Forging the Future: Pioneering Approaches in Business, Management and Economics Engineering to Overcome Emerging Global Challenges - 2024

https://doi.org/10.24867/FUTURE-BME-2024-045 Original scientific paper

SELECTION OF CRITERIA FOR EVALUATING INNOVATIVE PROJECTS

Ranka Sudžum[1] [0000-0001-5437-2019], Slaviša Moljević[2] [0000-0002-8141-4429], Angela Fajsi[3] [0000-0002-5706-4932], Slobodan Morača[4] [0000-0001-6174-1038]

Abstract

Market conditions determine the impossibility not only of development but also of the simple survival of organizations without innovations that create new business opportunities. Innovation projects have experienced exponential growth, leading to an open challenge of identifying the best project solutions. Due to limited resources, effective methods are needed to select profitable projects and innovative ideas. An important success factor for project selection is defining appropriate evaluation criteria. The paper focuses on the presentation and selection of criteria for the evaluation of innovative projects. The list of criteria was defined based on the conducted research in which evaluators and providers of grants for financing innovation projects participated. Criteria defined in this way can support funding agencies to improve their decision-making strategies, as well as to make better funding decisions based on expert evaluations.

Key words*: innovative projects, evaluation, criteria for evaluation*

1. Introduction

Companies operating in today's market face significant challenges due to globalization, rapid market changes, digitization, new regulations, as well as increased demand for product customization. To remain competitive, companies should be oriented towards thinking about new products, processes and ways of working. That's how they get new ideas, improve existing ones or create new businesses. Innovations represent the bearer of new ideas and new types of business. In addition, innovation in manufacturing, especially the adoption of new technologies and processes, has been identified as a key driver of the success of the

[1] University of East Sarajevo, Faculty of Mechanical Engineering, Bosnia and Herzegovina, ranka.gojkovic@ues.rs.ba

[2] University of East Sarajevo, Faculty of Mechanical Engineering, Bosnia and Herzegovina, slavisa.moljevic@ues.rs.ba

[3] University of Novi Sad, Faculty of Technical Sciences, Serbia, angela.fajsi@uns.ac.rs

[4] University of Novi Sad, Faculty of Technical Sciences, Serbia, moraca@uns.ac.rs

transformation process brought about by Industry 5.0, which represents the latest technological and social transformation of the manufacturing industry.

The understanding and definitions of innovation presented in the literature differ from each other. The concepts of innovation and invention were distinguished by Schumpeter as original combinations of new or existing knowledge, resources, equipment and other factors. A real innovation is not only an invention or an idea, but the definition implies the development of something that is successfully used in the production process (Gärtner et al., 2023). The Oslo Manual 2018 defines an innovation as: a new or improved product or process (or a combination thereof) that is significantly different from the unit's previous products or processes and that is made available to potential users (product) or put into use by the unit (process) (Galindo-Rueda, F., 2019). Some authors in addition to new and better quality products, including process innovation, organizational innovation, administrative innovation, marketing innovation and business model innovation.

Companies strive to implement revolutionary technologies by implementing innovative projects. The resources and funds of any organization are not enough for trial and error implementation of all proposed projects, therefore organizations require effective methods for selecting profitable projects and innovative ideas. The basic project evaluation and selection process usually involves six steps, namely, proposal submission, form review, project evaluation peer review, review result aggregation, panel evaluation, and final decision (Tian et al., 2005). It is a complex decision-making process that includes multiple evaluation criteria and multiple decision-makers (Liu et al., 2010). One of the current issues is how to evaluate an innovative project, taking into account its specificities. There is no consensus on how to evaluate innovative project ideas. Decisions on the selection of ideas within the innovation process are usually based on a set of criteria that innovation projects must fulfil (Eisenreich et al., 2021). It is especially important to include more indicators in the groups of criteria for evaluation, as well as to make recommendations for selecting projects for financing based on the final evaluation of criteria from a clearly defined list of criteria.

Traditional evaluation methods are focused on economic criteria, while feasibility and social aspects are neglected. The risks are not sufficiently treated, as well as the contribution of the project from the point of view of green economy, digitization and fulfilment of Sustainable development goals (SDGSs).

The aim of this paper is to propose criteria for the evaluation of innovative projects, which will speed up the process of selecting the most effective innovative projects for implementation.

After introductory considerations on the importance of work research, a literature review was conducted to identify existing approaches and to identify relevant criteria for evaluating innovative projects. Then a list of criteria for evaluating innovative projects was proposed, after which the selection of criteria was explained in the discussion. Finally, concluding remarks are given.

2. Literature Review

It is obvious that any innovation should be new and practically implemented, to bring economic or other benefits. An effective project is necessary to implement the innovation process. The innovation project is the rationale for introducing the innovation and the very process of implementing the innovation through investment. An innovative project is a form of creating an innovative activity of a company in a certain period of time, with certain activities and resources aimed at concrete results. Therefore, the innovation process requires significant resources, encounters obstacles for its effective. completion and includes changes that inherently represent uncertain outcomes. The potential economic utility does not in itself provide a basis for a detailed analysis of the various innovative project proposals to be evaluated. For this reason, a holistic perspective is necessary in the evaluation of innovations (Grekul et al., 2019).

Project selection in innovation management is usually based on criteria used to evaluate projects (Eisenreich et al., 2021; Dziallas & Blind, 2019). Determining a set of evaluation criteria is another critical step in selecting innovative project ideas (Cubukcu et al., 2024). Various academic studies have investigated sets of evaluation criteria. As the choice of criteria largely depends on the context of the project, the literature does not provide a unique list of criteria. The way in which evaluation criteria are applied and who evaluates innovative projects varies greatly (Eisenreich et al., 2021). When evaluating grant applications, three criteria were applied in paper (Gudkov et al., 2021): novelty and effectiveness of the proposed solutions, feasibility of the planned results of the innovation project, prospects of implementation and commercial realization of the product being created. Some authors recommend the use of a combined variant of the list of criteria method in solving the problem of efficiency assessment, where five groups of criteria can be distinguished: Social criteria; Economic criteria; Market criteria; Investment efficiency criteria; Scientific and technical criteria (Eisenreich et al., 2021). To select the most attractive innovative project, technoparks evaluate their production, financial and economic capabilities (Petryna et al., 2020). When evaluating grant applications, the following three criteria were applied: the novelty and effectiveness of the proposed solutions, the feasibility of the planned results of the innovation project, and the prospects for the implementation and commercial realization of the product being created (Gudkov et al., 2021). Many papers deal with the evaluation of innovative projects at the enterprise level. Such criteria can deal with different aspects of strategy, market, resources, technology and risk (Martinsuo & Poskela, 2011). It can be said that economic analysis is the most common criterion used in the project selection process (Khalili-Damghani & Tavana, 2014). Due to the fact that project results have short-term and long-term effects on social, economic and environmental aspects, some authors introduce the third generation of new criteria for the evaluation of projects related to sustainable development (Akhavein et al., 2021; Hesampour et al., 2016).

It can be concluded that it is necessary to create a list of criteria that, in addition to financial criteria, would also integrate innovation, feasibility, and social

criteria. Practically no examples can be found in the literature where criteria related to job creation, inclusion of vulnerable categories, impact on the green economy, digitization, fulfilment of the SDGs are integrated with the financial and feasibility criteria.

3. Criteria for evaluation of innovative projects

Innovations represent the main factors in the creation of a competitive market for new products, technologies and services, and they also have a significant impact on economic growth. The development of innovative companies is an important part of the innovation policy of every country (Gudkov et al., 2021). That is why the project-based approach is one of the most widespread approaches for the promotion of innovation. It is necessary to really assess the potential of the innovative project, because it has a significant impact on the processes aimed at the development of regional and national innovation policy, the selection of national priorities for the development of the innovative system. Therefore, in order to promote innovation, there are a large number of competitions for the financing of innovative projects, both from the government and ministries, as well as from various agencies and funds.

Support for these projects is provided on the basis of a grant. As a result, the task of project evaluation is highly professional. Expert evaluation is especially important, followed by the selection of the most promising projects for further financing and implementation. When evaluating grant applications, decision makers apply different criteria. The criteria are necessary to manage and control the multitude of innovative ideas and concepts that are submitted to the providers of funds. The choice of criteria is very important for the evaluation process itself in order to choose an adequate project for implementation. If many criteria are considered, the cost of analysis and solutions becomes very high and difficult to understand. If very few criteria are considered, important criteria may not be taken into account, and therefore the best project solutions may not be selected, and profitable innovative projects may be rejected. In many cases, evaluators must determine the values of the quality of the project in use, based on subjective criteria, not allowing an objective assessment of essential characteristics such as functionality or usability. Typically, between three and five criteria are used for evaluation. According to the literature, this number of criteria is common when evaluating numerous ideas (Eisenreich et al., 2021).

3.1 Selection of criteria for the evaluation of innovation projects

In this paper, the criteria were identified through an interview and a survey. Respondents were asked to describe their evaluation process and criteria for selecting innovative projects. Respondents represent members of commissions and decision-makers for project evaluation in institutions that award grants for financing innovation projects. Fifty respondents from Bosnia and Herzegovina participated in the research. After the obtained results, four groups of criteria were identified. Each criterion is divided into several sub-criteria (Table 1). In addition to

the financial criteria, criteria related to the innovativeness of the project idea, feasibility and criteria for social responsibility and inclusiveness were also defined.

Table 1: Criteria for evaluating innovative projects

ID	CRITERIA	SUB-CRITERIA
K1	**FINANCIAL CRITERIA**	• current financial and economic state of business, dynamics of its development, availability of outside investors • liquidity of company's investment to implement the project • investment return period from project implementation • profit from project implementation
K2	**INNOVATIVE PROJECT IDEA**	• the project's novelty rate • analysis of scientific and technical, technological novelty of the innovation • relevance of the project to the industry sector/market • stakeholder participation in the project • advantage of project competitiveness
K3	**PROJECT FEASIBILITY**	• feasibility in aspect of market demand, costs, and time • technical and human capacities for implementation of proposed project • total project duration • indicative plan of activities during project implementation • expected project results • commercial risk, technology risk, and project risk in case of project implementation, during and after the project implementation • fluctuations in a relevant market segment, feasibility of the sales plan • sustainability of the project
K4	**SOCIAL RESPONSIBILITY AND INCLUSIVENESS**	• creating new working places • influence on women economic empowerment • include vulnerable categories • contribution to the development of the green economy • contribution to the digital transformation of the applicant's business • contribution of the project to the achievement of sustainable development goals (SDGs)

4. Discussion

The literature on the evaluation of innovative projects showed that in most cases the authors try to use different criteria of the economic efficiency of innovations for the evaluation of innovations (Alexandrova et al., 2018). In practice, innovative projects are characterized by a wider range of criteria that should not be considered in the decision-making process. Accordingly, a list of criteria was defined, which includes, in addition to financial criteria, criteria for evaluating

innovation, feasibility and social responsibility and inclusiveness of vulnerable categories.

Financial criteria usually refer to profitability and revenue metrics (Eisenreich et al., 2021; Dziallas & Blind, 2019). Some authors mainly focus on profitability measures such as return on investment (Dziallas & Blind, 2019). In the proposed list of criteria, in addition to the return on investment, criteria related to the current financial and economic state of the business, the dynamics of its development, the availability of external investors, the liquidity of the company's investment for the implementation of the project, as well as the expected profit from the implementation of the project are defined. As part of the criteria related to the innovativeness of the project idea, the level of innovativeness of the project, the analysis of the scientific and technical, technological novelty of the innovation, the relevance of the project to the industrial sector/market, the participation of interested parties in the project (suppliers, distributors, customers, partner organizations) are considered, as and the competitive advantage of the project.

Based on the feasibility of the project from the point of view of market requirements, costs and time, criteria related to technical capacities and human resources necessary for project implementation, activity plan, project duration and expected results, market analysis, sustainability of the project and risk analysis were defined.

Innovation projects are characterized by high risk and uncertainty during the entire cycle, therefore special attention must be paid to the identification and risk determination procedures in all stages of development, production and implementation of an innovative project (Alexandrova et al., 2018).

In the context of Industry 5.0, presented by the European Union, it is also important to consider innovations that increase prosperity for people and organizations within the assessment. The Sustainable Development Goals (SDGs), also known as the Global Goals, were adopted by the United Nations in 2015, recognizing that action in one area will affect outcomes in others, and that development must balance social, economic and environmental sustainability. All three dimensions of sustainability in projects should integrate economic, social and environmental benefits. Assessment and evaluation of projects that are successful in sustainability can determine policies and procedures of the organization to achieve the final goals in the future of the organization (Hesampour et al., 2016).

Project selection is a typical problem of group decision-making based on multiple criteria, and its main goal is to select appropriate projects through the assessment of multiple experts from a given group of research projects characterized by multiple criteria (Liu et al., 2010; Cubukcu et al., 2024; Akhavein et al., 2021). As a rule, experts evaluate five to ten applications, which gives them the opportunity to analyse and compare different projects before choosing the most promising one. In addition to their knowledge and expertise, evaluators should research, and study significant amounts of additional information related to the proposed innovation (Gudkov et al., 2021). To increase the objectivity of the independent examination, it is suggested that at least three independent experts be involved in the assessment process.

Considering the complexity of the project evaluation, the list of criteria can also be used when applying the multi-criteria decision-making method (MCDM) when choosing the best project solutions. Also, the defined criteria do not have to have the same weight in the evaluation. The weights of the criteria can be evaluated at each new project evaluation.

5. Conclusions

In this paper, an analysis was performed and the significance of the criteria used in the evaluation of innovative projects was presented. Based on the research, a list of criteria was defined. Four groups of criteria have been defined, namely financial criteria, criteria for evaluating innovation, feasibility, and social responsibility and inclusiveness. For each group, corresponding sub-criteria are defined.

Innovative projects should satisfy not only economic, but a whole series of criteria, which are summarized in the proposed list. Using the proposed list of criteria can help formalize the evaluation and decision-making process for selecting an innovative project for implementation. The mentioned criteria will enable a more reasoned choice of financing variations in favor of a specific innovative project. Improving the innovation evaluation process can also help investors finance new ventures. The criteria defined in this way can also be used to award grants for innovations by the government, where priorities would be given to criteria such as social responsibility or technological feasibility.

The advisability of investing in the development of innovation through innovation projects is necessary to ensure the sustainable development of the economy. Market conditions determine the impossibility not only of development, but also of the simple survival of an organization without innovations that create new business opportunities.

Acknowledgments

This research was funded by the Ministry of Civil Affairs of Bosnia and Herzegovina, from the grant Support to technical culture and innovation in Bosnia and Herzegovina.

REFERENCES

[1] Petryna, M., Stavnycha, N., Tarayevska, L., Rishchuk, L., & Kushlyk, O. (2020). A methodological approach to the evaluation of the effectiveness of innovative projects. In *E3S Web of Conferences* (Vol. 166, p. 13018). EDP Sciences.

[2] Gärtner, Q., Ronco, E., Cagliano, A. C., & Reinhart, G. (2023). Development of an approach for the holistic assessment of innovation projects in manufacturing including potential, effort, and risk using a systematic literature review and expert interviews. *Applied Sciences*, *13*(5), 3221.

[3] Galindo-Rueda, F. (2019, July). Oslo Manual 2018: Guidelines for Collecting, Reporting and Using Data on Innovation. *In National Bureau of Statistics of China, OECD-NBS International Training Workshop on Innovation Statistics. Xi'an, China* (pp. 16–18).

[4] Birkinshaw, J., Bouquet, C., & Barsoux, J. L. (2010). The 5 myths of innovation. *MIT Sloan management review*, *52*(2), 43.

[5] Tian, Q., Ma, J., Liang, J., Kwok, R. C., & Liu, O. (2005). An organizational decision support system for effective R&D project selection. *Decision support systems*, *39*(3), 403–413.

[6] Liu, X. B., Pei, F., Yang, J. B., & Yang, S. L. (2010). An MAGDM approach combining numerical values with uncertain linguistic information and its application in evaluation of R&D projects. *International Journal of Computational Intelligence Systems*, *3*(5).

[7] Eisenreich, A., Füller, J., & Stuchtey, M. (2021). Circular project selection: How companies can evaluate circular innovation projects. *Sustainability*, *13*(22), 12407.

[8] Grekul, V. I., Isaev, E. A., & Korovkina, N. L. (2019). Developing an approach to ranking innovative IT projects. *Бизнес-информатика*, *13*(2 (eng)), 43–58.

[9] Fedosova, R. N., & Pimenov, S. V. (2009). Modern instruments for investment projects appraisal. *Vestnik of the Orenburg State University*, (5), 78–81.

[10] Dziallas, M., & Blind, K. (2019). Innovation indicators throughout the innovation process: An extensive literature analysis. *Technovation*, *80*, 3–29.

[11] Cubukcu, A., Ervural, B., & Ayaz, H. I. (2024). An extended intuitionistic fuzzy ABAC method for evaluating innovative project ideas. *Neural Computing and Applications*, *36*(16), 9375–9404.

[12] Gudkov, P. G., & Guseva, A. I. (2021). Accuracy of expert assessments in evaluating innovative projects. *Procedia Computer Science*, *190*, 284–291.

[13] Martinsuo, M., & Poskela, J. (2011). Use of evaluation criteria and innovation performance in the front end of innovation. *Journal of Product Innovation Management*, *28*(6), 896–914.

[14] Khalili-Damghani, K., & Tavana, M. (2014). A comprehensive framework for sustainable project portfolio selection based on structural equation modeling. *Project Management Journal*, *45*(2), 83–97.

[15] Akhavein, A., RezaHoseini, A., Ramezani, A., & BagherPour, M. (2021). Ranking Sustainable Projects through an Innovative Hybrid DEMATEL-VIKOR Decision-Making Approach Using Z-Number. *Advances in Civil Engineering*, *2021*(1), 6654042.
[16] Hesampour, A., Nikbakht, M., & Shirouyehzad, H. (2016). A method for ranking, assessment and evaluation of sustainability factors in project. *Journal of Modern Processes in Manufacturing and Production*, *5*(1), 29–44.
[17] Alexandrova, T. V., Zhukovskaya, S. L., & Voevodkin, N. Y. (2018). The development of a multi-criteria approach to assess innovative projects efficiency. *Revista ESPACIOS*, *39*(44), 22.