

## Article

# Evaluating Organizational Sustainability: A Multi-Criteria Based-Approach to Sustainable Project Management Indicators

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**Abstract:** Even though recent studies designate that sustainability should be integrated in project management, this integration remains a complex issue. Hence, there is a need to develop a new approach that would assess the organizational sustainability and reveal to what extent sustainable project management practices are effective. The aim of this research is to propose a Multi-Criteria Decision Analysis-based method to assess the integration of the sustainability philosophy in large-scale organizations via the utilization of sustainable project management-related indicators. By utilising the proposed approach to compare internal organizational structures, the researchers aim to reveal the sustainability integration level within different business units, in order to allow organizations to make decisions toward sustainable practices. The indicators used in the proposed model are related to key aspects of organizations and they measure how the departments' staff utilize sustainable project management processes in their construction projects. The case study was conducted in a market-leading design, engineering, and project management consultancy organization. Evaluating organizational sustainability can help organizations target their efforts in certain areas (enhancing sustainable outcomes). It can also facilitate data collection, analysis, and future projections.

**Keywords:** sustainability; PROMETHEE; indicators; project management; construction



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## 1. Introduction

During the last decades, the construction industry has been strongly criticized for poor sustainability performance [1]. This offers the construction industry a unique opportunity to contribute to improving global sustainability initiatives [2]. Literature reveals various approaches that tend to contribute toward this path. Green building technologies [3], energy consumption solutions [4], and greenhouse gas elimination techniques [5] are key examples. As useful as most of the aforementioned approaches that focus on technology-related developments might be, there is clearly a need for the development of sustainability evaluation systems [6]. Researchers distinguish the importance of developing effective strategies to improve the sustainability of a construction project [7,8]. All of these strategies include project management (PM) practices [7]. When faced with this variety of strategies, the choice of the suitable option is challenging. Essentially, this situation brings decision-makers to deal with a multi-criteria decision analysis (MCDA).

According to recent studies, sustainable PM practices should be embraced by organizations that seek modern solutions [9,10]. Therefore, PM in construction companies needs to build competences for sustainability by assessing their organizational sustainability approaches [11]. Such policies will enable practitioners to execute sustainable construction projects by evaluating complete and future projects. Given the fact that sustainability factors and indicators are used to assess different aspects of sustainability [12,13], the authors decided to develop an MCDA technique to evaluate organizational sustainability

in a large-scale organization via the utilization of sustainable PM-related indicators. The PROMETHEE (Preference Ranking Organization METHod for Enrichment of Evaluations) method was chosen, since it provided the required tools to assess several alternatives according to various criteria in an easy and effective way [14]. Among the sustainable development (SD) studies reported in the literature, only a few ones have focused on sustainability assessments for construction projects [15].

Organizational sustainability needs to be developed as a process that will enable SD in projects. Business managers constantly seek ways to enhance sustainable performance in all dimensions. During the last years, a vast number of policies and management solutions were developed to evaluate and report sustainable organizational structures. The importance of indicators for measuring organizational sustainability has been brought forth by practitioners [16]. Evaluating their utilization often creates the framework for establishing organizational schemes and further aids in understanding their importance. Sustainable project management indicators can facilitate the evaluation of organizational sustainability and enable the creation of sustainable projects. Furthermore, internal information concerning the data collected, built upon the sustainable development practices, can be extracted [17]. Consequently, such indicators deliver a valuable input for organizations that pursue sustainable attributes. Regardless of the sustainability indicators reported in the literature, the evaluation of organizational sustainability through indicators is still a new concept [18].

The aim of this research is to propose an MCDA-based method to assess the integration of the sustainability philosophy in large-scale organizations via the utilization of sustainable PM-related indicators. The difficulty in evaluating the organizational sustainability performance of organizations lies in elements that affect all the three dimensions of the triple bottom line (TBL) — the economic, environmental, and social scenario. Economic policies/plans, environmental restrictive practices, and complex organizational structures with different business streams, are key examples. This becomes even more complicated when looking at this from an organizational or even national perspective. Furthermore, perceptions of how individuals/practitioners conceive sustainability performance can greatly vary [19].

The remainder of the paper is organized as follows: Section 2 presents a literature review on the themes related to this research; Section 3 contains a detailed description of the methodology and the background details about the case study; Section 4 refers to the application of the method to the case problem; and finally the results of the findings are presented, followed by a conclusion of the research in which future directions are recommended.

## 2. Literature Review

### 2.1. Review on Sustainable Construction and Organizational Sustainability

The introduction of sustainability in construction projects comes with the need to develop sustainable societies [20]. The concept of “sustainable construction” was first mentioned in the literature at the First International Conference on Sustainable Construction in Tampa, Florida, US in 1994 [21]. It was the beginning of a new era for the construction sector. Various studies started implementing sustainability into their viewpoints when referring to construction projects. Hill and Bowen [22] put forward the case of a conceptual framework for attaining sustainable construction in terms of four pillars, which included the TBL of sustainability and technical perspectives. Shen, Wu [23] developed a set of indicators to assess the sustainability of construction projects. They categorized the indicators found according to the TBL scenario and included variables of project cost, health and safety, and environmental protection. Banihashemi, Hosseini [13] concluded that sustainable PM practices in the construction phases of a project could be done via the utilization of critical success factors (CSFs). Internationally recognized assessment systems for buildings were also demonstrating the way towards sustainability [24].

Nevertheless, focus on sustainability issues in construction needs to be developed even further [25]. Goel, Ganesh [7] highlighted the past and current situation of the construction industry and argued for the adoption of a sustainable project portfolio management. Szekely and Knirsch [26] shared the idea of integrating sustainability in construction through sustainability indices and performance indicators that measure sustainability performance and concluded that this is where researchers should undertake extensive research. Yu, Cheng [6] emphasized the importance of developing an appropriate sustainability evaluation system for construction projects. By reviewing previous literature, they concluded in four key points that constituted this plan: (1) a comprehensive approach of sustainability, including product organization, key stakeholders, and economic concerns; (2) a small number of indicators for practical and cost-effective implementation; (3) a lifecycle concern; and (4) project focus.

According to the Chartered Institute of Personnel and Development [27], the organizational sustainability context arises from the development of the TBL philosophy within business operations. In line with this viewpoint, the research of Wales [28] introduced the TBL concept for organizations which endeavored to achieve sustainability. Eccles, Ioannou [29], indicated in their research the importance of the “culture of sustainability” within organizational structures, also derived from the TBL scenario. They also mentioned that the organization’s objectives should be connected to the whole sustainable philosophy (values and beliefs) in order to achieve substantive changes in business processes. Following their research results, they revealed that “high sustainability companies significantly outperform their counterparts over the long-term, both in terms of stock market and accounting performance.”

According to Wales [28], modern organizations tended to participate more in sustainability incentives, increasing the number of professionals who possessed sustainability skills and knowledge. They tended to adjust into a more sustainable internal organizational approach. Many studies proposed the use of factors/indicators for assessing the sustainable index, under the TBL context, and relating the sustainability performance of organizations and their projects [30–32]. Through the use of sustainable PM factors/indicators, the researchers examined the benefits of sustainable development associated with all parts of an organization to improve its sustainability policies.

## 2.2. Review on MCDA Methods in Sustainable Construction Projects

MCDA methods have been widely used to make comparisons based on multiple criteria within a set of distinct alternatives [33]. These models can lead to high-quality decisions, especially when the number of factors are important, and the number of alternatives are reasonable. The main category of MCDA methods, that most researchers rely on when following sustainable practices in construction, are the outranking methods. Outranking methods are based on pairwise comparisons of the alternatives against one another, according to the assessment criteria.

Sustainable construction projects are designed by following the philosophy of creating a more advanced society with favorable health conditions, a viable economy and environmentally friendly conditions inside and outside of urban areas (TBL). Therefore, practitioners tend to turn their focus toward methods that can successfully deliver such projects. MCDA methods are able to collect and analyze the basic measures that lead toward the SD path and deliver robust results that will guide practitioners toward sustainable construction projects. In view of the extracted results and by adopting fitting sustainable policies and guidelines, they often attain their sustainable goals.

Vinodh and Jeya Girubha [34] selected an MCDA method to reveal the best sustainable orientation among many construction projects and Polatidis, Haralambopoulos [35] used MCDA to rank renewable energy construction projects. They analyzed different MCDA techniques and developed a conceptual framework for choosing the appropriate MCDA method. Jayal, Badurdeen [36] utilized similar optimization techniques and analyzed in depth sustainable constructions to evaluate the sustainability of the product, process and

system level. Wu, Wang [37] employed a hybrid MCDA method to select the optimal waste-to-energy construction based on sustainability perspective.

The authors chose to implement the PROMETHEE method in order to fulfil the aims of the research. The distinguished elements for choosing the specific MCDA method were:

- PROMETHEE effectively allocated alternatives, even though they seemed difficult to compare due to their ambiguous qualities;
- PROMETHEE could adequately handle qualitative, quantitative and missing values data;
- PROMETHEE allowed the authors to view the final rankings in a variety of charts and tables [38].

### 2.3. Review on Applications of PROMETHEE Method

The PROMETHEE method was first developed by Brans and Vincke [39]. PROMETHEE provides insights into comparisons between alternatives which are difficult to differentiate. The method was widely used in previous literature for multi-criteria assessments and had a strong presence in sustainability evaluations [15,34].

Gurumurthy and Kodali [40] utilized the PROMETHEE method to select the best concept amongst manufacturing systems to be implemented in the case study. Vinodh and Jeya Girubha [34] used the same method to select the best sustainable concept, considering criteria all TBL perspectives. Under the same methodology pattern, Zhao et al. (2019) ranked and evaluated sustainable energy technologies. Kolli and Parsaei [41] classified advanced manufacturing technologies centered in multiple criteria. The authors used the PROMETHEE method (outranking method) to avoid using a single criterion in this context. Advanced manufacturing technologies were based on multiple criteria due to their complexity. On the same page, Wiguna, Sarno [42] studied renewable energy site projects by using a combination of AHP and PROMETHEE methodology. Salminen, Hokkanen [43] compared three MCDA methods, namely PROMETHEE, ELECTRE, and SMART to evaluate their compatibility from an environmental perspective. Another sustainability assessment, this time through the spectrum of the social side of the TBL, was conducted by Wu, Wang [44], who utilized PROMETHEE to analyze hydropower projects; TBL aspects were considered in their analysis. Chen, Lo [45] developed their own ranking method, which was based on PROMETHEE, to select an optimal site for land.

Applications of the PROMETHEE method showcase the importance of implementing sustainable construction projects. While the literature reveals a large number of MCDA methods, it can be concluded that PROMETHEE provides robust results when it comes to sustainability concepts. Nonetheless, a few studies have focused on the utilization of PROMETHEE for evaluating organizational sustainability via the use of sustainable PM indicators.

### 2.4. Literature Gap

This paper attempts to bridge the research gap in the application of an MCDA-based method, namely PROMETHEE, to assess the integration of the sustainability philosophy in large-scale organizations, via the utilization of sustainable PM indicators. While MCDA methods have been previously used in sustainable concept-selection problems [34,46], the utilization of sustainable PM indicators to evaluate organizational sustainability is still a relatively new concept with plenty of gaps in research [12,28].

Wang, Yi [47] described in their study that “assessment of sustainability performance is the foundation to make the studied objective more sustainable”. In assessing sustainability, relative indicators have proven quite useful [8,30]. The indicators used in this study are related to parameters that reveal trends or modifications of one or more TBL aspects. In most cases, assessment methods are designed for evaluating different types of projects, and thus the selection of the most appropriate path can become problematic [48]. This fact may imply that there is a need to establish an approach to accurately assess the organizational sustainability of organizations. By comparing internal organizational structures, the

researchers aim to reveal the sustainability integration level within the different business units, in order to allow organizations to make decisions toward sustainable practices.

### 3. Materials and Methods

#### 3.1. Instrument of the Study

In this section, the materials and method used during the overall steps of this study are presented in detail. In the context of the current research a structured questionnaire was created and disseminated to selected participants. The questionnaire sent to the interviewees consists of three parts: (1) An introductory sheet including aim and scope, ethical considerations and an outline of the survey procedure; (2) questions concerning the respondents' background information (role in the practice and the market sector); and (3) evaluative questions on the predefined sustainability indicators in relation to the organizational performance of the department that the interviewees are part of. This practically consisted of the list of indicators along with a brief description, where the respondents were called to evaluate the performance value of each indicator, based on a scale of 1–9 (1 = poor performance and 9 = highly efficient performance). One important consideration at this point was that the proposed method was relevant to each organization's maturity level regarding sustainable project management. That is, "poor performance" for a high efficiency in the sustainability of an organization may mean a completely different thing than "poor performance" for a low efficient organization. In view of that, the proposed method works better in the inter-departmental comparisons within an organization (as in this case study), rather than in inter-organizational comparisons.

It is also worth noting that the total number of the indicators included in the survey was 41 and not 82 as Stanitsas et al. [49] enumerate in their study. The diminution of the initial list of indicators was based on the study that Stanitsas and Kirytopoulos [50] conducted. In their research, they explored and ranked the relative importance of the principal sustainable project management indicators of Stanitsas et al. [49], considering the views of construction project stakeholders. This ranking revealed the relative importance index (RII) of each of the 82 predefined indicators. Thus, the authors of this study chose to pick the most important ones according to the stakeholders' views. The main criterion on which the selection was based was the RII. Consequently, 41 indicators presented a RII score higher than 0.80. Other criteria that were directed to this selection were centered toward the purpose of this questionnaire. The authors aimed to: (1) deliver simplicity, proper description, comprehensibility, and suitability to the goal of the research; (2) achieve a high response rate for the questionnaire; and (3) achieve a quick completion time.

#### 3.2. The PROMETHEE Method

The literature reveals a large number of MCDA methods for pairwise comparison alternatives [33,42]. PROMETHEE is a widely applied and trusted method among academia, especially for comparing alternatives in each separate criterion [14,34]. The application of the method can be presented in six steps [15]:

- Step 1: Input data: this step entails the pairwise comparisons between alternatives for all the analyzed criteria;
- Step 2: Deviation calculation: the deviation between alternatives is calculated;
- Step 3: Preference function evaluation: the selection and application for each criterion;
- Step 4: Global preference index calculation: definition of the preference index is undertaken.
- Step 5: Computation of positive and negative outranking flows: reveals a first glimpse of the potential ranking based on the positive and negative outranking flows of each alternative;
- Step 6: Computation of net out flow: determines the final ranking of the alternatives by adding the negative ranking flow and the positive ranking flow for every pairwise comparison;

The PROMETHEE method comprises six types of preference functions (equations) to express the significance of the alternatives for a certain criterion/factor, and weights to reveal the relative importance of the criterion.

These six types of preference function are described as follows [14] cited in [34]:

- “Type I (usual criterion): It is a basic type without any threshold. No parameter to be determined.
- Type II (quasi criterion): It is always used for qualitative criteria and it uses a single indifference threshold and it should be fixed.
- Type III (V-shape criterion): Criterion with linear preference up to a preference threshold and it is to be determined.
- Type IV (level criterion): It is always used for quantitative criteria and it uses additional indifference. The indifference and a preference threshold which must be fixed; between the two, preference is average.
- Type V: (V-shape criterion): Criterion with indifference and linear preference. Both should be fixed; between the two, preference increases.
- Type VI (Gaussian criterion): It is seldom used. Preference increases and it follows normal distribution, the standard deviation of which must be fixed.”

### 3.3. Case Study Description

The case study was conducted in a market-leading design, engineering and project management consultancy organization with headquarters in Europe. The organization is already developing and implementing comprehensive sustainability approaches to meet international sustainable design standards for their buildings and structures. Furthermore, it aspires to incorporate sustainable philosophy and corporate responsibility in its internal structures resulting in a very high level of organizational sustainability. Organizational sustainability and sustainable policies are very important in achieving sustainable constructions [51].

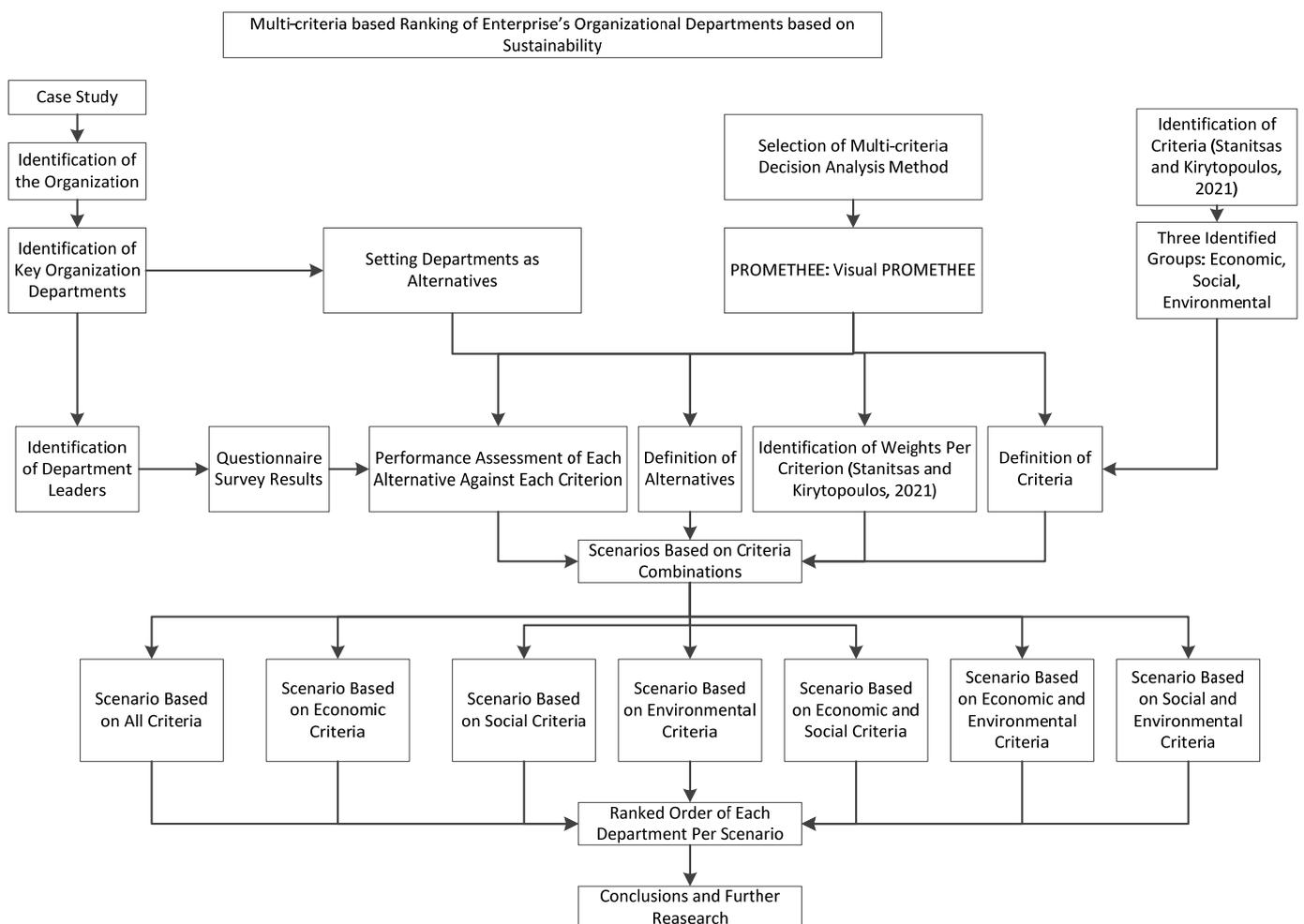
The application of the proposed method in the case study organization was conducted in order to show opportunities for even further enhancement of sustainability approaches within the different departments of the organization. Through decision-making the PROMETHEE method was used for assessing the integration of the sustainability philosophy of each department via the utilization of sustainable PM-related indicators, and the inputs were gathered via a questionnaire survey. By using a set of indicators, the “path” toward establishing a better organizational and professional competence is revealed. The survey adopted the indicators identified in Stanitsas, Kirytopoulos [50] (TBL attributes and categorization). The interviewees were all in managerial key positions and responsible for implementing sustainable concepts in their projects. In total, six professionals, from six key departments of the organization, took part in the survey.

The criteria considered for the orientation selection and their brief description are presented in detail in the next section.

## 4. Assessing the Sustainability Integration of a Large-Scale Organization Via the Utilization of Sustainable-PM Indicators

This section presents the research process and methodological approach followed in this study. The research was performed with a series of activities organized in phases, as shown in Figure 1. The key steps concern: (1) The case study which has been conducted in a market-leading design, engineering and project management consultancy organization. The selection of the case study derived through the identification of the organization and further the identification of its key departments and departments’ leaders. The departments chosen were set as the alternatives for the PROMETHEE method; (2) the questionnaire survey designed around the 41 indicators, as these were extracted from previous studies using Excel spreadsheets to help organize the questions. The data were collected from experts that held key positions in the case study organization, during a period of 1 month (June 2021). The results of the survey were used to assess each alternative against each

criterion (indicators identified from previous study). The questions included three tables with all the indicators accompanied by a brief description and next to them an empty cell where the respondents made a true statement according to their views. The ranking had to be done in consideration of the organizational performance in the department they were part of; (3) the selection of the MCDA-based method, namely PROMETHEE, to assess the integration of the sustainability philosophy of each department via the utilization of the sustainable PM-related indicators. This method is based on the analysis of different scenarios that include all possible TBL combinations to reach robust results; (4) the final ranking order of each department per scenario analyzed; and (5) the final considerations (conclusions and further research).



**Figure 1.** Research process/methodological approach of the study.

#### 4.1. Input Details and Findings

The input details, with reference to the comparison of internal organizational structures to reveal the sustainability integration level within the different business units, were composed.

The scenarios created for the analysis aimed to help organizations focus their actions in specific aspects of sustainability depending on their goals. In simple terms, the parameters and scenarios for these alternative approaches constituted a business approach for creating long-term value by taking into consideration internal TBL-related operations. Organizations could therefore identify opportunities for enhancing the sustainability processes among their departments and thus, enhance the overall organizational sustainability attributes.

Table 1 presents the considered alternatives. The departments of the organization were used in the method as the alternatives. The actual names of the departments have been masked in this paper for confidentiality purposes. The targeted departments along with the respondents from each department are: (1) Infrastructure and Transportation—Associate Architect; (2) Urban Development—Project Architect; (3) Urban Planning—Associate Director; (4) Social Construction—Technical Director; (5) Computer-Enabled Design—Associate Director; (6) Innovation, Research, IT—Digital Strategy Lead, Building Design Expert. The targeted interviewees were all in managerial key positions and responsible for implementing sustainable concepts in their projects. Under this notion and with the valuable contribution from the organization’s experts, the final ranking of the departments was conducted. The research’s aim was to reveal the sustainability integration level within the different department in order to allow organizations to make better decisions toward sustainable practices.

**Table 1.** Selected alternatives for the MCDA-based method.

Codes	Alternatives
A1	Infrastructure and Transportation—Associate Architect
A2	Urban Development—Project architect
A3	Urban Planning—Associate Director
A4	Social Construction—Technical Director
A5	Computer-enabled Design—Associate Director
A6	Innovation, Research, IT—Digital Strategy Lead, Building Design Expert

The parameters/scenarios for the alternative approaches were based on the TBL scenario of sustainability and include: (1) all criteria; (2) economic-related indicators (ECO); (3) environmental-related indicators (ENV); (4) social-related indicators (SOC); (5) economic- and environmental-related indicators; (6) economic- and social-related indicators; and (7) social- and environmental-related indicators. The specific scenarios based on criteria combinations occurred through the authors’ intentions to cover the full spectrum of the TBL scenario, in an attempt reveal valuable outcomes that reveal the sustainability integration level within the different departments. Covering all possible combinations, data can be extracted to reveal to what extent the departments’ staff utilize sustainable PM processes in their construction projects.

The assigned weights of the considered criteria were extracted from Stanitsas and Kirytopoulos [50] and are shown in Tables 2–4.

The average assessment of each indicator of the structured questionnaire that was sent to experts for evaluating the performance–effectiveness of each approach against each criterion, is shown in Tables 5–7.

The theoretical background of PROMETHEE as already described in Section 3.1, is necessary for comprehending the ranking of the alternatives and for the results based on the considered scenarios and criteria of the analysis [52].

**Table 2.** Weighting factors for ECO.

<b>Economic (ECO) Sustainability Indicators</b>	<b>Weights</b>
<b>Indicator</b>	
ECO1: Financial/economic performance	0.871
ECO2: Economic and political stability	0.820
ECO3: Stakeholder involvement/participation	0.847
ECO4: Innovation management/new product development	0.855
ECO6: Effective project control	0.856
ECO7: Best practice strategy	0.850
ECO8: Efficient allocation of resources	0.873
ECO13: Cost management plan	0.869
ECO14: Resource planning	0.846
ECO16: Effective strategic planning	0.828
ECO20: Ability to pay and affordability	0.848
ECO21: Environmental/economics accounting	0.865
ECO22: Developing an efficient risk management plan by the Project Management Team (PMT)	0.802
ECO23: Implementing an effective change management strategy	0.802
ECO24: Efficient data processing for decision-making practices	0.821

**Table 3.** Weighting factors for ENV.

<b>Environmental (ENV) Sustainability Indicators</b>	<b>Weights</b>
<b>Indicator</b>	
ENV1: Energy efficiency	0.880
ENV2: Available-fitting renewable energy resources/fossil fuels	0.855
ENV3: Eco-efficiency	0.885
ENV5: Sustainable use of natural resources	0.901
ENV6: Up to date environmental construction technologies and methods	0.872
ENV7: Environmental responsibility/justice	0.862
ENV8: Construction water quality impact	0.823
ENV9: Environmental impact assessment project report	0.875
ENV10: Environmental management systems/policy implications	0.854
ENV12: Climate change adaptation/disaster risk management	0.803
ENV13: Appropriate and flexible environmental design details and specifications	0.840
ENV14: Project biodiversity	0.815
ENV15: Environmental education and training	0.869
ENV17: Considering the life cycle of products and services to reduce environmental impacts	0.834
ENV18: Environmental management plan for impacts by the PMT	0.817

**Table 4.** Weighting factors for SOC.

Social/Management (SOC) Sustainability Indicators	Weights
Indicator	
SOC1: Social responsibility	0.812
SOC4: Labor practices	0.812
SOC6: Sustainable employment	0.828
SOC8: Human rights	0.843
SOC10: Public acceptance toward the project	0.823
SOC11: Stakeholder engagement/management	0.809
SOC18: Well-defined project scope and project limitations	0.848
SOC19: Holistic view of benefits	0.840
SOC23: Implementing a quality management system	0.807
SOC29: Adaptability in project environment	0.826
SOC37: Managing knowledge and awareness in promoting sustainable project delivery (PMT)	0.817

**Table 5.** Effectiveness per description criteria—ECO.

Criteria	ECO1	ECO2	ECO3	ECO4	ECO6	ECO7	ECO8	ECO13	ECO14	ECO16	ECO20	ECO21	ECO22	ECO23	ECO24
Average score	8	7	8	7	7	7	8	7	7	8	8	6	7	7	6

**Table 6.** Effectiveness per description criteria—ENV.

Criteria	ENV1	ENV2	ENV3	ENV5	ENV6	ENV7	ENV8	ENV9	ENV10	ENV12	ENV13	ENV14	ENV15	ENV17	ENV18
Average score	6	5	7	6	7	6	7	6	7	5	6	5	6	7	6

**Table 7.** Effectiveness per description criteria—SOC.

Criteria	SCO1	SOC4	SOC6	SOC8	SOC10	SOC11	SOC18	SOC19	SOC23	SOC29	SOC37
Average score	8	8	7	8	8	8	7	7	8	8	6

## 4.2. Computational Steps

### 4.2.1. Choosing the Alternatives

The choice of the alternatives derived through the consideration of the aim of the study. Given the fact that this aim involves the assessment of the integration of the sustainability philosophy in large-scale organizations via the utilization of sustainable PM-related indicators, the alternatives had to embrace the consideration of the TBL indicators. Thus, a combination of all the possible routes were derived (Section 4.1) and analyzed.

### 4.2.2. Criteria Weights and Effectiveness Per Description Criteria

This study utilized the Visual PROMETHEE Academic Edition program. The alternatives and the evaluation criteria were carefully chosen by the authors in an attempt to achieve the aim of the study. As previously mentioned, the assigned weights of the considered criteria were extracted by the research that Stanitsas and Kirytopoulos [50] conducted and analyzed through the SPSS program (Statistical Package for Social Sciences). The average score for each criterion (effectiveness/performance) occurred through the distributed questionnaires to experts, in which they had to rate their preferences using values from 1–9. Visual PROMETHEE software used all of these inputs for assessing which alternatives were considered best with respect to the aforementioned criteria per scenario.

Tables 5–7 present the mean values of the effectiveness per criterion as returned from the questionnaire.

## 5. Results and Discussion

The purpose of developing sustainable projects is to enhance environmental awareness and protection, to safeguard social welfare, and to create economic initiatives that will lead toward new attainments [53]. Under this notion, the main focus of this study leads toward evaluating organizational sustainability, which can help organizations target their efforts in certain aspects (enhancing sustainable outcomes) based on an MCDA-based method. The proposed model demonstrates that such an approach can provide useful insights for organizations regarding the use of sustainable PM indicators for projects that pursue sustainable outcomes. Developing and applying the proposed method can enable practitioners to analyze scenarios in a transparent way and to promote schemes that will improve the overall organizational sustainability. The proposed method presents prominent advantages and the most significant one is its simplicity.

The PROMETHEE method was used to assess the integration of the sustainability philosophy in large-scale organizations via the utilization of sustainable PM-related indicators. By comparing internal organizational structures, the researchers aimed to reveal the sustainability integration level within the different business units. Based on the input data as presented in the tables of Section 4.1, the internal organizational departments were evaluated using PROMETHEE (calculation and the analysis were then carried out using Excel spreadsheets). According to Urošević and Marinović [54], “PROMETHEE is based on the calculation of positive and negative flows for each alternative according to the weight of each criterion”. Positive outranking flow (Phi+) expressed the degree in which the alternative outranked other alternatives [55]. In the case study, that was used in this study to illustrate the proposed method, the positive outranking flow (Phi+) revealed the degree to which one department dominated over the others in terms of the use of the aforementioned sustainable PM indicators in its organizational processes and thus, the degree of utilization by the department’s staff. On the opposite side, negative outranking flow (Phi-) expressed the degree to which the alternative (each department in our case) is outranked by all other alternatives. In this study, it showed the degree to which the department was dominated by other departments, denoting a truncated integration/utilization of the sustainable PM-indicators to reach its sustainability goals, and simultaneously demonstrated an opportunity for further integration/utilization of the sustainable PM indicators to promote its sustainability goals. The net preference flow (Phi) is calculated by adding the positive (Phi+) and negative (Phi-) flows. To better understand the usefulness of the method, we needed to take into account that the alternative analyzed would have presented superior features if Phi had a higher value. Tables 8–14 showcase the Phi values (the results of Visual PROMETHEE software for the seven scenarios).

**Table 8.** Alternatives’ ranking—Scenario 1: All actions criteria.

Codes	Departments	Phi+	Phi-	Phi
A1	Infrastructure and Transportation—Associate Architect	0.578	0.1676	0.4104
A2	Urban Development—Project Architect	0.5133	0.2182	0.2951
A3	Urban Planning—Associate Director, International Urbanism Lead	0.4535	0.2891	0.1645
A4	Social Construction—Technical Director	0.3626	0.3604	0.0022
A5	Computer-enabled Design—Associate Director	0.208	0.276	−0.068
A6	Innovation, Research, IT—Digital Strategy Lead, Building Design Expert	0.0244	0.8285	−0.8041

**Table 9.** Alternatives' ranking—Scenario 2: Economic criteria.

Codes	Departments	Phi+	Phi-	Phi
A1	Infrastructure and Transportation—Associate Architect	0.6642	0.1742	0.49
A2	Urban Development—Project Architect	0.5902	0.1965	0.3938
A3	Urban Planning—Associate Director, International Urbanism Lead	0.4245	0.3488	0.0757
A5	Computer-enabled Design—Associate Director	0.3975	0.441	−0.0435
A4	Social Construction—Technical Director	0.3608	0.4386	−0.0778
A6	Innovation, Research, IT—Digital Strategy Lead, Building Design Expert	0.027	0.8652	−0.8381

**Table 10.** Alternatives' ranking—Scenario 3: Environmental criteria.

Codes	Departments	Phi+	Phi-	Phi
A3	Urban Planning—Associate Director, International Urbanism Lead	0.5075	0.2398	0.2677
A2	Urban Development—Project Architect	0.4645	0.2024	0.2621
A1	Infrastructure and Transportation—Associate Architect	0.4773	0.2282	0.2491
A4	Social Construction—Technical Director	0.3648	0.3562	0.0085
A5	Computer-enabled design—Associate Director	0	0	0
A6	Innovation, Research, IT—Digital Strategy Lead, Building Design Expert	0	0.7874	−0.7874

**Table 11.** Alternatives' ranking—Scenario 4: Social criteria.

Codes	Departments	Phi+	Phi-	Phi
A1	Infrastructure and Transportation—Associate Architect	0.5996	0.0729	0.5266
A2	Urban Development—Project Architect	0.4746	0.2708	0.2038
A3	Urban Planning—Associate Director, International Urbanism Lead	0.4179	0.2751	0.1428
A4	Social Construction—Technical Director	0.362	0.2571	0.1049
A5	Computer-enabled design—Associate Director	0.2369	0.435	−0.1981
A6	Innovation, Research, IT—Digital Strategy Lead, Building Design Expert	0.0552	0.8353	−0.78

**Table 12.** Alternatives' ranking—Scenario 5: Economic and Environmental criteria.

Codes	Departments	Phi+	Phi-	Phi
A1	Infrastructure and Transportation—Associate Architect	0.5703	0.2013	0.3689
A2	Urban Development—Project Architect	0.5271	0.1995	0.3276
A3	Urban Planning—Associate Director, International Urbanism Lead	0.4662	0.294	0.1722
A5	Computer-enabled design—Associate Director	0.1977	0.2194	−0.0216
A4	Social Construction—Technical Director	0.3628	0.3972	−0.0344
A6	Innovation, Research, IT—Digital Strategy Lead, Building Design Expert	0.0134	0.8261	−0.8127

**Table 13.** Alternatives' ranking—Scenario 6: Economic and Social criteria.

Codes	Departments	Phi+	Phi-	Phi
A1	Infrastructure and Transportation—Associate Architect	0.6372	0.1319	0.5053
A2	Urban Development—Project Architect	0.542	0.2275	0.3145
A3	Urban Planning—Associate Director, International Urbanism Lead	0.4218	0.3181	0.1037
A4	Social Construction—Technical Director	0.3613	0.3629	−0.0016
A5	Computer-enabled Design—Associate Director	0.3305	0.4385	−0.108
A6	Innovation, Research, IT—Digital Strategy Lead, Building Design Expert	0.0388	0.8527	−0.8139

**Table 14.** Alternatives' ranking—Scenario 7: Environmental and Social criteria.

Codes	Departments	Phi+	Phi-	Phi
A1	Infrastructure and Transportation—Associate Architect	0.528	0.1638	0.3643
A2	Urban Development—Project architect	0.4687	0.2308	0.2379
A3	Urban Planning—Associate Director, International Urbanism Lead	0.4703	0.2544	0.2159
A4	Social Construction—Technical Director	0.3636	0.3151	0.0485
A5	Computer-enabled Design—Associate Director	0.0983	0.1805	−0.0822
A6	Innovation, Research, IT—Digital Strategy Lead, Building Design Expert	0.0229	0.8073	−0.7844

Scenario 1 (Table 8) includes all the TBL criteria comprising all sustainable PM indicators; economic, environmental and social. Infrastructure and Transportation department exhibits the highest score. As an inference, the analyzed sustainable PM indicators were highly integrated into the internal organizational processes of this department in its way of attaining its sustainability goals. It seemed that the department's staff utilized these indicators in their everyday tasks, considering them contributing. Infrastructure and Transportation projects often involve significant land exploitation (natural resources), long-term investment plans, and social acceptance [56]. These elements constituted some examples of TBL inquiries that needed careful consideration by the departments' staff. Therefore, the involvement of such departments toward SD efforts was intensive and challenging.

Scenario 2 (Table 9) includes the economic criteria, comprising of just the ECO-related indicators. Once again, the Infrastructure and Transportation department exhibits the highest score, followed by the Urban Development and Urban Planning departments. Considering the development of modern cities which is necessary to secure employment, financial resources and a trustworthy economic pattern, it is vital that the departments that pursued SD in cities considered the economic-related indicators in their processes. Practitioners pursued projects that made sustainable economic development possible [57].

Scenario 3 (Table 10) includes the environmental criteria comprising just the ENV-related indicators. Following the results of this scenario, the Urban Planning department came first, followed by the Urban Development department. It seemed that the current environmental complications had turned into a worldwide concern, directing organizations toward the development of eco-friendly urban projects [58]. It is vital for the department's staff to study environmental-related indicators that will direct them toward improving the overall sustainability of their projects.

Scenario 4 (Table 11) includes the social criteria comprising of just the SOC-related indicators. While in this scenario it was expected that the Social Construction Department be the first one on the list, it seemed that the Infrastructure and Transportation Department, once again, scored higher than the other departments. It seemed that the staff of the Social Construction department did not consider the aforementioned indicators in their processes as much as the departments that scored higher. This occurrence can be interpreted in two possible ways. The first interpretation is that the staff of this department relied on other

social-related indicators that possibly contributed much more towards social sustainability incentives. The second one is that the department overlooked the importance of the social attributes as a way to achieve sustainability in their projects. Thus, it can be considered as a method of improvement, to increase the overall organizational sustainability.

Scenario 5 (Table 12) includes the combination of economic (ECO) and environmental (ENV) criteria. Infrastructure and Transportation and urban-related Development are dominant in these data. Recent years have seen significant efforts in ameliorating the economic and environmental aspects of sustainability in projects. Practitioners tended to perceive these pillars as the most vital to delivering extensive welfare. Social sustainability was the most neglected component of sustainability [59,60]. Developing the economic and environmental components of sustainability (SD) occurred as an outcome of population explosions in large cities, where ecological footprints were radically augmented, combined with damage to resources. This called for urgent actions from practitioners.

Scenario 6 (Table 13—economic (ECO) and social (SOC) criteria) and Scenario 7 (Table 14—environmental (ENV) and social (SOC) criteria) present the identical view as Scenario 5; Infrastructure and Transportation and urban-related Development Departments lead the way to sustainability. Their considerations in all TBL-related indicators constituted them as the largest contributors toward overall organizational sustainability development (SD).

The complete classification enabled by the PROMETHEE method revealed that the Rail/Transportation/Infrastructure Department is designated as the one with the highest integration of defined sustainable PM indicators in its processes, with regard to introducing sustainability in projects. Taking into consideration all results, the Research and Innovation department had the lowest score in all seven scenarios always presenting a negative net flow. The main scope of this department lied in the development of information technology (IT) applications that simplified the internal activities of all the other departments. Thus, it had less opportunities to implement sustainability tactics in its internal daily operations, as delivering sustainable IT projects might have required additional resources. However, it is worth noting that the highest Phi score was observed in the scenario of the social-related criteria. It can be assumed that the staff of this department defined and implemented corporate social responsibility business strategies and operations as a large-scale organization. Following the results of the scenarios for the building information model (BIM) department, it is revealed that zero values were taken as inputs. The Associate Director who responded to the distributed questionnaire, informed the authors about his/her unfamiliarity with the environmental-related indicators and the internal organizational tactics taken by the environmental-related department's staff. As a result, the respondent preferred not to answer this part of the questionnaire. Thus, as expected due to lack of values, this department was among the lowest ranked.

## 6. Conclusions

In the present study, the aim was to propose an MCDA-based method, namely PROMETHEE, to assess the integration of the sustainability philosophy in large-scale organizations via the utilization of sustainable PM-related indicators. By using the Visual PROMETHEE software, the alternatives (departments of the organization) were ranked with respect to the aforementioned TBL criteria. According to Zafirakou, Themeli [51], even for a relatively small data sample, as in our case, *“the PROMETHEE method is capable of completing the analysis and provide reliable results.”* The basic input data for the analysis were the weights of the criteria, which had been extracted by previous research, and the results of the questionnaire survey that was distributed to experts of a large-scale organization. The theoretical background of the PROMETHEE method was briefly described, as it was essential for understanding the ranking of the departments. The dominance of the Rail/Transportation/Infrastructure Department alternative is evident, constituting the use of the predefined sustainable PM indicators by the department's staff as a requisite for attaining sustainable projects. Evaluating organizational sustainability can help organiza-

tions target their efforts in certain aspects (enhancing sustainable outcomes). Such aspects were also considered by the departments that scored lower values in the analysis, meaning that there is room for development in their internal organizational sustainability policies. By enhancing their sustainability attributes, overall organizational sustainability is certainly heightened. Sustainable PM indicators that embrace the TBL spectrum can help toward this direction while determining key facets of sustainability which allow organizations to make decisions about the best ways to become more sustainable. The results can also help with data collection, analysis, and future projections.

Following the results of the research from the MCDA, it is concluded that the proposed method can be used as a decision-support tool in dealing with organizational sustainability assessment. The PROMETHEE method constitutes a useful basic and simple tool to conduct an unbiased evaluation of the departments who turned their focuses into a specific group of indicators (e.g., the Urban Planning and Design Department favored environmental-related indicators) through a high level of transparency in decision-making processes related to the integration of sustainable PM indicators in a manner that will allow organizations to make decisions toward sustainable practices.

All scenarios analyzed included all possible TBL criteria combinations comprising of all the sustainable PM indicators; namely economic, environmental and social. The Infrastructure and Transportation Department showcased its dominance in implementing sustainable PM indicators in its internal organizational practices to attain its sustainability goals. It seems that the department's staff utilized these indicators in their everyday tasks, constituting them as similar to their own qualities. The rest of the departments also involved significant TBL attributes in their projects that required careful consideration by the departments' staff. Urban development-related departments also revealed high scores, disclosing noteworthy efforts in ameliorating the sustainability of urban projects, an important element for modern cities.

A typical limitation of the case studies was that their outcomes could not be generalized unless repeated to numerous cases. However, in our case the use of the case study was not to reach general conclusions about the level of integration of sustainability aspects in organizations, but to illustrate how the proposed method could be implemented in order to help organizations identify opportunities for enhancing the sustainability processes among their departments.

Future research may focus on analyzing more large-scale organizations so that a greater sample will lead to more robust results. Another line of inquiry for future research could be the increase in sustainable PM indicators, which could be concluded through interviews with practitioners. Moreover, additional qualitative research and the analysis of additional scenarios is needed to evaluate the effectiveness of the internal organizational structures in delivering sustainable projects. Finally, while the PROMETHEE method developed in this paper provides an assessment of the alternatives, the combined use of additional ranking methods is also another possible inquiry for future research.

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