# Competitiveness assessment of engineering products



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# Competitiveness assessment of engineering products

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**Abstract.** This article discusses the problem of increasing the competitiveness of the engineering industry through the implementation of innovative projects. Based on the analysis of the features of innovative projects formulated a conclusion according to which the innovative projects effectiveness evaluation should take into account non-economic indicators such as social, ecological, resource, scientific and technological. We formulate the process and provide a methodology to evaluate the effectiveness of innovative projects based on non-economic indicators. This technique is aimed at assessing the projects increase the competitiveness of products, which is understood as a comprehensive line of products a whole range of different physical limitations of the essence, allowing the long run to get sustainable income.

## 1. Introduction

One of the most important aspects of economic development is the growth of production in all sectors and at every single enterprise. In conditions of a market economy and in connection with Russia's accession in WTO the important thing is increasing of business and industry competitiveness in general. The problem of nowadays competitiveness is very serious, particularly in engineering. Russia has long been staying as a leader in the field of engineering, but recently the powerful production of developing countries makes strong competition of domestic products. On the background of growing industries and increased competition special importance acquire innovation activities of enterprises, in particular the development and implementation of innovative projects. Effectiveness of innovative projects mostly depends on its proper evaluation, which gives an opportunity to determine the best alternative project that satisfies a whole range of restrictions of different physics. It’s obvious that any innovation must be new, practically feasible, must bring economic and other benefits. For the process of innovation need a project to be effective [1]. Innovative project is the statement of reasons for the promotion of novelty (innovation in particular) and the process of novelty, by the means of investing [2; 3]. Practicability of investing funds for the development of innovation is necessary to be justified so that innovative project met certain criteria. Set of criteria depends on the specifics of the engineering industry and businesses in particular. The main criterion is the economic practicability, expressed through a system of economic indicators. For evaluating the effectiveness of innovative projects, as a rule the method of «Cash flow» is used.

## 2. The basic part

«Cash flow» method is only able to evaluate the economical cost-effectiveness of the innovation project. M.A. Bendikov said: "the main criteria for the effectiveness of the innovative project is the assessment of its technical and economic feasibility in terms of enterprise, identification and

evaluation of its effect on the region, its economy, the environment, etc. " [4] . I.e. effectiveness of the innovation project can't be considered only from the point of view of economic efficiency [5; 6]. Certainly, economic efficiency is decisive in choosing the innovative project, however, in our opinion, *non-economic performance indicators* should also be considered, such as social, environmental, scientific and technical effects, etc., as they affect the competitiveness of the products, companies, industries and countries. Cost-effectiveness is not the same as social and is inherently "blocker" of socially useful innovation [7; 8]. Existing methodologies of innovation project evaluation often based on quantitative assessments and take into account only the economic benefit from its implementation [9].

According to our point of view, it's rational to divide the process of evaluation process of innovation project on two stages [10]:

Estimation of efficiency of an innovative project based on non-economic indicators;

Estimation of efficiency (in particular of the feasibility of an innovative project).

Such a division is dictated by the fact that for innovative projects that are implemented by investors as a State or State funds, particularly important meaning get projects, beneficial in the terms of improving the environment, technology and the image of the state, that's why the evaluation of economic efficiency becomes a secondary task.

At the first stage innovative projects using non-economic indicators are estimated. Since these indicators have mainly a high-grade basis, transfer them into a comparable form, i.e. in dimensionless units. With the help of expert assessments determine the coefficient of importance of each indicator. Besides the expert estimates, is also applicable Fishburne formula for cases where indicators can be ranked only by degree of their importance: "not significant", "significant", etc.:

$$\alpha_i = \frac{(n-i+1)}{n(n+1)} \tag{1}$$

where $\alpha_i$ – index of indicators' importance of $i$ category; $n$ – is the number of categories of innovative projects' performance indicators, $i$ – number of the appropriate category.

Then analyze evaluation of each indicator by the following formulas:

$$s_{ij} = \frac{SF_{ij}}{S\max_{ij}} \tag{2}$$

where $SF_{ij}$ – actual index value *i* for project *j*; $S_{\max ij}$ – maximum possible index value indicator of *i* for project *j*, if needed growth *i* indicator.

$$s_{ij} = \frac{S\min_{ij}}{SF_{ij}} \tag{3}$$

where $SF_{ij}$ – actual index value of indicator $i$ for project $j$; $S\min_{ij}$ – minimum possible index value indicator of *i* for project *j*, if reducing of indicator $i$ meaning is needed.

Thus, synthetic (Final) indicator of project is defined by the formula:

$$S_j = \sum_{i=1}^{n} \alpha_i s_{ij} \tag{4}$$

where $S_j$ – aggregate data of project $j$; $\alpha_i$ – index of importance (weight) of indicators $i$ category; $s_{ij}$ – evaluations of indicator $i$ of project $j$.

The meanings of aggregate data are in the range from 0 to 1. The closer the meaning of aggregate data to 1, the more preferred project, i.e. such a project is the best for improving of the competitiveness of engineering products, as considers the limitations of other physical entities (environmental, social, ergonomic, technical-technological etc.).

In the second stage using methods of cash flow the cost-effectiveness of projects is defined (counting indicators NPV, IRR, PI, DPP). We choose the one among effective from an economic point of view the projects that has the maximum yield.

The method described above should be used to evaluate innovative projects aimed at improving the competitiveness of engineering products. Thus, under competiveness the complex product accordance to a whole range of restrictions of different physics is meant, allowing to get a steady income in the long term, not just the common concept of value approach: engineering products, bringing profit is competitive. I.e. technique aimed at projects where investors and company's management team have set themselves the task not only in generating profits from the project, but also tasks related to the improvement of environmental, social, scientific and technological situation in the enterprise of the region and the country, which will undoubtedly improve the company's competitiveness in the domestic and international markets in the long term and for the long time lag.

## 3. References

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