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INNOVATION OF THE ECONOMIC SYSTEM: BELARUSIAN ASPECT

Analysis of innovative potential of Belarus and Russia

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ABSTRACT – *In the work the problem of innovative activity of economy of the country is highlighted. The authors have analyzed the innovative activity indicators of Belarus, Russia and other countries-leaders and lagging economies. Approaches to the determination of the category "innovation" have been studied. The classification of innovative development models has been proposed. The determination of innovative development models has been proposed. For the assessment of the level of innovative development of the country the tools have been proposed which include the labour, resultant, cost components with the differentiation into indicators. On proposed tools the approbation is performed on the basis of statistical data of Belarus and Russia during the years 2005-2014. The map of innovative development is proposed for visualization and forecasting of the strategy of stable country functioning. As a result it is received that for Russia the productive model of innovative development is indicative, and for Belarus the cloning model is indicative. In order to create conditions for regulating the innovative level of country development the groups of factors of influence are proposed, as well as recommendations for the increase of the level of innovative development of the country.*

Keywords*:* Innovation, innovative development model, tools, innovative activity, component, factor

1. INTRODUCTION

The modern epoch of speed development of information technologies, automated systems, creative methods, new product types, set tough conditions for providing competitiveness in the market. These conditions to which originality, economical efficiency, reference, environmental friendliness, mobility and many others refer, dictate the pressing necessity of operative adaptation to market

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metamorphoses, manifesting in the activation of innovative activity according to the principle "ahead of the curve" (with emphasis of the indicator of result quality, but not its quantitative basis). Thus, the innovations act as the keynote of the social and economic growth of the country creating the platform of forcing the technical and technological excellence, economic and ecological advantages, social security of society (Averina, 2014).

2. MATERIALS AND METHODS

The total aspiration of the countries to innovation determines the prospect of increase of life quality, diversification of economic activity, provides the barrier-free functioning of the country, on the one hand. However, the increase of incidents of unfair competition, significant "flow" of capital from "lazy" countries to innovative development to countries-rationalizers are possible, which will provide the already huge gap between separate countries in the economic development, on the other hand (Fig. 1).

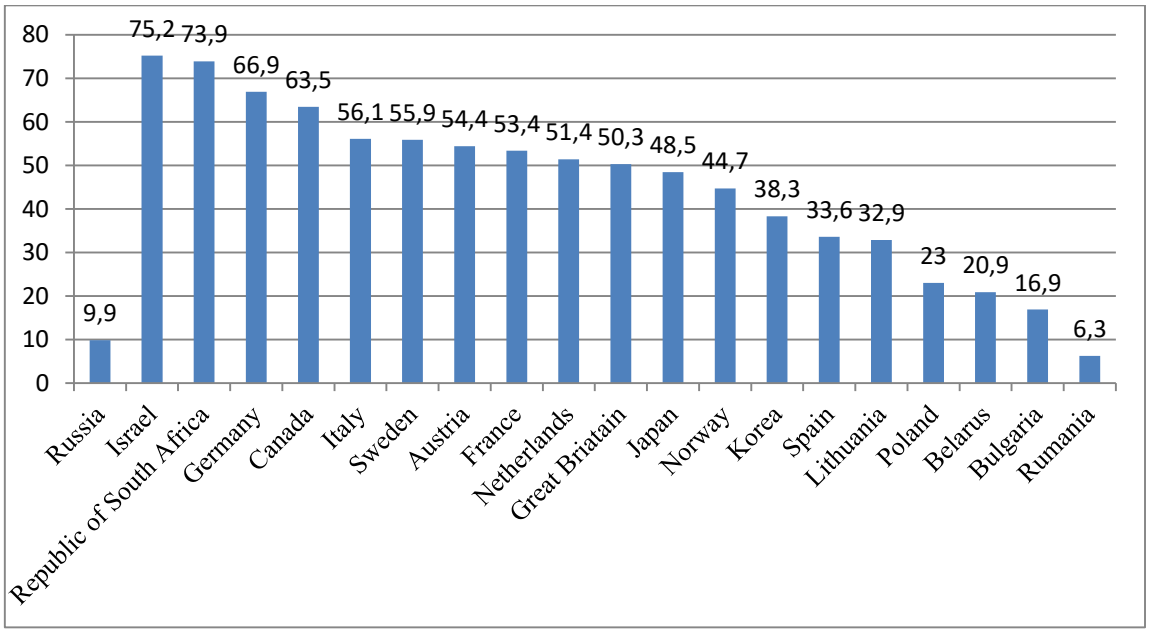

Fig. 1 Aggregate level of innovative activity by countries in 2015, %
(Indicators of innovative activity, 2016)

In Russia there is the largest share of innovative organizations, logically – in the highly technological sector of processing industry (32% of the total number of organizations in the country), and the least share – in the sector of production and distribution of electric energy, gas and water (5,1%) (Figure 2). In Belarus there is a high share of provision of innovative development of the country is concentrated on the acquisition of machines and equipment (53%), which can characterize consumer functions (consumption of already available innovations, but not their independent creation) (Fig. 2-3).

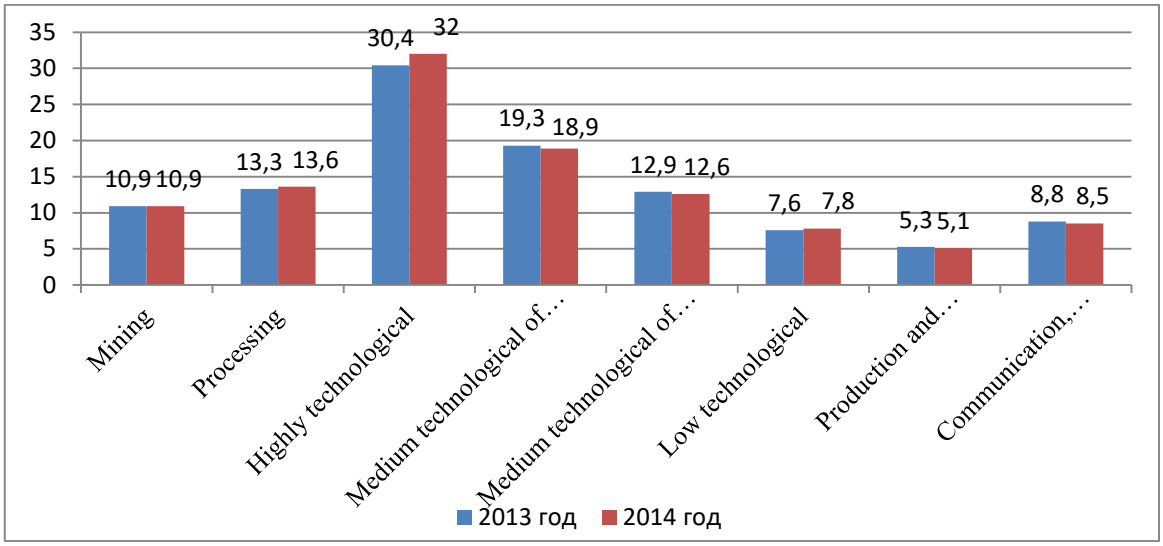

Fig. 2 Aggregate innovative activity by branches, %
(Indicators of innovative activity, 2016)

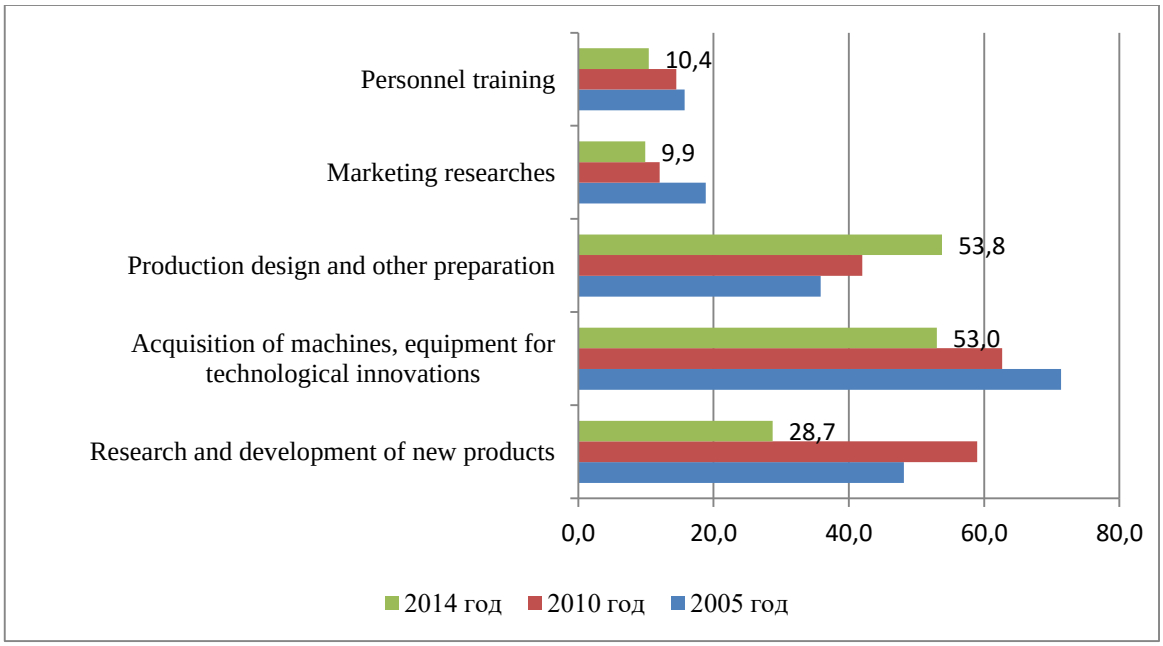

Fig. 3 Specialization structure of innovative organizations in the total number by types of innovative activity of Belarus, %
(Indicators of innovative activity, 2016)

3. RESULTS AND DISCUSSION

The role of innovation goods, technologies in any epoch, stage of country development is not overestimated, and the comparison of the current level and potential opportunities, determination of the current and predictable innovative development model act as the underlying motive of this work.

The vast majority of researches are given to the problematic of innovative development simulation which is associated with the economic effect from using their results in the practical activity.

Special attention is paid to the innovative development simulation in T.A. Averina's works, summarizing models of the following types: model of change of technologies; model of destructive event; model of innovative development generations; model of dependence of economic efficiency of innovation realization of the real economy sector on the innovative development trajectory by a product, by a process (Averina, 2014). In T.S. Milevskaya's works 3 models of innovative development of countries are distinguished: traditional, European, Asian, on the basis of life cycle of the innovative process, management structure (Goldyakova, 2006).

The development prioritization, available perfection potential, incentive mechanisms explain the differentiation of the level of innovative development of the countries and possible tendencies of their deformation (Chernova, Sadovnikov, 2015). The formed complex of tools and methods of functioning of the country in the innovative trajectory forms the realizable model. We have proposed its following representation: *"model of innovative development* is the integral vector of development based on the perfection of the organizational and managerial, technical and technological, economic processes of functioning, which forms the platform of competitiveness and socio-ecological-economic security of the country" (Lvov, Glaziev, 1986).

On the basis of used methods of stimulation of innovative activity, available technical, raw material, intellectual base of planned positions on the world-wide basis of economic prosperity different types of models are distinguished. The study of works of these themes allowed summarizing the existing models by two signs: territorial peculiarities and set of mechanisms of the innovative vector realization (Lvov, Glaziev, 1986).

With the aim of the quantitative assessment of the level of innovative development of countries and formation of the "vector of future" the following system of relative indicators is proposed (with the purpose of unification of used indicators and opportunity of intercountry comparison) with grouping by leading components:

1. Labour component:
   - 1.1. 1-cost of living budget/salary
   - 1.2. Share of population with higher education
   - 1.3. Share of persons who have defended theses to the entered persons (for academic degree).
   - 1.4. Share of researchers with aa academic degree to the total number of researchers.

2. Resultant component:
   - 2.1. Share of innovatively active organizations.
   - 2.2. Share of innovative products in the total number of production.
   - 2.3. Share of export of innovative products in the total volume of shipped products.
   - 2.4. Share of issued patents in the total number of submitted applications.

2.5. Share of world innovations of the country in the total volume of innovative products.

3. Cost component:
   3.1. 1-share of expenditures for the innovative activity in the total volume of innovative products.
   3.2. Expenditure share for the innovative activity in the total number of investments to the country (region).
   3.3. 1-share of worn-out machines and equipment.

This complex of indicators will provide the opportunity of assessment of the level on innovative development for the current or retrospective period, as well as will act as a platform of strategizing of the country development on the innovative trajectory of perfection.

The investment funds which provide the realization of multivector functions, definite tasks for development, approbation and implementation of received novelties into the practical activity are one of the most important factors and conditions of activation of the innovative activity.

The entrepreneurship has the largest share in the structure of lines of internal country expenditures (except Latvia for which the priority is the higher school), as well as the lever of economic dynamics. Innovative metamorphoses on the microlevel, providing the large scale of using novelties that have already passed the primary approbation stage.

The qualitative approach to the formation of the intellectual potential provides the efficiency of modernization decisions, generation of innovative ideas, influencing the realization of the course of country economic growth.

The problem of the innovative activity, innovative activity stimulation, and formation of innovative economy potential is overdue, and it is necessary to solve it. First it is necessary to decide the category "innovation", its element composition. The summary of different approaches of national and foreign scientists to this matter is presented in the table (Table 1).

Table 1. Approaches to determination of innovations

Approach	Characteristics
1. Process one (Postalyuk , Gusarova, 2014), (Goldyakova, 2006), (Milevska, 2012)	Innovaion is a process of accumulation, preservation, use and development of the innovative potential of business entities of the economic system. Innovativeness is creative opportunities and capabilities of business entities to create different types of innovations by creative destruction of their technical and technological, organizational and managerial, socio-ecological-economic, institutional and other internal environmental conditions. Innovativeness is creative opportunities and capabilities of business entities to translate, multiply different types of innovations by borrowing from the other their technical and technological, organizational and managerial, socio-ecological-economic, institutional and other external environmental conditions. (Postalyuk , Gusarova, 2014)
(Goldyakova, 2006) , (Lvov, Glaziev, 1986)	Innovation is the first practical use of the new

	scientific-technical, technological, organizational and economic, production or other decision.
2. Resultant one	Innovation is an idea, practice or product – a result of the creative process as products (engineering), technology. (Sampieva , Tamashev, 2011)
International recommendation of the Organization of economic cooperation and development (OECD) for gathering and analysis of data on innovations "Oslo guide"	Innovation is the introduction to civil circulation or used for own needs of new or improved products, new or improved technology, new services, new organizational and technical decision of production, administrative, commercial or other nature.

Summarizing the above, one can present the authors determination of innovations: "innovation is a result of intellectual labour formed on the basis of reflection of the process of solution of the existing problem in different sectors of functioning of the state, world by alternative variants of improvement of traditional forms of realization of their functions".

The mechanisms of stimulation of the innovative country development, tools of assessment of its level, prospect trajectories of development form the *models of innovative development* whose differentiation can be presented in the following structure:

1. Productive ones (by each type of innovations they provide high indicators).
2. Cloning ones (they are specialized on the development and creation of one of the types of innovations, but not on all).
3. Catching up ones (by independent efforts, but with less tempo they create their innovations) (Matveeva, 2015)

For assessment of the level of innovative development according to the proposed methods the calculation and analytical actions have been carried out according the above-described algorithm for the Republic of Belarus and Russian Federation in comparison (Table 2).

Table 2. Results of assessment of the innovative development of the country during the years 2005-2014 (Indicators of innovative activity, 2016)

Indicators	2005	2010	2011	2012	2013	2014
Republic of Belarus						
1. Labour component:	*0,2025*	*0,1704*	*0,1774*	*0,1936*	*0,1928*	*0,2112*
1- living budget/salary	0,7727	0,8451	0,8212	0,8318	0,8496	0,8355
Share of population with higher education	0,2020	0,2080	0,2100	0,2170	0,2250	0,2340
Share of persons who have defended theses	0,0491	0,0245	0,0290	0,0397	0,0363	0,0499
Share of researches who have the academic degree	0,2196	0,1956	0,1978	0,1962	0,1988	0,2037
2. Resultant component:	*0,1081*	*0,0987*	*0,1282*	*0,1287*	*0,1272*	*0,1079*
Share of innovatively active organizations in the total number	0,1410	0,1540	0,2270	0,2280	0,2170	0,2090

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Share of innovative products in the total number of manufactured products	0,1520	0,1450	0,1440	0,1780	0,1780	0,1390
Share of export of the innovative products in the total volume of the shipped products	0,1209	0,0736	0,0897	0,1148	0,1096	0,0830

Indicators	2005	2010	2011	2012	2013	2014
			Republic of Belarus			
1. Labour component:	*0,2025*	*0,1704*	*0,1774*	*0,1936*	*0,1928*	*0,2112*
Share of issued patents in the total number of applications	0,7127	0,6322	0,7878	0,6900	0,6836	0,5048
Share of world country innovations in the total volume of innovative products	0,0080	0,0090	0,0150	0,0110	0,0115	0,0120
3. Cost component:	*0,4530*	*0,5199*	*0,5428*	*0,5564*	*0,5429*	*0,5340*
1-Share of expenditures for innovative activity in the total number of innovative products	0,7713	0,8200	0,8260	0,8453	0,8460	0,8533
Share of investments for reconstruction and modernization	0,2510	0,2960	0,3190	0,3330	0,3080	0,2850
1-share of worn-out machines and equipment	0,4800	0,5790	0,6070	0,6120	0,6140	0,6260
INTEGRAL ASSESSMENT:	0,2149	0,2060	0,2311	0,2403	0,2370	0,2300
			Russian Federation			
1. Labour component:	*0,2797*	*0,2728*	*0,2863*	*0,2946*	*0,2991*	*0,3066*
1- living budget/salary	0,5272	0,4557	0,5709	0,6037	0,6212	0,6646
Share of population with higher education	0,2080	0,2020	0,2110	0,2120	0,2150	0,2180
Share of persons who have defended theses	0,2270	0,2360	0,2120	0,2180	0,2210	0,2250
Share of researches who have the academic degree	0,2460	0,2550	0,2630	0,2700	0,2710	0,2710
2. Resultant component::	*0,1369*	*0,1284*	*0,1485*	*0,1513*	*0,1562*	*0,1531*
Share of innovatively active organizations in the total number	0,1020	0,1080	0,1110	0,1110	0,1090	0,1090
Share of innovative products in the total	0,0900	0,0480	0,0545	0,0540	0,0640	0,0575

number of manufactured products						
Share of export of the innovative products in the total volume of the shipped products	0,2570	0,1861	0,3076	0,3202	0,3146	0,3077
Share of issued patents in the total number of applications	0,6800	0,6820	0,6700	0,6890	0,6950	0,7040
Share of world country innovations in the total volume of innovative products	0,0300	0,0530	0,0580	0,0600	0,0610	0,0620
3. Cost component:	*0,4290*	*0,3968*	*0,4079*	*0,4289*	*0,4329*	*0,4345*
1-Share of expenditures for innovative activity in the total number of innovative products	0,7568	0,6838	0,6840	0,7401	0,7414	0,7388
Share of investments for reconstruction and modernization	0,2820	0,2610	0,2740	0,2890	0,2950	0,3000
1-share of worn-out machines and equipment	0,3700	0,3500	0,3620	0,3690	0,3710	0,3700
INTEGRAL ASSESSMENT:	0,2542	0,2404	0,2589	0,2674	0,2725	0,2732

For differentiation of expected levels of the innovative development the method of grouping by the mean value is used. Three groups are distinguished, which correspond to innovative development models – productive, cloning, and catching up. As a result a map of the innovative level of countries during the studied period is received.

The assessment results from the following picture:

- by labour potential in the innovative activity Russia has the indicator 0,3066 (which is by 45% higher than in neighbouring Belarus), stipulated by the high degree of stimulation of innovators (researches, rationalizers), by quality of the educational process;

- the resultant component has determined the high level for Russia and low level for Belarus (by 42% lower than in Russia), determined by the competitiveness of national products in the world market, used effective technical and technological decisions;

- the cost component on the contrary has reflected the high level in Belarus (by 18,6% more than in Russia), which is the evidence of the interest of the higher leadership of the country and realization of the policy of total economy innovation.

The integrated indicator of the innovative development corresponds to:

- *productive* model – for Russia (0,2732);

- *cloning* model – for Belarus (0,2300).

The level of innovative development is formed on the basis of influence of different

categories of factors of endogenous and exogenous nature, stipulating the dynamic shifts in regard to the realized line (Figure 4).

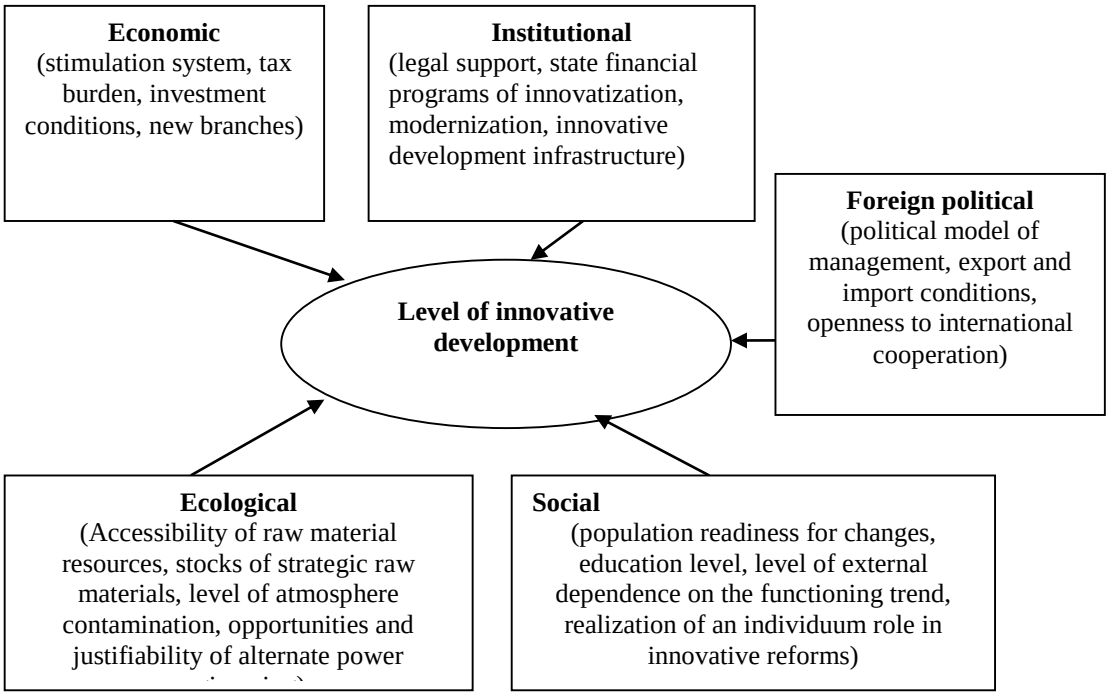

Fig. 4 Factors of influence on the level of innovative development of the country

On the basis of chosen indicators 5 vectors of the innovative development of countries are distinguished from the proposed system:

1. Stimulating one (on the basis of salary and cost of living budget).
2. Scientific one (by the proportion of applicants, persons who have defended theses and the share of researches with an academic degree).
3. Globalization one (on the basis of export of innovations and their share in regard to the world significance).
4. Vector of renewal (by the share of innovatively active organizations and the share of innovative products).
5. Vector of effectiveness of investments (by the level of expenditures for the innovative activity).

As a result 5-axis structure of important factors of the innovative development of Belarus and Russia has been built.

4. CONCLUSION

At the present period the extensive type of formation of "innovativeness" (on the bases of expenditure growth) prevails meanwhile in our countries, rather than the intensification scheme of development (on the basis of growth of the return of resources used). Therefore, the existing reserves of the development potential of the countries shall be involved fully.

As recommendations for expansion of opportunities, increase of the degree of

innovative development of the countries we'll distinguish the following:

1. *Strengthening incentive measures* of employees in the development of the economy innovative sphere (introduction of the differentiated system of progressive bonus award, expansion of programs of financing of innovative projects).

2. *Formation of alliance economic systems* (on the basis of vertical and horizontal schemes of integration of providing prompt deliveries, quality of raw materials, real buyers).

3. *Development of the innovative infrastructure* (expansion of the number of technoparks, innovative funds, venture firms, approbation of start-up-projects).

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5. GLOSSARY

Development strategy - a set of logical stages in the development of mechanisms to stimulate innovation in order to obtain an economic effect.

Entrepreneurial initiative – an innovation idea of business plan.

Efficiency of innovative activity - a qualitative change in the result of intellectual activity.

Evaluation criterion - sign of selection of the studied processes (phenomena).

Factor of influence - priority feature (cause) of the event change.

Innovation — a new idea or method, or the use of new ideas and methods; the development of new products, designs, or ideas;

Innovation structure - a system of innovative active organizations and auxiliary business entities.

Methods of management – a complex of ways to study the cause and effect relationships of the subject.

Technological structure - the predominant technological (technical) process (group of equipment) for a certain period

Vector of innovative development- a group of priority areas for the development of science, technology, and innovation