

Fuzzy AHP-Vikor Method for Decision Making for Residential Project

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ABSTRACT: The fuzzy logic technique is especially useful for improving the accuracy of construction models because it takes into account those parts of a project that cannot be measured in certain terms are subjective or may not have exact or complete values. The fuzzy logic used for capturing uncertainty related to subjectivity and inexplicit that we previously could not model. We can effectively model both quantitative and qualitative aspect and capitalize on expert intelligence to develop better systems in the construction industry.

The VIKOR method was developed for multi-criteria optimization of complicated systems. It determines the compromise ranking list and the compromise solution obtained with the initial weights from Fuzzy AHP method. Choose the best ideal solution in multicriteria sense from the set of N feasible alternatives M_1, M_2, \dots, M_n evaluated according to the set of n criterion functions. In this paper, we used both fuzzy AHP and Vikor method for decision making where the results demonstrate the usefulness and effectiveness of the modified new method.

KEYWORDS: Multi-criteria, Fuzzy method, VIKOR, Fuzzy AHP.

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 the construction industry, the fuzzy 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 the construction 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. Lotfi Zadeh 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's Advice, the fuzzy method reflects the human thought. Thus, fuzzy Analytical hierarchy process was developed for solving the problems^[12]

The VIKOR is most popular and extensively applied Multi-Attribute Decision Making methods, which was designed for multi-criteria optimization of a complex problem. This method used for ranking and selecting best 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]

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II. METHODOLOGY

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

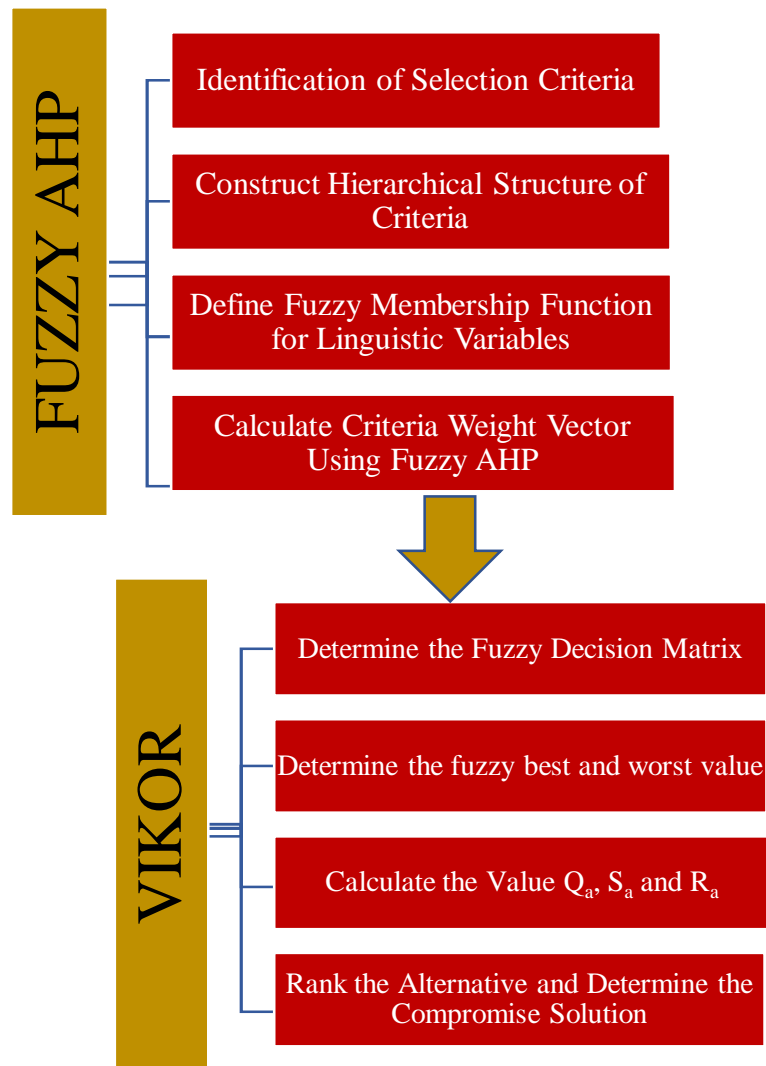


Figure.1 – Methodology

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III. RESULTS & DISCUSSION

Weight of each criteria is calculated

Table 1 - Weight of Criteria

Criteria	Sub-criteria	Weight	Weight
C1		.256	
	C11	.323	0.083
	C12	.02	0.005
	C13	.03	0.01
	C14	.627	0.161
C2		.209	
	C21	.51	0.107
	C22	.29	0.061
	C23	.2	0.042
C3		.24	
	C31	.51	0.122
	C32	.29	0.1
	C33	.2	0.05
C4		.123	
	C41	.056	0.01
	C42	.284	0.035
	C43	.66	0.081
C5		.123	
	C51	.04	0.005
	C52	.45	0.055
	C53	.5	0.062
C6		.055	

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	C61	.056	0.003
	C62	.284	0.016
	C63	.66	0.04

Table 2. Contractor Ranking and Score

Contractor	S _a	R _a	Q _a	Rank
ALT - 1	.173	.255	.077	2
ALT - 2	.803	.6782	.122	4
ALT - 3	0	.1526	.062	1
ALT - 4	0.97	.6452	.161	5
ALT -5	.37	.4372	.081	3

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

$$Q(A^{(3)}) - Q(A^{(1)}) \geq DQ$$

Where, $A^{(3)}$ and $A^{(1)}$ 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 $Q(A^{(3)}) - Q(A^{(1)}) = .173$

Hence it is satisfied this condition.

2) Second Condition: Acceptable stability in decision making

As Table 2 show 3rd alternative get best ranked.

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 1st and 3rd. After further investigation company select 3rd alternative as a contractor for phase-2.

IV. CONCLUSION

The case study demonstrates the model strength and user-friendly feature of this and its capability for any practical application. In this case study, Vikormethod gives the best alternative from the option using weight calculated by fuzzy Analytic hierarchy process.

REFERENCES

- [1] Aleksandar Rikalovic, IlijaCotic, "A Fuzzy Expert System for Industrial Location Factor Analysis", Vol. 12, No. 2, 2015.
- [2] Amaury A. Caballero, Jose D. Mitrani, "Fuzzy Logic Methodology for the Comparison of Construction Firm", Florida International University, USA (2008).
- [3] Anjali Baghel, Tilotma Sharma " Survey On Fuzzy Expert System", International Journal of Emerging Technology And Advanced Engineering, Vol. 3, Issue 12, December 2013.
- [4] AnimeshKumar Sharma, Badri Vishal Padamwar, "Fuzzy Logic Based Systems in Management and Business Application", International Journal of Innovative research in engineering and science vol. 1, issue 2 January 2013.
- [5] D. Singh, R.L.K. Tiong, "A Fuzzy Decision Framework for A Contractor Selection", Journal of Construction Engineering and Management 131(1) (2005) 62-70.
- [6] E. Palaneeswaran, M. Kumaraswamy, "Recent Advances and Proposed Improvements in Contractor Pre-Qualification Methodologies", Building and Environment 36 (1) (2001) 73-87.
- [7] Fong, P.S. and Choi, S.K., "Final Contractor Selection Using the Analytical Hierarchy Process", Construction Management and Economics, 18, (2000) 547-557.

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor & UGC Approved Journal)

Website: www.ijirset.com

Vol. 6, Issue 8, August 2017

- [8] Hatush, Z., and Skitmore, M. "Contractor Selection Using Multi-criteria Utility Theory: An Additive Model", Building and Environment, 33, (1998) 105-115.
- [9] J.H.M Tah and V.Carr, "Proposal for Construction Project Risk Assessment Using Fuzzy Logic", Construction Management and Economics, 18, (2000) pp 491-500.
- [10] Jamil Ahmad et.al. "A Fuzzy Linguistic VIKOR Multiple Criteria Group Decision Making for Supplier Selection", International Journal of Science: Basic and Applied Research (IJSBAR) (2015) Vol.19, No.1, pp 1-16.
- [11] Keeney R. and Fishburn P., "Seven Independence Concepts and Continuous Multi-attribute Utility Functions", Journal of Mathematical Psychology, 11(3) (1974) pp 294-327.
- [12] Opricovic, S. and Tzeng, G. H., "Extended VIKOR method in comparison with outranking methods", European journal of operational research, Vol. 178, (2007) pp. 514-529.
- [13] Serhat Aydin, Cengiz Kahraman, "Evaluation of E-commerce Website Quality Using Fuzzy Multi-criteria Decision-making Approach", IAENG International Journal of Computer Science, 39:1, IJCS 39-1-07.
- [14] Seyhan Nisel, "An Extended VIKOR Method for Ranking Online Graduate Business Programs", International Journal of Information and Education Technology, Vol. 4, No. 1 (February 2014).
- [15] Tong, L. I., Chen, C. C. and Wang, C. H., "Optimization of multi-response processes using the VIKOR method", International journal of advanced manufacturing technology, Vol. 31, (2007) pp. 1049-1057.
- [16] Zadeh, L.A. (1965). "Fuzzy Sets" Information and Control, Vol. 118, pp 338-353.