

Critical Success Factors and Strategies for Sub-contractor Management in Infrastructure Projects

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Abstract - With complexities involved in construction projects continuously on a rise, the role of subcontractors has become crucial for the successful execution of these projects. This paper tries to examine the current subcontractor management system adopted by general contractors. A case study approach was adopted for the same and 3 projects based upon contract value are selected. In the second phase, through literature review and expert opinions, critical factors affecting the performance of subcontractors were identified and ranked based on their relative importance. Lastly, interviews with experts working as industry leaders were conducted to understand the various strategies which can be adopted to improve the performance of subcontractors in a project.

Key Words: Vendor Management, Supply Chain Management, Construction Management, Sub-contractor Management.

1. INTRODUCTION

Each construction project possesses a unique characteristic in terms of engineering and construction. To deal with the arising complexities of projects, general contractors must either develop in-house expertise for each construction activity or sub-let the work to a sub-contractor. The option of sub-contracting generally emerges to be more profitable and sustainable in the market. While the general contractor is responsible for the overall success or failure, sub-contractors are deployed to perform specific tasks under the supervision of the general contractor without any obligation to the client. In countries like Hong Kong, United Kingdom researchers have arrived at a consensus that sub-contracting of activities in a project helps the general contractors to reduce the cost and resources required [1]. However, sub-contracting, in certain cases has also proved to be fatal in the success of a project. According to [2], poor subcontractor performance is a major reason for delays and poor quality of work in construction projects. In Malaysia and UAE, poor subcontracting is found to be among the top five reasons contributing to project delays [3]. With global spending in the construction sector projected to reach \$17.5 Trillion by 2030, it becomes important for the general contractors to maximize the performance of sub-contractors in a project. In order to achieve the same general contractors, need to focus on factors or uncertainties that might impact the

performance of a sub-contractor. Along this line, the objective of this study is to:-

- To understand the sub-contractor management system adopted by general contractors in construction projects.
- Identify the critical factors affecting performance of sub-contractors in construction projects.
- To statically analyse the identified factors and rank the factors based upon their impact on sub-contractor performance.
- To identify the strategies which can be adopted in the industry to counter the challenges encountered in management of sub-contractors.

2. RESEARCH METHODOLOGY

A mixed research methodology was adopted to conduct the study. The study was conducted in four phases. Firstly, a literature review was conducted to identify the factor's affecting performance of sub-contractors in construction projects. In the second phase, a qualitative research technique was adopted to understand the applicability of identified factors. In this direction, five infrastructure projects were shortlisted. The criteria for selection of projects are mentioned below:-

- The Project has major amount of work being carried out by sub-contractor

Value of the project is greater than 500 Cr. In the third phase of the study, interviews were conducted with the relevant professionals from the projects. The objective of these interviews was to understand the sub-contractor management system adopted by the stakeholders and applicability of the identified factors in context of Indian construction industry. (Patton, 2002) suggested that sample size in qualitative research should be determined by the concept of saturation and can be limited to between five to fifty interviews depending upon the interview content. In the present study to avoid biased results from the interviews representatives from the side of General contractor, Sub-contractor and Client were interviewed. Saturation was observed in the Tenth interview, further one more interview was carried out. 4 General contractors, 4 Subcontractors, and 3 clients were interviewed. The

selection was made based on position in the organization and experience of the individual in project management. The interviews were carried out personally and the duration of each interview varied from 45 minutes to 1 hour.

Further to quantitatively assess the identified factors, a questionnaire approach was adopted. The questionnaire designed for this study had 2 sections. 1st section included questions related to demographic information of the respondent. The 2nd section of the questionnaire included questions related to identified factors affecting performance of subcontractors in a project. The experts were asked to rate the impact of a factor on the performance of sub-contractor on a scale of 1-5. The scale was defined as follows:

Table-1: Definition of rating scale adopted in the study

Rating	Meaning
1: Very Low	The given factor has a negligible impact on performance of the sub- contractor in the project.
2: Low	The given factor has a slightly significant impact on performance of the sub-contractor in the project.
3: Moderate	The given factor has a significant impact on performance of the sub-contractor in the project.
4: High	The given factor has a remarkable impact on performance of the sub-contractor in the project.
5: Very High	The given factor has a consequential impact on performance of the sub-contractor in the project.

In total 150 questionnaires were floated, and 88 responses were received from industry professionals.

Demographic information about respondents is summarized below: -

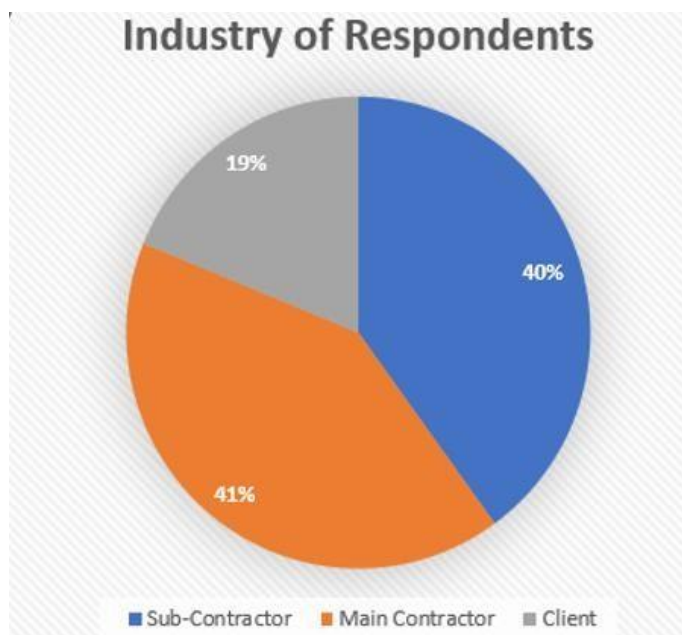
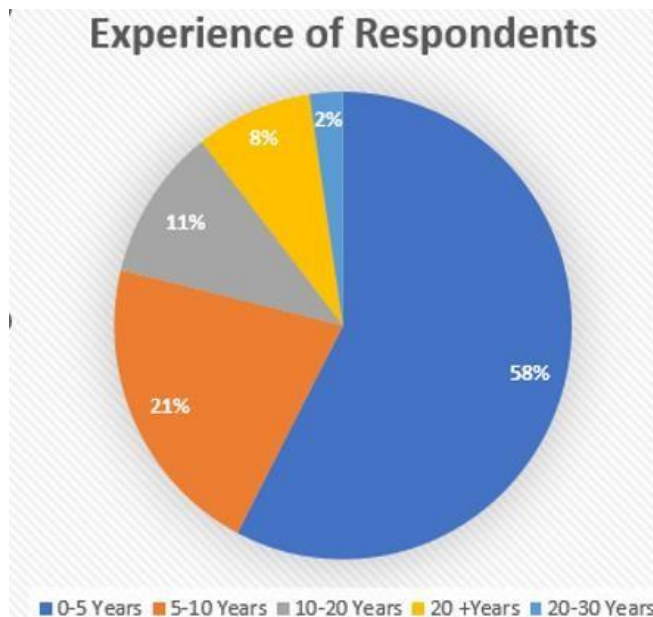


Figure-1: Demographic information about respondents

The data collected was analyzed in MS Excel and Python. The RII (Relative Importance index) method was used to rank the factors affecting the subcontractor's performance. The relationship for computing RII is depicted below:-

$$\sum W / (A * N)$$

$\sum W$ = The weighting given to each factor by the respondent.

A= The highest weight N= Sample Number

contractors. Experts involved in the study stressed the fact that ambiguity of contractual clauses often leads to disputes among the stakeholders, ultimately delaying the progress of the project. To address this issue, various experts agreed that standard contract documents must be established by the general contractors with the contract document containing two parts, one including the general conditions and part two including the special site-specific conditions of the work. Further, with the complexity of projects on a rise, various researchers in past have suggested that clauses related to amendment of orders and management of claims in a project must be formulated in consultation with legal experts in a project.

7. STRATEGIES TO BE INCORPORATED IN TRADITIONAL SUB-CONTRACTOR MANAGEMENT FRAMEWORK:-

In order to identify strategies for factors identified in the study, interviews with industry leaders and consultants were conducted. These led to the identification of following strategies for improving sub-contractors' performance in the life cycle of a project.

1. Region-wise vendor redeployment, vendor consolidation: -

The strategy of region-wise vendor redeployment and vendor consolidation has been successfully adopted by general contractors in the procurement of raw materials. **Vendor consolidation** refers to a process in which all the vendors offering a particular material/ equipment in the given region are shortlisted. **Vendor Redeployment** refers to deploying the same vendor for the supply of a particular material/service at multiple sites. The general contractors should shortlist some good-performing sub-contractors based upon a set of pre-qualification criteria. Once the Sub-contractor has satisfied the Pre-qualification criteria, when a requirement for service is identified, the general contractor shall directly approach these sub-contractors for the services instead of searching the market again. The review of case studies revealed a high rate of vendor redeployment in case of purchase items but in the case of sub-contracting, the rate of vendor redeployment was very low. Discussion with the experts from the general contractor side revealed that redeploying a

particular sub-contractor for similar work at another project is attributed to his, willingness and capacity to execute the work.

2. Negotiation of Payment terms: -

During the finalization of contract, both the parties must understand the short-term and long terms implication of delayed payments on the project. To minimize the payment risk, the sub-contractors and general contractors must ensure that the payment terms agreed in the contract are adhered to strictly. In order to lure the general contractors for timely release of payments, dynamic discounts on net payable must be included in the payment terms. The prices of the contracts must be negotiated based on concepts such as Day sales outstanding. If the day sales outstanding is higher than initially agreed by both the parties, the total value of the contract must also increase proportionately and vice versa must also be applicable. Also, in order to improve the cash position in contracts various options like mobilization payment, and lower retained percentages can be beneficial in improving project finances and maximizing the final cash balance.

3. Inclusion of performance-based incentives in the contracts: -

Most of the experts agreed that to motivate the sub-contractors, performance-based incentive clauses must be introduced in the contract documents. These incentives can be in form of monetary incentives like Cost plus incentive fees, share-in-savings- incentive, and non-monetary such as an automatic extension of contracts in case of services. The strategy of monetary incentives was utilized in one project selected as a case study and yielded successful results. The sub-contractor completed the given scope of work one week ahead of the scheduled date of completion. To utilize such arrangements effectively more research needs to be carried out in terms of understanding the type of incentive to be used and the extent to which these incentives must be passed on along the supply chain.

8. CONCLUSION

The main objective of the study was to understand the traditional sub-contractor management strategy which is currently being adopted for execution of projects and various challenges encountered. It can be concluded that there is a wide spread of sub-contracting in construction industry. But the sub-contractor management strategies being utilized by various stakeholders are not being able to deliver the expected result. The sub-contractor selection process is not regulated through any statutory body. Lack of standardization in contractual terms and conditions has led to exploitation of sub-contractors in various cases. The pace at which sub-contractors execute the works has not been able to match the requirements of clients and general contractors. Cash flow management has also emerged as one

the critical issue in traditional sub-contractor management setup. To overcome all these issues various strategies which must be integrated with traditional sub-contractor management framework were identified and discussed in detail with experts. The utilization of these strategies can prove to be effective in improving the overall relationship between the stakeholders and enhancing the performance of subcontractors.

REFERENCES

1. Arditi, 2005. Issues in sub-contracting practice. Journal of construction engineering and management
2. Choudhry¹, R. M., Jimmie W. Hinze, M., Arshad³, M. & Gabriel⁴, a. H. F., 2012. Sub- contracting practices in construction industry of Pakistan. Journal of Construction Engineering and Management.
3. Abisugab, 2016. "Effect of path-goal leadership styles on the commitment of employees on construction projects". International Journal of Construction Management.
4. El-Kholy, A. M., 2019. A new technique for subcontractor selection by adopting choosing by advantages. International Journal of Construction Management
5. Hailu, H. A., 2017. Determinants of Subcontracting Performance in road Construction projects.. International Journal of Scientific Engineering and Research (IJSER).
6. Ashraf M. Elazouni and Fikry G. Metwally. (2000). Decision Support System for Subcontracting Construction Works. Journal of Construction Engineering and Management, 191-200.
7. Li, Weifang. (2018). The Study on Sub- contract Management in EPC Engineering.
8. LIM, P. X. Z. a. B. T., 2014. An Empirical Study In Subcontractor Selection and Long -Term Alliance Relationship Between Main -Contractor And Subcontractor. International Journal of Construction Management.
9. H. Randolph Thomas, Flynn, Christopher J. (2011). Fundamentals of Sub Contractor management. ASCE.
10. Liu, Jun Ying, Yang, Pengfei, Xia, Bo, Skitmore, Martin . (2017). Effect of perceived justice on subcontractor willingness to cooperate: The mediating role of relationship value. ASCE.
11. Loosemore Martina, Lim Benson. (2021). Relationship quality in construction projects: A subcontractor perspective of principle contractor relationship. International Journal of Project Management.
12. Temitope Seun Omotayo, Oskar Danvers- Watson, Adekunle Sabitu Oyegoke . (2022). Subcontractor trust issues on payment and valuation practices in UK private projects. Journal of Financial Management of Property and Construction.
13. Marshamll, 2000. Partnering in construction: a critical review of issues, problems and dilemmas,. Construction Management and Economics.
14. Assbeihat, J. M., 2019. Reasons behind Sub- contractor failure in construction projects.. International Journal of Civil Engineering and Technology (IJCIET).
15. Creed S. J. Eom, P., Seok H. Yun, P. & Joon H. Paek, P., 2008. Subcontractor Evaluation and Management Framework for Strategic Partnering. Journal of Construction Engineering and Management
16. Dimitrios Robert I Stamatou, K. A. K. S. T. P. S. G. & I. T., 2019. A process reference model for claims management in construction supply chains: the contractors' perspective. International Journal of Construction Management.
17. Jammal, M., 2018. Reasons behind sub- contractor default in construction projects.. International journal of civil engineering and management.
18. Jianga, 2014. Negotiating Construction Contracts through Practical Cash Flow Planning and Analysis Model. International Journal of Construction Management.
19. Will Hughes, Incentives in construction contracts.. CIB world congress 2007.

