

# Methods of assessing the efficiency of innovation activities of industrial enterprises

*Nikolay Voytolovskiy*<sup>1,\*</sup>, *Andrey Butyrin*<sup>2</sup>, *Andrey Chizhik*<sup>3</sup>

<sup>1</sup> Sankt-Petersburg State Economic University, 21, Sadovaya street, St. Petersburg, 191023, Russia

<sup>2</sup> Moscow State University of Civil Engineering, Yaroslavskoye shosse, 26, Moscow, 129337, Russia

<sup>3</sup> Moscow Aviation Institute, Volokolamskoe highway, 4, Moscow, 125993, Russia

**Abstract.** The purpose of this study is to improve the methods for assessing the efficiency of innovation activity of an enterprise. The paper proposes a system of economic indicators to assess the market attractiveness of innovation projects and the readiness of the enterprise to implement them. Using these indicators, it is possible to predict the potential of an innovative product on the market, as well as to determine the financial and economic opportunities of the enterprise. The presented methods for assessing the impact of innovations on the development efficiency of the enterprise's economic activities allow determining the growth rates of the main economic indicators of the organization. The developed mechanism for a comprehensive assessment of the implementation of innovations at the enterprise allows determining the commercial effectiveness of the introduction of innovations and the impact of new technologies on the intercompany results of the enterprise, resulting in the possibility of taking into account the commercial and intercompany efficiency of investment in projects.

## 1 Introduction

A significant increase in the role of innovation in modern conditions predetermines the intensification of the innovation activity of enterprises through the implementation of promising research and development projects and the implementation of innovative programs. The situation in the global economy shows that the innovation component of the development of enterprises is the main source of economic growth and contributes to an increase in the level of competitiveness of the organization [1]. Domestic and foreign science has a significant number of approaches and methods for solving the problems of innovation management and the formation of mechanisms for its economic assessment. Many processes associated with the implementation of the achievements of scientific and technological progress, the corresponding economic and management problems were studied. Nowadays, there is a need to develop theoretical concepts and methodological approaches to assessing the economic efficiency of innovation projects, which will allow integrating the indicators of the commercial efficiency of innovation projects and the parameters of the economic development of the enterprise. The topic of research, in our

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\*Corresponding author: [voytolovskiy@mail.ru](mailto:voytolovskiy@mail.ru)

opinion, is particularly relevant in modern conditions and is a scientific task of great national economic importance [2, 3].

The main task of analyzing the efficiency of innovation activity of the enterprise is to calculate the criterion for assessing innovations, i.e. groups of indicators, the values of which will make it possible to decide on the attractiveness of this novelty for the organization and, if necessary, compare alternative innovations. As a rule, various indicators of investment analysis efficiency are assumed as such indicators, the applicability of which for assessing innovations is repeatedly substantiated theoretically and confirmed in practice. At the same time, the internal economic conditions for the implementation of innovation projects in specific enterprises are ignored, and the impact of innovations on the efficiency of the development of organizations is not analyzed.

## 2 Materials and methods

The concept of a systematic approach to assessing the results of introducing innovations proposed by the author is to develop indicators that take into account not only external, commercial criteria for the efficiency of investments in innovations but also internal, economic opportunities for enterprise development [4]. Table 1 shows the stages of the implementation of an innovation project together with the proposed methods for assessing the efficiency of innovation projects.

**Table 1.** Stages of innovation projects and methods for assessing their efficiency.

Stages of project	Economic tasks	Proposed methods	Required initial information
Research	Formation of idea. Market analysis. The study of the purchasing power of potential customers.	Methods for assessing the market attractiveness of innovation	The parameters of consumer actions: their number and volume of purchases made by them. Planned cost and sales of innovative product.
Constructive	Creating a prototype. Test launch of a new product in production Formation of consumer opinion about a new product.	Methods for assessing the possibilities of implementing an innovative project by the enterprise	The amount of funds allocated to research and development (R&D). The proportion of personnel engaged in R&D. The property intended for R&D. Intellectual property. Mastering the new technology. Advertising budget of innovative products.
		Methods for assessing additional costs for the implementation of an innovative project	Costs associated with engineering work. Costs of material resources. Costs of purchasing equipment and preparing areas for its placement. Costs of attracting personnel. Costs of organizing the sales system.
Commercial	Carrying out activities for the preparation of production on an industrial scale. The implementation of experienced sales.	Methods for assessing the efficiency of costs associated with the implementation of a project	The enterprise's total costs of a new product with the exception of innovative costs. Innovative costs. Revenue and profits from sales of novelty. The annual amount of depreciation. Average annual output per employee.
Distributive	The launch of the production of novelty on an industrial scale. Formation of a product distribution system and the use of this system due to the launch of a product on the market.	Methods for assessing the impact of the innovation project on various areas of the enterprise	The cost of intellectual property of the enterprise. The value of the assets of the enterprise. Labor productivity of employees.

Together with the specified data, the table presents a list of activities inherent in each of the stages of an innovation project and a list of initial data for conducting analytical actions using each of the proposed methods. Table 1 allows presenting the structural links between the stages of the implementation of innovation projects and the proposed methods for assessing the efficiency of these projects.

At the first stage, there is a selection of ideas for an innovative product according to the principle of greatest attractiveness. As a part of the ongoing selection, it is necessary to conduct a preliminary market study, determine the demand for a new product in terms of those market segments that are categorized as potential consumers.

At the second, constructive stage, the development and improvement of technology, the creation of a prototype of a new product takes place. It is also possible to test it by potential consumers.

At the next, commercial stage of the implementation of the innovation project, it is planned to conduct various preparatory measures to organize the production of a new product on an industrial scale and bring the product to the market. The proposed methods will allow calculating the economic effects in the enterprise operation, resulting from investing in a new product [5].

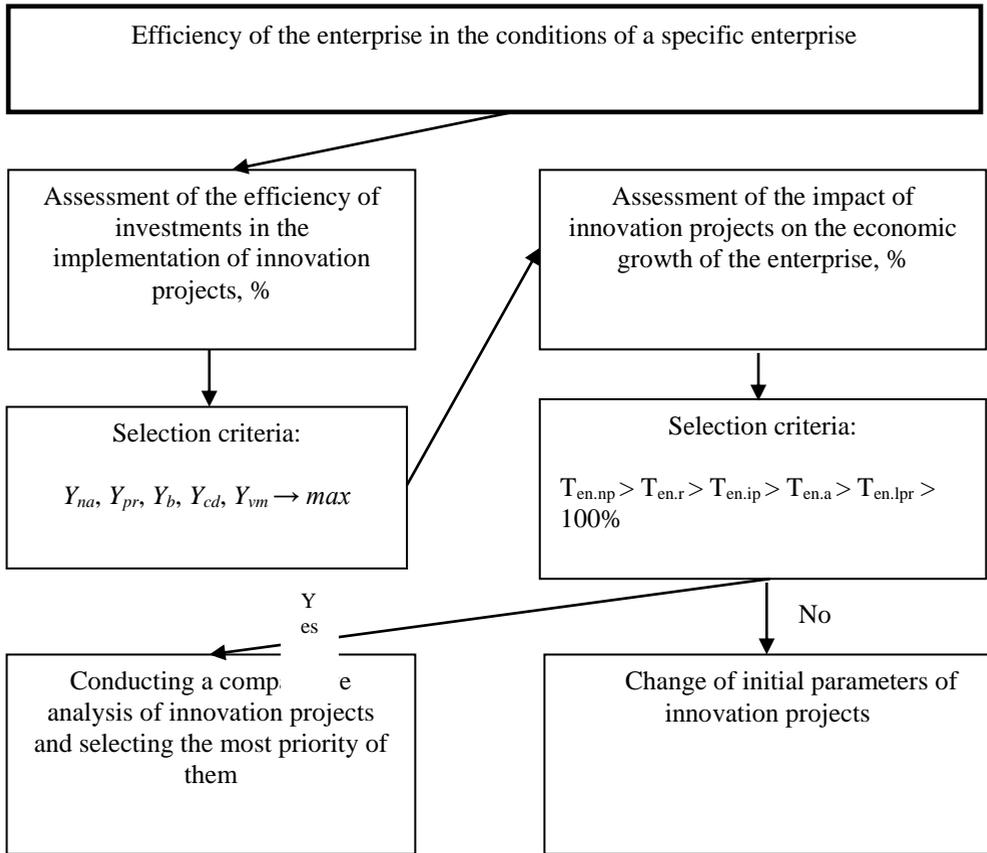
The fourth, distributive stage of the innovation project implementation is characterized by the launch of the production of the novelty in the industrial volume and the formation of the distribution system of a new product. The activities carried out at this stage have a significant impact on the performance of the enterprise. In this regard, the author proposes a method for assessing the impact of a new or improved technology on indicators characterizing the operation of the enterprise. The use of this method involves the calculation of the growth rates of the following indicators: intellectual property of the enterprise ( $T_{en.ip}$ ), net profit ( $T_{en.np}$ ), revenue from sales of products ( $T_{en.r}$ ), assets ( $T_{en.a}$ ), labor productivity of workers ( $T_{en.lpr}$ ). In this case, the criterion for accepting a project for implementation is the following ratio of the growth rates of the specified indicators:  $T_{en.np} > T_{en.r} > T_{en.ip} > T_{en.a} > T_{en.lpr} > 100\%$ . Satisfaction of the values of the growth rates of indicators to the conditions of this inequality indicates the positive impact of the novelty implementation on the enterprise's internal economy.

Thus, together with the results of analyzing the attractiveness of innovations in the market and the possibilities for implementing an innovation project by the enterprise, the procedure for selecting projects that are most preferable for implementation should be based not only on the results of calculating the coefficients reflecting the commercial efficiency of investments but also on assessing the impact of innovation on growth rate of economic indicators of the enterprise (Figure 1) [6].

The system of analytical actions in this direction creates an opportunity to assess the dependence of the economic growth of the enterprise on the value of the investment costs of the project.

### 3 Results

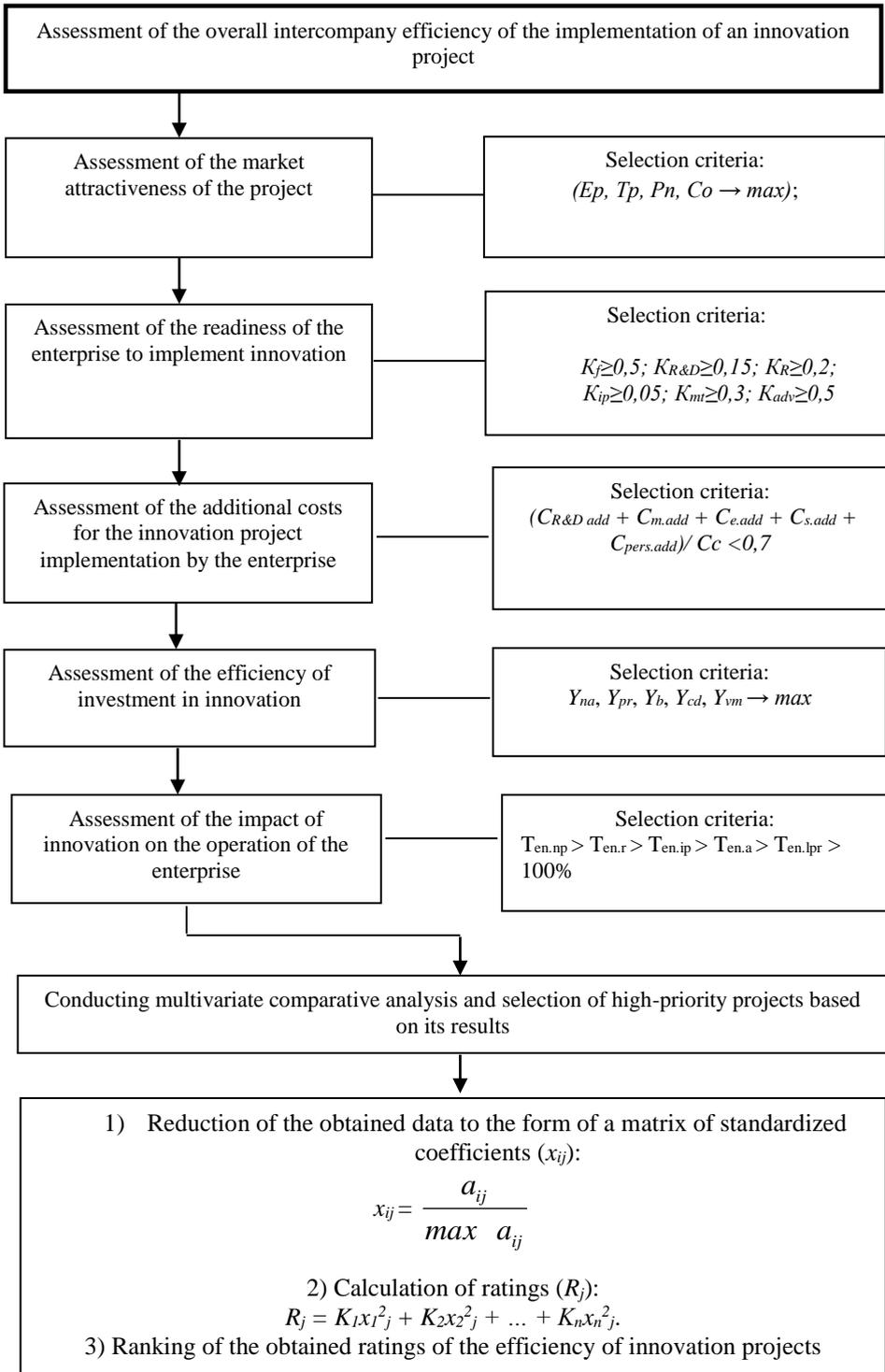
Thus, the above algorithm allows an assessment of the impact of the project on the economic parameters of the enterprise's operation. This method complements the above method of the efficiency of the involvement of new technologies in the economic activity of the enterprise and the method of studying the investment potential of the enterprise.



**Fig. 1.** Algorithm for using methods to assess the impact of investment in an innovative product on the efficiency of the enterprise.

As a result of the above analytical actions, an economic entity obtains the values of various parameters for a comprehensive assessment of the efficiency of innovation projects. A significant positive point is that the indicators proposed for calculation allow a comprehensive analysis of the novelty. But, on the other hand, the presence of a large number of different estimated indicators complicates the process of choosing the most attractive project [7].

The solution of similar problems is carried out through multidimensional comparative analysis. This analysis is carried out in order to systematize the available groups of indicators in order to compare them. Its use is justified if it is necessary to submit a rating assessment of the activities of several economic entities or when choosing a project among several alternative ones (Figure 2).



**Fig. 2.** The mechanism for assessing the overall intercompany efficiency of innovation projects based on multidimensional comparative analysis.

The proposed approach in conjunction with existing methods, which are based on a

temporary assessment of cash flows, allows for a multifactorial and, accordingly, more objective assessment of the efficiency of innovation projects. This is due to the fact that the integration of these approaches makes it possible to assess the efficiency of projects both from the perspective of external investors and taking into account the results of the project's impact on the operation of the enterprise which is planned to be involved in the project implementation.

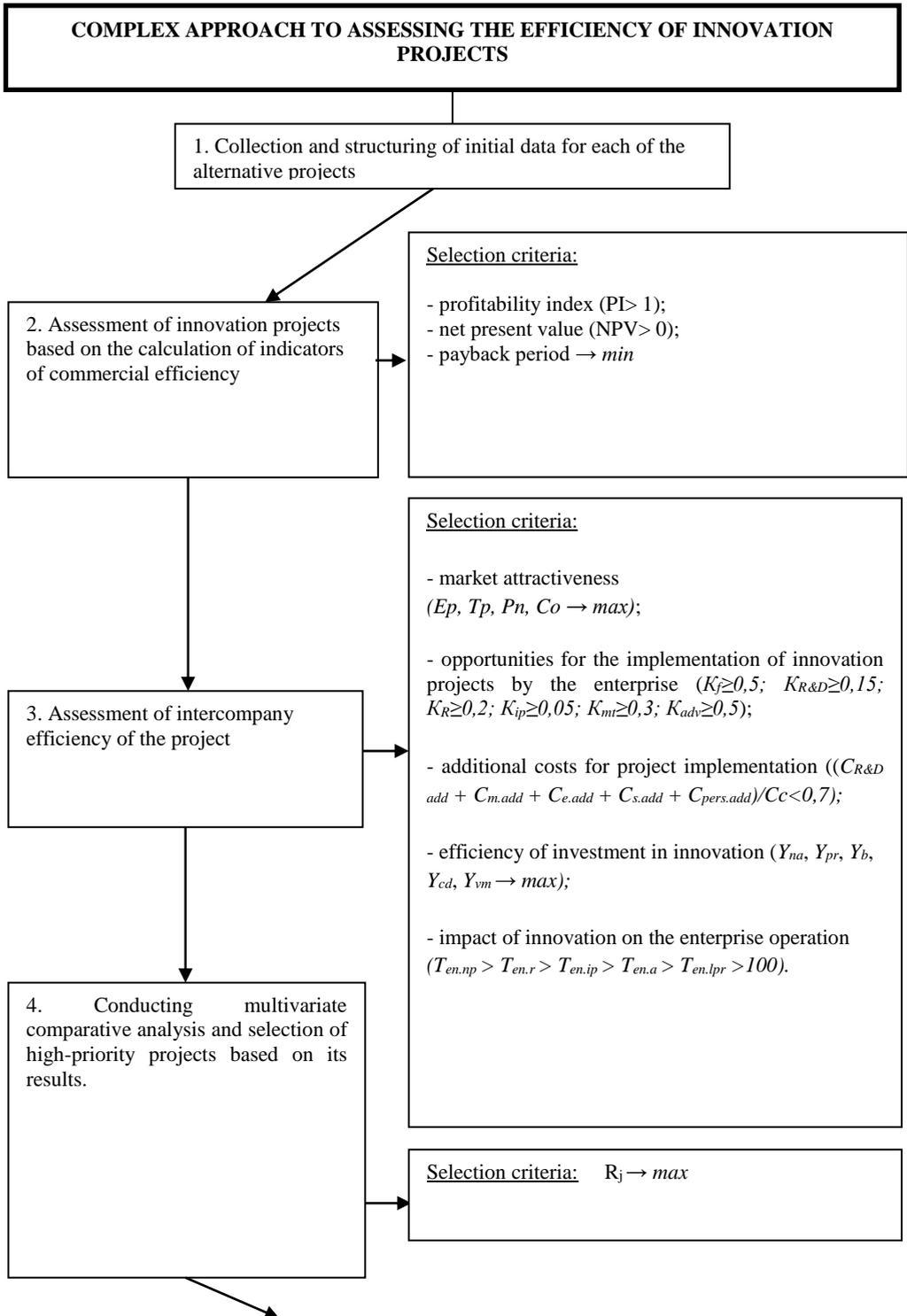
Therefore, it is necessary to use the methods of external commercial efficiency and methods that allow displaying the impact of the project on the enterprise operation within a single approach [8].

Figure 3 shows a comprehensive mechanism for assessing the efficiency of innovation, which allows combining these methods.

The developed mechanism consists of the following stages:

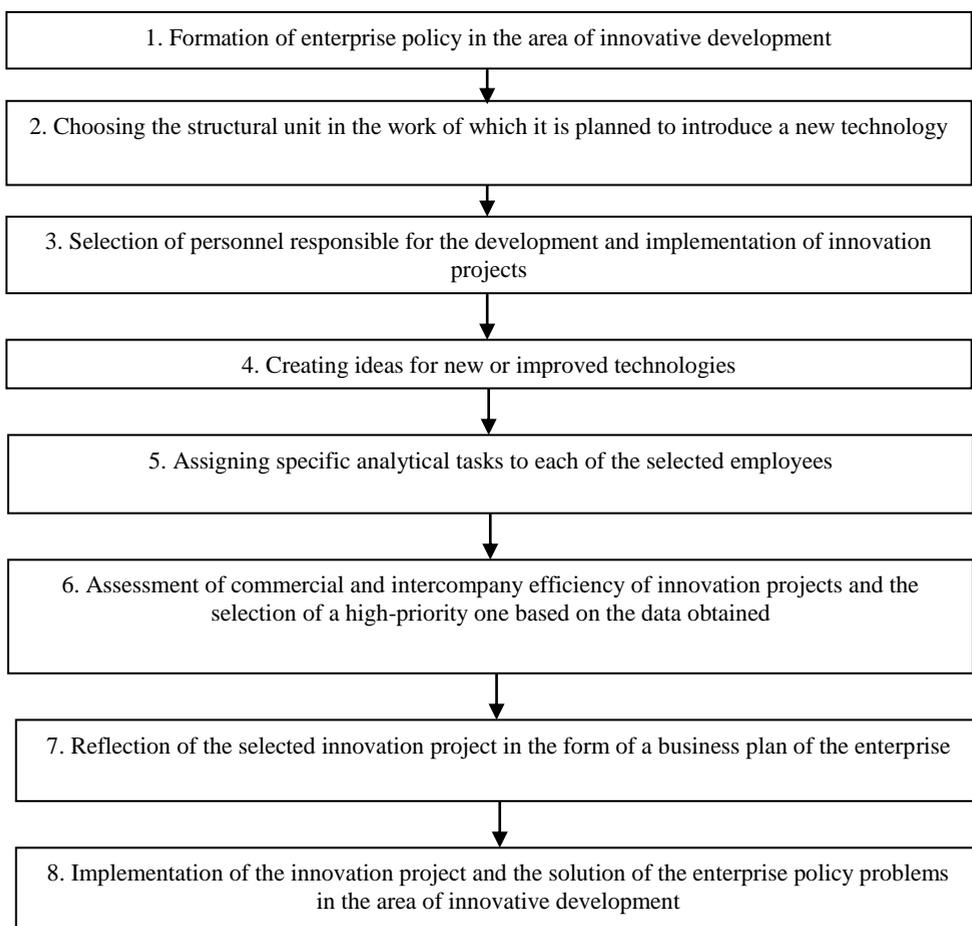
1. Collection and structuring of initial data.
2. Assessment of innovation projects based on the calculation of indicators of commercial efficiency.
3. Assessment of intercompany project efficiency.
4. Conducting multivariate comparative analysis and selection of high-priority projects based on its results.
5. Introduction of a high-priority technology in the enterprise operation.

Thus, the proposed integrated approach to assessing the efficiency of innovation projects is a variant of significant modernization of the existing "Methodological recommendations on assessing the efficiency of investment projects" and "Analyzing the efficiency of investment and innovation activities of an enterprise" by supplementing them with methods of intercompany efficiency of innovation projects.



**Fig. 3.** Comprehensive mechanism for assessing the efficiency of introduction of innovation at the enterprise.

In order to use in practice the proposed system for assessing the efficiency of innovation projects, the author has developed a scheme that reflects the structure and sequence of actions for analyzing and selecting projects based on the results of the analysis (Fig. 4).



**Fig. 4.** Algorithm for the development, assessment of economic efficiency and the implementation of innovation projects at the enterprise.

A distinctive feature of this scheme is that it establishes the responsibility and interconnection of performers at each stage of the innovation project.

The importance of a comprehensive mechanism for assessing the efficiency of innovation projects lies in the fact that the results obtained through this assessment reflect the collective estimate and are the criteria for selecting innovation projects among alternative ones.

## 4 Conclusions

The developed mechanism complements the currently used methodology for assessing the commercial efficiency of projects, used both for investment and innovation projects. According to the proposed mechanism for assessing innovation projects, those projects that have a positive assessment of commercial efficiency ( $NPV > 0$ ) are selected first. The final selection of a high-priority project is carried out according to the rating of their intercompany efficiency (project №3). In practical terms, the application of the developed

mechanism will make it possible to take a more reasonable (due to an expanded system of criteria) decision on the feasibility of the implementation of a project.

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