

# A Review on Incorporating ESG Metrics in Contractor Selection for Infrastructure Projects: A Micmac Perspective

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*Abstract- For Engineering, Procurement, and Construction (EPC) and Design-Build (DB) projects, choosing the right contractors is essential to the project's success. To make sure the best contractor is picked for the task, important contractor selection factors should be considered. The contractor's technical proficiency, expertise, financial stability, safety record, and overall reputation within the industry may be among these criteria. Budgetary restrictions and the project's complexity should both be taken into account. The selection procedure must be methodical, open, and equitable, and it must include a review of the contractor's credentials in light of the project's specifications. The correct contractor must be chosen in order for an EPC or DB project to be completed successfully, hence careful consideration must be given to each candidate before deciding. The paper examines the crucial variables impacting contractor selection in construction projects in India, and creates a model based on the interaction between these factors using interpretative structural modelling. Additionally, MICMAC analysis is utilized to distinguish between "driving factors" and "dependent factors." The goal is to understand the factors affecting contractor selection in construction projects in India. Through a review of the literature and expert opinion, ten elements are selected as the most important determinants influencing contractor selection. With the assistance of five specialists, an ISM model is created (two from academics and three from industry). According to ISM studies, contractors' financial stability, Performance on works (Quality), Current projects in hand and Lowest Bidder are the top most criteria which should consider while selecting contractor for DB/EPC projects. Joint Venture/single point of responsibility is listed at the bottom level, suggesting that it influences but is not affected by other factors.*

*The middle-level factors are transitional because they both influence and are affected by other factors.*

*Indexed Terms- Contractor Selection, Design-Build Projects, Engineering Procurement Construction (EPC), Project Delivery Methods, Sustainable Construction*

## I. INTRODUCTION

### 1.1 Need for Study

The contractor selection process is a critical aspect of Engineering, Procurement and Construction (EPC) and Design-Build (DB) projects. It is important to choose a competent and reliable contractor who can deliver the project within budget, time, and scope constraints, and with high quality standards. The contractor selection process affects the project outcomes and can have a significant impact on project success or failure.

The contractor selection criteria differ depending on the project size, kind, and complexity, as well as the aims and expectations of the stakeholders. The criteria also change over time as the industry evolves and new technologies and practices are introduced. A comprehensive and systematic evaluation of the contractors' capabilities, experience, and performance is crucial to ensure the best value for the project.

A study on the contractor selection criteria for EPC and DB projects is necessary to understand the current practices and challenges in the industry, identify best practices, and provide recommendations for improvement. The study can also help project managers, owners, and stakeholders to make informed decisions and ensure that the contractors selected for

the projects meet their expectations and requirements. Additionally, the study can provide insights into the factors that influence the contractor selection process, the trade-offs involved, and the risks associated with the process.

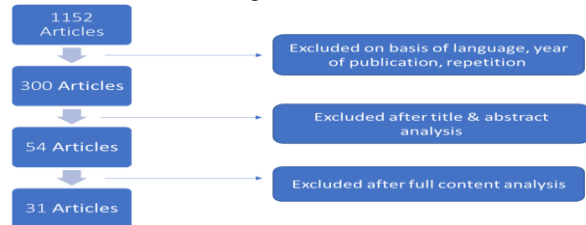
1.2 Research problems & questions

Contracts have progressed from item rate packages to lump-sum, fixed-price, time-bound agreements. The responsibility of project management has gradually transferred from the owner/developer to the contractor. There is a clear movement from owner-managed projects to EPC Contracts, and the risk of schedule and expense overruns, as well as the obligation of designing and procuring materials and construction, has been handed to the contractor. Selecting a contractor becomes crucial in this situation. If a proper or appropriate proposal is chosen, the results may be improved. This challenge can be solved by using several factors to improve selection criteria.

1.3 Research Objectives

- To identify selection criteria for EPC and DB projects from literature review.
- To study and analyses of ISM Model
- To apply MICMAC Method for the Selection Criteria

1.4 Literature screening



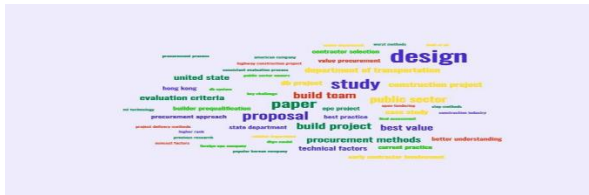
The literature from the Scopus and WOS databases was shortlisted based on the criteria, and the final 31 publications were evaluated in the literature review. During the literature review, Word clouds for keywords were made for those words which are frequently used in literature also with help of those keywords and their co-occurrence with other keywords connections diagram was created. Authors' and their connection with other authors show their

relation and location so that it become easy to find out the recent research trends in EPC/DB projects.



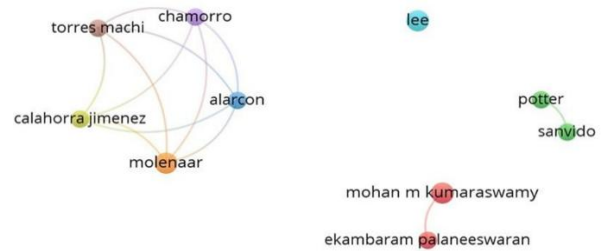
(Source: Compiled by authors)

Figure 2: Word cloud of author keywords



(Source: Compiled by authors)

Figure 3: Word cloud of 50 most frequent words in the literature



(Source: Compiled by authors)

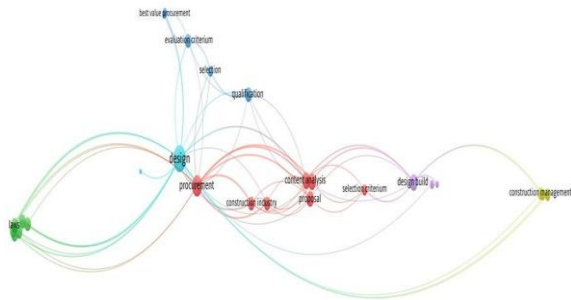
Figure 4: Network of prominent authors and connections among them



(Source: Compiled by authors)

Figure 5: Network Co-Authorship connections across countries

The network of authors who have published minimum 2 nos. of documents. However, the min. no of citations is taken as zero. In the network, it is Apparent that there are only 10 authors who satisfy the criteria and share negligible connection. The network diagram shows four independent clusters in different colors with no inter-cluster connections, which indicates that the most of the authors who share connections probably belong to same country and in most cases to the same organization.



(Source: Compiled by authors)  
 Figure 6: Network of all keywords: author & index keywords

In the field of construction contractor evaluation, there has been a significant amount of research conducted on the multi-criterion feature selection technique. Most of these studies were focused on the traditional Design-Bid (DB) project delivery method, where the design is already finalized, and contractors are bidding on a completed design. However, in the Design- Build (DB) method, the bidding process takes place at an earlier stage and the assessment of Design-Build teams is based on their capability to execute the project. Although the nature of the project may differ,

the selection criteria for contractors in Design-Build projects could be similar to those used in DB projects.

When it comes to choosing a Design-Build team for government works projects, it's important to take into account quality, price, and cost during the selection process. The client firm's requirements dictate the various selection criteria for a particular project, and researchers have identified the most common success criteria. Gransberg and Senadheera (1999) identified three common approaches for awarding DB contracts in infrastructure projects: the Adjusted Score Design-Build, the Low-Bid Design-Build, and the Best-Value DB. El Wardani et al. (2006) categorised the procurement approaches for DB projects and compared them to help determine which one to use during the DB team selection process. They also documented the use of the best-value selection approach for Design-Build projects.

Palaneeswaran et al. (2003) developed a framework for selecting the best-value contractor and described the DB selection approach for a bridge. This framework can serve as an example of the selection techniques that are currently being used, emphasizing the legal issues associated with procurement processes that consider various technical factors, not just the lowest bid.

## II. RESULTS

A systematic literature review revealed that there are some critical factors to consider when selecting contractors.

Table:- List of selection factors for DB projects

Technical Factors	Financial Factors	Others
Shorten the duration	Reduce cost	Single point responsibility
Constructability/Innovation	Financial Stability	Reduce claims
Large project size/complexity	Firm Capacity	Home Office Location
Construction Experience	Bonding Capacity	Intangibles/Interview/Reference
Current Workload	Budget Compliance	Licensure and Professional Registrations
Site And Architectural Design	Financial Information Directed Project	Insurance Requirements

Work Plan & Schedule	Return of Savings	Key Staff
Quick delivery of construction processes	-	Willingness to Sign Contract Agreement
Schedule Compliance	-	Company History
Flexibility of design changes	-	Legal Issues
Design/Build Experience	-	Team Organization
Project Experience	-	Apprenticeship Training
Safety Record	-	Location
Local/DBE Usage	-	Experience with Local Conditions and Regulatory Officials
Mechanical, Plumbing & Electrical Systems	-	Less conflict between project team
Quick project commencement	-	Effective communication between project parties
Team Qualifications	-	Transfer risks to contractor

### CONCLUSION

This study reviewed the growing significance of Environmental, Social, and Governance (ESG) metrics in the contractor selection process for infrastructure projects, particularly within Design-Build (DB) and EPC frameworks. As sustainability, social responsibility, and ethical governance continue to shape the future of construction, the inclusion of ESG criteria is no longer optional but a strategic necessity.

Through the lens of MICMAC analysis, this review highlights how ESG-related factors differ in terms of their influence and dependence on each other. The analysis classifies these criteria into driving, linkage, dependent, and autonomous categories—providing deeper insights into which ESG factors should be prioritized in decision-making frameworks. For instance, indicators like HSE performance, carbon management, and transparency in reporting often emerge as driving variables, exerting substantial influence over other sustainability metrics.

The study reinforces the value of applying system-

based decision tools like MICMAC to better structure ESG integration into contractor evaluation processes. By doing so, project owners and stakeholders can make more informed, transparent, and future-ready procurement decisions.

Future research should explore the integration of MICMAC with other MCDM tools such as ISM, AHP, or DEMATEL for a more comprehensive modeling approach, as well as applying the framework in real-world case studies or public-private procurement systems.

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