Fuzzy Logic Use for Decision Making in Construction Industry

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Abstract:- Decision making in a construction industry is a tough job of project manager due to complexnature of industry. This project presents a fuzzy approach for decision making using a fuzzy expert system to give an additional tool to the project manager while taking adecision. This project defines various selection criteria for contractor selection with using fuzzy logic and fuzzy approach to select best suited from alternatives.

Fuzzy set theory is related to inexact and vague information which we deal in the construction industry. Construction clients had realized through the last decades that the lowest price bid is not always the best. Evaluation of contractors based on multi-criteria basis is, therefore, becoming more important to the construction industry. This project describes the decision-making model for selection of a contractor for construction projects.

Keywords: *Fuzzy Logic, Decision Making, Fuzzy Set, Management, VIKOR, Fuzzy AHP.*

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I. INTRODUCTION

Decision making is a key factor for the completion of a project. Due to the complex nature of construction industry, it's tough for any project manager to take the correct decision and for that it's necessary to provide assistance to project manager to help him in taking decisions in a complex situation.

In theconstruction industry, thefuzzy logic used for capturing uncertainty related to subjectivity and inexplicit that we previously could not model. We can effectively model both qualitative and quantitative aspect and capitalize on expert intelligence to develop better systems in theconstruction industry. **Fuzzy logic** based on "degrees of truth" Boolean logic on which the modern computer is worked. The idea of fuzzy logic was brought forward by Dr. LotfiZadeh of the University of California at Berkeley in 1960[16]

Analytical hierarchy process method is one of the MADM methods, which has been used in several practical decision-making problems. The goal of Analytical hierarchy process is to capture an expert'sAdvice, the fuzzy method reflects the human thought. Thus, fuzzy Analytical hierarchy processwas developed for solving the problems[12]

The VIKOR is most popular and extensively applied Multi-Attribute Decision Making methods, which was developed for multi-criteria optimization of acomplex problem. This method focuseson ranking and selecting from alternatives in the presence of different criteria. It introduces the multi-criteria ranking method with respect to particular measure of "closeness" to the "ideal" solution [15]

II. METHODOLOGY

The research method used to achieve the objective of the thesis is based on following steps.

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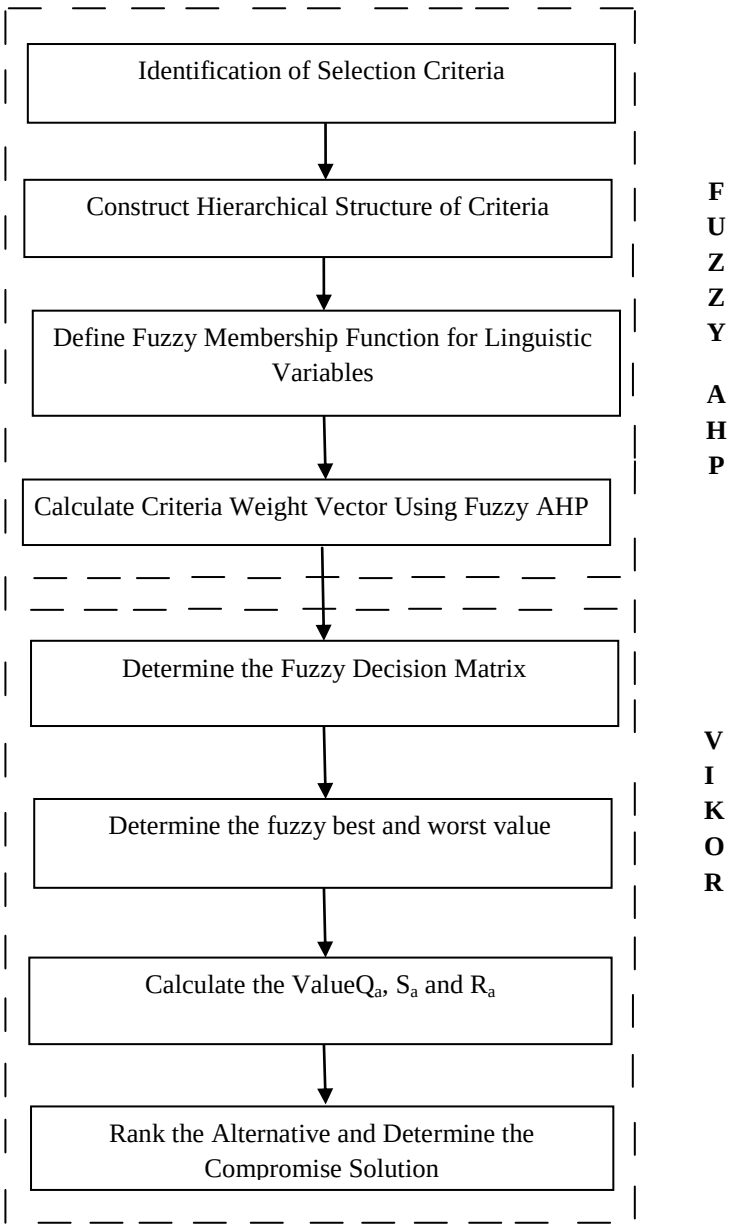

Fig.1 – Methodology

III. RESULTS & DISCUSSION

Table 1. Contractor Ranking and Score

Contractor	Q_a	S_a	R_a	Rank
PIPL	0.97	0.6452	0.161	5
KIPL	0.173	0.255	0.077	2
SEPL	0.37	0.4372	0.081	3
SCEP	0.803	0.6782	0.122	4
PBCC	0	0.1526	0.062	1

Prioritization was done based on the value of *Q* of which the lowest value accounted for the highest priority.

Now, according to the results, the conditions were tested as follows:

1) First condition: Acceptable advantage

$Q(A^5) - Q(A^3) \geq DQ$

Where, $A^{(5)}$ and $A^{(3)}$ are the first and second options, respectively and $DQ = \frac{1}{(J-1)}$ and *i*are the number of alternatives. DQ = $\frac{1}{(19-1)}$ = 0.055 and $Q(A^{(2)}) - Q(A^{(5)})$ = .173

Hence it is satisfied this condition.

2) Second Condition: Acceptable stability in decision making

As Table 7.1 show 5th alternative get best ranked.

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Finally, the contractor was aselection (as per rank) based on their fuzzy membership functions. Table Represent the score of each contractor. There close call between alternative 2nd and 5th. After further investigation company select 5th alternative as a contractor for phase-2.

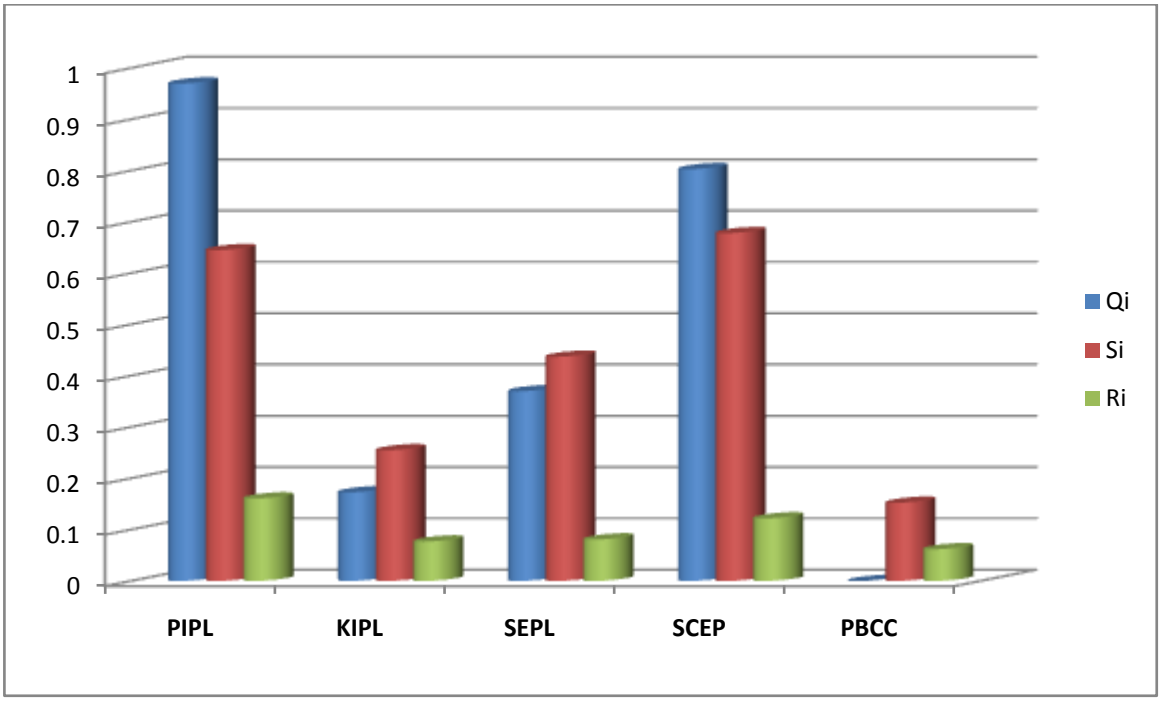

Fig.2 -GraphicalRepresentation of Result

IV. CONCLUSION

This project reports the outcomes of a contractor selection decision-making framework in the field of construction industry. In India contractor are select only on their quoted rate, but most of the time due to thefinancial condition, amanagement problem, atechnical issue or labor problem of contractor firm project get delayed and delayed beyond the limit.

In this case study, phase-1 project is already delayed by 8 months and only 65% work is completed and thebuilder has to be delayed their possession by 10 months due to the management problem and labor issue from contractor side, for phase 2 as per above result we are going to final 5th alternative (PBCC).

The case study demonstrates the model strength and user-friendly feature of this and its capability for any practical application.

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