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Review

Cost-Benefit Analysis in the Function of Controlling Sustainable Investments

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Abstract: In the contemporary business environment, effective investment management becomes a crucial factor for competitiveness and sustainability. This paper explores the role of cost-benefit analysis (CBA) within the framework of controlling sustainable investments, with the aim of identifying ways and extents to improve decision-making processes and contribute to sustainable development. Cost-benefit analysis serves as a quantitative tool that enables the evaluation of economic benefits and costs of investment projects, providing a clear picture of their efficiency and profitability. Within the realm of controlling, investment controlling utilizes CBA for precise monitoring and management of resources, facilitating investment optimization and risk minimization. The paper focuses on the methodology of sustainable CBA statements and their application in the control of sustainable investments. CBA not only allows for a quantitative evaluation of the financial aspects of projects but also integrates sustainability criteria, such as environmental and social impacts, thereby contributing to a holistic approach to decision-making. The research findings indicate that integrating cost-benefit analysis into the function of controlling sustainable investments enhances resource management and the achievement of sustainable goals. The paper concludes that the successful integration of CBA into investment controlling is essential for competitive investment management and long-term sustainability.

Keywords: Cost-benefit analysis (CBA); controlling; sustainable investments.

1. Introduction

In today's dynamic business environment, where resources are limited and competition is intensifying, effective investment management becomes crucial for the long-term success and sustainability of organizations. Investments, whether in new projects, capacity expansion, or modernization of existing operations, constitute a significant part of a company's growth and development strategy. Modern business is more focused on investing in knowledge and intangible rather than in tangible assets [1]. However, investment decisions are often associated with high levels of uncertainty and risk, necessitating precise and comprehensive analysis.

Cost-benefit analysis (CBA) is one of the most important tools for investment analysis, allowing the evaluation of a project's economic viability through the comparison of expected benefits and costs. This method provides clear quantitative data that aid in making informed decisions, thereby reducing risk and maximizing return on investment. Within the realm of controlling, CBA plays a crucial role in optimizing resources and enhancing the efficiency of investment decisions.

Sustainable investments, which focus on long-term environmental, social, and economic benefits, are increasingly becoming a priority for organizations aiming for sustainable development. In this context, integrating cost-benefit analysis into the controlling function enables not only the assessment of financial viability but also the evaluation of sustainability impacts. Controlling these investments involves monitoring and evaluating project performance, identifying potential issues, and adjusting strategies to ensure the achievement of sustainability goals.

The objective of this paper is to explore the role of cost-benefit analysis within the framework of controlling sustainable investments, analyzing how this method contributes to optimizing investment decisions and achieving sustainability objectives. The paper will cover the theoretical framework of controlling, as well as a review of methodologies and the scope of applying cost-benefit analysis in the context of sustainable investment approaches.

2. Framework and setting of investment controlling

Controlling is focused on the synergistic effect of creating comprehensive, relevant, and reliable information (both quantitative and qualitative), encompassing non-financial and financial data for business decision-making. This information is selected according to the requirements of the management level based on the criteria of competence and decision-making authority [2]. More specifically, controlling is understood as a distinct, holistically guided function and management subsystem, grounded in the scientific method of business analysis; it is aimed at the synergistic and effective integration and unification of all management functions and multidisciplinary knowledge to optimize the process of transforming numerous heterogeneous data from all legal and legitimate sources; additionally, it involves connecting and transferring these data into a format practical for use, with the objective of providing competent and collaborative support to management in leading and directing a vital, adaptable, and development-capable enterprise [3]. In this way, controlling plays a crucial role in successful investment management within a holistic context, providing competent and collaborative support to management in leading, monitoring performance, and overseeing investment management to ensure sustainability and benefits for investors and interested parties. One of the goals of controlling is to influence the short and long-term optimization of returns and profitability of the company, in order to maintain its reputation [4]. Research indicates a significant potential for further development of controlling practices in European companies, which should result in a healthier society and environment [5].

Thus, the effective application of investment controlling helps organizations optimize investment decisions, reduce risks, and increase long-term value, and the development of advanced methods and tools in the field of controlling will be crucial for further progress in investment management.

By analyzing the practice, the following key areas of investment control activities can be highlighted:

- Risk Management Support: This involves identifying, analyzing, and controlling risks that may affect the success of investment projects, including non-investment risks such as operational, market, reputational, and regulatory risks.
- Capital Cost and Revenue Management Support: This is critical for the success of investment projects as it focuses on monitoring and analyzing all financial aspects of the project to ensure that resources are used efficiently and that the project delivers the expected financial results.
- Reporting: This is a key function of investment controlling that includes collecting, analyzing, and presenting information about project progress and results, including both internal stakeholders — management and project teams — and external interested parties.
- Performance Monitoring: This involves tracking the progress of investment projects and evaluating whether objectives are met. This process includes defining key performance indicators (KPIs) to be monitored throughout the project, continuously tracking these KPIs to assess project progress, and analyzing performance.
- Compliance with Relevant Laws, Regulations, and Standards: Compliance is crucial for the success of investment projects. Investment controlling encompasses continuous monitoring of regulatory changes, development and implementation of internal policies and procedures to ensure compliance, and regular internal audits to ensure adherence to policies and regulations.

The development of analytical methods and tools in the context of sustainable investing is crucial for enhancing investment control. Controlling must expand its scope, change indicators, and introduce advanced instruments, to direct business activities to the well-balanced interests of all the company's stakeholders [6]. An integrated approach to starting the control system should be applied, which implies and takes into account financial and economic aspects [1]. Improving the analytical platform focused on sustainability contributes to the success of controlling by enhancing forecasting accuracy, improving risk management, increasing transparency, and advancing performance, which is essential for achieving business vitality through positive impacts on society and the environment, in addition to economic benefits.

3. The concept of benefit/cost analysis as a foundation for controlling sustainable investments

3.1. Assumptions of benefit/cost analysis

Benefit/cost analysis (CBA) is an economic evaluation process that involves comparing the total costs of a project with its total benefits to determine whether the benefits outweigh the costs. If benefits exceed costs, the project or decision is deemed advantageous. CBA is essential as it provides decision-makers with a method to compare the costs and benefits of various options, facilitating informed decision-making. It is utilized across various fields to inform decision-making processes, including public policy, business, healthcare, and environmental programs.

Given that benefit/cost analysis is a form of economic evaluation that derives from financial assessments of investment viability, certain adjustments are necessary. Extending CBA analysis to include intangible (non-market) effects, even those spanning very long periods, such as long-term environmental impacts, demands a reassessment of the classical arguments on discounting [7]. These adjustments fundamentally shape the assumptions of the CBA methodology for a rigorous evaluation of investment utility:

- Economic Discount Rate: The discount rate used to convert future cash flows to their present value. This rate reflects the time value of money and the opportunity cost of capital.

- Fiscal Adjustments: Adjustments to project costs and benefits to account for fiscal effects such as taxes, subsidies, tariffs, and other government policies that impact actual costs and benefits.
- Market Price Adjustments: Adjusting market prices of resources based on generally accepted economic values or international standards, often using conversion factors or coefficients to translate market prices into economic prices. Shadow prices indicate the intrinsic or true value of a factor or product in the sense of equilibrium prices [8].
- Externality Accounting: This involves assessing the effects that a project or intervention has on third parties or society at large, which are not included in the direct costs and benefits considered in the analysis. These impacts can be either positive or negative and often include indirect benefits and costs that are not reflected in market prices.

In this context, externalities represent impacts that are not directly included in the basic costs and benefits of the project but have significant effects on the broader community. Estimating these externalities can be challenging, particularly when considering ecological footprints whose effects extend over larger geographical areas or longer periods, making their quantification and valuation difficult.

Assigning financial values to external impacts presents a complex task, especially for aspects without market prices, such as human life, time, leisure, recreation, noise levels, silence, and aesthetic values of nature. Although it may seem difficult or even impossible to precisely determine the value of these elements, various methods and techniques can be applied to gain useful insights into their values.

Examples of Measures for Including External Impacts in the Calculation, by Area:

1. *Environmental Externalities:*
    - Positive: Improvement in air quality, preservation of biodiversity, reduction of noise pollution.
    - Negative: Air and water pollution, destruction of natural habitats, increase in noise pollution.
2. *Health Externalities:*
    - Positive: Enhancement of public health through reduced pollution, and increased physical activity due to new recreational spaces.
    - Negative: Health risks associated with emissions from industry or transportation, increased disease rates due to pollution.
3. *Social and Community Externalities:*
    - Positive: Creation of new jobs, improvement in social cohesion, enhancement of quality of life.
    - Negative: Increased social inequalities, changes in community social structure, gentrification.
4. *Economic Externalities:*
    - Positive: Boost in economic activity, attraction of investments, increase in local revenue.
    - Negative: Increased costs due to pollution, and decreased property values due to negative project impacts.

Quantifying external impacts involves converting these impacts into calculable values to compare them with the project's costs and benefits. By employing various methods to identify and quantify these impacts, analysts can provide a comprehensive analysis that aids in informed decision-making about the project's viability. In the absence of objective assessments, analysts often

attempt to convert subjective estimates of benefits into calculable values that can be compared with project costs, frequently utilizing different "willingness-to-pay" methods. This approach is based on determining the maximum amount individuals or groups are willing to pay for a given benefit or to avoid a specific cost, typically measured through surveys or market transactions.

Incorporating quantified external impacts into the overall benefit/cost analysis aims to provide a comprehensive view of the project's viability.

- Calculation of Opportunity Costs: Represents the value of the best alternative benefits missed when making a certain decision or reimbursement choice with adoption and necessary associated financing actions under a constrained budget [9].

3.2. The benefit-cost ratio as the basis for a sustainable analytical concept

The Benefit-Cost Ratio (BCR) is an indicator that represents the relationship between the present value of the total benefits and the present value of the total costs of a project. Consequently, the higher the coefficient indicating the ratio, the more attractive the project becomes, facilitating a straightforward comparison of the project's benefits and costs by quantifying economic benefits relative to costs. The BCR is expressed by the following formula [10]:

$$BCR = \left|\text{Present Value [Benefit]}\right| / \left|\text{Present Value [Costs]}\right|$$

The cash flows used to calculate the BCR of traditional economic benefits and costs are derived from financial forecasts. However, with the affirmation of the ESG concept, benefits do not directly come in the form of monetary values, so in the process of presenting a sustainable BCR, it is necessary to convert these into accounting monetary values.

The process of presenting BCR involves evaluating cash flows separately for benefits and costs. Benefits include but are not limited to, revenues, sales, savings, increased asset value, competitiveness, and potential residual value at the end of the projection horizon, among others. Benefits may also encompass social and environmental aspects, such as improved health and productivity, reduced or avoided carbon dioxide emissions, and other ecological benefits, allowing a holistic view of the investment's impact on sustainability. This implies the monetization of social and environmental benefits, utilizing various methods to assign monetary values to intangible benefits.

Costs include but are not limited to, initial investments, costs for creating products or results, administrative expenses, disposal costs, and potential residual costs at the end of the projection horizon. Costs may also encompass negative effects on public health, risks related to increasing costs for resources or disposal, or impacts on nearby farms, fisheries, or tourist locations.

Different methods are used to include costs, and the concept of Total Cost Assessment (TCA) [11] allows for a comprehensive and accurate evaluation of all relevant costs and benefits associated with a particular project, policy, or program. Within this framework, the following types of costs and benefits are covered:

- Direct Costs and Benefits: Includes all costs and benefits directly associated with the project, such as initial investments, operational costs, revenues, savings, and other immediate financial transactions.
- Indirect Costs and Benefits: Encompasses costs and benefits that are not directly linked to the project but impact the overall evaluation. For example, increased employee productivity, reduced maintenance costs, or improved company image.

- Contingent Costs**:** Includes potential costs that may arise in the future, such as fines, penalties, or costs for remediation or rehabilitation.
- Internal Intangible Costs: Covers costs not directly reflected in financial statements but affecting the enterprise, such as loss of reputation, employee morale, or reduced competitiveness.
- External Intangible Costs: Refers to costs borne by society as a whole, not just the enterprise implementing the project. Examples include ecological damage, health impacts on the community, or effects on the local economy.

Acceptability Criteria:

- BCR > 1**:** If BCR is greater than 1, it means that the present value of benefits exceeds the present value of costs. The project is considered economically justified and should be accepted.
- BCR = 1**:** If BCR equals 1, it indicates that the benefits and costs of the project are equal. The project is at the threshold of economic justification and may be accepted or rejected depending on other factors.
- BCR < 1**:** If BCR is less than 1, it means that the present value of benefits is less than the present value of costs. The project is not economically justified and should be rejected.

The BCR has limitations, particularly regarding assumptions about the discount rate, and forecasts of the size and distribution of cash flows for benefits and costs. In theory and practice, various types of Cost-Benefit Analysis (CBA) have been developed depending on the specific context and objectives of the analysis. Common is the commercial Cost-Benefit Analysis, which assesses investment projects or decisions in terms of their market value, using market prices to assign monetary values to costs and benefits. Meanwhile, Cost-Effectiveness Analysis (CEA), Cost-Utility Analysis (CUA), Cost-Minimization Analysis (CMA), and Cost-Consequence Analysis (CCA) are most frequently used in healthcare, which involve a choice ideally based on a comparison of the health benefits, harms, and costs associated with each alternative [12]. Distributional Cost-Benefit Analysis evaluates a particular project, policy, or program according to its distribution among different social groups. Sustainability Cost-Benefit Analysis is a method used to assess the efficiency of projects and policies aimed at achieving sustainable development.

4. Framework and scope of sustainability cost-benefit analysis

Sustainability Cost-Benefit Analysis (SCBA) involves the identification, quantification, and monetization of all relevant costs and benefits associated with a specific project or policy, encompassing economic, ecological, and social aspects. Costs and benefits can be classified into the following categories:

- Economic Costs and Benefits: Capital costs, operational costs, cost savings, increased revenues.
- Ecological Costs and Benefits: Reduction of emissions, conservation of natural resources, and improvement in air and water quality.
- Social Costs and Benefits: Enhancement of health and safety, social justice, and quality of life.

All costs and benefits must be expressed in monetary units, which involves applying market prices as well as "shadow prices" and evaluating benefits in terms of avoided costs, such as healthcare costs due to reduced pollution.

Accordingly, the following formula can be derived for the cost-benefit ratio of sustainability:

Sustainability Cost-Benefit Ratio = │Present Value [Benefits]│ / │Present Value [Costs]│

In practice, the Return on Sustainability Investment (ROSI) indicator is often used to measure and evaluate the value proposition of specific criteria related to environmental protection, social responsibility, and corporate governance (i.e., ESG) employed in socially responsible investing [13].

The formula for ROSI is [14]:

$$ROSI = (Benefits - Costs)/ Costs$$

A positive ROSI percentage indicates beneficial sustainability effects, as the benefits generated by the investment exceed the incurred costs. The ROSI methodology guides managers to better appreciate the financial benefits of sustainability, and the monetization of sustainability can lead to competitive advantage and shared value for multiple stakeholders [15].

Practical applications of Sustainability Cost-Benefit Analysis show a significant contribution to enhancing a company's ESG activities. Strong ESG proposition can create value—and a framework for understanding the five key facilitating top-line, growth, reducing costs, minimizing regulatory and legal interventions, increasing employee productivity, and optimizing investment and capital expenditures[16]. Investors are willing, on average, to pay 20 basis points more per annum for an investment in a fund with an ESG mandate as compared to an otherwise identical mutual fund without an ESG mandate, suggesting that investors as a group expect commensurately higher pre-fee, gross returns, either financial or non-financial, from an ESG mandate [17]. Specifically, more than half of the companies, precisely 59%, that report positive impacts from operational ESG investments have observed a positive effect of sustainability improvements on overall company profitability [18].

Table 1. Overview of Sustainability ROSI Effects.

Company	Initiative Description	Financial Benefit	Year
HP	Sales where sustainability criteria were known and supported by HP's Sustainability and Compliance organization.	$3.5 billion in commercial sales	2021
Unilever	Efficiency improvements in sustainable sourcing helped Unilever achieve operational cost savings.	€1.2 billion in operational savings	From 2008
McKesson	Operating cost savings from manufacturing efficiency improvements that reduced product defects and waste.	$227 million in operational savings	2020
Nike	Improvement in profit margins by replacing certain shoe components with more sustainable materials and enhancing supply chain sustainability practices.	$50 million improvement in profit margins	2020
Anheuser-Busch InBev	Improvement in annual operating income by collaborating with barley growers to accelerate the adoption of sustainable farming practices.	$7,5 million improvement in annual operating income	2023
Medtronic	Cost savings from 80+ energy efficiency projects that reduced energy usage and GHG emissions.	$7,5 million in operational savings	2021

Regarding environmental ESG activities, they relate to reducing greenhouse gas emissions, carbon accounting, waste reduction and circularity, and managing climate risk, all of which contribute to improving the Return on Sustainability Investment (ROSI).

Social ESG activities and initiatives include human rights, labor standards, workplace health and safety, employee diversity, equity, inclusion, and belonging, as well as social and community impacts, all of which contribute to improving the Return on Sustainability Investment (ROSI). For example [10]:

- 3-6% higher annual returns are achieved by public companies excelling in social impact initiatives, as reported by a study from Bank of America Merrill Lynch.
- 28% higher revenue, increased net income, and 30% greater profit margins are realized by firms leading in diversity hiring, employment, and inclusion, according to an Accenture study surveying 140 American companies.
- 71% of employees under the age of 34 prefer to work for companies that align with their values and contribute positively to society.
- Up to 50% improvement in employee retention can result from effective and transparent ESG and CSR programs, as indicated by data and internal studies from Starbucks, Campbell, Babson College, and Glassdoor.

Governance ESG activities and material considerations include company ownership structure, decision-making, corporate policies and oversight structures, leadership diversity, privacy and data security, investor relations, and corporate transparency, all of which also contribute to improving the Return on Sustainability Investment (ROSI). For example [10]:

- 85% of institutional investors incorporate ESG factors into their investment decisions.
- 61% of investors view strong ESG and CSR performance as indicative of "ethical corporate behavior that reduces investment risk" and as an "indicator of a corporate culture less likely to produce costly errors such as financial fraud."
- 19% higher revenues from innovation are generated by diverse management teams compared to those with less diversity.
- $4.2 million is the average cost associated with a corporate data breach or consumer privacy violation.
- $50 trillion+ in global ESG assets and investments are projected to be surpassed by 2025.

Each organization navigates its own unique ESG trajectory, with ESG representing a genuinely long-term strategic journey for boards and management teams. Despite this variability, the benefits of strong ESG performance—such as improvements in brand reputation, talent recruitment, organizational culture, operational efficiency, risk management, and capital access—are substantial and frequently measurable.

5. Conclusions

In the contemporary business environment, effective investment management represents a crucial component for achieving long-term success and organizational sustainability. Cost-benefit analysis (CBA) has proven to be an exceptionally valuable tool in this process, enabling precise assessment of investment economic viability through quantitative comparison of benefits and costs. Within the context of controlling, CBA not only provides a foundation for making informed

decisions but also facilitates continuous monitoring and optimization of resources, contributing to the achievement of sustainability goals.

The analysis of various aspects of cost-benefit analysis and its application in the context of sustainable investment controlling has demonstrated that this method significantly enhances organizations' ability to identify and evaluate key success factors. CBA enables not only quantitative evaluation of financial aspects of projects but also the integration of sustainability criteria, such as environmental and social impacts, which contributes to a holistic approach to decision-making.

The research has also highlighted certain challenges in applying CBA, including the complexity of assessing long-term benefits and difficulties in quantifying non-financial aspects of sustainability. However, these obstacles can be overcome through improvements in methodological approaches, the development of more sophisticated tools and techniques, as well as increased transparency and involvement of all relevant stakeholders in the evaluation process.

Based on the research findings, it can be concluded that the integration of cost-benefit analysis into the function of sustainable investment controlling is crucial for efficient resource management and achieving sustainability goals. Further research is recommended to enhance CBA methodology and develop new approaches that will enable better alignment of economic, environmental, and social aspects of investments. This paper provides a foundation for further research and development of strategies that will enable organizations to better leverage the potential of cost-benefit analysis in the context of sustainable investments, contributing to value creation and long-term success.

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