

ESTIMATION OF ENTERPRISE INNOVATION EFFICIENCY

ОЦІНКА ЕФЕКТИВНОСТІ ІННОВАЦІЙНОЇ ДІЯЛЬНОСТІ ПІДПРИЄМСТВА

The article substantiates theoretical approaches to assessing the efficiency of the enterprise innovation activity and proposes a comprehensive approach to the evaluation criteria. The introduction of innovations is important not only from the point of view of obtaining positive results of innovation with minimal costs but also defining the innovation itself as a value and meeting its quality requirements. When evaluating the effectiveness of the implementation of innovative projects, this approach is particularly relevant. Efficiency evaluation of the innovations' introduction should be based on an integrated approach that allows the use of short-term, medium-term, and long-term evaluation criteria. Indicators calculation of the innovation activities efficiency with these criteria in mind allows you: to assess the use of internal resources in the innovations' implementation; the possibility of choosing alternative innovative solutions; to estimate the efficiency of the innovations introduction, their quality and their value by comparing with enterprises-competitors or with products-analogues.

Key words: enterprise, innovation, innovation project, innovation activity, evaluation of innovation efficiency, efficiency criteria evaluation.

В статті обґрунтовані теоретичні підходи к оцінці ефективності інноваційної діяльності підприємства та запропоновано комплексний підхід до критеріїв оцінювання. При дослідженні питань ефективності інноваційної діяльності підприємства акцент було зроблено на те, що впровадження інновації важливо не тільки с точки зору отримання нововведення з мінімальними витратами, а й визначення саме нововведення як цінності, яке має бути корисним і потрібним, тобто відповідати певним вимогам, як з боку підприємства, ініціуючого його запровадження, так і з боку споживачів цієї інновації. Такий підхід є особливо актуальним стосовно визначення не тільки ефективності інноваційної діяльності, а також процесів оцінки. У сучасних ринкових умовах необхідним є підвищення вимог до економічних вимірів економічних обґрунтувань прийняття рішень стосовно інноваційних проектів, які можуть фінансуватися тільки після оцінювання кожного з можливих їх варіантів. Основу процесу визначення рівня ефективності інноваційної діяльності складає комплексне дослідження та аналіз багатокритеріальної системи оцінки ефективності інноваційних процесів промислових підприємств. Формування критеріїв оцінки ефективності інноваційної діяльності повинно здійснюється з урахуванням базових вимог: по-перше, видів оцінки ефективності інноваційних рішень; по-друге, наданих завдань, та, по-третє, відповідних показників. При оцінюванні ефективності інноваційної діяльності підприємства повинні враховуватися короткострокові критерії ефективності інноваційних рішень. При оцінюванні ефективності інноваційних проектів та оцінюванні ефективності інноваційних рішень на основі бенчмаркінгу повинні враховуватися середньострокові критерії ефективності інноваційних рішень. При оцінюванні ефективності інноваційного розвитку на основі прогнозування повинні враховуватися довгострокові критерії ефективності інноваційних рішень. Оцінка ефективності впровадження нововведень повинна ґрунтуватися на комплексному підході, який дозволяє застосовувати короткострокові, середньострокові і довгострокові критерії оцінювання. Розрахунок показників ефективності інноваційної діяльності з урахуванням цих критеріїв дозволяє: оцінити використання внутрішніх ресурсів при впровадженні інновацій; можливість вибору альтернативи інноваційних рішень; виробляти оцінку ефективності впровадження нововведень, їх якості та їх цінності шляхом порівняння з підприємствами-конкурентами або з продуктами-аналогами.

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ня потребаний к экономическому обоснованию инновационных проектов, которые должны финансироваться только после оценки эффективности каждого из возможных вариантов. Внедрение инноваций важно не только с точки зрения получения положительных результатов нововведения с минимальными затратами, но и определения самой инновации как ценности и соответствия ее требованиям качества. При решении вопросов определения эффективности инновационной деятельности и процессов оценки такой подход является особенно актуальным. Оценка эффективности нововведений должна основываться на комплексном подходе, который позволяет применять краткосрочные, среднесрочные и долгосрочные критерии оценивания. Расчет показателей эффективности инновационной деятельности с учетом этих критериев позволяет: оценить использование внутренних ресурсов при внедрении инноваций; возможность выбора альтернативных инновационных решений; производить оценку эффективности внедрения нововведений, их качества и их ценности путем сравнения с предприятиями-конкурентами или с продуктами-аналогами.

Ключевые слова: предприятие, инновация, инновационный проект, инновационная деятельность, оценка эффективности инноваций, критерии оценки эффективности.

У статті обґрунтовано теоретичні підходи до оцінки ефективності інноваційної діяльності підприємства та запропоновано комплексний підхід до критеріїв оцінювання. При дослідженні питань ефективності інноваційної діяльності підприємства акцент було зроблено на те, що впровадження інновації важливо не тільки с точки зору отримання нововведення з мінімальними витратами, а й визначення саме нововведення як цінності, яке має бути корисним і потрібним, тобто відповідати певним вимогам, як з боку підприємства, ініціуючого його запровадження, так і з боку споживачів цієї інновації. Такий підхід є особливо актуальним стосовно визначення не тільки ефективності інноваційної діяльності, а також процесів оцінки. У сучасних ринкових умовах необхідним є підвищення вимог до економічних вимірів економічних обґрунтувань прийняття рішень стосовно інноваційних проектів, які можуть фінансуватися тільки після оцінювання кожного з можливих їх варіантів. Основу процесу визначення рівня ефективності інноваційної діяльності складає комплексне дослідження та аналіз багатокритеріальної системи оцінки ефективності інноваційних процесів промислових підприємств. Формування критеріїв оцінки ефективності інноваційної діяльності повинно здійснюється з урахуванням базових вимог: по-перше, видів оцінки ефективності інноваційних рішень; по-друге, наданих завдань, та, по-третє, відповідних показників. При оцінюванні ефективності інноваційної діяльності підприємства повинні враховуватися короткострокові критерії ефективності інноваційних рішень. При оцінюванні ефективності інноваційних проектів та оцінюванні ефективності інноваційних рішень на основі бенчмаркінгу повинні враховуватися середньострокові критерії ефективності інноваційних рішень. При оцінюванні ефективності інноваційного розвитку на основі прогнозування повинні враховуватися довгострокові критерії ефективності інноваційних рішень. Оцінка ефективності впровадження нововведень повинна ґрунтуватися на комплексному підході, який дозволяє застосовувати короткострокові, середньострокові і довгострокові критерії оцінювання. Розрахунок показників ефективності інноваційної діяльності з урахуванням цих критеріїв дозволяє: оцінити використання внутрішніх ресурсів при впровадженні інновацій; можливість вибору альтернативи інноваційних рішень; виробляти оцінку ефективності впровадження нововведень, їх якості та їх цінності шляхом порівняння з підприємствами-конкурентами або з продуктами-аналогами.

Ключові слова: підприємство, інновація, інноваційний проект, інноваційна діяльність, оцінка ефективності інновацій, критерії оцінки ефективності.

Setting a problem. The development of national economies in the world is largely determined by the effective operation of enterprises and the effectiveness of newly introduced innovations. At present, it has become particularly important to deeper investigate the ways and possibilities of effective use of innovation activity as the basis of economic growth, and to search methods for assessing the efficiency of enterprises' innovation activities in those spheres of management, which serve as a catalyst for economic development.

The current stage of the development of Ukrainian industrial enterprises is characterized by a serious

crisis in the innovation sphere, which requires the use of active measures for its overcoming both from the state and from the enterprises. To solve these problems, it is necessary to systematically study the essence of the efficiency of the innovative activity of the enterprise and its components, as well as the search and the use of optimal measures to assess the innovation efficiency.

The recent research analysis and publications. Theoretical and practical aspects of innovation activity efficiency have been studied in the works of the following foreign and Ukrainian scholars:

T. Bryan, P. Drucker, B. Santo, B. Twiss, K. Freeman, J. Schumpeter, F. Valenti, L. Vodachek, O. Alimov, V. Alexandrova, A. Arefeva, Y. Bazhal, S. Gutkevich, B. Danylyshyna, P. Zavlyn, O. Savchuk, A. Galchytsky, V. Gayets, V. Gerasimchuk, S. Ilyashenko, G. Kindratsko, A. Kyrychenko, S. Kozachenko, A. Kuznetsova, O. Kuzmina, O. Lapko, A. Nalyvaiko, Novitsky, V. Solovyov, L. Fedulova, D. Chervanyov, N. Chukhray, M. Chorna, Yu. Yakovets, G. Yalovyy, S. Yampolskiy, and others.

Despite the wide variety of scientific problems associated with innovations and the depth of their research, some aspects of modern economic science are still not sufficiently explored and have not received the appropriate theoretical and practical development. In particular, there is a need for the deeper theoretical evolution of the problem of analysis and evaluation of the innovation activities efficiency and the identification of priority directions for improving the efficiency of this activity.

Setting a task. The purpose of the study is to consider the problems of assessing the efficiency of the enterprises' innovation activities under modern economic conditions and to comprehensively research and analyse the multicriteria assessing system of the industrial enterprises' innovation processes efficiency.

Presentation of the main research material. At the present stage of the world economic development, innovations are becoming more and more important, because just they largely determine the competitiveness of countries in world markets and become new sources of economic growth based on knowledge.

The achievement of competitiveness and high rates of labour productivity, as main indicators of economic development, are currently fully possible only in industrialized countries that implement science, technology, and innovation policies, the purpose of which is to stimulate, develop, and introduce advanced technologies, whose performance substantially exceeds characteristics of traditional countries.

The explosive development and spread of new technologies, their penetration into all spheres of human activity today lead to rapid and profound changes in global markets, the structure and nature of modern industrial production, economy, and social sphere. These changes are so significant that the world is entering, perhaps the largest technological transition in history, when the wealth of natural resources and cheap labour cease to be the main growth factors.

The analysis of the innovation scale and efficiency in the Ukrainian economy shows a relatively low activity in the use of scientific and technological achievements in production, their weak involvement in solving the main tasks of domestic economy restoration. Innovations are not yet critical for the development of economic activity and ensuring the country's

economic stability, although nowadays the innovation activity is the most important condition for the creation of competitive goods and services as a factor for the growth of our country's economy and the state must directly finance innovative projects, stimulate investments in innovation projects from private and state-owned enterprises through the creation of preferential terms for those enterprises that implement advanced technology, and are also engaged in research activities.

The analysis of the innovation activity of Ukrainian industrial enterprises makes it possible to conclude that there is a lack of positive dynamics in terms of promoting an innovative type of stable economic growth.

The reasons that restrain the implementation of innovation activities include the reduction of funding for fundamental research. Participation of the state (the state budget and local budgets) in innovation activity is unimaginably small (at the level of 1% of the total amount of innovations financing). Investment opportunities of national banks also remain at a low level. In addition, Western experts point out at the excessively high investment and economic risks for the Ukrainian economy, which are estimated at 60%, as shown by the volume of other countries investments in the machine-building industry of Ukraine (3.6% of total investments) [1].

Under today's market conditions, it is necessary to increase the requirements for economic measurements and economic feasibility decisions in relation to innovative projects that can be financed only after an economic assessment of each of their possible variants.

Managers-practitioners from the countries with developed market economies pay proper attention to the problems of assessing innovations efficiency. According to the investigation conducted by the leaders of senior management of North American private enterprises, the efficiency of implemented innovations is first and foremost evaluated by a variety of numerical systems of indicators – such an approach is supported by more than half of the 355 respondents being interviewed. Numerical criteria in these circumstances are: the impact of innovations on the growth of the enterprise's income (78%), customers' satisfaction (76%), revenue growth from the sale of new products (74%), labour productivity growth (71%), and profit dynamics (68%) [2].

The result of the innovation activity of any enterprise is the production of competitive products and the strengthening of positions in the market and its financial state. Choosing the best option for an innovation project involves getting bigger results with less or equal costs. Consequently, the innovation economic efficiency is determined by comparing the results with the costs that provided this result.

At the same time, in some scientific publications, it is suggested that it is necessary to distinguish between efficiency and effectiveness. In particular,

innovative activity, according to P. Drucker, is a well-organized, rational, systemic work [3].

This approach makes it possible to see in the innovation the purpose of the activity that becomes or has become a reality that continues under the same conditions and with the use of the same resources but with the result, which is radically changing and incorporates the potential for future innovations.

Innovation, which is based on new knowledge, causes change, and is aimed at creating a new need, provides innovation as a system, as an image of thought and action. Effectiveness, according to P. Drucker, is a consequence of «doing the right things» while efficiency is a consequence of the fact that «these things are created in a proper way» (doing things right). Both the first and second statements are equally important [3].

As for the problem of determining the efficiency of innovation activity and evaluation processes, such an approach is particularly relevant. Receiving innovation (in the form of a new product, technology, methods of organization and management), which is the consequence of the innovation process, it is important not only to get innovations with minimal cost but also to determine the innovation itself as a value, which should be useful and necessary, that is, to meet certain requirements, both from the side of the enterprise, initiating its introduction, and from the consumers of this innovation.

To assess the economic efficiency of innovation (innovation projects) in domestic practice, it is a common practice to use a system of indicators, which are briefly highlighted in the literature [2; 4-8]. These indicators reflect the ratio of costs and results, which will be obtained from the realization of innovations.

The following types of efficiency evaluation of innovation activities are distinguished: scientific and technical, economic, resource, social, and ecological evaluation.

In the process of scientific and technical evaluation, it is determined:

- the extent to which adopted technical solutions correspond to technological requirements in the industrialized countries and contribute to the movement towards the post-industrial society;
- what is the level and scale of the novelty of the innovation project, its constituent parts, whether it is based on an intellectual product or on intellectual property protected by patents;
- how promising are the technology and technical facilities incorporated in the project;
- what market (external or internal) new products are aimed at.

The economic assessment includes a system of indicators that reflect the ratio of the results and costs of each participant in innovation. The starting point for their identification is the market demand for innovation (the volume of its sales during the accounting

period), the forecast price of innovation (taking into consideration expenditures, inflation rate, loan interest, level of profitability) and the value of real cash flows, which is determined by the amount of current expenses, investments, sales revenue, etc.

The resource evaluation is carried out to determine the impact of innovation upon the volume of consumption of a resource certain type and to overcome the problem of its limitation, define its indicators of increasing the efficiency of their use.

The social assessment is to determine the contribution of innovation to improve the life quality of employees of a particular enterprise. Successful implementation of innovative projects is related not only to the social effect at the level of each particular enterprise but also at the level of society [8].

The ecological assessment takes into account the impact of innovation on solving environmental problems, which is especially important when implementing innovative projects that can change the level of ecological safety.

It is worth paying attention to the fact that the results of the enterprises' innovative activity can be both quantitative and qualitative in nature of their measurement and evaluation. A. Yu. Serbenovskaya points out that any result of innovations in value terms is summed up with an economic effect while other results that cannot be estimated in value terms cannot be absorbed by the economic effect and exist independently. That is, all quantified results are components of the economic effect as a whole, and those varieties of the obtained results, which are qualitative, create the possibility of their separate existence since they are not included in the overall economic effect as a system category [9].

The basis of the process of determining the innovation efficiency level is the complex study and analysis of the multicriterial system for assessing the efficiency of innovative processes in industrial enterprises [8].

To determine the efficiency of innovation in evaluating innovation activities, the following tasks are to be solved:

- the result assessment of innovation activities implementation (effective approach);
- the degree assessment of the achievement of the enterprise goals (target approach);
- the efficiency estimation of expenditures on the result achievement from the innovation activity, taking into account its duration (cost and static-dynamic approaches).

The efficiency of innovation activities is reflected both in the production stage and in the implementation phase (internal and external, intermediate and final, static and dynamic efficiency). In addition, the complexity of innovation activity is reflected in the duration of the innovation lifecycle, which necessitates the evaluation of efficiency at each of its stages [8].

The study of criteria for evaluating the efficiency of innovation activities revealed that there is a wide range of evaluation criteria in the scientific literature. It should be noted that the majority of scholars, as well as the recommendations of the United Nations Industrial Development Organization (UNIDO), determine the criterion of economic efficiency as the main criterion for evaluating innovation activity.

In addition to the criterion of economic efficiency, it is necessary to take into account the criterion of compliance with long-term strategic goals, thus allowing ensuring the competitiveness of enterprises. The multidimensionality of the criteria for assessing the efficiency of innovative projects, the diversity of time intervals, which are based on individual efficiency criteria, require a certain organizational infrastructure, distributed in space and in time, which ensures the efficient implementation of problem-oriented methodology and methods in solving the problems of technical and economic basis of innovation projects [10].

Formation of the criteria for assessing the efficiency of innovation activities is carried out with regard to the following basic requirements: approaches to the assessment of the efficiency of innovative solutions, tasks, and indicators (table 1).

The criteria for assessing innovation activities reflect a comprehensive approach to determining efficiency and should have the following characteristics:

- ease of measurement of the indicator quantitative estimation;
- ease of obtaining information, on the basis of which this indicator is evaluated;
- unambiguous interpretation of the information received on the basis of one or another criterion.

It is necessary to pay special attention to the assessment of the management efficiency of innovative projects at the enterprise.

The process of evaluating the efficiency of managing innovative projects at an enterprise is a complex and multi-stage process, which requires the application of a variety of approaches. To evaluate the management efficiency of innovative projects in general is to conduct a complex process of evaluation on the principles of system activity, formalization, adaptability, and flexibility. This process should include a system of assessment, which synthesizes indicators on the criteria of economic, social, scientific and technical, and environmental efficiency.

Separation of the target directions contributes to the implementation of a comprehensive assessment of the management efficiency of innovative projects at enterprises.

Evaluating efficiency on the basis of the integration approach involves taking into account a wide range of factors, which are specified in certain calculation methods. In particular, the assessment of the organization's activity based on the concept of strategic maps implies the use of a balanced system of indicators (BSI) for the enterprise and its individual structural units involved in the formation and use of the enterprise innovative potential and is a balanced system of key performance indicators in four areas:

- financial, which characterize the ultimate efficiency of innovative activity;
- market, which characterizes the relationship with customers and suppliers;
- internal business processes that characterize operational excellence;
- training and development that show the level of staff and development prospects.

Despite some critical remarks concerning the application of a balanced system of indicators for assessing the activities of domestic enterprises, one

Table 1

Criteria for assessing the efficiency of innovative decisions

Types of estimation of efficiency of innovative decisions	The given tasks	Indicators
Short-term criteria for the efficiency of innovative solutions		
Evaluation of the activity efficiency	Evaluate the efficiency of internal resources for innovation	Productivity, flexibility, efficiency, satisfaction, and quality of activity
Medium-term criteria for the efficiency of innovative solutions		
Evaluation of innovative projects' efficiency	Choose alternatives to innovative solutions and substantiate their efficiency	- net received income - profitability index - internal rate of return - the payback period
Evaluation of innovative solutions' efficiency on the basis of benchmarking	Evaluate the efficiency of innovative solutions, their quality and value by comparison with competitors or counterparts	- competitiveness of innovative solutions; - criteria of market segments matching the enterprise potential when working at these segments; - criteria of the innovative solutions risks
Long-term criteria for the efficiency of innovative solutions		
Estimation of the innovative development efficiency on the basis of forecasting	Evaluate the efficiency of innovative solutions based on the identification of trends change in indicators, their implementation and use	- forecasting of the results of implementing innovative solutions; - forecasting of changes and effect of factors influencing the efficiency of innovative decisions realization; - taking into account the influence of the environment on the implementation of innovative projects

can single out such key points of this concept, which determine its practical value. Firstly, strategic maps combine quantitative and qualitative indicators for evaluating the efficiency of an enterprise's innovation activity, which complement information from sources of financial reporting and reduce the risk of an enterprise to achieve short- and long-term goals. Secondly, enterprise activity is not limited to obtaining profit in the short term, so it must be taken into account all possible factors of innovation activity. Thirdly, the efforts made by an enterprise to improve its financial position in the future may not give the expected result in the long run.

At the same time, a balanced system of indicators enables the company employees to better understand the content of their work and its content in the overall strategy of the enterprise innovative development. Along with the final indicators of the activity results evaluation, indicators are used to characterize the level of resources utilization for the enterprise innovation activity. In addition, three periods of the enterprise development are taken into account: past, current, and future, thus adjusting the enterprise efforts not only to improve the present financial state but also to obtain a certain result in the future. It also provides for decomposition of the main indicators of the company activities and their bringing to the grassroots of management, which enables to significantly increase control over their implementation and incorporate the factor of management decentralization as an important index in improving the efficiency of the enterprise management in general.

Besides, the conditions' complexity for the adoption and implementation of innovative solutions also requires non-typical approaches to the synthesis of evaluation indicators, in particular, grouping the efficiency indicators into belated and preventive indicators. The belated indicators are oriented towards the activity results at the end of the period and characterize activity for the past period. Preventive indicators are oriented at the evaluation of the activity current processes and characterize the progress towards the goals' achievement [7].

Conclusions based on the conducted researches. Comprehensive consideration of the directions and conditions for the innovations' implementation indicates that the efficiency of innovation activity is manifested at the microeconomic and macroeconomic levels, and the process of the efficiency integrated assessment of the enterprise innovative activity implies its implementation according to the stages. The efficiency assessment of the enterprise innovation activity should be carried out on the basis of criteria that reflect a comprehensive approach to determining innovation efficiency and include relevant short-term, mid-term, and long-term objectives.

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ESTIMATION OF ENTERPRISE INNOVATION EFFICIENCY

The purpose of the article. The development of national economies in the world is largely determined by the enterprises' efficient operation and the efficiency of newly introduced innovations. Under modern conditions of a competitive economy, innovation activity, which requires intensification of innovations' introduction in all spheres of production, should become a priority for Ukraine, and necessitates a balanced and integrated assessment of innovation efficiency as the basis for making objective managerial decisions. The purpose of the study is to consider the problems of assessing the efficiency of enterprises innovation activities under modern economic conditions, as well as comprehensive research and analysis of the multicriteria system for assessing the efficiency of innovation processes of industrial enterprises.

Methodology. Solving the problems set in the research has been carried out with the use of modern scientific methodological approaches, methodological recommendations, as well as general scientific and special methods. These methods include theoretical synthesis, analysis and synthesis, scientific abstraction, induction, deduction, analysis of the hierarchy, and others.

Results. In researching the problems of the efficiency of the enterprise innovation activity, the emphasis was placed on the fact that the introduction of innovation is important not only in terms of innovation with minimal cost but also the definition of the innovation itself as a value, which should be useful and necessary, that is, it should meet certain requirements both from the part of the enterprise initiating its introduction and from the consumers of this innovation. This approach is especially relevant in determining not only the efficiency of innovation activities but also evaluation processes. The basis of the process of determining the level of efficiency of innovation activity is complex research and analysis of the multicriterial system for evaluating the efficiency of innovative processes of industrial enterprises. Formation of the criteria for assessing the efficiency of innovation activities should be carried out taking into account the basic requirements: firstly, types of evaluation of the innovative solutions' efficiency; secondly, given tasks, and, thirdly, corresponding indicators. In evaluating the efficiency of enterprises' innovation activities, short-term criteria for the efficiency of innovative solutions should be taken into consideration. When evaluating the efficiency of innovative projects and evaluating the efficiency of innovative solutions based on benchmarking, medium-term criteria for the efficiency of innovative solutions should be taken into account. Assessing the efficiency of innovation development on the basis of forecasting, one should take into consideration long-term criteria for the efficiency of innovative solutions.

In addition, an assessment of the enterprise efficiency can estimate the internal resources efficiency for the innovation, introduction. Evaluating the efficiency of innovative projects allows choosing alternatives to innovative solutions and justifying their efficiency. Evaluation of the innovative solutions' efficiency on the basis of benchmarking allows estimating the efficiency of innovations, their quality and value on the basis of comparison with enterprises-competitors or products-analogues.

Practical implementation. Practical implementation of scientific research consists in the fact that the evaluation of the innovation activities efficiency at enterprises with the use of integrated approach to the criteria of evaluation can determine the innovation efficiency taking into account relevant specific tasks and indicators.

Value/originality. It is proposed to carry out an assessment of the efficiency of an enterprise's innovation activity using an integrated approach to the evaluation criteria, which takes into consideration short-term, medium-term, and long-term objectives.