

FACTORS AFFECTING ON CONTRACTOR'S BIDDING STRATEGY IN LARGE SCALE RESIDENTIAL CONSTRUCTION

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Abstract- Bidding is unique one is every of the largest construction companies are facing today and also bidding is a strategic decision that helps contractor firm to survive. Traditionally, bidding behaviors are highly unstructured in construction companies. However, as the Characteristics of construction industry are different from those of other industries, many issues such as abnormal low-bids and poor project quality have been derived from the competitive bidding system and higher the development of the construction market. This paper identifies the factors affecting in residential construction projects of Indian construction industry. Total 49 factors were identified under contractors groups. Total 75 respondents of contractors who participated in this field survey. This paper suggests an approach to carry out ranking of factors affecting on contractors bidding strategy by two different techniques. Relative importance index and Importance index based on degree of severity and degree of frequency and also discuss about the ranking of the cases.

Keyword: Bidding Strategy, Competitive market, Relative importance index, Importance index, Construction industry

I. INTRODUCTION

There is considerably more to adequately offering for development work than decisively breaking down and valuing the material, gear, and work prerequisites for a vocation. The offering procedure can be indulgently, including direct expenses for data seek, appraisal of determinations, subcontractor sales, and proposition arrangement temporary worker couldn't have enough cash to haphazardly buffalo employments. . General development contractual workers create offering methodologies, either effectively or sadly characterized, to guide them in powerful what employments to proposition and how to delicate those occupations. Temporary workers need to settle on vital choices in admiration of: (i) anticipate decision regardless of whether to offer for an occupation; and (ii) which check up ought to be coordinated in the count. With restricted reaction time to various offering opportunity, temporary workers need to take a stab at activities that put them at favourable position as far as valuing productivity. These general factors include: an raise in project size from that normally handle, doing work in an unknown geographic location, taking on new types of work or moving between the public and private sectors, losing key personnel in one of three primary areas of operation, building operations, supervision and accounting, lack of managerial ripeness in expanding operations, use of poor association systems, failure to estimate project productivity, lack of tools cost control, poor bill and collection measures, transition to a automated accounting classification from a manual one. Estimating and bidding are two important functions performed by construction contractors. Many of the decisions required in arriving at the final bid price are based on experience and intuition. Deciding on an appropriate margin, or markup, to add to the estimated cost of a project is one such decision. The only possible way for a contractor firm to survive and acquire its aims are winning tenders and making profit. Although in some cases, the contractors undertake projects and make profit without having to win a tender, this is not the usual application. Contract bidding, like all other forms of pricing, is essentially about contractors making strategic decisions in respect of which contracts to bid and the bid levels necessary to secure them.

II. OBJECTIVE OF STUDY

The main objectives of this study include the following.

1. This paper has an objective for future studies and its results will become worthwhile information in efforts to improve the contractor's bidding strategy in the large scale residential construction industry.

2. To rank factors of bidding strategy by RII (Relative importance Index) and by IMPI (Importance Index) method.

III. LITERATURE REVIEW

A number of studies have been carried out to determine the factors affecting on contractor's bidding strategy in large scale residential construction.

1. Nyoman Yudha Astana, Rusdi HA. and Mohamad Agung Wibowo (2015) did studied factors affecting bidding strategy in construction. Strategy is a comprehensive action plan that specifies guidance and a critical direction for the allocation of resources to achieve long-term goals of the organization. Bidding strategy in construction defines as a management skills of using all available resources both physical and financial, in order to offer a comprehensive and competitive bidding through consider various aspects, including internal, external and environment, with aim to win the bidding competition, and provide maximum project performance. There are many factors that influence the bidding strategy. These factors influence depend on the situation, when the research done. This research was conducted in four major cities in Indonesia. The method used is survey and interviews of 61 major contractors who is believed to have a good strategy. The ten factors such as client characteristics, project characteristics, contract, profit, project financing, company characteristics, company experience, bidding situation, economic situation and competition are forming a dimensional construct of bidding strategy. It is evidenced through path coefficient with T-statistics greater than T-table. The most influence factors of environmental as the economic situation, and the competition. While external factors and internal factors respectively is contract, client characteristics, project characteristics, and company experience, company characteristics, profit/benefit, project financing, are the important factors. The influence factors can be considered as guidance for contractors in preparing their bidding strategy in order to win the competition and obtain the best results.
2. Rajubhai Prajapati, Prof. Jayeshkumar Pitroda, and Prof. Jaydev J. Bhavasar (2015) did studied analysis of factor affecting contractor's bidding strategy using RII method. This paper presents the analysis of factors affecting contractor's bidding strategy of 81 respondents from various construction firms of central Gujarat region using RII method. The construction industry is considered as an important sector in the world as it develops and achieves the goals of society. A questionnaire-based survey was used to judge the attitude of contractors and engineers towards factors affecting contractor's bidding strategy in central Gujarat Region. 115 questionnaires were distributed out of which 81 questionnaires were returned as follows: 37 from contractors and 44 from engineers as respondents. The respondents were asked to indicate the level of importance of each of the 50 factors as not important, very less important, less important, and moderate important, high important and very high important on contractor's bidding strategy. The results indicated that the most important factors affecting contractor's bidding strategy are: Terms of payment, Current financial situation of the company, Possessing enough qualified technical staff to do the job, Possessing enough qualified technical staff to do the job, History of client' payments in past projects (considering delays, shortages), History of client's payments in past projects (considering delays, shortages), Financial status of your company (working cash requirement of project) and Availability of the required materials within the region.
3. M. T. Banki, B. Esmaeeli, and M. Ravanshadnia (2008) did studied on the assessment of bidding strategy of Iranian construction firm. This paper focuses on the previous trends of the bidding prices to estimate proper bidding cost in the Iranian construction industry The prices might be influenced by external characteristics such as competitors' policies, the number of tendered projects, the number of contractors competing in the current tender, project characteristics, and the client. The subject of bidding price can be investigated through the client view or the contractor view. This paper attends the second approach. This paper present a quantitative analysis of impact of number of bidders on project bid prices. The study found that increasing the number of bidders will result in decreased project bid prices. Overall, the findings of this research work suggest a number of areas for future study. First, a more detailed research study investigating facilities may be appropriate. While the results of this study reflect, in general, the findings of earlier work, there is a limitation in that it addresses specifically contracts with more than 5 million dollars. The evaluation of the final project cost compared to the bid day offer was beyond the scope of this study. Other researches can be conducted to evaluate more data from each type of contract in each area of construction market of Iran. The data must categorize in to different type of construction work such as buildings, schools, airport and etc.

4. McCaffer (1976) sympathizing with the approach of Whittaker, undertook a similar analysis. He produce distributions of bids for roads and building works which were shown to be virtually normal distributions with standard deviations of 8.4% for road contracts and 6.3% for buildings contracts. The use of these overall distributions, or the distributions for contracts grouped together by the number of bidders, makes it possible to predict the lowest bid from an estimate of the mean bid. It must be emphasized that such figures would need to be compiled for each type of contract in each area, and that the figures shown are not necessarily universally applicable.

IV. RESEARCH METHODOLOGY

The data collection to determine the most influential factors on contractor’s bidding strategy of large scale residential construction firms was done through a survey by explorative questionnaire to the respondents involved in daily activities of construction firms in various regions in the central Gujarat region of India. The questionnaire was designed so that respondents can give the rank to their answers based on the Likert scale. The analysis of these data was done by Relative Importance Index (RII) and Importance Index (IMPI) methods using Microsoft Excel.

V. DATA COLLECTION

The target population included civil engineering and buildings construction firms of a total number of 75 respondents were surveyed from the central Gujarat region of India, namely cities like Ahmedabad, Gandhinagar, and Mehsana. The details of various stakeholders and total numbers of were collected through Road and Building Department, Gujarat. To obtain a statistically representative sample of the population, the formula shown in Eq. (1) was used (Hogg and Tannis 2009)

$$n = \frac{m}{1 + \left[\frac{m-1}{N}\right]} \dots \dots \dots (1)$$

Where, n, m and N represents the sample size of limited, unlimited and available population respectively. Here, m is calculated by following equation (5.2).

$$m = \frac{z^2 * p * (1 - p)}{e^2} \dots \dots \dots (2)$$

Where,

z = the statistic value for the confidence level used, i.e. 1.96 and 1.645 for 95% and 90% confidence level respectively;

p = the value of population that estimated and

e = the sampling error to estimated. Because the value of p is unknown. Sinich et al. (2002) suggest the value 0.5 to be used in sample size. (26)

Thus,

$$m = \frac{1.645^2 * 0.5 * (1 - 0.5)}{0.1^2}$$

$$m = 67.65$$

Here, confidence level is taken as 90%. Now,

$$n = \frac{67.65}{1 + \left[\frac{67.65 - 1}{420}\right]}$$

$$n = 58.41$$

$$\approx 59$$

As the response rate is always very low, the questionnaire was distributed to contractor’s more than the sample size requirement. Total 75 questionnaires were distributed to different respondents in Ahmedabad, Gandhinagar, and Mehsana. They were sent the reminder for sending their feedback after 10 to 15 days sending the questionnaire. This study received

63 responses. So, the response rate (as compare to sample size = 59) is in this research is 84%, which is considered as very good in this kind of survey research.

VI. DATA ANANLYSIS APPROCH

The following two types of approach should be used for data analysis

A. Relative Importance Index technique:

Kometa et al. used the Relative Importance Index method helps to determine the relative importance of the various factors affecting strategy of bidding of contractor in major construction firms. The six-point scale ranging from 0 (No important on the strategy of bidding) to 5 (Very high impact on the strategy of bidding) is adopted and it is transformed to relative importance indices (RII) for each factor as follows in equation (4.1)

$$RII = \frac{\sum W}{A} \times N \dots\dots\dots (4.1)$$

Where:

W is the weight given to each factor by the respondents and ranges from 0 to 5

A = the highest weight = 5

N = the total number of respondents.

B. Importance Index technique:

Assaf and Al- Hejji (2006) used this Importance Index (IMP.I.) as a function of severity & frequency to rank the causes of delay of large construction projects of Saudi Arabia. (6)

1) Frequency index:

A formula is used to rank risk event based on frequency of occurrence as identified by the participants with equation 4.3.

$$\text{Frequency Index (F. I.)}(\%) = \sum a \frac{n}{N} \times \frac{100}{4} \dots\dots\dots (4.2)$$

Where,

a = constant expressing weighting given to each response (ranges from 1 for rarely up to 4 for always),

n = frequency of the responses,

N = total number of responses.

2) Severity index:

A formula is used to rank risk event based on severity as indicated by the participants with equation 4.4.

$$\text{Severity Index (S. I.)}(\%) = \sum a \frac{n}{N} \times \frac{100}{4} \dots\dots\dots (4.3)$$

Where,

a = constant expressing weighting given to each response (ranges from 1 for little up to 4 for severe),

n = frequency of the responses,

N = total number of responses.

3) Importance index:

The importance index of each event is calculated as a function of both frequency and severity indices, as follows in equation 4.5:

$$\text{Importance Index (IMP.I.)}(\%) = \frac{[\text{F. I.}(\%) \times \text{S. I.}(\%)]}{100} \dots\dots\dots (4.4)$$

VII. RESULTS AND FINDINGS

The all ranking indices explained earlier were used to rank factors affecting from viewpoints of the contractor's. Total 63 respondents participated in this survey.

A. Top 10 factors ranked by Relative Importance Index (RII) technique (based on all respondent)

The relative importance index, RII, was computed for each factor identifies the most significant causes. The factors were ranked based on RII values. From the ranking assigned to each cause of the most important factors affection on bidding strategy in large scale residential construction industry.

Based on the ranking, the 10 most important factors affection on bidding strategy in large scale residential construction industry by RII were : (1) Prompt payment habit of the client. [RII=0.88]; (2) Type of project. [RII=0.87]; (2) Fines for delay. [RII=0.87]; (3) Availability of required cash. [RII=0.82]; (4) Work capital required to start the job. [RII=0.81]; (5) Establishing long relationship with client. [RII=0.78]; (6) Past experience with similar project. [RII=0.736]; (7) Market condition. [RII=0.730]; (8) Quality of available labour. [RII=0.72]; (9) Availability of equipment and materials. [RII=0.69]; (10) Completeness of drawings and specification. [RII=0.54].

Sr No.	Factors	RII	Rank
1	Prompt payment habit of the client (Terms of payment)	0.882	1
2	Type of project	0.879	2
3	Fines for delay	0.879	2
4	Availability of required cash	0.822	3
5	Work capital required to start the job	0.812	4
6	Establishing long relationship with client	0.780	5
7	Past experience with similar project	0.736	6
8	Market condition	0.730	7
9	Quality of available labour	0.726	8
10	Availability of equipment and materials	0.695	9
11	Completeness of drawings and specification	0.546	10

Table 1. Top 10 factors by Relative Importance Index (RII)

B. Top 10 factors ranked by Importance Index (IMPI) technique (based on all respondent)

The importance index of each factor is calculated as a product of both frequency and severity indices. Based on the ranking, the 10 most importance factors affecting on contractor's bidding strategy in large scale residential construction by IMPI were: (1) Location of the project. [IMPI=79.22%]; (2) Quality of available labour. [IMPI=77.44%]; (3) Availability of equipment and material. [IMPI=68.86%]; (4) Type of project. [IMPI=58.77%]; (5) Design quality and term. [IMPI=52.03%]; (6) Completeness of drawings and specification. [IMPI=51.49%]. (7) Job start time. [IMPI=51.14%]; (8) Degree of possible alternative to reduce cost. [IMPI=46.57%]; (9) The client financial capacity. [IMPI=43.91%]; (10) Financial goals of the company. [IMPI=43.31%].

Sr No.	Factors	IMPI (%)	Rank
1	Location of the project	79.22	1
2	Quality of available labour	77.44	2
3	Availability of equipment and materials	68.86	3
4	Type of project	58.77	4
5	Design quality and team	52.03	5
6	Completeness of drawings and specification	51.49	6
7	Job Start time	51.14	7
8	Degree of possible alternative to reduce cost	46.57	8
9	The client financial capacity	43.91	9
10	Financial goals of the company	43.31	10

Table 2. Top 10 factors by Importance Index (IMPI)

C. Data accuracy checks:

It is always essential to check accuracy of collected data by statistical methods. In this research, ranking of criteria by group of contractor’s was checked as per Spearman’s rank correlation coefficient. In order to test the relative agreement between the responses from groups of contractor’s, the ranks of the calculated RII weights corresponding to the factors affecting on contractor’s bidding strategy in large scale residential construction were analysed using the spearman’s rank correlation method. Rank correlation coefficient is a measure of correlation that exists between the two sets of ranks. It is a measure of association that is based on the ranks of the observations and not on the numerical value of the data. The value of spearman’s rank correlation coefficient will vary between “+1” to “-1”. “+1” indicates a perfect positive correlation and “-1” indicates perfect negative correlation between two variables (Kendall and Gibsson ,1990; Kothari, 2004). It was worked out by following equation:

$$r = 1 - \frac{6 * \sum d^2}{n^3 - n} \dots \dots \dots (1)$$

Where,

r = Spearman’s rank correlation coefficient between two parties,

d = difference between ranks,

n = number of parameters being ranked.

The value of Spearman’s rank co- relation only contractor’s group is 0.38 This shows that there is very marginal difference in opinion of expert’s for weighting of criteria and they all exhibit strongly positive correlation.

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