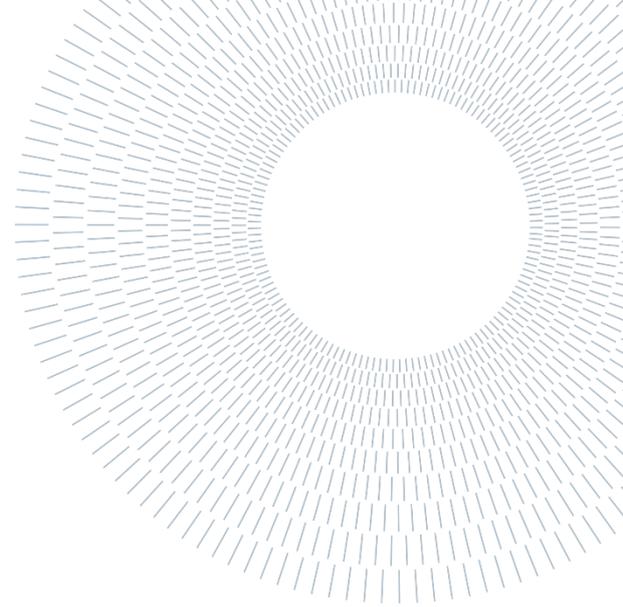




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EXECUTIVE SUMMARY OF THE THESIS

MEASURING WHAT IS MISSING IN MEGAPROJECTS

SOCIAL SUSTAINABILITY ASSESSMENT THROUGH THE ANALYSIS OF SECONDARY STAKEHOLDERS' SATISFACTION

TESI MAGISTRALE IN MECHANICAL ENGINEERING – INGEGNERIA MECCANICA

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1. Introduction

Megaprojects are pivotal in driving global economic and social development, connecting the world through vast networks like railways, highways, and airports. These projects not only facilitate movement and international trade but also significantly influence GDP growth, population well-being, and government revenue. The term "megaproject" has evolved to represent large-scale, complex projects that require immense resources and coordination, impacting a multitude of stakeholders. Unlike regular projects, their intricate nature makes them distinct and challenging to manage. The rapid pace of global change, coupled with shifting cultural values, focusing on social gains and community opinions, has transformed the landscape of megaproject management. Social value delivered, social impacts, and public perception have become paramount. The increasing focus on climate change and environmental considerations further adds to the complexity. As a result, the concept of "success" remains vague and there is a pressing need for more reflexive evaluation methods that balance accountability and social impact. This thesis aims at bridging the existing gap in literature

by introducing a holistic performance evaluation framework for megaprojects. A significant component of this framework is the assessment of secondary stakeholders' satisfaction, for which a specific model is devised. The research draws from extensive literature, mostly from Europe and the United States, as well as European Commission guidelines and experts' opinions from these regions.

2. Background

2.1. What is a megaproject

It is common knowledge that the term megaproject refers to those projects with a value of 1 billion dollars or more. However, over time this definition has evolved, and now this term is used to describe large-scale projects that require significant resources, time, and coordination to complete. [1] Megaprojects implementation has a huge potential of transforming economies and societies on a large scale. It plays an important role in solving the needs of people's livelihood, and promoting economic and social development. Megaprojects are not a magnified version of smaller projects: they are characterized by high cost, high organizational complexity and high impact on

multiple primary and secondary stakeholders, making them a unique kind of project to lead.

2.2. Secondary stakeholders

In recent years, the role of secondary stakeholders — those who affect or are affected by the organization, but not directly involved in transactions with it — has gained prominence in the successful execution of megaprojects. A shift in attention from primary stakeholders towards secondary stakeholders acknowledges the valuable impact these groups, such as local communities, can have. [2] Research consistently advocates for their early involvement to optimize project performance and mitigate conflict risks. Achieving success in megaprojects extends beyond the conventional parameters of budget, time, and scope: it involves creating social and economic value. [3] Therefore, project managers need to shift from a "management of stakeholders" paradigm, where stakeholders are simply a means to an end, to a "management for stakeholders" approach aimed at overall performance improvement and social value creation. Engaging secondary stakeholders can provide more efficient solutions and highlight potential conflict areas due to their unique local expertise. However, this engagement must be carefully managed to ensure it does not undermine the authority of project managers.

2.3. Iron triangle

The Iron Triangle, a cornerstone concept in project management, encapsulates the intricate balance between three key elements: scope, cost, and time. This model is often employed as a benchmark for assessing project governance success. Studies conducted during the 20th century noted that while many scholars agreed that cost, time, and scope should be used as evaluation criteria, they should not be the only factors considered. The Iron Triangle's popularity can be attributed to its simplicity, providing a straightforward framework for assessing project performance. However, given the complexity and uniqueness of megaprojects the performance evaluation model based on the pure iron triangle is limited and it does not allow a constructive type of evaluation, usually resulting in reputational disruption and no lesson learned. [4] So, there is a need for more comprehensive and nuanced evaluation frameworks that can better account for the complex dynamics of these projects.

3. Megaprojects global evaluation framework

Over the years, the conception of megaprojects changed and academics started to value the impact of such ventures on local communities, society and secondary stakeholders, considering it as important as the economic aspects. This change in vision brought the need for a new framework of performance indicators and success factors, a framework that reflects these new values and the broad impact of such projects. The modern literature widely reports this need but remains vague about the implementation of a practical model to perform this holistic evaluation. Such global model can bring several advantages to large projects management practices, making them more adaptive, sustainable, and learning-oriented. This research proposes a comprehensive framework to evaluate both quantitative and qualitative aspects to assess the performance of megaprojects. The framework is composed by the nine parameters presented in *Table 1*. Megaprojects performance evaluation has always been done conceptualizing megaprojects as static structures that can be completely defined at project beginning. However, given their complexity and time duration, megaprojects can be better conceived as dynamic and evolving networks. This leads to the need for a dynamic evaluation model that can be iteratively used during project development. The specific development of a practical evaluation model for one parameter, secondary stakeholders' satisfaction, follows the presentation of this framework.

4. Secondary stakeholders' satisfaction

With literature showing a growing interest for more ethical and sustainable megaprojects, where secondary stakeholders have a relevant role, the performance evaluation must include a parameter to assess their satisfaction. Understanding how secondary stakeholders perceive a megaproject can help managers to recognize and minimize its effect on people and places, to improve project benefits and to rethink a tailored approach for the local communities, which will lead to improved project accountability and transparency in the decision-making process, generating more "community inclusive" megaprojects.

Parameter	Description
Cost	Comparison between forecasted and actual costs and analysis of differences with a learning-oriented approach.
Time	Time evaluation including aspects as speed of response to changing project conditions.
Scope	Considers adaptability to stakeholders' evolving needs and alignment with societal objectives.
Value	Sum of the accrued economic benefits and wider social gains, minus the incurred capital costs.
Stakeholders' satisfaction	Measure of primary and secondary stakeholders' perception of the project.
Quality	Evaluation of quality of service and quality of outcomes.
Environmental impact	Multifaced evaluation that extends beyond the project's development phase, into its post-completion period.
Reputation	Reputation evaluation for project, participating organization, and society.
Risk and safety	Assessment of social, technical, economic, environmental and political risks, together with workers' safety.

Table 1 – Megaprojects global evaluation framework

The proposed model for secondary stakeholders' satisfaction assessment articulates in three different evaluation methods:

1. **Direct involvement:** direct involvement of population to understand how the project is impacting their lives and how it is being perceived.
2. **External observation:** analysis of objective factors from an external point of view.
3. **Promoter's eye:** analysis of performance with project promoter to understand if the desired benefits were achieved.

The usage of these three approaches gives a balanced and unbiased view on secondary stakeholders' satisfaction. Each approach develops into a series of measurable KPIs that have to be evaluated. The model structure, with all KPIs is shown in Figure 1. All KPIs will be described in the following paragraphs. The final aim of the model is to produce an indicator, the *Secondary stakeholders' satisfaction factor* ($II SH_{sat f}$), which would assign a mark on a scale from 0 to 100 to the project. This indicator is the average between *Direct involvement factor* (DI_f), *External observation factor* (EO_f) and *Promoter's eye factor* (PE_f):

$$II SH_{sat f} = \frac{1}{3} * DI_f + \frac{1}{3} * EO_f + \frac{1}{3} * PE_f$$

The scores for each approach are computed as the mean of the underlying KPIs. Moreover, the proposed model aims at satisfying the need for an evaluation approach that follows the dynamicity of megaprojects. Thus, it can be applied in three different ways:

1. **Dynamic tool:** during project development to timely identify criticalities and implement corrective actions.
2. **Final evaluation tool:** right after project delivery to evaluate the overall development process.
3. **Ex-post evaluation tool:** years after project delivery to assess its long-term impacts.

4.1. Direct involvement

The first methodology to evaluate secondary stakeholders' satisfaction is the direct involvement of impacted citizens through two parallel approaches: surveys to population and consultation with categories representatives. Surveys to population have the aim of directly gathering the opinion of impacted people, understanding how they are perceiving the project, how it is impacting their life, how they were informed about its future benefits and if there are particular concerns about its development. Surveys have to be performed at large time intervals or project milestones, being costly, time-consuming and invasive: it is hard to have a large amount of people completing the survey, and it is counterproductive to allocate too many resources to the analysis. On the other hand, consultation with categories representatives can be performed at shorter time intervals, requiring less resources, to get a more frequent feedback. Moreover, representatives can be a good filter for citizens' requests and concerns, making the analysis of results easier.

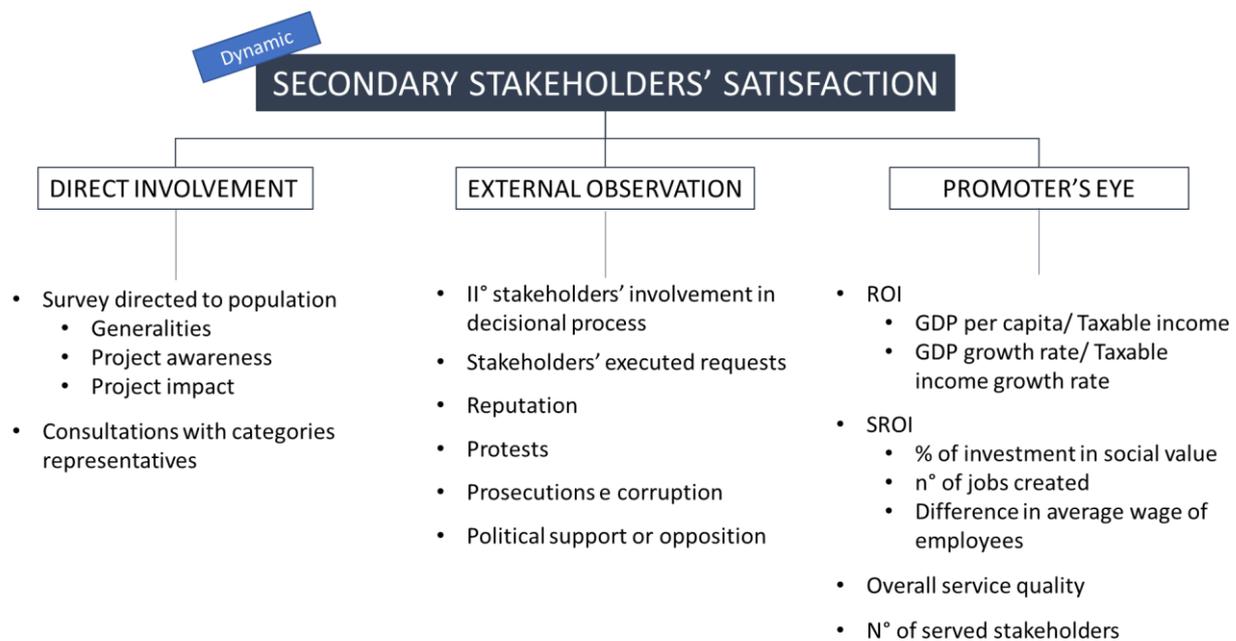


Figure 1 - Secondary stakeholders' satisfaction evaluation model

4.2. External observation

The second approach is external observation, meaning the measurement of several objective parameters from an external point of view. The aim is to obtain an unbiased perspective on how the project is performing and how secondary stakeholders are perceiving it. This assessment takes into account six measurable factors, some of which can be computed or obtained by publicly available data and sources, while others require data to be collected and stored during project development. These KPIs are: secondary stakeholders' involvement in decisional process, measured as the number of local communities represented in the decisional board over the total; stakeholders executed requests, measured by keeping a database of the received requests, their importance, their outcome and their cost and by computing the percentage of realized requests, weighted by their importance; project reputation, measured by analyzing media stories of major local and national newspapers and evaluating the percentage of positive and negative articles; protests against the project, measured by analyzing authorized and unauthorized protests, their importance and entity; prosecution and corruption, parameter that considers the number of investigations, first instance judgments and definitive convictions; and political support and

opposition, where the percentage of parliament opposition that supports a megaproject is measured to understand if the project is politicized or if its interest is shared among all parties.

4.3. Promoters' eye

Promoter's eye is the third and last component of the holistic model that focuses on secondary stakeholders' satisfaction. The main scope of this is to analyze the impact of the project from the Promoter's point of view, comparing the obtained results with initial forecasts. Each parameter is measured either with commonly used models in the megaproject world or by adapting models from different industries. The KPIs in this approach are: percentage of investment delivered in social value, measured by using the SROI (Social Return on Investment) to quantify the gains in social value in monetary terms; number of jobs created, measured through the comparison between forecasted indirect and induced jobs and the actual values after megaproject completion; difference in wages of employees, measured by using the Difference-in-Difference model to verify that the increase or decrease in wages is caused by the megaproject; GDP per capita and GDP growth rate, measured comparing forecasted values with actual ones after project completion; Overall Service Quality, measured through SERVQUAL model, with a

series of questions to gain an evaluation of the service quality perceived by citizens during and after project completion; and number of served stakeholders, forecasted by calculating the capacity of the megaproject through traveling forecasting models or other models depending on the type of megaprojects, then comparing the data with the actual one. Given the long-term nature of some of the above-described parameters (GDP, GDP growth rate or social return on investments), the results obtained from this analysis are more relevant in the ex-post evaluation. Nevertheless, the analysis can be performed also during project execution, especially for parameters as the overall service quality.

5. Model validation

The proposed model has been validated through the “Validation with experts” approach. Ten semi-structured interviews have been conducted with large projects experts coming from different backgrounds, between July and August 2023. They had a duration of 45-80 minutes each and they were all transcribed to analyze results through textual coding. The interview has been designed in order to validate all aspects of the model, with a top-down approach, starting from the overall goal and going through all its parts, KPIs and measuring techniques. It has a four levels structure with a total of 23 questions, excluding a level zero about respondent generalities. The aim of each level is to respectively evaluate: the importance of model objective, the correctness of the three parallel approaches, the correctness of the KPIs in each approach, and the correctness of the measuring technique for each KPI. Each interview covered all levels. In *Table 2* the ten interviewed experts are presented.

n	Sector	Ctry	YoE	Category
1	Infrastructure	USA	35+	Project manager
2	Construction management	Italy	30+	
3	Construction management	Italy	15+	
4	Infrastructure	Italy	40+	Manager
5	Infrastructure	Italy	40+	
6	Infrastructure	USA	40+	Structural engineer
7	Architecture and urban development	USA	20+	Urban development architect
8	Architecture	USA	10+	
9	Architecture and urban development	Italy	10+	
10	Social sustainability	Italy	20+	Social sustainability expert

Table 2 - Interviewed experts

5.1. Results and findings

Three possible outcomes were assigned to each parameter: green tick means parameter was approved; yellow bars indicate parameter was approved, but some concerns were raised; and red cross means parameter was rejected. *Table 3* reports the results derived from the interviews as percentage of outcomes for each model parameter.

Parameter	✓	≡	✗
Secondary stakeholders' satisfaction	100%	-	-
Dynamic model usage	100%	-	-
Final Evaluation	100%	-	-
Ex-post evaluation	90%	10%	-
Direct involvement	100%	-	-
External observation	100%	-	-
Promoter's eye	100%	-	-
Surveys to population	60%	30%	10%
Categories representatives	70%	30%	-
Secondary stakeholders' involvement in decisional process	70%	-	30%
Stakeholders' executed requests	100%	-	-
Project reputation	100%	-	-
Protests against the project	100%	-	-
Prosecution and corruption	70%	-	30%
Political support and opposition	100%	-	-
Social return on investment (SROI)	100%	-	-
% of investment in social value	100%	-	-
Number of jobs created	90%	10%	-
Difference in average wages	60%	10%	30%
Return on investment (ROI)	100%	-	-
GDP growth	100%	-	-
GDP growth rate	100%	-	-
Overall service quality	100%	-	-
Number of served stakeholders	100%	-	-

Table 3 - Interviews results

Results show that the main goal of the model, its application (except a minor observation about ex-post evaluation timing), and the three main approaches used to measure the proposed KPI found unanimous approval, making the general structure of the model successful. The same can be said for the majority of model parameters, except the ones highlighted in yellow or in red, based on the rejection rate and importance of raised concerns, which found experts in disagreement and highlighted some cultural differences. In particular, some experts highlighted how population surveys must be done with caution, paying close attention to the submitted questions to obtain objective answers, not driven by emotions. Additionally, a strong informational

campaign should be implemented in order to educate citizens about each project, and results must be correctly considered. Some disagreement was also found for consultation with categories representatives, with American respondents stating that there could be a real risk of lobbying and biased representatives pursuing personal interests instead of communities' ones. Oppositely, in Italy this practice is positively seen, since representatives are considered as a filter for citizens' opinions and requests. Some respondents did not agree on the fact that involving secondary stakeholders in the decisional process could be a good thing for project's success. Here another cultural difference emerged: experts said that in Italy it is very unusual to involve them in the decisional process, and their opinion is usually considered not so trustworthy or relevant. On the other hand, it emerged that in the United States it is a common practice to involve secondary stakeholders in discussion about the development of new megaprojects and their opinion can change the project outcome. The measurement of corruption was another dividing parameter, with some experts considering it useless, since, in their opinion, it does not directly impact project performance. Another respondent highlighted that an excessive effort in fighting corruption could also lead to the opposite result, meaning a corruptive system that is distributed, individual and uncontrollable. Finally, some respondents had doubts about the direct impact of megaprojects on employees' salaries.

The obtained results highlight the need for a deeper study of some model parameters, to understand the best way to measure them and their real importance in such evaluation framework. Indeed, the observed cultural differences are significant, and the fact that two presumably similar cultures have different points of view on some practices and metrics reinforces the relevance of the ones they agreed upon.

6. Conclusion and future developments

This work introduces a practical model to assess social sustainability of megaprojects through the analysis of secondary stakeholders' satisfaction. It does so after proposing a global evaluation framework for megaprojects performance assessment, a framework that extends the classical metrics and includes parameters that reflect what

society considers important in this historical period. This research could serve as the basis for a practical holistic evaluation model for megaprojects performance, however, many themes must be further developed to completely fill the gap. Firstly, there is the need to develop a practical model for the assessment of all the metrics introduced in the global framework. Then, the relative importance of parameters should be deeply studied to properly weight the evaluation. Another important step to implement would be the application of the proposed model to a real case study. Moreover, model validation should be done involving other people from different cultures, to understand its applicability around the world. Finally, it would be useful to deepen the analysis by studying how the model could be adapted to fit each specific category of megaprojects.

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