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A Comprehensive Model for Evaluation and Selection of Construction Projects

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Abstract

In today's era, many project-oriented organizations, driven by the necessity of establishing meaningful connections between strategies, plans, and projects, and aiming to maximize the productivity of their plans and projects, have shifted their approach from project-centric to portfolio management. In this study, the criteria influencing the selection of an optimal portfolio of construction projects were examined using a qualitative method. Based on library and documentary studies and related standards, several indicators were identified, and their impact was assessed through grounded theory methodology using three-stage coding. Data were collected through questionnaires and interviews with a selected statistical population of experts and managers in technical and construction fields, as well as contractors and project implementers. The priority and impact of various elements were analyzed. Ultimately, multiple indicators were extracted. The results revealed that the twelve main criteria influencing the optimal selection of construction projects are: 1) Quality, 2) Timeliness, 3) Resilience, 4) Efficiency and Effectiveness, 5) Accountability, 6) Purposefulness, 7) Achievability of Goals, 8) Budget, 9) Scheduling, 10) Access to Material Supply, 11) Detailed Documentation, and 12) Parallel Performance. In the final step, the Kappa index was used to evaluate the agreement between the coding performed by the researcher and the experts. In this study, the extracted codes reached theoretical saturation after fourteen interviews. Finally, considering the qualitative and practical nature of the research, and leveraging the researcher's scientific understanding and extensive practical experience in both technical and managerial aspects of project-oriented organizations, as well as the extracted indicators, a conceptual model was proposed for the optimal design and management of construction project portfolios in project-oriented organizations in the country.

Keywords: Management, Optimal Management, Portfolio Management, Urban Projects, Construction Projects.

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Problem Statement

Projects are tools for organizational change. Today, the number and activities of project-oriented organizations and companies have increased, although in most cases, they have not achieved their desired goals and have a short maturity period. Decision-making in project selection, determining the best set of projects, or in other words, the optimal project portfolio aligned with the organization's vision and objectives, is one of the most critical and challenging issues for managers. In this research, portfolio management indicators are examined and analyzed from the perspective of project-oriented organizations for resource management, planning, and execution of construction projects. Organizations, within the framework of the country's economic, social, and legal planning system, prepare development plans and then transform them into operational projects within the administrative and executive system, bringing them to the implementation stage. Furthermore, given the strategic approach of most development plans and five-year programs at national and regional levels, and their project-oriented nature, the need to establish project management principles in the existing management process is evident. This ensures the simultaneous operationalization of efficiency (doing the project right) and effectiveness (doing the right project) through the definition of an integrated construction project management system.

Project-oriented organizations need to invest in projects to ensure profitability and progress. However, they often face multiple projects and, given resource, budget, and scheduling constraints, must select projects that best meet organizational goals. Incorrect project selection has two negative consequences: on the one hand, resources are wasted on unsuitable projects, and on the other hand, the organization achieves less profit or satisfaction. Therefore, the first step for project-oriented organizations in strategic and goal-oriented portfolio management is the correct selection of projects. In the next stage, to implement strategies, projects must be properly scheduled and resources allocated. Given the constraints of organizations, especially budget limitations, one of the most critical issues for these organizations is the arrangement of project portfolio management (PPM).

Theoretical Framework

Project portfolio management is an approach derived from project management knowledge. In this system, the focus is on managing a combination of projects that can be realized by considering various organizational resources and constraints. Selecting appropriate and prioritized projects that, despite financial, human, and time constraints, lead the organization to its goals with better speed and quality is one of the fundamental principles of this system.

Project portfolio management seeks to answer questions such as: "Which project should we accept?" and "Which project should we reject?" It aims to balance the organization's strategic and tactical necessities. Therefore, project portfolio management can be defined as "achieving the best level of performance with limited resources."

In general, the processes required to define a project portfolio include the following steps:

- **Identifying and Classifying Projects:** In this step, projects are fully identified and categorized. This includes proposed projects as well as ongoing or incomplete projects, where the project breakdown structure is determined.
- **Comprehensive Evaluation of Projects:** At this stage, projects, whether new or ongoing, are individually evaluated based on their characteristics and applications. If evaluations have already been conducted, the information is analyzed, and any overlooked aspects are reviewed. Various evaluation methods are applied depending on the type of project and organizational characteristics.

- **Project Selection:** In this step, among the proposed projects, those that meet the organization's selection criteria are chosen for comparison and prioritization with ongoing or incomplete projects.
- **Project Prioritization:** At this stage, projects are ranked based on the organization's prioritization criteria among new and ongoing projects to identify potential projects that the organization intends to undertake or continue.
- **Balancing the Project Portfolio:** This step is typically carried out in organizations with high project maturity. Decision-makers review the results of the selection and prioritization stages to determine whether the defined portfolios align with the organization's objectives. This step helps the organization select and implement an optimal portfolio that delivers the best results.

These processes enable organizations to manage projects effectively and allocate resources in the best possible way.

In this regard, various models have been proposed for project portfolio selection, which are generally divided into two categories:

- **Traditional Models:** These include linear programming models, scoring models, ranking, and checklists, which primarily focus on financial criteria.
- **Modern Models:** These models pay more attention to the diverse characteristics of projects and aim to make better decisions in project portfolio selection.

Ultimately, the goal of these models is to select projects in a way that leads to increased productivity.

Research Methodology

In this mixed-method research, using the grounded theory approach from qualitative studies, a comprehensive model for managing the portfolio of construction projects is examined. Unlike hypothesis-testing methods, this approach helps generate hypotheses. In this regard, semi-structured interview questions are designed, and data are analyzed. The stages of data coding are systematically conducted, including open, axial, and selective coding, to identify, strengthen, and integrate the main concepts.

Data analysis in this study is carried out in multiple stages to establish analyses and various connections between the data. This process includes refining concepts and using various methods, ultimately leading to the development of theories and improving our understanding of the studied phenomena. The designed research, based on multi-grounded theory methods, collects data from reliable sources and conducts precise analyses to analyze and explain the management of construction project portfolios, contributing to a deeper understanding of this subject. This approach aims to provide a comprehensive analysis to develop and improve decision-making processes in the field of construction projects, thereby enhancing the quality of these projects.

The third step involves meta-synthesis, analysis, and integration of qualitative findings. In this stage, the extracted codes are categorized into themes based on their similarities. Analysis is conducted using affinity diagrams, and the codes are assigned to subcategories based on the researcher's understanding. This process continues until all codes are assigned to related categories. Finally, the categories are identified and analyzed.

Discussion and Conclusion

This article examines and presents a comprehensive model for evaluating and selecting construction projects, with the primary goal of improving decision-making processes in managing the portfolio of these projects. The development of this model emphasizes flexibility, multidimensionality, and

the use of multi-criteria decision-making methods to effectively address real challenges in evaluating and correctly selecting projects.

- **Diversity of Dimensions and Criteria:** In construction projects, technical, financial, environmental, social, and economic criteria are of high importance. This diversity of criteria requires a systematic method for evaluation that encompasses all aspects. The use of Q-sort and TOPSIS methods in this model demonstrates a balanced and comprehensive approach that considers each of these dimensions.
- **Use of Multi-Criteria Decision-Making Methods:** The TOPSIS method, due to its capability in multi-criteria analysis and strong theoretical foundations, forms one of the main strengths of this model. This method allows decision-makers to make decisions based on the distance from positive and negative ideals, preventing bias toward specific criteria.
- **Alignment with Strategic Objectives:** One of the key steps in the proposed model is ensuring the alignment of projects with organizational strategic objectives. This ensures that all selected projects are not only individually optimal but also contribute to achieving the organization's overarching goals.
- **Flexibility:** The proposed model is designed to adapt to environmental and organizational changes. The ability to adjust the weighting of criteria and indicators according to changes in the operational environment is one of the standout features of this model, increasing its efficiency and acceptance in practice.