

INTEGRAL MODELS FOR EVALUATING INNOVATIVE DEVELOPMENT OF ENTERPRISES: CURRENT APPROACHES AND DIRECTIONS FOR IMPROVEMENT

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Abstract. This article provides an in-depth scientific analysis of the methodology used in practice to assess the effectiveness of innovative activities of enterprises. The study substantiates that existing approaches to determining the effectiveness of innovative activities are mainly limited to financial indicators and cannot fully reflect the technological, organizational and social results of innovation. Based on the analysis of theoretical views of international and domestic scientists, the need to introduce a complex, multi-index and multi-factor approach to assessing innovative efficiency is shown. The article proposes an integrated assessment system that includes the share of innovative products, the coefficient of technological renewal, the effectiveness of scientific and research expenditures, intellectual property activity and the rate of market implementation. The conclusions obtained are of important practical importance in strategic management of the innovative development of enterprises, substantiation of investment decisions and increasing the efficiency of the national innovation system.

Key words: innovative activity, innovative efficiency, assessment methodology, integrated index, innovative product, research and development costs, intellectual property, innovative development, industrial enterprises, competitiveness.

Introduction

In the current global competitive environment, ensuring sustainable economic growth, scientific and technological progress, and the effectiveness of innovative activity are becoming one of the priorities of the state economic policy. The reforms being implemented in Uzbekistan, especially the modernization and digitization of industrial sectors and the expansion of the production of import-substituting products, have sharply increased the need for a scientific assessment of the innovative activity of enterprises. In this process, improving the methodological foundations of assessing the effectiveness of innovative activity, revising the current assessment system and adapting it to the economic environment are emerging as urgent tasks.

In determining ways to increase the efficiency of investment activities, the financial strategy of enterprises, the formation of capital structure, diversification of investment portfolios, and taking into account the efficiency indicators of corporate governance are of primary importance. This, in turn, indicates the need to further improve the scientific and methodological foundations of corporate financial management, introduce modern assessment methods, and conduct a deeper study of the institutional mechanisms of investment processes.

In assessing the effectiveness of investment activities in Uzbekistan, it is necessary to develop a comprehensive methodological approach that is appropriate to the national economic conditions, taking into account advanced international practices. This, on the one hand, will provide a transparent and reliable database for foreign investors, and on the other hand, will create an opportunity to accurately and objectively assess the effectiveness of the investment policy implemented in the country.

Literature review

Determining and evaluating the effectiveness of innovative activities in the current global competitive environment is one of the strategic factors of economic growth. It is necessary to include not only economic results, but also technological, organizational and social efficiency in the evaluation methodology of innovation efficiency. This situation allows to fully demonstrate the innovative potential of the enterprise and the sustainable development of the innovative environment.

Dzhikharevych B.S., Limonov L.E. and June N.B. according to: "Investment "The effectiveness of an activity can be determined primarily by the level of income received as a result of investment. In their approach, the economic effect of investment is measured only by financial indicators, and efficiency is explained in close connection with the return on investment."*

Savelyev Yu.V. takes a broader approach to this issue: "In determining the efficiency of investment, it is necessary to clarify the volume of capital investments and analyze their horizontal and vertical structure. In this approach, efficiency is determined not only by performance indicators, but also by the structural distribution of investments."†.

At the same time, according to local researcher S. Rustamova: "The concept of investment efficiency is interpreted broadly. In her opinion, investment efficiency is a set of economic, political, regulatory, legal, social and other conditions that affect investment processes in the country. This approach shows that efficiency should be assessed not only in terms of financial results, but also in relation to all institutional and social factors of the investment environment"‡.

Analysis of existing literature and F. Berger, Y. Schumpeter, R. Based on the research of Solow and modern schools of innovative management, four main factors determining the effectiveness of innovative activities of enterprises are formed:

- the ability to acquire financial capital,
- the level of qualified personnel and human capital,
- a mechanism for effective organization of innovative processes,
- formation of corporate culture and innovative environment focused on creativity.

These factors are systemically interconnected, and their impact on economic efficiency is manifested in a complex way. At the same time, economic analyses show that

*Dzhikharevych B. S., Limonov L. E. Investment policy of regions: effectiveness and priority development. — SPb. : Nauka, 2008. — 272 p.; Junda N. B. Finansovaya otchacha investitsi i otsenka ix ekonomicheskoy effektivnosti // Finansy i kredit. — 2013. — No. 18. — S. 41–50.

†Savelev Yu. V. Horizontal and vertical structure of investment and regional development system // Problemy prognozirovaniya. — 2014. — No. 5. — S. 64–73.

‡Rustamova S. Factors determining the investment environment and its attractiveness in our country. / Finance, No. 2, 2018. p. 55.

indicators that determine innovative efficiency are not limited to financial results, but should also be measured by technological changes, competitive advantages in the market, and the level of practical use of scientific potential.

Expert interviews conducted with heads of industrial enterprises during the research process made it possible to identify additional factors that ensure the effectiveness of innovative activities. The most important of them are:

- priority attention to technological innovation;
- strengthening the research and development (R&D) base;
- Stimulating the production of new products and technological solutions.

78% of the enterprises surveyed identified the development of scientific and technological ideas as the main factor for innovation success, while 69% emphasized the need for additional investments in innovation activities. At the same time, 61% of participants stated that the introduction of new technologies and the purchase of modern equipment are important means of ensuring innovative competitiveness.

Analysis of innovative development strategies shows that 46 percent of the surveyed enterprises set product innovation as a priority goal, while 64 percent consider modernization of existing products, adaptation to consumer needs, and cost reduction as the main directions. Only 31 percent of enterprises are implementing strategies aimed at creating fundamentally new products or services.

At the same time, the results of the analysis also show that there are factors limiting the effectiveness of innovative activities. In particular, limited external financing opportunities, high cost of investment resources and ineffective state support mechanisms slow down innovation processes. Although 82 percent of enterprises noted that they had received state support at least once, only 13 percent consider state support to be the main factor in innovative development.

Therefore, it is necessary to expand the criteria for evaluating the effectiveness of innovative activities in the improvement of current methodologies, that is, to introduce dynamic, complex and cognitive analysis models. These models make it possible to empirically assess the impact of innovations on economic results, determine the level of financial stability and scientific-technological integration.

Analysis and discussion of results.

At present, when evaluating the effectiveness of innovative activity in enterprises, financial results (innovative product volume, profit dynamics, level of cost recovery, etc.) are of primary importance. However, a comprehensive system of indicators covering the scientific, technological and social effects of the innovation process has not yet been fully formed. Therefore, in the research, the use of a multi-index approach, i.e. a multi-dimensional generalized evaluation system, is proposed as a scientifically based solution for evaluating the effectiveness of innovative activities.

The factors that form the scientific basis for assessing innovation efficiency include indicators such as the level of technological innovation, the effectiveness of using intellectual resources, financial stability, the rate of innovation introduction in the market, and the potential for creating new jobs. To analyze them, it is necessary to use a comprehensive set of statistical, correlation, and index methods.

There is a system of the following main indicators for evaluating the innovative activity of industrial enterprises:

- share of innovative products (% share in the total volume of products);
- economic of innovative projects;
- coefficient of technological renewal;
- share of investments directed to innovations, (%);
- the number of new jobs created as a result of innovation;
- share of intellectual property objects (patent, license, know-how).

Based on these indicators, an integrated index of innovative activity efficiency is calculated, which includes financial and non-financial factors. Such an approach makes it possible to evaluate the effectiveness of innovation not only through economic results, but also in terms of scientific and social impact.

In order to ensure the scientific reliability of the research in the process of forming an integral indicator of the innovative activity of industrial companies, an in-depth analysis was carried out of the financial and innovative reports of 57 companies, which are considered leaders in their industrial sectors, as well as more than 40 scientific publications on assessing the effectiveness of innovative activity for the last five years. In addition, 16 scientific interviews were conducted with expert leaders of large industrial companies, and their opinions and considerations served as an important source in determining the practical direction of the research. In addition, the system of key performance indicators recommended by the American Center for Productivity and Quality was analyzed, and indicators that meet international standards for assessing innovative activity were selected.

Based on the results of the study, a multi-factor evaluation methodology of the innovative activity of industrial enterprises was proposed. Five main efficiency indicators were selected based on the synthesis of economic-statistical, correlation-regression and expert-score methods to calculate the integrated indicator. They cover:

- share of innovative products and utility index;
- coefficient of technological renewal;
- level of capital recovery of innovations;
- effectiveness of research and development costs;
- speed of introduction of innovative initiatives in the market.

In addition, it was recommended to calculate three indicative indicators that do not directly affect the integrated indicator, but form the innovative environment. They consist of:

1. Innovation potential of scientific organizations, higher educational institutions and research institutes, as well as scientific research development indicator (percentage).
2. The number of proposals received by the department's enterprises and organizations on new technologies and technical and technological solutions created during the reporting year.
3. The number of new powers granted to the organization based on the results of innovative activities - that is, an increase in the level of scientific and organizational independence.

The proposed integrated assessment system creates an opportunity to transform the innovative behavior of enterprises by combining the economic and non-economic effects of

innovative activity. It evaluates the innovative activity of enterprises in integration with the factors of economic stability, scientific potential and technological diversification.

Industrial enterprises are the central element of the national innovation system. Their investments in scientific research, technological upgrading and production of innovative products have a decisive impact on the technological development of industries in the country's economy. The mechanisms of such an effect are manifested through:

- establishing a system of commercialization of innovations and transfer of technologies;
- placing an order for scientific research and experimental construction works;
- attracting other entities to innovative activities by creating a competitive environment in the market.

In this sense, the role of industrial enterprises as a driver in innovative development becomes important in the development of their technological strategies. This, in turn, serves as a decisive factor in determining priority technological areas, optimal allocation of resources and development of innovative infrastructure.

In the current global economy, innovative activity is emerging as a key factor ensuring sustainable growth and competitiveness of the real sector. At the same time, in the process of making strategic decisions, it is important to correctly and scientifically assess the innovative activity of industrial companies. There are a number of studies devoted to assessing innovative activity, which are mainly based on indicators such as funds spent on research and development, the number of patents created, patent citations or the number of new products launched on the market. However, a unified approach that would allow for a complete and comprehensive assessment of the level of innovative activity has not yet been formed.

Such an approach allows for a comprehensive assessment of innovative activities of enterprises, analysis of their innovative behavior and their transformation.

An increase in the scale of innovative products, scientific developments and services created by industrial enterprises in the country's economy is an important guarantee of national competitiveness and economic growth. From this point of view, the method of integrated assessment of innovative activity serves as an important analytical tool in the justification of the scientific and technological policy of the state.

The competitiveness and sustainable growth of the country's economy largely depends on the level of innovative activity of industrial enterprises. The increase in the volume of innovative products, developments and services - as a practical result of scientific and technical progress - serves to create high added value in the economy, technological renewal and resource saving. Therefore, the expansion of the scale of production of innovative products has a direct impact on the growth of scientific and technical potential in the country's economy.

In recent years, the innovative activity of industrial enterprises in the Republic of Uzbekistan has shown a consistent growth trend, with the volume of innovative products and the amount of spending on innovations increasing every year. This indicates that the scientific and technical base of the economy is being strengthened, and the integration between scientific potential and production processes is deepening.

Table 1

Economic indicators of innovative products, developments and services created by enterprises of the Republic of Uzbekistan[§]

Years	Enterprises producing total innovative products, developments and services, unit	Volume of innovative products, developments and services, billion soum	Spending on innovative products, developments and services billion. soum
2010	289	1849	264.4
2011	385	1348.7	372.6
2012	338	3635.9	311.9
2013	683	4614.7	4634.2
2014	1601	7043	3757.4
2015	2134	8023	5528.5
2016	2374	10688.2	2571.4
2017	2456	14231.3	5789.6
2018	2698	16123.1	5899.7
2019	2785	19876.5	5986.1
2020	1371	10980.1	2890.9
2021	2897	23123.7	7891.7
2022	3 105	25,940.5	8 245.3
2023	3 462	28,786.2	8,914.6
2024	3 920	31,552.8	9,730.4

According to the table, in 2021–2024, the volume of innovative products and services in the country increased from 23.1 trillion soums to 31.5 trillion soums, that is, by almost 1.4 times. This growth is explained, first of all, by the use of scientific and technological solutions in industrial sectors, the expansion of digital transformation processes, and increased investments in scientific research.

At the same time, spending on innovations has also increased from 7.9 trillion soums in 2021 to 9.7 trillion soums in 2024, which indicates the growing activity of the national innovation ecosystem. The growth in the volume of innovative products is especially rapid in the manufacturing sector, the electric power industry, and the chemical industry. This, in turn, is shaping high results in the integrated indicator of innovative activity, strengthening the trends of technological innovation in the economy.

A number of practical measures are being implemented in the country's industry in order to stimulate innovative processes, increase production efficiency and ensure product competitiveness. Studies devoted to evaluating the efficiency of innovative activities of enterprises can be conditionally divided into three main directions:

1. Research on indicators that measure the resources and results of innovative

[§]Data from the National Statistics Committee of the Republic of Uzbekistan.

activity;

2. Studies reflecting the indicators of innovative activity and their measurement methodology;

3. Research aimed at forming a system of multidimensional indicators to evaluate various characteristics of innovations.

There is no single universal method for assessing the effectiveness of an enterprise's innovative activities, therefore, assessment models at the level of each country, region, or individual enterprise are formed in accordance with their economic environment, resource potential, and technological capabilities.

A comprehensive approach that combines international, regional, and enterprise-level private assessment approaches is most appropriate for determining the results of innovative activity efficiency.

This methodology is based on the fundamental concept of innovative potential analysis put forward in scientific research by F. Berger. In this concept, the analysis of innovative activity is carried out on the basis of a "top-down" algorithm. This means that the analysis process begins at the macroeconomic or sectoral level and then gradually deepens to lower hierarchical levels of research - that is, to the level of individual enterprises, sectoral divisions and projects.

Conclusion

Analysis of factors affecting the effectiveness of innovative activities shows that an innovation policy focused on customer needs is a decisive mechanism for increasing the competitiveness of an enterprise in the market, since an increase in the share of new products and services and an increase in the level of certification according to international standards determine the innovative maturity of the enterprise and its ability to enter regional and global markets. Expenditures on technological innovations, in turn, are a key factor in increasing labor productivity and resource efficiency through indicators of the efficiency of industrial waste use, the level of safety in the production process, and equipment with modern equipment. Indicators of energy efficiency and labor productivity, which characterize the size of the enterprise and its competitive position, reflect the enterprise's ability to technological renewal and sufficient potential for implementing innovative activities. Management's involvement in innovation policy is a central factor determining the effectiveness of research and development, demonstrating the strategic importance of innovation management through the introduction of advanced technologies, the share of patented objects, and the number of technologies implemented in practice. The total volume of investments and their composition, especially the share of funds allocated to R&D and development, serve to expand the company's innovative potential, create new technologies, and sustainably continue the innovation cycle. At the same time, spending on technologies created under a license is an important criterion indicating how effectively the mechanisms of external and internal knowledge exchange work in shaping the corporate innovation ecosystem.

The analysis shows that, although the current methods of assessing the effectiveness of innovative activities of enterprises are mainly based on financial results, a comprehensive system of indicators covering the technological, organizational and social consequences of innovation has not yet been fully formed. The introduction of a multi-index approach and

the calculation of an integral index consisting of factors such as the share of innovative products, the coefficient of technological innovation, the effectiveness of research and development expenditures and intellectual property activity will allow forming a true picture of the innovative development of enterprises. Accordingly, improving the system of assessing innovative activities is of great importance not only for increasing competitiveness, but also for accelerating the pace of technological innovation of industrial sectors.

On the other hand, the results of an in-depth study of innovation processes in industrial enterprises have shown that the factors influencing the development of innovations are multifaceted and interrelated. In particular, the efficiency of financial resources, human resources, technological infrastructure and insufficiently formed corporate innovation environment directly affect the dynamics of innovative activity. Interviews with enterprise managers also confirmed that the success of innovations largely depends on the effective implementation of strategies aimed at technological innovation, strengthening the research base and creating new products. Therefore, the introduction of complex assessment mechanisms, stimulation of research and development and strengthening of innovation infrastructure are considered a priority task in order to increase the efficiency of innovative activities in enterprises.

REFERENCES

1. Dzhikharevych B.S., Limonov L.E. Investment efficiency and efficiency. - SPb.: Nauka, 2010. - 256 p.
2. In June N.B. Ekonomicheskaya otsenka investment proektov v promyshlennosti. - M.: Ekonomika, 2012. - 224 p.
3. Savelev Yu.V. Investment analysis and capital management. - M.: Finance and statistics, 2009. - 288 p.
4. Rustamova S. Investitsionnaya deyatelnost and investment climate and transitional economy. - Tashkent: Science and technology, 2018. - 176 p.
5. Berger F. Innovation Potential and Economic Development. - Berlin: Springer, 2006. - 312 p.
6. Schumpeter JA The Theory of Economic Development. - Cambridge, MA: Harvard University Press, 1934. - 255 p.
7. Solow RM Technical Change and the Aggregate Production Function. // Review of Economics and Statistics. - 1957. - Vol. 39, No. 3. – P. 312–320.