

ANALYSIS OF COSTS AND BENEFITS AS A METHOD OF ECONOMIC VALUATION AND DECISION-MAKING IN PROJECT MANAGEMENT

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Abstract: The process of analyzing costs and results in order to make a decision whether or not to accept a certain investment project includes: defining the project, determining and quantifying costs and expected results, choosing a discount rate, discounting costs and results, and comparing the present value of costs and results. The basis of the approach is the assessment of investment alternatives based on the consideration of all costs and results and giving priority to investment alternatives that would have no chance of being realized assuming that they are evaluated exclusively through the prism of the purely economic interests of individual economic entities. Determining and quantifying the costs of the considered investment project is a relatively simple procedure. Total costs consist of operating and investment costs. The first are the costs arising from its exploitation, while the second relate to the costs of planning and creating the project, procurement of basic assets, construction of machines, including labor costs. The result of the implementation of the investment project are the economic effects that are realized through its exploitation. However, the realized investment project can bring significant indirect effects both for the investor and for other economic entities (individuals and companies), as well as for society as a whole.

The validity of an investment decision in a cost-benefit analysis largely depends on the discount rate used in the analysis. The amount of the discount rate is influenced by a large number of factors, and there is still no established mathematical procedure for choosing its optimal size, which is understandable due to the fact that its choice is influenced by subjectivism and different preferences of analysts. A large or small discount rate depends on the overestimation or underestimation of the value of the project. The discount rate is equated with the interest rate only in conditions of a perfect capital market, or, when the amount of available capital is unlimited, and therefore the interest rate is unchanged. Due to the fact that the capital market is not perfect even in highly developed countries, it is logical to expect that the interest rate will change with the amount of loans given or received on the capital market.

The financial analysis considers the financial effects of the project, which are valued in the market through the monetary amounts of estimated costs and expected revenues of the company from the point of view of investors. The economic analysis determines the social value of the project. In other words, it gives an answer to the question of how the implementation of the project affects the entire society. Due to this fact, when evaluating and making decisions in capital budgeting, it is necessary to look at the overall effects that will be given by the specific project. A frequently used tool for identifying, measuring and comparing the costs and benefits of an investment project, program or government activity is the cost benefit analysis methodology. Looking at the total costs and benefits of an investment project, this concept goes a step further and quantifies all the consequences of the project - taking into account both tangible and intangible impacts.

Keywords: project, project management, cost-benefit analysis, measuring costs and benefits, criteria of cost benefit analysis.

1. INTRODUCTION

A project is a unique process consisting of a set of coordinated and controlled activities with a beginning and an end, undertaken to achieve a goal according to specific requirements, including time, cost, and resource constraints (Schwalbe, 2021). Every project has its own specific beginning and end. The completion of the project occurs when the objectives of the project are met, or when it becomes clear that the objectives of the project will not be achieved, or when the need for the project no longer exists, so the project is ended.

Project management is a scientifically based, practically confirmed concept. It includes the interdisciplinary application of a number of methods and techniques of planning and control organization. By planning, monitoring and controlling the time, resources and costs of project implementation, the basic goals of project management are achieved, which can be marked as the completion of the project with the planned costs and in the planned course.

Cost benefit analysis is an extremely important method of evaluating the effectiveness of investments in individual investment projects. Cost-benefit analysis is an important component of any project that has strategic importance.

This is for the basic reason that in the implementation of numerous projects, in addition to economic ones, a number of non-economic effects are also realized. That is why it is necessary to apply a cost-benefit analysis when assessing the justification of an investment. The results of the cost-benefit analysis show that the project is justified for implementation, provided that the total benefits are greater than the expected benefits.

Bearing all this in mind, the aim of the paper is to explain the essence of cost-benefit analysis in addition to indicating the basic characteristics of the project category and the concept of project management, especially referring to its basic criteria in evaluating the justification of the implementation of individual projects.

2. PROJECT AND PROJECT MANAGEMENT

A project is something unique, creative, resourceful, time-limited, highly uncertain, different from ordinary, ongoing work. An entrepreneurial and managerial venture also contains all these elements, with the goal clearly focused on *profit*, as a positive financial result of the entire venture, and it should last as long as profit is realized. In other words, an entrepreneurial or investment venture consists of a series of related projects (product development, production, launch, sales, payment, etc.) that continue continuously as long as they achieve their main goal - profit. In this way, an entrepreneurial venture is both a **process** and a **series** of one-time, but functionally connected acts that achieve a common goal in a given time. The following projects are most often considered within the framework of a complete and unique management process: human resources development project; new technology introduction project; new product development project; project to increase exports and competitiveness; quality standard introduction project, rehabilitation and environmental protection project, energy projects, etc.

A project usually involves constraints and risks with regard to cost, planning and execution of requirements. It is characterized by the following features:

- orientation towards the result, concreteness and practicality
- focus on solving relatively complex problems and issues
- an activity with specific goals and expected results
- limitation of time, money, technical means and personnel
- it is planned in advance and evaluated at the end (Pokrajac, 2016).

It should be taken into consideration that projects are not a novelty and an organizational innovation of recent times. Moreover, numerous undertakings, especially construction and architectural (e.g. Egyptian pyramids, Roman viaducts, etc.), from ancient times prove the extraordinary achievements of human creativity, causing our admiration and the inevitable question - how it had all been done in the first place.

Besides the mentioned features of the projects, all projects share another common feature - the transformation of ideas and activities into new creations. The ever-present element of risk and uncertainty tells us that events and activities within a whole (project) can almost never be predicted with absolute certainty. For some very complex and advanced projects, even the possibility of completing the project cannot be predicted.

The purpose of project management is how to foresee as many dangers and problems as possible, and to plan, organize and control activities so that the project is done as successfully as possible despite all the risks. It is important to note that this process begins before any resources are allocated and continues throughout the project.

The goal of project management is that the final result satisfies the project investor or customer, i.e. the client, within a certain (agreed) time frame and within the expected costs. In the development of project management, and especially in the development of methods used in project management, great progress was made precisely in the second half of the twentieth century, and this was actually encouraged by impatient investors who wanted to put their projects (investments) into profitable use as soon as possible.

The field of project management, although it developed from technical disciplines, has become increasingly multidisciplinary over time under the influence of other fields. Thus, for successful work on the entire project, apart from the narrower area of project management, first of all the organizational structure and environment of the project should be taken into account. Also, knowledge in the area of project implementation, standards and legal frameworks, as well as general knowledge in business management and interpersonal relations is extremely important.

Project management or project management is the application of knowledge, skills, tools and techniques in project activities to achieve project goals. Project management is carried out by applying management processes, initiation, planning, execution, supervision and control, and project closure. The person in charge of achieving project goals is called the project manager. The term "project management" is sometimes applied to the organizational and management approach to managing projects and operations, which actually represents "management by projects". Despite the fact that it is about the adoption and application of project management procedures to the management of the organization, the terms are not synonymous, and the approach of this type of organization management goes beyond project management standards.

Key words that describe the content of the project are:

- uniqueness: an undertaking with a unique ("remarkable") goal and project result (product or service).
- timing and limitation: start and end of the project, total duration of the project, project calendar.
- specific and limited resources: human, technical and financial (Pokrajac, 2016).

Moreover, it is necessary to emphasize the procedure of progressive development of the project, which implies that the project is developed in stages and then gradually refined. Progressive elaboration implies continuous improvement and detailing of the plan through a series of repetitions in which the collected information becomes more detailed, and the estimates more precise. Thus, for instance, at the beginning of the project, it is not necessary to define the scope of the project precisely, and then it is described more clearly and in detail, according to the deepening of the understanding of the set goals and expected results.

To all that has been said, we can add one more dimension of the project that Kerzner points to, and it is multifunctionality (Kerzner, 2013). In an organizational sense, this practically means that the project crosses almost all existing functional lines within the existing organization.

When planning larger and more expensive projects, it is necessary to carry out valid preparations and previous analyses. The following analyzes are taken into account:

- technical feasibility analysis: resources and constraints,
- analysis of economic justification: the relationship between benefits and resources,
- analysis of financial profitability: return on invested funds and possibility of financing,
- project risk analysis,
- analysis of strengths, weaknesses, opportunities and risks (Pokrajac, 2016).

When it comes to financial profitability, it is assessed through a financial analysis, the purpose of which is to determine the profitability of the investment, as well as whether all future income will be sufficient to cover future expenses incurred during the implementation of the project. Otherwise, the profitability of the investment is expressed as the ratio of benefit (profit) and invested funds.

The economic justification of the project is determined using an economic analysis that evaluates the investment project's contribution to the economic well-being or quality of life of a region or the country as a whole. So, it is done on behalf of society, not just investors, as is the case in financial analysis. This analysis includes both benefits and social costs (externalities) that are not considered in standard financial analysis.

Since the project can also bring negative external effects (damages or costs), it is necessary to look at and evaluate such effects, which is otherwise very difficult.

Actually, the project may cause certain environmental damage, the effects of which appear in a wider area, which is difficult to define (e.g. air pollution, soil contamination, etc.) or in the long term, so it is difficult to quantify and evaluate them. Besides this, it is particularly difficult to determine the value of things or phenomena that have no market value, such as health and human life, time and free time, noise, a clean natural environment, etc.

3. COST - BENEFIT ANALYSIS IN EVALUATING THE ECONOMIC JUSTIFICATION OF THE PROJECT

The philosophy of cost-benefit analysis is perhaps best reflected by the so-called "Pareto improvement" named after the Italian economist Vilfredo Pareto. The principle of Pareto improvement is based on the assumption that it is not possible to implement any project in society that will not harm anyone. Economists introduced the principle of Pareto improvement for projects analyzed by cost-benefit analysis, and mostly implemented by the government (Brent, 2017). According to this principle, it pays to invest in any project where the benefits to those who enjoy them are greater than the costs to those who endure them. For projects that realize benefits and that compensate the resulting costs, it can be said that they have achieved a complete Pareto improvement. "Pareto's approach is based on individualistic values. Change should always be accepted if it allows some individuals to gain and others not to lose" (Stiglic, 2013, p. 72).

Cost-benefit analysis is a tool for identifying, measuring, and comparing the costs and benefits of an investment project, program, or government activity. This includes quantifying the relevant consequences or impacts in monetary terms. Looking at the total costs and benefits of an investment project, this concept goes a step further and quantifies all the consequences of the project - taking into account both tangible and intangible impacts. Tangible impacts are those that can be effectively observed and measured.

Cost-benefit analysis is a procedure for determining: a) the present value of all revenues and benefits and b) the present value of all investments and costs, as well as losses, that can be expected during the economic life of a private or public project. It is about the benefits and costs (in monetary terms) that a project brings to the company (the project proponent) and the investor, as well as to society as a whole. The condition for this is that, beyond doubt, the income and benefits, i.e. investments, costs and losses, must be reduced to a monetary value, and then

added up, so that they can be compared with each other. This analysis can be done: - only for one project, when the dilemma is deciding whether to accept the offered solution or continue with the existing solution (without any changes for several projects, when there is a possibility of comparing different investment projects (investments) and, on that basis, the choice of the alternative that gives the greatest benefit (for a given cost) or that entails the least cost (for a given benefit). Financially profitable and at the same time acceptable is that project where the income and benefits exceed the investments, costs and losses.

Cost-benefit analysis determines the social value of the project in the final score. This cannot be done on the basis of distorted market prices of a large number of products and services (due to market imperfections) and administratively regulated prices of certain goods, as well as the fact that the external effects of the project (in the form of benefits and damage to society) cannot be monetarily valued. Thus, total costs and total benefits are converted into calculated (socially acceptable) prices, taking into account the social discount rate. The project proponent (investor) is able to independently determine the calculation prices for the costs that may arise as a result of the consumption of production factors of domestic origin. However, the calculation of material costs or depreciation of imported equipment cannot be performed on the basis of the exchange rate formed by the market. In those conditions, realistic presentation of the financial effects (costs and benefits) of the project can be achieved by using calculation (real) prices. This shows the reality of economic analysis.

In order to get to indicators of economic profitability of the project, the analysis is carried out according to the following procedure: a) conversion (translation) of market-formed and administratively regulated prices into calculation prices; b) monetization of non-market impacts of the project; c) inclusion of additional indirect impacts of the project in the economic analysis; d) discounting of estimated costs and benefits and e) calculation of indicators of economic return of the project.

Consequently, conducting a cost-benefit analysis from a public sector perspective is complex. Due to the fact that any changes in policies, programs or projects may have implications for many stakeholders relevant to the government decision maker, it is important that these implications are assessed before the policy or project is approved. Cost-benefit analysis allows decision makers to move away from political decision-making into a formalized framework that effectively identifies good from bad decisions (Sunstein, 2018).

Cost-results analysis implies the determination and quantitative expression of the costs and benefits of investment projects, the basic procedures of its application, as well as the criteria respected by this approach that relate to valuation and decision-making in capital budgeting (Tevfik, 2018). In other words, the essence of this technique is the evaluation of investment options based on the evaluation of all costs and results. Because of this, the priority is given to alternative investments that would have had no chance of being realized if they had been treated exclusively through the prism of the interests of individual economic subjects.

Cost-benefit procedure includes:

- project definition,
- determination and quantification of costs and expected results,
- selection of the discount rate,
- discounting costs and results and
- comparison of the current value of costs and results in order to make a decision on the acceptance or

non-acceptance of a certain investment project (Petrović & Denčić, 2013).

Cost-benefit analysis criteria are:

- present value of net benefits,
- benefit-cost ratio,
- internal rate of return and
- payback period criterion (Petrović & Denčić, 2013).

The present value of the net (pure) benefits of a certain investment project is calculated when the discounted value of the costs is subtracted from the discounted value of the results. The formula for calculating this quantity is $Vns = Rs - Ts$, where Vns denotes the net present value, Rs the present value of the results, and Ts the present value of the costs. The present value of results Rs and the present value of costs Ts are determined by two factors: a) the time interval in which they occur and b) the amount of the discount rate. Mathematically, the present value of results and the present value of costs are calculated using the following formulas: $Rs = Rj/(1+i)^j$ and $Ts = Tj/(1+i)^j$, where i denotes the discount rate.

The discount rate is used to reduce all costs and results to a single moment in time, usually the moment of starting the realization of a given project. It is usually not applied directly (as a divisor or multiplier) when calculating the discount calculation, but discount factors (or present value factors) are first calculated, by means of which future returns are discounted to the present value. The discount factor $1/(1+i)^n$ represents the present value of one monetary unit realized in future years (n) or the value from the financial table.

The procedure for determining the discount rate is adapted to the defined cash flow concept:

- for cash flow after debt servicing, the discount rate represents the cost of own capital
- for cash flow before debt servicing, it expresses the weighted average cost of capital.

Today, there is a whole series of dynamic indicators that are based on the discounting technique and are successfully used to evaluate investment projects. However, what calls into question the accuracy of these indicators, and therefore the validity of the investment decision, is precisely the discount rate. Taking too high or too low a discount rate leads to overestimation or underestimation of the value of the indicator. The choice of a real discount rate represents a significant difficulty considering that this rate depends on numerous factors and there is still no established mathematical procedure for choosing the optimal rate, therefore the choice is burdened by the subjectivism of man, who, making that choice, determines the weight and influence of certain factors, according to personal knowledge and preferences. A simplification of the discount calculation is often done - the interest rate is taken from the capital market, but slightly increased, i.e. adjusted for the risk premium.

The discount rate is usually equated with the interest rate, but this relationship is not simple and only applies in some special cases. Namely, the discount rate is equated with the interest rate only in conditions of a perfect capital market, i.e. when the amount of capital available is unlimited, and therefore the interest rate is unchanged. Given that the capital market is not perfect even in highly developed countries, it is logical to expect that the interest rate will change with the amount of loans given or received, which means that the discount rate cannot be equated with the interest rate.

Some of the factors that influence the formation of the discount rate are:

- available amount of funds - own and borrowed
- interest rate at which a loan can be obtained or given
- the risk of giving or receiving funds
- general state of the company - development and financial policy
- economic policy of the country
- inflation rate
- the state of the international capital market.

Difficulties in determining the discount rate are particularly reflected in cases where the period for which discounting is carried out is very long, and it is necessary to predict the discount rate for a longer period of time, although in practice a constant discount rate is usually taken into account. That is why, in specific cases of investment evaluation, in order to reduce complexity and simplify the calculation, the interest rate is often used or slightly increased. If a loan is obtained for the realization of the project, then the interest rate at which the loan is obtained is used for the calculation. If own funds are used for the realization of the investment project, the interest rate at which the funds could be loaned is used for the calculation.

In Western countries, it is considered that these interest rates should be increased by a certain number of points, usually two are proposed, because when calculating the efficiency of investments in a company, investments made by the community in research or infrastructure, which greatly affect the facility, are not taken into account in which the company invested.

All these ways of overcoming the shortcomings of the discount account, which are reflected in the difficulty of choosing a real discount rate represent an approximation that has a significant impact on the validity of the criteria and the assessment of investments. There is still no optimal solution for this problem, but as a certain improvement, the use of sensitivity analysis of the criteria to different values of the discount rate can be recommended.

It should be noted that in addition to the discounting technique, the compounding technique is also used in practice. It is also based on the discount rate. In fact, discounting and compounding are two sides of the same coin that are mathematically related by the discount rate (i) and the number of years (n).

Bearing all that in mind, we come to the conclusion that discounting is the reduction of future amounts to the present time, and compounding is its inverse procedure, reducing the present value of the amount to the future.

Measuring the influence of individual factors and even the choice of the discount rate value itself is not in the domain of exact calculations. It can be said that the discount rate for companies that are financed exclusively with their own funds is approximately equal to the opportunity cost of investing their own capital, and for companies that borrow, it is equal to the total cost of capital. The application of the discount rate has greatly contributed to the efficient assessment of investments and represents one of the basic management variables for the efficient allocation of investment funds in the national economy, as well as for the allocation of funds to individual parts of the company. The logic of the whole procedure is as follows: after all the costs and all the results have been reduced to their current sizes by the discounting technique, all those projects with a net present value greater than zero are acceptable. Thus, in light of the choice between a number of options, the most acceptable option is the one with the highest net present value.

The coefficient of costs and benefits (k) represents the criterion of Cost-benefit analysis by dividing the present value of the total results (R_j) with the present value of the total costs, assuming the invariance of the discount rate throughout the entire time interval $k=R_j/T_j$. The condition for coefficient k to be an acceptable indicator of investment efficiency is that it is greater than unity. Logically, among several projects, one should choose the one with the highest cost-benefit ratio. This coefficient is a particularly applicable indicator of the efficiency of investments when, in the time interval under review, the limits of the size of financial resources necessary for the realization of a certain project come to the fore. In other words, the coefficient is based on a quite common situation in real life, which is known as the division into initial investment costs and project operating costs that are covered by the results that the project brings. In this sense, the special advantage of the coefficient k comes to the fore when deciding on the most acceptable project within the limits of available funds.

The internal rate of return represents the discount rate at which, in the entire time interval, the value of the result (R_s) is equal to the net present value of the costs T_s . Among a number of activities, one should decide on the project with the highest internal rate. An economically justified project is any project whose internal rate of return is higher than the market interest rate, i.e. the adopted discount rate (i). In the event that the choice is between a number of mutually exclusive projects, the most profitable project is the one with the highest rate of return. In practice, this criterion is not used so often.

The payback period criterion is used when assessing the efficiency of investment projects characterized by intensive economic and technological obsolescence of equipment, products and processes. The payback period is a time interval determined in years, in which the present value of the total costs will be compensated from the present value. The project is justified under the condition that the payback period is shorter than the projected economic life of the project.

4. CONCLUSION

Cost-benefit analysis is an activity that everyone implicitly performs on a daily basis throughout their lives. Whenever they make a decision, people consider the consequences and impacts of their choices by identifying advantages and disadvantages. When deciding between more than one potential alternative, they will choose the option that provides the greatest benefit at a given level of cost, or a given level of benefit at the least cost. A realized investment project can bring effects both to the investor and to other economic entities (individuals and companies) as well as to society as a whole. This is particularly characteristic of investments in infrastructure facilities.

Cost-results analysis is a methodological procedure for choosing the most favorable way to achieve the set goal. Costs and effects are quantified in order to determine the system in which these activities achieve the desired goals. The most favorable alternative is the one that implies minimal costs for the realization of the set level of responsibility, or vice versa, the one that provides the highest effectiveness for a given level of costs.

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