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Relative Importance Index (RII) for Effective Evaluation of Construction Subcontracting Practices

Ms. Neha Dube[1], Prof. R. R. Wankhade[2] andProf. S. Sabhuiuddin[3]

[1]PG Scholar, Dept of Civil Engineering, Prof Ram Meghe College of Engineering and Management, Badnera, Maharashtra, India
[2&3]Assistant Professor, Dept of Civil Engineering Prof Ram Meghe College of Engineering and Management, Badnera, Maharashtra, India

ABSTRACT:

The paper aims to arrive at effective method of evaluation of subcontracting practices. Evaluation of subcontracting is explored in terms of cost, quality, time and capabilities. A questionnaire survey was administered to subcontractors, general contractors, and construction owners to investigate these issues and to determine the differences in perceptions between the parties. The results confirm the focus of the construction industry primarily remains quality within the time schedule. This is will reflected with the highest relative importance index values for the quality of material and quality of work subcontracting factors as allocated construction industry professions from the Amravati region as respondents. The cost aspect has been given less importance in comparison with the quality and time. Further, the financial capability of the subcontractor is overlooked over his capability to deliver quality product and adherence to schedule & company policies. The findings of the study so obtained can be useful as a guideline of subcontractor selection enhance overall productivity and effective construction Management.

Key word: Subcontracting , Cost, Quality, Time, Capabilities

1.Introduction

Subcontractor is a construction firm that contracts with a general contractor to perform some aspect of the general contractor's work. On many projects, especially building projects, it is common for 80 to 90% of the work to be performed by subcontractors. Regardless of the general contractor's skills, portions of virtually every project will be subcontracted to firms that possess specialized skills. Even though a large portion of a construction project is usually performed by subcontractors, the issues concerning subcontracting practice are seldom acknowledged and the ways to improve subcontracting practice are seldom discussed. The subcontracting issue of concerns includes payment, selection, insurance, safety, partnering with various parties, and productivity. The key concerns are to arrive at better selection process and adopting method for evaluation and management of subcontractors.

The subcontractor's performance data is evaluated with respect to strategy, evaluation and management. Its components includes establishment of vision and strategy, goals, categories, evaluation criteria, and indexing. The results are represented as a score, which can be applied as feedback within the management process[1].

Due to complexity in construction project subcontracting in the construction industry are more than any other industries. Identification of range of issues faced during the implementation of subcontracts in the construction project is important. The study is important to know the various factors of subcontracting. As its identification and assessment may help to achieve possible output within a desired period.

Study aims to understand and find out the factors related to subcontracting associated with construction projects in Amravati region. The composition of questionnaire will be prepared for the purpose of data collection. On the basis of collected data studies on the assessment of subcontract factors in project be done and most significant factors will be sorted out. In order to identifycomprehensive list of factors of subcontracting associated with residential township project questionnaire survey were distributed to stakeholders. Questionnaire includes various types of questions which give clear path to cover concepts of subcontracting and related terms which arise in construction practice[2]. Questionnaire consists of objective type questions with multiple choice options which makes dissertation study easier and help in evaluation. The questionnaire includes questions for the general inspection which covers various factors project. After that all collected data will be feed in software. Further analysis of data will be done on the basis of collected data. The relative importance index technique will be used for giving rank. The bar charts, graphs, tabular comparisons, ranking gradation, flow charts, will be used in research methodology[3].

Supplier selection based on the total cost of ownership, main contractor–subcontractor partnering principles subcontractor rating system, multiattribute utility theories and comparative evaluation. Most of them focus on project-based partnering and have failed to discuss the process of evaluation that enables subcontractor growth in the long term.

2.0 Characteristics Of Subcontractor Evaluation And Management

The following characteristics were selected as necessary for a subcontractor evaluation and management system: subcontracting practice, strategy.
Subcontractors are generally selected through a bidding process based on financial stability their planning, designing, and financing skills, comprehensive management capabilities, laborer productivity and management efficiency. However, existing systems for evaluating subcontractors do not appear to possess standardized subcontractor evaluation criteria, methodologies, or systematic performance management.
Subcontracting strategy is based on the business strategy of the main contractor and dedication to a common goal or mutual objectives. Under certain circumstances, respective objectives conflict, and subcontractings are pushed down the hierarchy from the client to main contractor to subcontractor; the partners in this situation do not genuinely adopt a win–win attitude[4].
Partnering is one way to improve performance within the construction process; it can create synergy and maximize the effectiveness of each participant's resources. Increasing collaborative work enhances mutual relationships, also contributing to enhanced levels of cooperation and productivity.
Feedback loops and consequent decision making were necessary to convert measurement systems into management systems Therefore, the management process must include continual periodical and project-based subcontractor performance evaluations and feedback of results.
The strategic planning and management tool used to align business activities to the vision and strategy of the organization and monitor organizational performance against strategic goals.

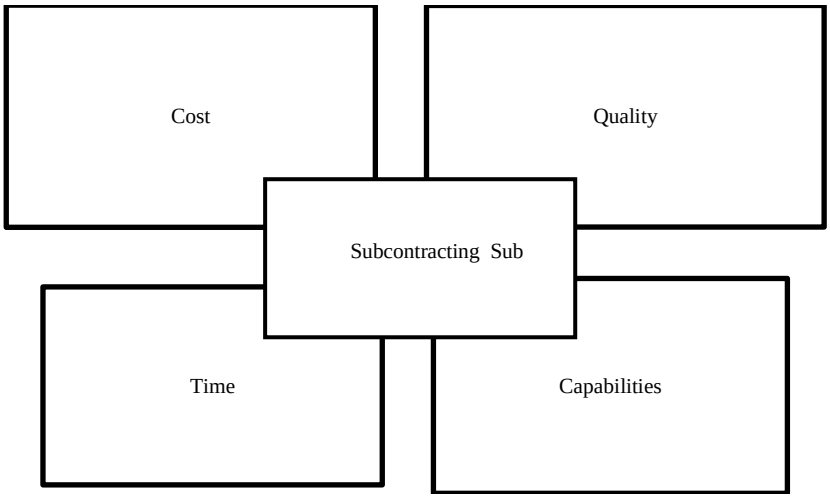


Figure 2.1 :Subcontractor evaluation model

Evaluation and selection of Subcontractors will be done with respect to criteria derived from investigation conducted by Arslan et al. (2008)

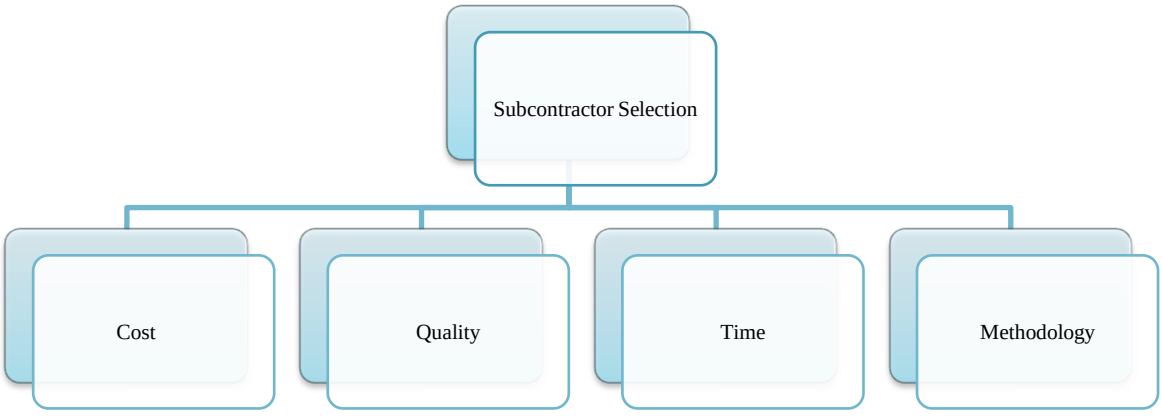


Figure 2.2 :Subcontractor evaluation Factors

3.0 Methodology

Vision of mutually emphasizing customer satisfaction by providing the highest-quality service through global competitiveness, and their strategic goals for achieving this vision included customer satisfaction, technical edge, partnerships, and competitiveness.. Therefore, we established the strategy for the proposed system as "continuous growth of the subcontractor through establishment of collaborative relationships and value enhancement of the overall supply chain."

3.1 Confirmation Of Evaluation Criteria

Table 1 presents achievement goals, selected preliminary criteria for each of the four categories, and the final 15 performance areas established through the interview process. The four categories for subcontractor evaluation and management were modified to include the financial soundness of the subcontractor, service to the main contractor, the on-site project management process, and continuous improvement[5].

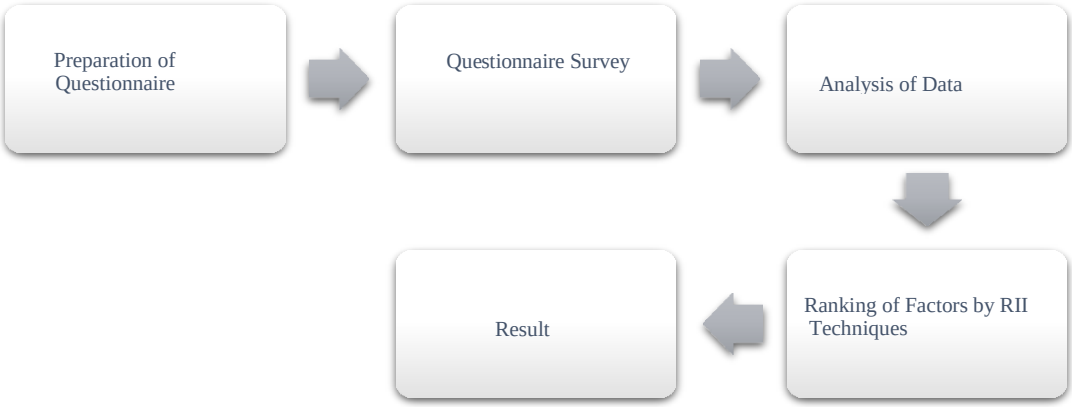
3.2 Weighting Subcontractor Indexes

When applying the BSC model, it is important to manage the index by weighting the four different categories (Olson and Slater 2002). The analytic hierarchy process was used to determine the degree of importance or weight for each subcontractor index because the results of this process are less biased than personal decisions (Saaty 1980; Winkler 1990).

By applying the relative weighting described previously, it is possible to execute evaluations using subcontractor performance data. Subcontractor evaluation could then be separately categorized as a regular evaluation periodically conducted at least once a year to evaluate overall subcontractor performance.

Methodology used for this study consist of six stages as shown in figure below.

Figure 3.1 : Methodology process



In the methodology process method used for the assessment of factors.. Construction industries tend to use a qualitative approach since it is more convenient to describe the risks than to quantify them.

3.3 Data Collection

A structured questionnaire survey approach was considered to study the impact of various subcontracting factors associated with subcontracting during construction phase. Questionnaire assists to study the attitude of engineer, contractor, project manager, architecture, and consultant towards subcontracting identification and assessment. A questionnaire was preferred as the best effective and suitable data-collection technique for the study. It was concluded that the questionnaire was described as a self-administered tool with an appropriate response. The design strategy of the questionnaire was that the questions had to be simple, clear, and understandable for the respondents. The questionnaire has the definite advantages of requiring a smaller time to be responded and more accuracy in the final outcome. For this study twenty four important factors were considered and were listed under four groups based on the literature review. These groups give comprehensive summary of the main key factors. These factors were summarized and collected according to previous study. Groups considered for this study are cost, quality, time and adequacy. For this study target groups are engineer, contactor, consultant, project manager and architect. 204 questionnaires were distributed out of which 103(52.33%) were received[6].
For data collection questionnaire survey form is used. It consist of two parts, first part include general information of respondent, second part include the factors in associated with subcontracting. It was organised in the form of scaling. The respondent were required to rate the factors for the way they affect subcontracting using their own experiences on construction sites. The questionnaire required the respondents to rank the subcontracting factors on a scale with the rating of 1 to 5 i.e. “1,” representing not considered; “2,” representing Somewhat Important; “3,” representing Moderately Important; “4,” representing Very Important; “5,” representing Essentially important, according to the degree of importance of factors. The responses were to be based on the experiences, understanding and knowledge of the respondents and not related with any specific project. A relative importance index method is used to analyse the data. The method of questionnaire was simple and direct and this method was selected to establish a means of developing a list of factors associated with Contracting.

Table 1: Various types of important factors consider for subcontracting

Sr. No.	Groups	Factors
1	Cost	Financial capacity
2		Timely payment
3		Completion of job
4	Quality	Quality of work
5		Workmanship
6		Team efficiency
7		Quality of material
8		Experience
9		Safety
10		Qualification
11	Time	Availability of human resources
12		Bid Submission
13		Work completion
14		Work Schedule
15		Lack of financial resources
16	Capabilities	Methodology
17		Availability of workmen
18		Availability of Labours
19		Availability of Material
20		Availability of Equipment
21		Worker facilities
22		Safety compliance
23		Contract Compliance
24		Policy Compliance

3.4 Data Measurement

In order to select appropriate method of analysis, the level of measurement must be understood. For each type of measurement in this research, Ranking scales were used. Ranking scale as shown in Table 2 is a ranking or a rating data that normally uses integers in ascending or descending order. The numbers assigned to the important (1, 2, 3, 4, 5) do not indicate that the interval between scales are equal, nor do they indicate absolute quantities[7].

Table 2: Ranking scale used for data measurement

Item	Not Considered	Somewhat Important	Moderately Important	Very Important	Essentially important
Scale	1	2	3	4	5

The Relative Importance Index (RII) method used here to rank (R) the different subcontractings. These rankings make it possible to cross-compare the relative importance of the factors as perceived by the five groups of respondents (i.e. Engineer, Architect, Contractors, consultant, and Project manager). Each individual subcontractings' RII perceived by all respondents will be used to assess the general and overall rankings in order to give an overall picture of the factors in associated with subcontracting during the construction phase in Amravati region. This RII technique is used by many researchers [6]. The Relative importance index is calculated as:
Where,

$$R = \frac{\sum W}{A\,N}$$

W = the weight given to each factor by the respondents and ranges from 1 to 5.

A = the highest weight = 5.
N = the total number of respondents.

3.5 Data Analysis

For the factors associated with subcontracting project during the construction phase in Amravati region, data collected from various group of organization in Amravati district. The questionnaire were distributed out. For correct analysis, it is very important to include response from all the parties included in project and hence contractor, engineer, project manager, consultant and architecture are includes in questionnaire survey[8]. The respondents having various lengths of years of experience in handling various types of project. Various categories are involved in construction therefore for correct analysis contractor, engineers; project manager, consultant and architecture are to be considered.

3.6 Relative Importance Index Factors

As stated above questionnaire survey to be conduct for collection of data. The collected data analyzed using relative importance index (RII) method using ranking scale ranging from 1-5.

Factors having different relative importance index calculated from relative importance index techniques (RII) and ranks were given to the factors of factors associated with subcontracting. Various graphs plotted for the results, which were obtained from survey.

4.0 Results

Form the analysis of important factors associated with subcontracting during construction phase, response from various project parties is involved. Once after the data collection work, it was required to have the ranking of the factors. Each factor was given ranks according to the calculation done using the relative importance index (RII) method. The calculation results consist of RII in fraction and rank of the factors. From all the results above, we found the rankings and relative importance of each factors. All these subcontracting factors are associated with subcontracting during the construction project.

Conclusion

Subcontracting is one of the importantly essential part of contract, its critically important for general contractor as hiring specialized subcontractor with particular skills are demanded by the clients. Evaluation of the subcontractor on the aspects of cost, quality, time and capabilities becomes essential as selection of subcontractor itself is an time consuming process and holds capability to potentially affects the project outcome. The important factor requiring due attention are quality of work and quality of material. Work completion, Team efficiency, labour availability, completion of job and maintaining work schedule are the next important factors to be considered while selecting the subcontractor. All potentially points towards the time factor and demands timely follow up and execution of the project activities by the subcontractor while sticking to the required work specification. The next set of factors to be essentially considered while selecting the subcontractor are ‘safety’, ‘timely payment to his labors’ and ‘availability of material’. The capabilities of the subcontractors could be well overlooked while substantiating his selection based on potential to deliver quality work within given time frame. The results and the conclusions drawn thereon will have limited application mainly applicable to local industry.

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