Projects' Financial Feasibility

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Abstract: *The decision to invest in a project is very difficult. Therefore, before developing a project, we need to determine whether the idea of a project is feasible, if the investment of resources in the project is profitable for the promoter and creates added value for its beneficiaries. Also, if there are several scenarios to solve the project problem, you need to decide which one is the most advantageous. Here comes the cost-benefit analysis, a financial management tool used by decision-makers to help substantiate decisions on financing investment projects.*
The paper reviews the methods used in the cost benefit analysis and the case study is used as the research method, the article presenting the financial assessment for an investment project for the construction of a waste incinerator with energy recovery. The article aims to study the financial feasibility of the project through two indicators: net present value and internal rate of return.
Keywords: *project, feasibility, net present value, internal rate of return*

Introduction

An analysis of the feasibility of a project idea can determine whether the investment to be made will be successful or the investment decision can generate loss of money, resources, time, the project proving to be unprofitable. Such an analysis allows for answers to several questions:
• Is the company able to invest in the project?
• Are there favourable conditions and sufficient funds to successfully complete the investment?
• Is the implementation of the project subject to risks? What risk response solutions can be applied to counteract them?
• Once the investment is made, will it prove profitable?

The feasibility study of a project idea is done in several ways:

- *Market feasibility* that allows the market to assess the potential of the market to validate the viability of the project and adopt a fair competitive position; it determines whether the idea of a project is feasible under current market conditions;
- *The technical and organizational feasibility* that determines whether the firm owns or has access to the material, technological and human resources needed to implement the project, the effects the project may have on the environment, analyzes the legislative context in which the project will be carried out, and the political one to identify the factors that could create obstacles to the project;
- *Financial feasibility* to decide on the cost-effectiveness of the project and the possibility of financing it.

1. About Financial Feasibility

Financial feasibility is one of the axes of the feasibility study of a project and is centered on the financial profitability of the project and the possibility of financing it.

The financial feasibility study is designed precisely to avoid irrationality in decision-making, essentially at strategic level, but the same analysis can be applied to tactical and operational decisions.
It consists of providing quantified data that will be used to establish the underlying assumptions and scenarios to respond to a series of questions before developing a project:

- Are resources available for project development?
- If not, can the external capital be mobilized and under what conditions?
- What are the real costs of the project?
- What are the current limits?
- What are the critical levels, the abandonment limits of the project and the residual cost?

When considering the financial feasibility of a project, the following issues need to be considered:

- Determining the investment costs and the way they are achieved over time; determining daily / monthly operating costs;
- Forecasting revenue, based on estimated sales and pricing policy;
- Projection of revenues and costs;
- Analysis of various economic indicators;
- Projection of the working capital requirement;
- Projection of future cash flows;
- Identification of sources of financing (internal, bank credits, suppliers, capital increase, grant funds, etc.);
- Determine when revenue is equal to spending, ie the profit is zero;
- Calculation of the duration of the investment recovery.

2. Using Cost-Benefit Analysis in Analyzing the Financial Feasibility of a Project

Cost-benefit analysis is a decision-making method that evaluates the benefits of a project, as well as the possible (positive or negative) consequences of decisions made on it. It can be applied to all types of decisions, regardless of their importance.

The method allows you to measure the opportunity of a project, as well as its financial repercussions. It is a financial management tool that can be used before deciding to invest, for risk assessment, for example, or after the decision, to evaluate the results obtained and to verify whether the previously set objectives have been achieved.

It assumes [3]:

- Identifying, specifying and evaluating costs, including purchase, construction, maintenance, repair and operation costs (energy consumption, rent) related to a proposal for its intended lifecycle;
- Identifying, specifying and evaluating the benefits of the proposal over its foreseen life.

In the cost-benefit analysis, several evaluation methods can be used:

- Method of recovery period;
- Net updated value method;
- The internal rate of return method.

All three of these methods financially assess a project based on its cash flow.

a) *The recovery period method* is a simplistic method that calculates the length of time that runs until recovery of the initial investment in the project, based on the expected cash flows. When applying the recovery method, the following considerations must be considered:

- Cash flows must be calculated after deduction of taxes (the method involves recovering the investment from the net revenue of the project)
- Excluding depreciation costs from operating costs (capital expenditure included in the beginning)
- Funding costs - actual or theoretical - of the recovery period should be included in the cash flow in operating costs.

The recovery period is calculated either as the ratio of the initial investment cost to the average annual cash flow (updated recovery period), or by altering the annual project flow values - outflows and input flows - until the total gets positive (the real recovery time).
The method can not be considered as a baseline in the evaluation of a project, but can be used when calculating the net present value and the internal rate of return of two investment projects at equal amounts, with the lower recovery period being chosen.

b) *Net present value method*
The net present value is the amount obtained by updating the cash flow relative to the year in which the project takes place, taking into account the time evolution of the value of the money.[1]

$$NPV = -I + \sum_{i=0}^{n} \frac{FN_i}{(1+a)^i} + \frac{V_r}{(1+a)^{n+1}}$$

where:
I – initial investment
n - updating period (number of years the project goes on)
FN_i – the cash flow at the moment i
a - discount rate
Vr - the residual value of the project

The value of money depreciates over time, mainly due to inflation. The present net factor depends on how the discount rate is calculated. The discount rate can be dictated by: inflation rate, interest rate, investment risk rate.

If NPV> o, the investment is considered profitable and the investment decision is made in the project, if NPV = 0, the investment is rejected for caution, if NPV <0, the investment is unacceptable.

c) *Internal rate of return method*
In applying this approach, it is assumed that the updated net cash flows in the future will be able to cover the initial investment and calculate the internal rate of return. The internal rate of return is obtained by successive approximations or is calculated using a calculation program.

Internal rate of return is the value of the discount rate for which the NPV value is equal to 0.

If the IRR is lower than the discount rate, then the investment project is no longer effective because the total of updated investment spends become higher than the discounted cash flows and the NPV will have a negative value (NPV <0).

For IRR higher than the discount rate, the investment project is effective and the NPV is positive (NPV> 0).

If the evaluation is made for several alternatives based on the IRR, the project for which the IRR is higher will be chosen.

3. Calculation of Net Current Value and Internal Rate of Return Using Statistical Functions

The NPV and IRR statistical functions in the Excel spreadsheet program can be used to calculate net present value and internal rate of return.

For example, we consider the following case: An organization wishes to make a project with an initial investment of $ 200,000, and there are two proposals to choose from. Proposal A requires an investment of $ 200,000 and has a net cash flow of $ 60,000 for each of the first five years. Proposal B also requires an investment of $ 200,000, but has a negative cash flow in Year 1, after which the cash flow becomes positive. Cash flows for the years 1-5 are shown in Table 1.1.

Table no. 1 Cash flows for the two solutions

Year	Proposal A ($)	Proposal B ($)
0	(200000)	(200000)
1	60000	-10000
2	60000	70000
3	60000	80000
4	60000	70000
5	60000	60000

The NPV statistical function is used to calculate the net present value. An discount rate of 10% is considered.

	A	B	C
1	Discount rate	0,1	
2		**Proposal A ($)**	**Proposal B ($)**
3	Time 0	-200000	-200000
4	Year 1	60000	-10000
5	Year 2	60000	70000
6	Year 3	60000	80000
7	Year 4	60000	70000
8	Year 5	60000	60000
9	Net present value	=NPV(B1;B4:B8)+B3	=NPV(B1;C4:C8)+C:

	A	B	C
1	Discount rate	10%	
2		**Proposal A ($)**	**Proposal B ($**
3	Time 0	-200000	-200000
4	Year 1	60000	-10000
5	Year 2	60000	70000
6	Year 3	60000	80000
7	Year 4	60000	70000
8	Year 5	60000	60000
9	Net present value	27447,21	-6068,2

Figure no. 1. Calculation of net present value with NPV statistical function

For the calculation of the internal rate of return, the IRR statistical function is used:

	A	B	C
1		**Proposal A ($)**	**Proposal B ($)**
2	Time 0	-200000	-200000
3	Year 1	60000	-10000
4	Year 2	60000	70000
5	Year 3	60000	80000
6	Year 4	60000	70000
7	Year 5	60000	60000
8	Internal rate of return	=IRR(B2:B7)	=IRR(C2:C7)

	A	B	C
1		**Proposal A ($)**	**Proposal B ($)**
2	Time 0	-200000	-200000
3	Year 1	60000	-10000
4	Year 2	60000	70000
5	Year 3	60000	80000
6	Year 4	60000	70000
7	Year 5	60000	60000
8	Internal rate of return	15,24%	9,02%

Figure no. 2. Calculation of internal rate of return with IRR statistical function

The analysis by the two methods demonstrates that the first project proposal is financially feasible. At the first proposal, the net present value is positive, indicating that the investment is recovered at the end of the 5 year period, and profitability is obtained, and the second net present value is negative, demonstrating that the investment is not recovering over the horizon life of 5 years of the project.

The same conclusion can be reached by calculating the internal rate of return, in the case of the first alternative rate of return is higher than the second rate, and is higher than the discount rate.

4. Financial Evaluation for a Project to Achieve an Energy Recovery Incinerator

The financial analysis of an investment project highlights whether it will generate a positive net cash flow over the reference period (sustainability verification), as well as the project's level of effectiveness through: the financial net present value (FNPV) and the financial internal rate of return (FIRR) [5] [6].

Making the financial assessment for the investment of the waste incinerator, with energy recovery, the data from table no. 2 present the financial and economic revenues as well as the project costs over a 12-year horizon.

The total value of the investment is 56,000 thousand Euros, of which 80% are eligible costs. The residual value of the investment is 20,000 thousand Euros, and the lifetime of the project is 12 years. The project's financial revenues are derived from waste treatment, energy sales for heating and the sale of electricity for electricity. Economic revenue is generated by reducing the emission of harmful gases and reducing odours, dust. The financial analysis of the project is presented in Table no. 3. Chart no. 3 presents the net and discounted cash flow for the analyzed project. A discount rate of 5% is considered.

Table no. 2. Revenue (financial and economic) and project costs over a 12-year horizon

	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13
Revenues from waste treatment	3000	3000	3000	3000	3000	3000	3000	3020	3020	3020	3020	3020
Revenues from energy sales for heating	2700	2700	2700	2750	2750	2750	2750	2760	2760	2760	2760	2760
Revenues from energy sales for electricity	2200	2200	2200	2250	2250	2250	2250	2270	2270	2270	2270	2270
Total financial revenue	7900	7900	7900	8000	8000	8000	8000	8050	8050	8050	8050	28050
Externalities (reduction of harmful gas emissions)	2700	2700	2700	2700	2700	2700	2700	2700	2700	2700	2700	2700
Externalities (reduction of odors, dust)	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Total economic revenue	3700	3700	3700	3700	3700	3700	3700	3700	3700	3700	3700	3700
Operating costs	2800	2800	2800	2800	2810	2810	2810	2810	2810	2810	2810	2810

Table no. 3. Calculation of the financial net present value and the financial internal rate of return

Discount rate	5%												
Year	1	2	3	4	5	6	7	8	9	10	11	12	13
Net present factor	1	0,952381	0,907029	0,863838	0,822702	0,783526	0,746215	0,710681	0,676839	0,644609	0,613913	0,584679	0,556837
Total revenues		7900	7900	7900	8000	8000	8000	8000	8050	8050	8050	8050	28050
Total costs	56000	2800	2800	2800	2800	2810	2810	2810	2810	2810	2810	2810	2810
Net cash flow	-56000	5100	5100	5100	5200	5190	5190	5190	5240	5240	5240	5240	25240
Discounted cash flow	-56000,00	4857,14	4625,85	4405,57	4278,05	4066,50	3872,86	3688,44	3546,64	3377,75	3216,91	3063,72	14054,58
FNPV	1054,00												
FIRR	5,28%												

Updated revenue		7524	7166	6824	6582	6268	5970	5685	5449	5189	4942	4707	15619
Updated costs	56000	2667	2540	2419	2304	2202	2097	1997	1902	1811	1725	1643	1565

Total revenue - benefits (B)	81924,28
Total costs(C)	80870,28
B/C (financial)	1,013

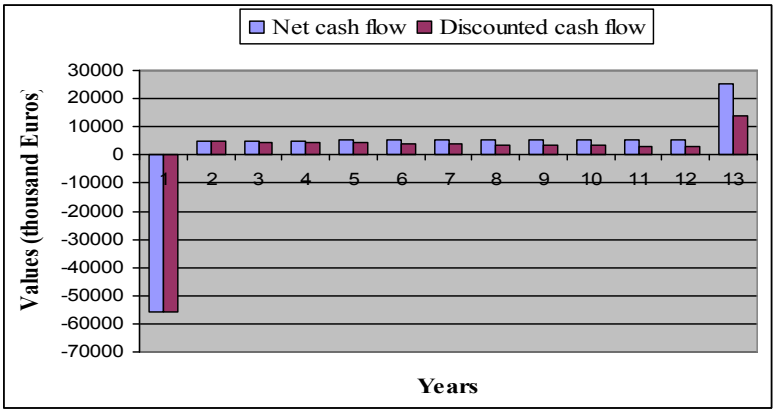

Figure no. 3. The net cash flow and the one discounted in the financial analysis of the project

The net present value (1054 thousand Euros) is higher than 0 and the internal rate of return (5.28%) is higher than the discount rate, so the project is efficient.

Public investment projects do not aim to maximize profits, such as the private sector, but maximize social welfare [2]. In this case, we use the economic analysis that will highlight the contribution of the project to the creation of added value for the citizens.

With the cost of investing more than 50 million Euros, the project is considered to be a major public project [4]. The economic analysis, which is mandatory in this case, follows the calculation of the economic performance indicators: the net present value (ENPV), the internal rate of return and the (EIRR), cost-benefit ratio (B/C). Table no. 4 presents the economic analysis for the project. Chart no. 4 compares the net and discounted cash flow for the project analyzed in terms of economic performance. An discount rate of 5.5% is considered.

Table no. 3. Calculating the economic net present value and the economic internal rate of return

Discount rate	5,50%												
Year	1	2	3	4	5	6	7	8	9	10	11	12	13
Net present factor	1	0,947867	0,898452	0,851614	0,807217	0,765134	0,725246	0,687437	0,651599	0,617629	0,588218	0,554911	0,525982
Total revenues		11600	11600	11600	11700	11700	11700	11700	11750	11750	11750	11750	31750
Total costs	56000	2800	2800	2800	2800	2800	2800	2800	2800	2800	2800	2800	2800
Net cash flow	-56000	8800	8800	8800	8900	8900	8900	8900	8950	8950	8950	8950	28950
Discounted cash flow	-56000	8341	7906	7494	7184	6810	6455	6118	5832	5528	5265	4966	15227
ENPV	31126,37												
EIRR	13,40%												
Updated revenues		10995	10422	9879	9444	8952	8485	8043	7656	7257	6912	6520	16700
Updated costs	56000	2654	2516	2385	2260	2142	2031	1925	1824	1729	1647	1554	1473

Total revenues – benefits (B)	111266,03
Total costs (C)	80139,66
B/C (economic)	1,39

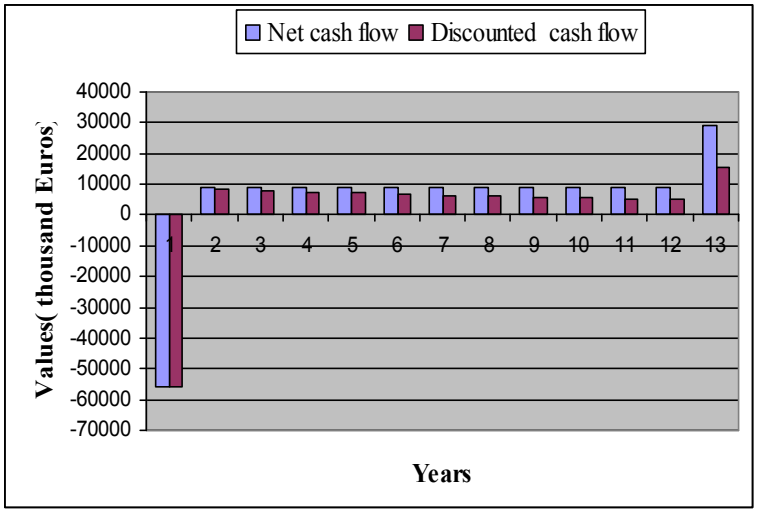

Figure no. 4. The net cash flow and the one discounted in the economic analysis of the project

As the net present value (31126,37 thousand Euros) is higher than 0 and the internal rate of return is higher than the discount rate (13,4%), the project contributes to the creation of surplus value for the population, contributing to the improvement of citizens' well-being. The investment is also feasible in terms of the updated total revenue / updated total cost ratio, this indicator being over-total.

Conclusions

The feasibility analysis of a project pursues several objectives:
• Measuring the objectives to be achieved,
• Evaluating the conditions for the success of the project (timing, resources, competence, funding, etc.)
• Studying the various possible scenarios,
• Project implementation planning.

It is carried out on several levels: commercial feasibility, technological and organizational feasibility, financial feasibility, economic feasibility.
The financial feasibility analysis is carried out before making the decision to invest in a project. It accompanies the technical and economic studies and must take into account the regulations, the legal and fiscal environment of the project. It supposes:
• Estimated cost of the project;
• Identification of project financial risks;
• Elaboration of a financing plan;
• Analyzing the financial balance;
• Evaluating the project's profitability;
• Identification of sources of funding (internal and / or external).

The financial feasibility analysis makes it possible to identify the financial determinants of the success of a project, its economic balance, and the establishment of the financial framework for its operational implementation.

Financial feasibility provides information on the financial benefits the project can generate for the promoter. It allows, if the project can not self-finance, knowing the threshold from which external sources can be used to carry out the project.

Unlike financial feasibility, economic feasibility allows to determine the added value the project can create for the target group (population). It provides information on the contribution of the project to improving well-being.

By calculating the net present value and the internal rate of return, one can determine whether a project is financially feasible. However, in order to get a complete picture of the financial feasibility of the projects, the analysis can also be complemented by other indicators, such as the recovery of the investment and the profitability index.

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