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PREPARATION OF PREQUALIFICATION SYSTEM FOR INDIAN ROAD PROJECTS BASED ON DEA TECHNIQUE

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ABSTRACT

The study shows the modification of existing prequalification system and why it needs to be modified. The contractor plays a vital role in the execution of the project and achieving the desired aim of the project. Selecting the appropriate and competent contractor comes out to be challenging for the decision maker or the selecting authority. To make sure that the bidding is done by the eligible bidders prequalification system is processed. In India we follow the L1 concept means the bidder who gives the lowest bid is selected by the decision makers, this study is helpful in changing this concept. The methodologies used are: Literature Review, Questionnaire Survey, DEA tool. DEA (Data Envelopment Analysis) is a tool used to determine the efficiency of the DMUs. Questionnaire survey was helpful in analyzing the number of contractors and deriving their efficiency. The factors through which all the contractors are analyzed were derived from the literature review. The concept used in India needs to be changed and new rule needs to be followed. Though the existing prequalification system covers almost all the factors but still some of the factors are missing. Prequalification system plays vital role in the bidder selection so it should be analyzed properly and research in this field should be continuous to make it more effective.

Keywords*: *Data Envelopment Analysis, Decision Making Units, Prequalification.

I. INTRODUCTION

The contractor plays a very vital role in the execution of the project and achieving the desired aim of the project. Selecting the appropriate and adroit contractor comes out to be challenging for the decision makers or the selecting committee. Awarding the contract to the bidder is a two way process :

1. Prequalification
2. Evaluation of Tender

Prequalification is a process in which the bidder is examined properly by analyzing him through his experience and resources and then allowing him to bid for the tender. It acts as a filter or screening for all the bidders and alleviating the work of the decision makers. To ensure the successful execution of project the tender should be

awarded to the bidder who is experienced in that type of work, technologically involved , technically and managerially sound , and can manage equipments at the time of need keeping in mind all these things prequalification process is generated.

In this paper author has developed a model which is helpful for the DMUs(Decision making Units) to select the appropriate contractor for the road projects. This paper shows the need of prequalification system for selection process and terminating the lowest bid concept.

II. METHODOLOGY

The questionnaire method was used to benchmark the existing road contractors. The factors used in the questionnaire were derived from literature review and had interviewed some of the industrialist which were directly or indirectly connected with road projects or had worked on it. The factors procured were then compared with the existing prequalification system of NHAI(National Highway Authority Of India) and found that there is a need to modify it.

The total number of 35 factors were obtained through all above process which were then grouped into 7 categories in which bid price was taken as an input for my study and rest 6 as an output.

Some of the gaps were analyzed in the existing prequalification system for road projects, factors such as health and safety, past performance of contractor, age of the company etc were missing which means it needs to be introspect and rectified.

Table 1 Factors considered for the Data Envelopment Analysis for the selection of contractor

Variables group	Factors considered	Measurement unit or method of evaluation	Inputs considered	Output considered
Bid price		Rupees	1	
Financial data	• Total assets • Current assets • Total liabilities • Current liabilities • Net worth • Working capital • Net profit before and after tax	Scale between 1 (least) and 5		10

	• Annual turnover • Liquidity status of the company • Authorized and paid up capital	(highest)		
Organization	• General management • Technical management • Site supervision • Age of the company • Familiarity with local working culture • Familiarity with the regulating authority • Health and safety record of the company • Achievement of quality level • Post business attitude • Past failure			10
Past performance of contractor	• Attitude towards correcting faulty works • Good relationships with past projects • Relationships with subcontractors/ suppliers • Demerit points in past			4

	projects			
Experience record	• Total number of years experience in civil construction work • Total number of years experience in specialize construction work • Specialized knowledge of particular construction method • List of all contracts of same or above the price of that particular contract during the last 5 years • List of contracts executed during the last 5years similar in nature and size to the contract for which application is made • Subcontractors description and similar work previously executed			6
Performance potential of the contractor	• Equipment proposed for the work • Proposed site organization			2
Project specific criteria	• Health and safety setup for the project • Qualification and experienced level of project			2

	manager			
Number of inputs and outputs			1	34
Total number of inputs and outputs			35	

The survey was done in which the questionnaire was floated to around 50 contractors who were having the experience or still working as a road contractor. The factors given were supposed to be rated on the basis of their priority on the prequalification system of Indian roads categorized as 1,2,3,4 and 5 in which 5 being the most important and 1 being the least one.

Only 30 contractors gave the required response for the desired work by which the contractors were judged or analyzed on the basis of their mark in a box. They were also given a project or a tender which was selected from NHAI website, they were allowed to analyze that tender properly and put their bid for that project. The contractors gave their desired response and processed their bids. The response achieved was then put into the tool called DEA (Data Envelopment Analysis) to derive the efficiency of the contractors

In this paper the author has considered a total number of 35 factors including both input and output factors shown in table 1. Based on the study by Purnima Bajpai (2015) to maintain the reliability of DEA the number of DMUs should be thrice the number of factors considered . Here the factors considered are 35 and the number of DMUs are 30 so to ensure the correct result of DEA an ideal contractor has been taken by the author who has the minimum bid price with maximum output. After examining the response and data, the contractor 4 gave the lowest bid of Rs 1287.79 crores hence the bid taken for the ideal contractor should be equivalent to Rs 1287.79 crores.

Table 2 Bid proposed by the contractors

Number of contractors	Bid proposed in Rs(crore)
Contractor 1	1295.79
Contractor 2	1293.79
Contractor 3	1300
Contractor 4	1287.79
Contractor 5	1291.5
Contractor 6	1295
Contractor 7	1289.79
Contractor 8	1299.5
Contractor 9	1293.69
Contractor 10	1290
Contractor 11	1295.65

Contractor 12	1297.9
Contractor 13	1293.85
Contractor 14	1292
Contractor 15	1297.56
Contractor 16	1290.69
Contractor 17	1291.2
Contractor 18	1290.9
Contractor 19	1296.75
Contractor 20	1298.79
Contractor 21	1289
Contractor 22	1296
Contractor 23	1289.89
Contractor24	1294.79
Contractor 25	1290.95
Contractor 26	1297.83
Contractor 27	1290
Contractor 28	1292.95
Contractor 29	1294
Contractor 30	1291.79
Ideal Contractor	1287.79

III. DATA ENVELOPMENT ANALYSIS

The response achieved from the number respondents were then put into the tool called DEA. The DEA is tool used to derive the efficiency of DMUs (Decision Making Units). Here the DMUs are the contractors which will be analyzed according to their responses considering their inputs and outputs (where inputs are the bid price and outputs are the factors).

The model used in DEA is BCC model which follows Variable Returns to scale (VRS) using Output Oriented Model. BCC model is used to identify the type of scale in which DMUs is operating i.e increasing, decreasing or constant return to scale. Output oriented model is a model which follows the rule of maximizing the output units without exceeding or increasing any input function. In this type of model variation is done in output units without making any changes in input. By using this method the contractors were to be analyzed and evaluating their efficiency.

IV. RESULTS

In this study, the 4th contractor who gave the lowest bid should be selected according to the concept followed in India, but after the ideal contractor only contractor 7 was able to obtain the efficiency of 1 rest were less then 1 from the results of DEA, the 7th contractor who gave the 3rd lowest bid came out with the efficiency of 1 and

the 4th one who gave the lowest bid came out with the efficiency of 0.80 which means technically contractor 7 is more efficient and should be selected rather than contractor 4.

There is a need to change this concept and follow the new rule. Though the existing prequalification system covers almost all the factors but still some of the factors are missing. Prequalification system plays vital role in the bidder selection so it should be analyzed properly and research in this field should be continuous to make it more effective.

V. CONCLUSION

The contractor plays very crucial role in the completion and execution of the project and the selection of the contractor is also very important phase, so the prequalification system is adopted by NHAI (National Highway Authority of India) but still we lacks in the contractors part as in India we follow the L1 (lowest bid) concept which by this study proves that it needs to be changed.

In this study, the 4th contractor who gave the lowest bid should be selected according to the concept followed in India, but this study proves that the 7th contractor who gave the 3rd lowest bid comes out to be more efficient than the 4th one that means if we compare both the contractors the 7th contractor should be selected to make the project more efficient.

There is a need to change this concept and follow the new rule. Though the existing prequalification system covers almost all the factors but still some of the factors are missing. Prequalification system plays vital role in the bidder selection so it should be analyzed properly and research in this field should be continuous to make it more effective.

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