

Sustainable Project Management: an index to project efficiency with social investment

Camila de Araujo¹[0000-0002-2657-0664], Lie Yamanaka²[0000-0001-8059-415X], and Vanda Maria Luchesi¹[0000-0003-0148-0299]

¹ Federal University of Uberlândia

² Federal University of Goiás

Abstract. This paper aims to propose an index of project efficiency linked to project profit and social investment in order to promote the sustainable development of organizations and society. In this sense, we aim to establish a sustainable relationship between project management and social sustainability, which plays a crucial role in the implementation of future organizational change. To develop the proposal – Index of Project Efficiency with Social Sustainability, we use the Design Science Research method, with 5 stages (problem identification and motivation, objectives of a solution, design and development, demonstration and evaluation). To demonstrate and evaluate the proposal, a case study was conducted in which the efficiency of a project without social investment was compared to the efficiency with social investment. With the new index, this study showed that it is possible to achieve financial efficiency with social gains by calculating the efficiency index of the project with social investment. In summary, this study presents two important contributions: a new concept of "sustainability FROM the project" that relates an investment in sustainability measures to the financial gains from the project, and a way to focus on the social aspect of the triple bottom line based on corporate social responsibility.

Keywords: Project Sustainability, Social Responsibility, Project earning, Efficiency index.

1 Introduction

Investing in sustainability is critical for businesses in light of Agenda 2030. Consequently, balancing a company's spending and profits while investing in sustainability can be challenging [1], as a smaller percentage of companies already integrate sustainability into their overall activities [2].

The link between project management and sustainability has been proven [1], and project management plays a crucial role in implementing organizational change and promoting sustainable development of organizations and society [2, 3], and it can also directly contribute to higher project profitability [4].

However, it is important to make some considerations regarding sustainability in project management related to the dimensions of triple bottom line: economic, environmental, and social. Companies' perception of project sustainability is only related to economic and environmental aspects, so the social aspect is missing [2]. It is necessary achieving a balance between economic, social, and environmental sustainability [5].

Adding to the need to balance investment in sustainability in projects with the need to include the social dimension, it is necessary to create more opportunities for companies to invest in sustainability measures that combine corporate social responsibility and revenue management, so that the project remains profitable for companies.

There is a need to develop mechanisms to demonstrate that it is possible to make social investments in an economically sustainable way for companies, based on their projects for new products or improvements in the production structure, as a way to promote the achievement of goals related to the Sustainable Development Goals (SDGs) and ISO 26000. Since cost is one of the most important factors to consider in a project [6], there must be a way to generate social investment from a project's earnings, creating a controlled impact on the project's efficiency. In this way, this paper aims to propose an index of project efficiency linked to project profit and social investment, to promote sustainable development of organizations and society, contributing to the optimization of project profitability.

2 Corporate Social Responsibility Investment

Social responsibility investment has been the subject of various studies and approaches, and most of the literature attempts to establish a relationship between corporate social responsibility investment and its impact on financial performance. The main results show a positive relationship between investment and financial impact, although there are criticisms of this exclusively financial approach [7–10].

Interest in and understanding of the concept of corporate social responsibility (CSR) date back to the 1950s and 1960s, but there are still many challenges to the practice of CSR in corporations, its intent, focus on investment, and use of information for contestable purposes such as greenwashing [11–14]. It is well-known how important it is to see investments in CSR as a business strategy and long-term vision. The arguments are that if investments in CSR are part of the organizational strategy (mission, vision, corporate values), social responsibility begins to maintain the competitiveness of the organization, legality, and good reputation among various stakeholders [15, 16].

Over the years, the number of companies publishing CSR reports has increased, referring to the triple bottom line concept (social, economic, and environmental) and expanded to a vision of stakeholder engagement and governance known as ESG (Environmental, Social and Corporate Governance) [8, 9]. 92% of the world's 250 largest companies have produced corporate social responsibility reports, an increase of

62% in 10 years (2005 to 2015) [17]. Fortune 500 companies reported investing \$20 billion annually in social responsibility activities. In the same year, companies generated \$12 trillion in revenues and \$945 billion in profits, so social responsibility investments represent more than 0.5% of corporate revenues and 2% of corporate profits [18, 19]. This scenario shows the need to consider investments in CSR in all aspects of the organization, including analyzing the efficiency of projects and their sustainability.

3 Project Sustainability

The link between the concepts “project management” and “sustainability” has continuously grown, since conventional project management is not suitable in a sustainable manner [20]. There are different interpretations about project sustainability. Two main perspectives are distinguished [21]: '**sustainability by the project**', which refers to the **output of the project**, and '**sustainability of the project**', which refers to the **project management process**.

Despite one paper [22] state that there is no widely adopted definition to the concept of the sustainability in project management, a pair of researchers [23], based on a systematic review of the literature, presented one of the first definitions of the term “sustainable project management” (p. 79):

Sustainable Project Management is the planning, monitoring and controlling of project delivery and support processes, with consideration of the environmental, economical and social aspects of the life-cycle of the project's resources, processes, deliverables and effects, aimed at realising benefits for stakeholders, and performed in a transparent, fair and ethical way that includes proactive stakeholder participation.

Thus, it can be stated that sustainability within the project must always be linked to the financial, environmental and social dimensions, related to both the project process and the main result of the project [2, 24]. However, the integration of the concept of sustainable project management (SPM) into processes and practices of organizations still a challenge [3]. The challenge is even greater in the social dimension [2]. Even though the generation of social impact has been gaining importance for management of projects, providing benefits such as better results for stakeholders and long-term business success [25, 26], the social dimension has received less attention [2, 25].

Since project efficiency is an important contributing factor to stakeholder satisfaction [27], there is an opportunity to think about ways that organizations can integrate sustainability in project, looking to social dimensions, without harming the project earnings or the organization profits in general.

4 Project Efficiency

The efficiency of a project depends on how well its resources are used [26]. Sustainability increases process efficiency and enables companies to minimize the costs associated with production and other processes in the project [28]. Efficiency can be seen as an important factor for project success [27, 29], which is related to adherence to schedule, cost and agreed specifications/quality indicators. Following this idea, projects must be carried out in an efficient manner [30].

In the literature, there are three traditional dimensions of project efficiency: budget, time and scope [27, 31]. Thus, project efficiency is related to meeting cost, time, and scope targets [27]. Once projects have their constraints, especially in terms of time and resources, monitoring and controlling project efficiency is highly desirable for sustainability.

One way to calculate project efficiency performance, considering the expected cost and time to deliver the project scope, is Earned Value Management (EVM), a suitable method from a practical and mathematical point of view [32]. EVM must implement sound, consistent and well-documented performance metrics that are understood by the organization [33] and are mainly based on three elements: Actual Cost (AC), Planned Value (PV) and Earned Value (EV). In this way, these elements can serve as the basis for calculating the efficiency of the project. Many organizations use EVM to measure and control project performance [34].

Since it is recommended a project's ex-post evaluation including efficiency (use of time and cost) and sustainability (persistence of positive effects over the long term, and other positive or negative impacts due to implementation of the project) [35], there is an opportunity to study a way to think in an index of project efficiency including sustainability.

5 Materials and method

Since the aim of this study is to propose an index of project efficiency that takes into account the use of part of the profit for social investment, the Design Science Research method was chosen because it is a problem-solving method based on the construction of artifacts [36]. The stage model [37] was used as a protocol for development.

In stage 1, the identification of the problem, a review of the literature on sustainable project management was conducted based on the publication [38]. From the analysis of the content of the literature, the problem of how organizations can implement practices that target the social dimension of sustainability and go beyond practices that target both the end product and the project process without compromising the efficiency of this project emerged.

In stage 2, the definition of the objectives of the solution, the goal was defined to find a way to analyze the impact of the amounts taken from the profit used for social investment on the efficiency of the project.

The development of the proposal itself, stage 3, we assumed the variables as a basis the calculation of the project's efficiency by [29]. Then, we proposed an adjustment of

the equation with an insert a percentage value of the effective earnings per year of the project and create the **Index of Project Efficiency with Social Sustainability – PESoS Index**.

The demonstration (stage 4) the efficacy of the index proposal, a case study was used, on a real project to build a grain storage unit, which is economically viable [39].

Finally, the stage 5 (evaluation), this study compares the proposal with the traditional efficiency index and analyzes the impact of the investment of the project's profits on the efficiency of the project.

The next section presents the development of the proposal – PESoS Index.

6 Development of PESoS Index

As presented in the previous section, we assumed the variables as a basis the calculation of the project's efficiency by [29]. The variables are presented below.

Planned Project Values:

- Total Planned Project Cost (CP_d),
- Planned earnings per year (EP_{yd}),
- Planned project time (TP_d),
- Minimum possible project time (TP_{min}),
- Number of years of project earnings (N)
- Planned project cost with losses (TCP_d).

The planned cost of the project with losses (TCP_d) is calculated by formula:

$$TCP_d = CP + EP_{yd}(TP - TP_{min}) \quad (1)$$

considering the financial losses between the minimum time TP_{min} and TP_d .

Effective values:

- Effective Total Cost of the Project (CP),
- Effective gain per year of the project (EP_y),
- Effective Project Time (TP),
- Cost effective with losses (TCP).

For our purposes, it is worth noting that, the Effective Project Cost with Losses (TCP) is calculated by the formula:

$$TCP = CP + EP_{yd}(TP - TP_{min}) + N\lambda_{iN}(EP_{yd} - EP_y) \quad (2)$$

considering the financial losses between TP_{min} , TP and the difference between EP_{yd} and EP_y , applied for time N at the market interest rate i. The coefficient λ_{iN} , is a process economics rate, used to add/loss the earning per year using an interest rate i, [40]:

$$\lambda_{iN} = \frac{(1+i)^N - 1}{Ni(1+i)^N}, \quad \text{for } i \neq 0$$

and $\lambda_{iN} = 1$, for $i = 0$.

Thus, the index of traditional project efficiency can be calculated by the following formula, according [29]:

$$\eta_{Pm} = \frac{TCP_d}{TCP} \quad (3)$$

To propose the index of project efficiency linked to project profit and social investment, we proposed to insert a **percentage value of the effective earnings per year of the project denoted by δ_S** , considering that companies invest, on average, 0.5% of their revenues in social responsibility actions [27 - 28].

To consider δ_S it is necessary the adapt the of calculate the Effective Project Cost TCP, now named **Planned project cost with Social investment**, denoted by TCP_S , using the following proposed formula:

$$TCP_S = CP + EP_{yd}(TP - TP_{min}) + N\lambda_{iN}(EP_{yd} - EP_y) + N\delta_S EP_y \quad (4)$$

Then, we get the **Index of Project Efficiency with Social Sustainability – PESoS Index (η_{Pms})**:

$$\eta_{Pms} = \frac{TCP_d}{TCP_S} \quad (5)$$

The demonstration and a comparative analysis (evaluation) of the two indexes are presented below.

7 Comparative Analysis

In order to compare the **traditional project efficiency** with **Project Efficiency with Social Sustainability**, values from a real project to build a grain storage unit [33] are used and present below. The financial values are being presented in Brazilian currency (Real – R\$) and the time in years.

Using the data in table 1 to calculate TCPd, TCP, and TCPS, by the formulas given in equations (1), (2), and (4) respectively, we obtain:

- TCPd: R\$ 4.410.404,38
- TCP: R\$ 4.509.178,80
- TCPS: R\$ 4.524.913,75

Table 1. Input values for efficiency calculation.

Item	Value	Reference
CPd (R\$)	R\$ 4.300.000,00	[39]
CP (R\$)	R\$ 4.300.000,00	Based on the budget presented by [39]
EPyd (R\$)	R\$ 662.426,30	[39]
EPy (R\$)	R\$ 629.398,14	Based on the predicted value by [39], discounting the value of one year of inflation (IGPM) - R\$ 33.028,16
N (years)	5	[39]
i (% per year)	20%	[39]
Tmin (years)	0,83	Equivalent to 10 months, considering the projection by [39] for the operation of the business.
TPd (years)	1	considering the projection by [39] for the operation of the business.
TP (years)	1	considering the projection by [39] for the operation of the business.
δ_s (% de Epy)	0,5%	[27 - 28]

In this case, the efficiency of the project without social investment was 97.809481%, and the **efficiency of the project WITH social investment which was 97.469358%**. It is possible to verify that the efficiency of the project has a variation of only 0.34%. Since the value of the social investment per year was R\$ 3.146,99 and over N=5 years the Total social investment was R\$ 15.734,95.

Table 2 shows data from a simulation keeping the effective cost equal to the planned cost (CPd = CP) and varying the Effective earning (EPy), based on the discount of the 1 (one) year inflation value by the IGPM for each previous value. It can be seen that the efficiency of the project also varies, and when the EPy is smaller, the variation in efficiency is also smaller. In the last column of this table are introduced new variables: **Total social investment over N years (TSI) and Social investment per year (SI)**.

Table 2. Simulation actual cost equal to planned and varying actual earning per year (values in Brazilian currency – R\$)

EPy (\$)	TCP (\$)	TCPs (\$)	η_{Pm}	η_{Pms}	η	SI (\$)	TSI (\$)
629.398	4.509.179	4.524.914	97,8%	97,5%	0,34%	3.147	15.735
596.370	4.607.953	4.622.862	95,7%	95,4%	0,31%	2.982	14.909
563.342	4.706.728	4.720.811	93,7%	93,4%	0,28%	2.817	14.084
530.314	4.805.502	4.818.760	91,8%	91,5%	0,25%	2.652	13.258
497.286	4.904.276	4.916.709	89,9%	89,7%	0,23%	2.486	12.432

Concerning the effect of δ_s on the efficiency of the project, figure 1, presents the linear evolution of efficiencies η_{Pm} (traditional project efficiency) and η_{Pms} (PESoS Index) for different values of TCP and TCPs.

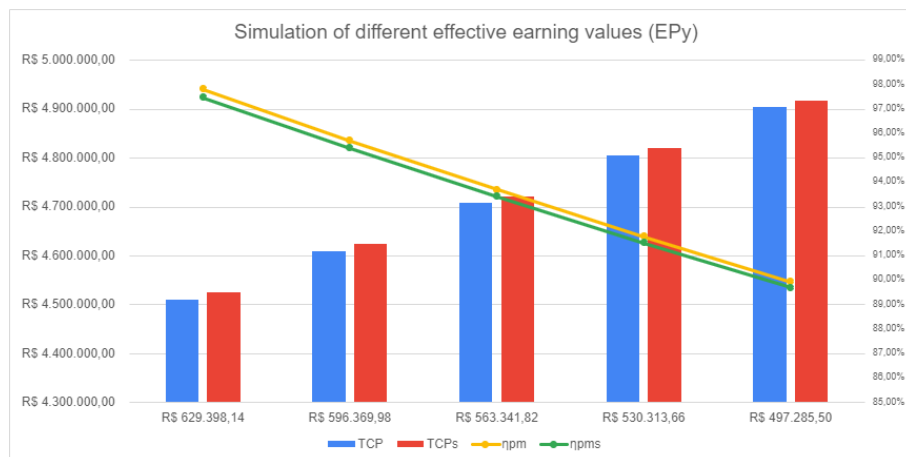


Fig.1. Simulation of different effective earning values keeping the effective cost equal to the planned cost.

In this way, we can think in new perspective to project sustainability, beyond “sustainability by the project” (product), and “sustainability of the project” (process), a third one: **“Sustainability FROM the project”**, which relates an investment in sustainability measures to the financial gains from the project.

8 Conclusions

This study presented PESoS Index – Index of Project Efficiency with Social Sustainability, which shown that it is possible to obtain financial efficiency with social gains. The adjustment of the equation proposed by [29] has shown that when significant social investments are made compared to the investments currently made by companies, the global financial impact in terms of costs is insignificant in the total value of the project. On the other hand, there are social gains and long-term economic returns in business valuation with returns to stakeholders.

It is possible to state that the study presents two main contributions: (a) the concept of "Sustainability FROM the Project", which relates an investment in sustainability measures to the financial gains from the project, and (b) a way to focus on the social aspect of the Triple Bottom Line based on corporate social responsibility (the index proposed). Then, a link is established between corporate sustainability policies and sustainability project management practices [1].

Organizations can combine measures that focus on the "Sustainability of the project" and the "Sustainability by the project" with this study proposal. This allows the organization to achieve social investment goals without compromising the economic efficiency of its projects.

However, as a limitation of this research, the results of one case study may not be representative of other projects in different sectors, even within the same country. Additionally, it would be valuable to discuss how these principles might need to be adapted for different sectors, such as the service industry.

References

1. Armenia, S., Dangelico, R.M., Nonino, F., Pompei, A.: Sustainable project management: A conceptualization-oriented review and a framework proposal for future studies. *Sustainability* 11(9), 2664 (2019).
2. Magano, J., Silvius, G., Silva, C.S. e., Leite, Â.: The contribution of project management to a more sustainable society: Exploring the perception of project managers. *Project Leadership and Society* 2, 100020 (2021).
3. Silvius, G., Marnewick, C.: Interlinking Sustainability in Organizational Strategy. *Project Portfolio Management and Project Management A Conceptual Framework*. *Procedia Comput Sci.* 196, 938–947 (2022).
4. Kaufmann, C., Kock, A.: Does project management matter? The relationship between project management effort, complexity, and profitability. *International Journal of Project Management* 40 (6), 624–633 (2022).
5. Elkington, J.: Towards the Sustainable Corporation: Win-Win-Win Business Strategies for Sustainable Development. *Calif Manage Rev.* 36, 90–100 (1994).
6. Silvius, G., Kampinga, M., Paniagua, S., Mooi, H.: Considering sustainability in project management decision making; An investigation using Q-methodology. *International Journal of Project Management* 35, 1133–1150 (2017).

7. Shabbir, M.S., Wisdom, O.: The relationship between corporate social responsibility, environmental investments and financial performance: evidence from manufacturing companies. *Environ Sci Pollut Res* 27, 39946–39957 (2020).
8. Halbritter, G., Dorfleitner, G.: The wages of social responsibility - where are they? A critical review of ESG investing. *Review of Financial Economics* 26, 25–35 (2015).
9. Velte, P.: Meta-analyses on Corporate Social Responsibility (CSR): a literature review. *Manag Rev Q* 72, 627–675 (2022).
10. Benlemlih, M., Bitar, M.: Corporate Social Responsibility and Investment Efficiency. *Journal of Business Ethics* 148, 647–671 (2018).
11. Carroll, A.B.: Corporate Social Responsibility Evolution of a Definitional Construct. *Bus Soc* 38, 268–295 (1999)
12. Shayan, N.F., Mohabbati-Kalejahi, N., Alavi, S., Zahed, M.A.: Sustainable Development Goals (SDGs) as a Framework for Corporate Social Responsibility (CSR). *Sustainability (Switzerland)* 14, 1–27 (2022).
13. Gatti, L., Seele, P., Rademacher, L.: Grey zone in – greenwash out. A review of greenwashing research and implications for the voluntary-mandatory transition of CSR. *International Journal of Corporate Social Responsibility* 4, 1–15 (2019).
14. Fatima, T., Elbanna, S.: Corporate Social Responsibility (CSR) Implementation: A Review and a Research Agenda Towards an Integrative Framework. *J Bus Ethics* 183, 105–121 (2023).
15. Fatima, T., Elbanna, S.: Corporate Social Responsibility (CSR) Implementation: A Review and a Research Agenda Towards an Integrative Framework. *J Bus Ethics* 183, 105–121 (2023).
16. ElAlfy, A., Palaschuk, N., El-Bassiouny, D., Wilson, J., Weber, O.: Scoping the evolution of corporate social responsibility (CSR) research in the sustainable development goals (SDGS) era. *Sustainability (Switzerland)*. 12(4), 5544 (2020).
17. Meier, S., Cassar, L.: Stop talking about how CSR helps your bottom line. *Harvard Business School Cases*. 2–6 (2018)
18. Fortune: Fortune 500 - 61th edition annual ranking of America's largest companies, <https://fortune.com/ranking/fortune500/2015/>
19. Meier, S., Cassar, L.: The End Of CSR (As We Know It) And The Rise Of Businesses With A Conscience. *Forbes*. 1–5 (2018)
20. Chofreh, A.G., Goni, F.A., Malik, M.N., Khan, H.H., Klemeš, J.J.: The imperative and research directions of sustainable project management. *J Clean Prod.* 238, 117810 (2019).
21. Magano, J., Silvius, G., Silva, C.S., Leite, Â.: Exploring Characteristics of Sustainability Stimulus Patterns of Project Managers. *Sustainability*. 13(7), 4019 (2021).
22. Aarseth, W., Ahola, T., Aaltonen, K., Økland, A., Andersen, B.: Project sustainability strategies: A systematic literature review. *International Journal of Project Management* 35, 1071–1083 (2017).
23. Silvius, G., Schipper, R.P.J.: Sustainability in project management: A literature review and impact analysis. *Social Business* 4, 63–96 (2014).

24. Huemann, M., Silviu, G.: Projects to create the future: Managing projects meets sustainable development. *International Journal of Project Management* 35, 1066–1070 (2017).
25. Carvalho, M.M., Rabechini, R.: Can project sustainability management impact project success? An empirical study applying a contingent approach. *International Journal of Project Management* 35, 1120–1132 (2017).
26. Ika, L.A., Pinto, J.K.: The “re-meaning” of project success: Updating and recalibrating for a modern project management. *International Journal of Project Management* 40, 835–848 (2022).
27. Serrador, P., Turner, J.R.: The Relationship between Project Success and Project Efficiency. *Procedia Soc Behav Sci.* 119, 75–84 (2014).
28. Kivilä, J., Martinsuo, M., Vuorinen, L.: Sustainable project management through project control in infrastructure projects. *International Journal of Project Management* 35, 1167–1183 (2017).
29. Bouras, V.K.: A Method for the Evaluation of Project Management Efficiency in the Case of Industrial Projects Execution. *Procedia Soc Behav Sci.* 74, 285–294 (2013).
30. Frinsdorf, O., Zuo, J., Xia, B.: Critical factors for project efficiency in a defence environment. *International Journal of Project Management* 32, 803–814 (2014).
31. Shenhar, A.J., Levy, O., Dvir, D.: Mapping dimensions of projects success, (1997)
32. Telles, L.G., Kern, A.P.: Método EVM como Ferramenta de Gestão Pró-Ativa de Obras Públicas. *Encontro Latino Americano e Europeu sobre Edificações e Comunidades Sustentáveis*, 5 (2023).
33. ASSOCIAÇÃO BRASILEIRA DE NORMAS TÉCNICAS: NBR ISO 21508 - Gerenciamento de valor agregado no gerenciamento de projetos e programas. (2022)
34. Nouban, F., Alijl, N., Tawalbeh, M.: Integrated earned value analysis and their impact on project success. *International Journal of Advanced Engineering, Sciences and Applications* 1, 34–39 (2020).
35. OECD: Evaluation and Aid Effectiveness Glossary of Key Terms in Evaluation and Results Based Management. (2002)
36. Lacerda, D.P., Dresch, A., Proença, A., Antunes Júnior, J.A.V.: Design Science Research: método de pesquisa para a engenharia de produção. *Gestão & Produção* 20, 741–761 (2013).
37. Peffers, K., Tuunanen, T., Rothenberger, M.A., Chatterjee, S.: A Design Science Research Methodology for Information Systems Research 24, 45–77 (2014).
38. Yamanaka, L., Luchesi, V.M., Araujo, C. de: Gerenciamento de Projetos Sustentáveis: uma análise bibliométrica da produção internacional. In: *Anais do 43o Encontro Nacional de Engenharia de Produção - ENEGEP*. Fortaleza (2023)
39. Vergara, W.R.H., Oliveira, J.P.C., Barbosa, F.A., Yamanari, J.S.: Economic and financial feasibility analysis for the acquisition of a storage soybeans and corn facility. *Revista Gestão da Produção Operações e Sistemas* 12, 41–62 (2017).
40. Holland, F., Watson, F., Wilkinson, J.: *Introduction to Process Economics*. John Wiley, London (1974)