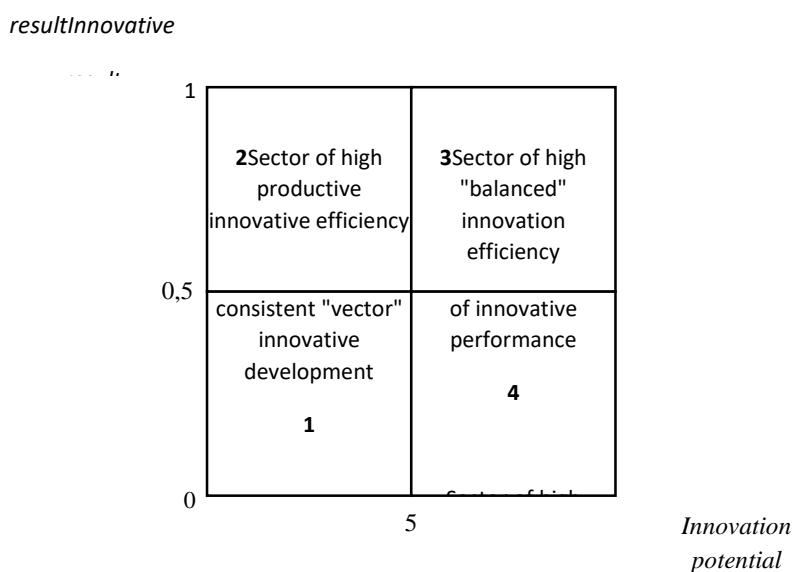
The innovative potential of the industry can be expressed by the following formula:

$$PI_i = \frac{ETI_i}{EI_i},$$

Where  $PI_i$  - innovative potential of the  $i$ -th industry;  $ETI_i$  - the cost of technological innovation in the  $i$ -th industry;  $EI_i$  - the total cost of innovation in the  $i$ -industry.

The denominator of this formula is the total cost of innovation, which includes the costs of technological, marketing and organizational innovation. In the numerator, we chose the costs of technological innovation, because when analyzing the distribution of costs by types of innovation, it was revealed that the greatest share was occupied by technological innovations. In particular, in the analysis of medium technological industries of high level, this specificity is confirmed by the following statistics: in 2014, the share of technological innovation was 98%, marketing - 1.6%, organizational - 0.4% [9]. This is due to the fact that in the medium technological industries of high level (chemical industry, automotive industry, etc.) the main focus is on innovations in the form of a new or improved product, production process or new technology. As a result, we used the costs on technological innovation, in view of their great importance in this class of industries.

Further, to solve the task of developing a tool for identifying innovative positioning of the industry, we used the matrix method as one of the most common and visual approaches used in determining the positions of the business. Figure 1 shows the matrix of innovative positioning of the industry.



**Figure 1:** Matrix of innovative positioning of the industry

With the help of the presented model of innovative positioning of the industry, it is possible to conduct a joint analysis of two indicators - innovation potential and innovative result. The innovation potential is located along the abscissa axis; the innovative result is along the ordinate axis.

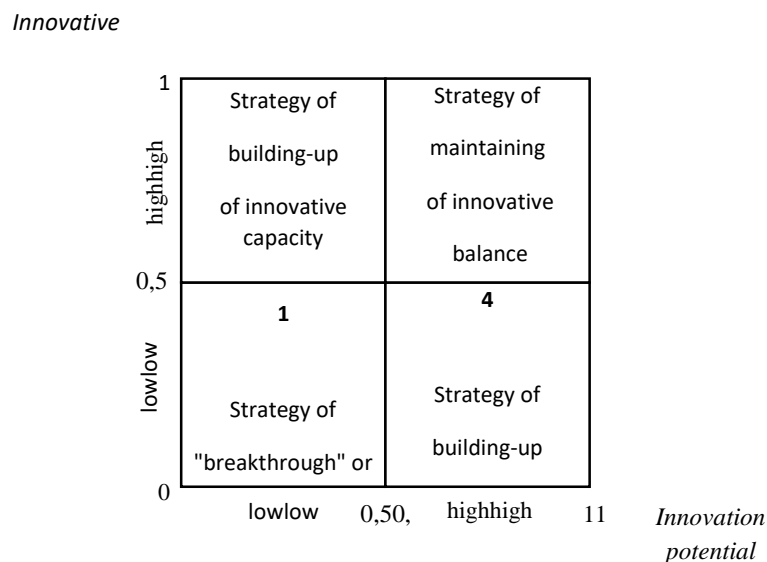
The matrix has four quadrants (sectors), each of which is characterized by a certain degree of efficiency of innovative activities in the industry. In other words, the matrix shows what innovation potential is available to this or that branch, and how it manages it, obtaining an innovative result in the form of, for example, innovative product, service, profit from the sale of an innovative product, etc.

The innovative result indicator ( $R_{li}$ ) can range from 0 to 1, the innovation potential ( $PI_i$ ) is measured in a similar range. This range in both formulas is explained by the fact that the numerator is always less than the denominator when calculating, since it is an integral part of the indicator in the denominator.

An innovative result equal to one means that the industry produces completely new products that meet the criteria of innovation or products produced with radically new technological changes. This indicates that enterprises in the industry are implementing a policy aimed at producing innovative products of a high degree of novelty. An innovative result equal to zero indicates that there is no production of innovative products.

Innovation potential equal to one means that in the industry technological innovations predominate, aimed at the production of innovative products, a radical change in technologies in the production of products. Innovative potential, equal to zero, means that this industry does not invest in technological innovations or does not incur expenses for innovations at all.

As a result, each of the quadrants of the matrix has its own characteristics. In addition, the proposed model makes it possible to identify innovative strategies for the further development of the industry, depending on whether it enters into one or another segment of the matrix (Figure 2).



**Figure 2:** The matrix of innovative positioning with possible innovative strategies for the development of the industry

The first quadrant of the matrix is characterized by a low efficiency of innovative activity, and is designated as "Sector of low balanced innovative efficiency". In this segment, innovative potential and innovative results are in the range from 0 to 0.5, which indicates a low level of available resources for innovative activity's implementation in the industry and, therefore, a minimum result. In this sector, there is practically no financing for innovative processes, and as a result, innovative products are not produced (the innovative result is 0) or the volume of innovative goods is not high.

The innovative strategy of industries in the sector of low "balanced" efficiency implies "breakthrough" or consistent "vector" innovative development. The industry in this sector should pursue a policy of active financing of innovation activities, in particular, financing of technological innovations due to the specific activities of enterprises in this group of industries. If the industry for a long time will be in this sector, then it can lose competitive positions in the market.

The second quadrant is characterized by an innovative result that ranges from 0.5 to 1 (a zone of high innovative efficiency) and an innovative potential from 0 to 0.5 (a zone of low innovative potential). This quadrant was named "Sector of high productive innovative efficiency". The finding of an industry in this quadrant of the matrix is characterized by the fact that the industry produces a significant number of innovative products. However, the innovative potential in this case can be equal to both 0 and 0.5, which indicates a weak financing of innovation activities of enterprises or complete lack of financing. The finding of an industry in this quadrant can be explained by the fact that in the industry there was a temporary financing, for example, the implementation of an innovative project, resulting in a certain period of time to maximum returns in the form of an innovative product. The location of the industry in this quadrant depends on a variety of factors: on the specifics of

the innovative product or service that were developed and implemented in the course of innovative activity, the actions of competitors, the acceleration of the scientific and technological progress, the duration of the demand for this product, etc. We can conclude that this quadrant as a whole is characterized by a rather high position in the sphere of innovative activity.

The industry in this sector must adhere to the strategy of building innovative capacity. With high innovative efficiency and low innovative potential, the enterprises entering this industry need to ensure systematic financing of innovative activity through the creation of special funds, which will receive the necessary funds for the full and timely implementation of the innovation process.

The location of the industry in the third quadrant characterizes the high degree of efficiency of innovative activity that it implements. As a result, this segment was named "Sector of high balanced innovation efficiency". Innovative potential and innovative results are in the range from 0.5 to 1. Industries included in this segment have a high potential for innovation processes, implementation of innovative activities and, as a result, to obtain the maximum innovative result. However, if the innovation potential is equal to one, then it shows the costs only for technological innovations, and also that the industry does not finance the marketing and organizational innovations that are an indispensable element in maintaining the competitiveness of industry enterprises.

The finding of an industry in the third segment of the matrix predetermines the pursuit of a strategy for maintaining the innovation balance, which implies the preservation of existing positions in the field of financing and the result of the implementation of innovative activity. To increase sales of the innovative product produced and to maintain positions in this segment of the matrix, industry enterprises can implement marketing innovations and begin to implement organizational innovations.

The fourth quadrant of the matrix of innovative positioning characterizes industries that have prospects for increasing the effectiveness of innovative activity. It was named "Sector of high potential innovative activity". In such industries there is a high potential, the effective use of which can show in the future a high innovative result. The industry that enters into this segment invests enough money in innovation, but the innovative result is at a low level. This can be explained by the time factor, in which the cost on innovation has not yet affected the activities of the industry in the form of an innovative product. Another explanation may be that in the industry, despite the funding of innovation, an innovative product is not produced, or the existing product on the market has undergone such minor changes that the funds spent do not correspond to the result.

This segment can be matched by the strategy of increasing the innovation result due to high indicators of innovation potential and low indicators of innovation results. If the low effectiveness of innovation activity is explained by the time factor, then it is difficult for enterprises of the industry to influence the indicators of the innovation result. A large time gap between the financing of innovation activity and the return in the form of an innovative product produced and sold can be caused by the specifics of developing an innovative product, creating experimental samples, etc. The second reason for the low effectiveness of

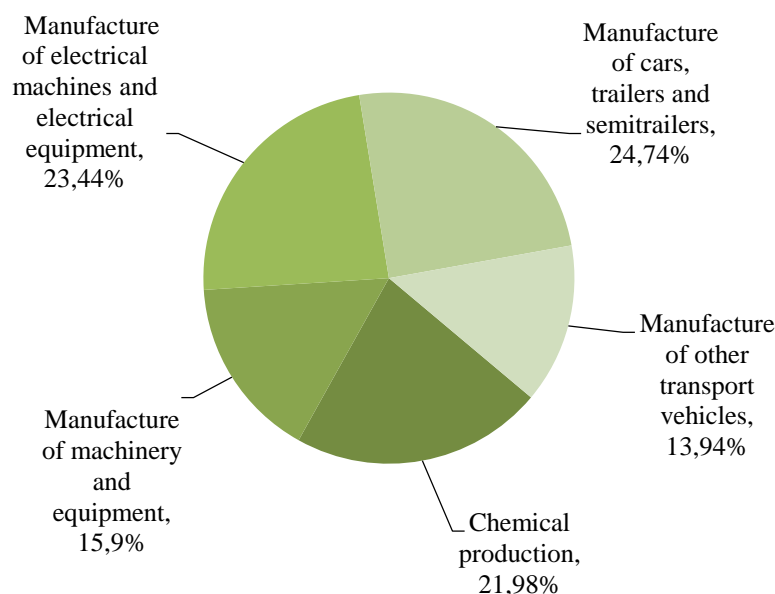


the invested funds is the discrepancy between the volume of financing and the goods produced. This fact can be explained by the presence of unskilled employees engaged in this project to develop an innovative product. In addition, there may be a situation of unclaimed products on the market, despite the compliance of the funds spent and the quality of the product produced. In case of the poor performance the managers of the industry should review the policy in the field of innovation, monitor the qualitative and quantitative indicators of the innovation process.

### **Analysis of the effectiveness of innovative activities of medium technological industries of high level**

Before we proceed to the calculation of the relevant indicators and the construction of an innovative positioning matrix, we conducted a traditional comparative analysis of the general nature of innovative activity in medium-technological industries of high-level.

Figure 3 illustrates the greatest innovative activity of the industries in the production of cars, trailers and semi-trailers: the share of innovative active enterprises here is 24.74%; production of electrical machinery and equipment - 23.44% and chemical production - 21.8%.

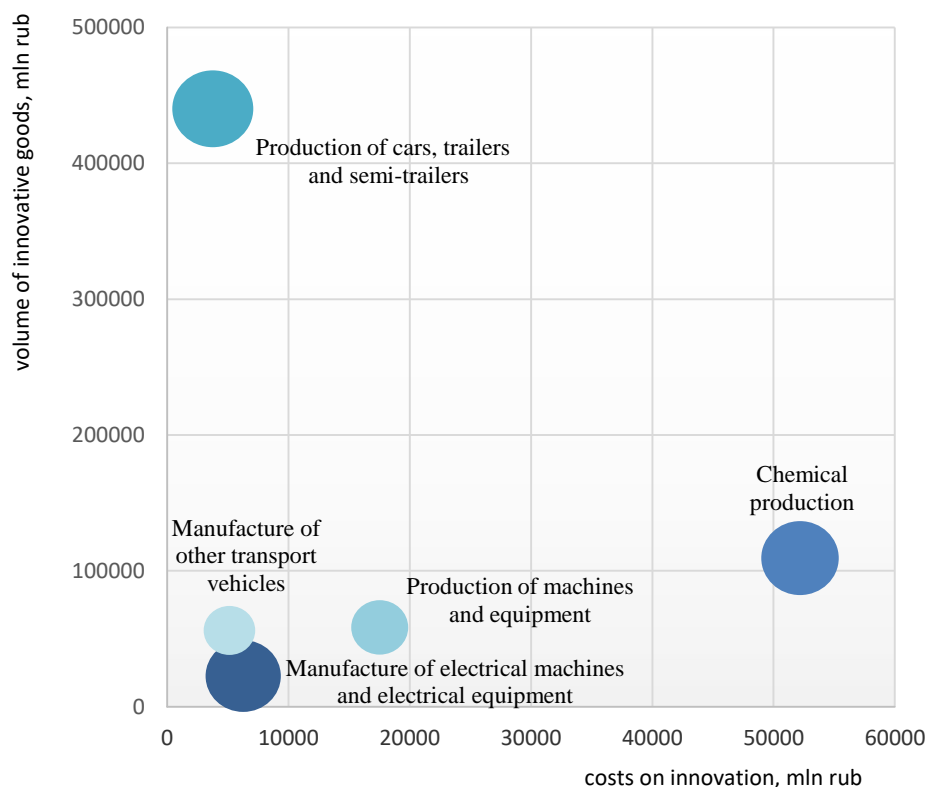


**Figure 3:** The share of enterprises exhibiting innovative activity by types of economic activity in medium technological industries of high-level in 2014, % (compiled by the authors according to the National Research University "Higher School of Economics" - NRU HSE)

For further analysis, we used: an indicator of the total cost of innovation, which included the costs on technological, marketing and organizational innovation, as well as an indicator of the volume of production of innovative products. The purpose of our analysis was to determine the comparative positions in the field of effectiveness of innovative activities of

each industry among others, as well as the actual calculation of the cost effectiveness for the production of innovative products.

Figure 4 shows the location of the group of industries in question, obtained from the NRU HSE statistics [9]. The size of the circumference of each industry was determined by the share of innovatively active enterprises in the relevant industry.



**Figure 4:** The nature of innovative activity of medium technological industries of high-level in 2014 (compiled by the authors according to the data of NRU HSE) [10]

According to the figure, we can judge that the most significant expenses for innovations were made in the chemical industry, however, the volume of production of innovative products in the automotive industry is much higher than in other industries.

To assess the validity of the invested funds, we can calculate the cost-effectiveness ratio for innovative activities for each industry using the following formula:

$$CEI = VIP/EI,$$

where *CEI* - the cost effectiveness of innovation; *VIP* - the volume of innovative products; *EI* - expenditure on innovation.

The data for calculating the cost effectiveness of innovation are presented in Table 1.

**Table 1:** Efficiency of innovation costs in medium technological industries of high level (calculated by the authors according to the data of NRU HSE) [10]

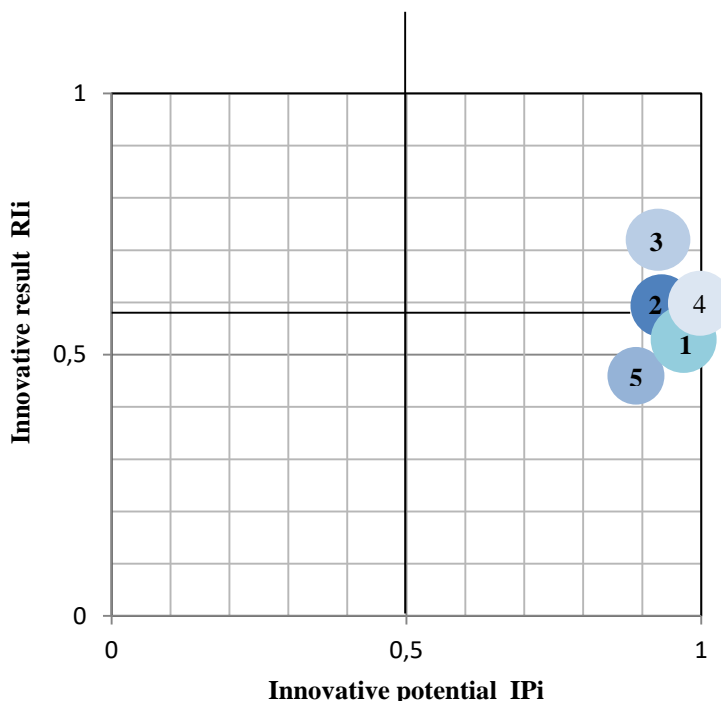
Industry	Efficiency of innovation costs CEI, rubles / 1 rub.				
	2010 г.	2011 г.	2012 г.	2013 г.	2014 г.
Chemical production	4,95	4,68	3,64	2,01	2,42
Manufacture of machinery and equipment	4,37	4,9	5	4,61	2,88
Manufacture of electrical machines and electrical equipment	4,51	3,86	3,44	2,66	3,45
Manufacture of cars, trailers and semitrailers	19,09	18,45	21,25	9,61	14,4
Manufacture of other transport vehicles	11,55	12,78	13,56	9,52	10,21

According to the obtained data, we can judge that during the period under study the costs in terms of the volume of innovative products in the automotive industry had a greater effect than the rest of the industries belonging to this group. In other words, we can say that 19.09 (2010), 18.45 (2011) and 21.25 (2012), are invested in each investment unit for innovation in the automotive industry, etc. of units of innovative products in monetary terms. The data presented indicate the effectiveness of innovative activity in this industry.

#### **Realization of the technique of innovative positioning of the industry on the example of medium-technological industries of high-level**

Using the previously developed technique, we can implement the process of innovative positioning of high-tech industries at a high level. To do this, we perform all the necessary calculations: the indicator of the innovation result ( $Rli$ ) and the innovation potential indicator ( $Pli$ ) for each of the sectors under consideration based on the statistics for 2014. In addition, we use the available data on the share of innovation-active enterprises of each of the industries to determine the size of the circle of each sector under investigation on the matrix of innovative positioning.

The results of calculations and constructions are shown in Fig. 5.



NOTES: 1 - chemical production; 2 - manufacture of machinery and equipment; 3 - production of electrical machines and electrical equipment; 4 - manufacture of cars, trailers and semitrailers; 5 - manufacture of other vehicles

**Figure 5:** Matrix of innovative positioning of medium technological industries of high level as of 2014 (calculated and compiled by the authors according to the data of NRU HSE) [10]

It can be seen from the figure that the branches "Chemical Production" and "Production of Other Vehicles" are located in the quadrant "Sector of High Potential Innovation Efficiency" of the matrix of innovative positioning. This situation is characterized by a high level of innovative potential and a low degree of innovative results. Taking into account that the branches are located in the upper right corner of the quadrant, one can say that there is a significant innovative potential in the sectors under consideration, while the level of innovation performance can be characterized as average one, as its value is close to 0.5. According to our technique of innovative positioning for these industries, the strategy of further increasing the innovation result is preferable.

The branches "Production of electrical machines and electrical equipment", "Production of cars, trailers and semitrailers" and "Production of machinery and equipment" are located in the third quadrant of the matrix of innovative positioning in the "Sector of high balanced innovation performance", characterized by high levels and innovative capacity, and innovative result. A more balanced position belongs to the branch "Production of electrical machines and electrical equipment." Recommended technique in the framework of the innovative positioning of the industry in this case will be the strategy of maintaining the innovative balance. At the same time, the position of the analyzed sectors in the lower left corner of the quadrant indicates the need to use as a tool to maintain this balance a consistent

increase in the effectiveness of innovation in the form of an increase in the output of innovative products.

## DISCUSSION

In order to realize innovative activity and get a tangible effect due to this, the economic subject of the industry must have the activity and ability for this realization. In this context, the concepts of innovation activity and innovation potential are used.

In general, innovation potential can be represented as the readiness of the economy and society as a whole to different kinds of change.

Experts define innovative potential as follows:

- first, as accumulated a certain amount of information on the results of scientific and technical works, inventions, design and development, samples of new equipment and products [11];
- secondly, as a system of factors and conditions necessary for the implementation of the innovation process [12].

There is also a resource theory of innovation potential, in which it is viewed as the aggregate of resources that the business entity possesses and due to which innovative activity is provided at the enterprise of the sector [13]. In this context, E.P. Maskaikin and T.V. Artser [14] under the innovative potential understand the totality of production-technological, labor, financial, organizational-managerial and intellectual potentials.

The ability of the subject to implement innovative activities is characterized by the availability of financial, labor, intellectual, communication, material and other opportunities. The sum of these opportunities forms the innovative potential of the enterprise, which is an integral part of the innovative potential of the industry [1].

The concept of innovation activity is sometimes considered a synonym for the concept of innovative potential, which, in our opinion, is not entirely correct. Innovative activity implies first of all the realization of the opportunities available to the enterprise or industry in the innovative sphere of activity. In this regard, we consider more appropriate to use the term "innovative performance" (effectiveness of innovation).

It should also be noted that in addition to the production of innovative products, the innovative result of the industry will be characterized by the activities of enterprises within the industry, and this activity will be manifested through increased productivity; market share; profitability; company values; obtaining monopoly power to produce this product; increasing competitiveness; labor safety; reduction of environmental pollution [15].

Thus, when evaluating the effectiveness of innovation, we will use two indicators: innovation potential and innovative result. As a characteristic of the innovative potential, we will take the amount of financial resources allocated for innovative activity or in other words the costs on innovation in the industry under consideration, and the innovative result will be evaluated through the volume of production of the innovative product that will be produced as a result of innovation activity's implementation.

## CONCLUSION

Based on the conducted research, the technique of innovative positioning of the industry was developed, which makes it possible to determine the position of the industry from the point of view of the effectiveness of its innovative activity in the two-dimensional space formed by two indicators - innovative potential and innovative result. As a result, a matrix was formed consisting of four quadrants, each of which, due to its initial characteristics, received a certain name. The position of the industry in a certain quadrant of the matrix determines its innovative efficiency and further strategic directions of innovative development. It should be taken into account that the obtained model of innovative positioning is not exhaustive and comprehensive in the question of assessing the effectiveness of innovative activity, since the financial resource was used as the basis for identifying innovation potential, in other words the amount of money spent on innovation, while in addition to the financial resource there are other important types of resources used in innovation. However, the innovative product as an indicator of the innovative result, in our opinion, is quite exhaustive and does not need alternative options, since the specificity of medium technological industries of high-level assumes first of all the production of material goods.

The proposed technique of innovative positioning was tested using the example of statistical data in the sphere of innovative activity of medium technological industries of high-level. The state of all the industries studied is characterized by sufficient innovative potential, at a simultaneously low level of its implementation in the form of innovative products' production. The analysis of the state of innovative activity in medium technological industries of high-level also made it possible to conclude that, given sufficient costs for technological innovation and the innovative products' production, it is also necessary to develop organizational and marketing innovations.

Thus, with the help of the proposed technique of innovative positioning, it is possible strategically to plan the innovative development of the industry, since the presence in one or another segment indicates the presence or absence of innovative processes in the industry (whether there are costs for innovation, what is the share of technological innovations, is there a production of innovative goods and what is the ratio of the costs on innovation and the production of these goods), due to which one can assess the real economic and competitive position because, in our opinion, the availability of innovative processes is one of the criteria for competitiveness.

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