Vendor Selection Problem for Radial Drilling Arm by Fuzzy Inference Decision Support System

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Abstract— Like many complex supply chain problems, vendor selection problems are not so well defined which can be handed over completely to computers, whereas many human characteristics are also essential to the issues. In this paper attention is given to the fuzzy System helps Vendor Selection Problem (VSP) for Radial drilling Arm (RDA). It required expert's view, conversion it into fuzzy term, making 8 rule base Fuzzy System. At ending point, conclusions and likely areas of Fuzzy in selecting vendors are present.

Key words: Radial drilling, Fuzzy System, Vendor Selection Problem (VSP)

I. INTRODUCTION

The vendor selection process has undergone significant changes during the past twenty years. These include increased quality guidelines, improved computer communications, and increased technical capabilities, essential changes in the vendor selection process. Here, the tabular form of literature survey on VSP.

Approach	Research work
Linear Weighting Method	Vendor selection decision is the most common way of rating different vendors on the performance criteria for their quota allocations [1].
Selection Criteria	Proposed multiple criteria vendor service factor ratings and an overall vendor performance index reference number, as in [2].
LP (Linear Programming Method)	Formulated the vendor selection decision as a LP problem to minimize the total purchasing and storage costs [3, 4, 5, 6].
LP Model	A single item LP model to minimize the aggregate price under constraints of quality; service level and lead-time [7].
MIP (Mix Integer Programming)	MIP approach with the objective of minimizing purchasing, inventory and transportation related costs without any specific mathematical formulation and demonstrated it through selecting the vendors [8].
GP (Goal Programming)	Also proposed the use of GP for price, quality and delivery objectives [9].
DSS	By integrating the analytical hierarchy process with linear programming [10].
	Five-stage model for vendor evaluation [11].
VSP	Fuzzy mixed integer goal programming [12].
	Presented a data envelopment analysis method for a VSP with multiple objectives [13].
	Used the analytical hierarchical process to generate weights for VSP reference number, as in [14], [15].

Table 1: Literature survey on VSP

II. FUZZY INFERENCE DECISION SUPPORT SYSTEM

It requires conversion of expert's view, Fuzzification, Rule Construction, Defuzzification in at the end surface views for DSS [16].

A. Fuzzy Ranges (Converted Through Experts View)

Name of the Vendor	Quality of Material				Delivery of Material				Price
	Expert-1	Expert-2	Expert-3	AVG	Exp-1	E-2	E-3	AVG	AVG
V-1	(0.9-1)	(0.7-0.9)	(0.3-0.8)	(0.3-1)	(0.9-1)	(0.7-0.9)	(0.3-0.8)	(0.3-1)	(0.3-1)
V-2	(0.2-0.7)	(0.1-0.3)	(0-0.3)	(0-0.7)	(0.2-0.7)	(0.1-0.3)	(0-0.3)	(0-0.7)	(0-0.7)

Table 2: Fuzzy conversion of experts view for RDA

B. Fuzzification And The Membership Functions

Figure 1 and 2 show the Fuzzification of QOM and Net-Rating respectively. This same procedure is repeated for other two inputs variable "DOM and Price".

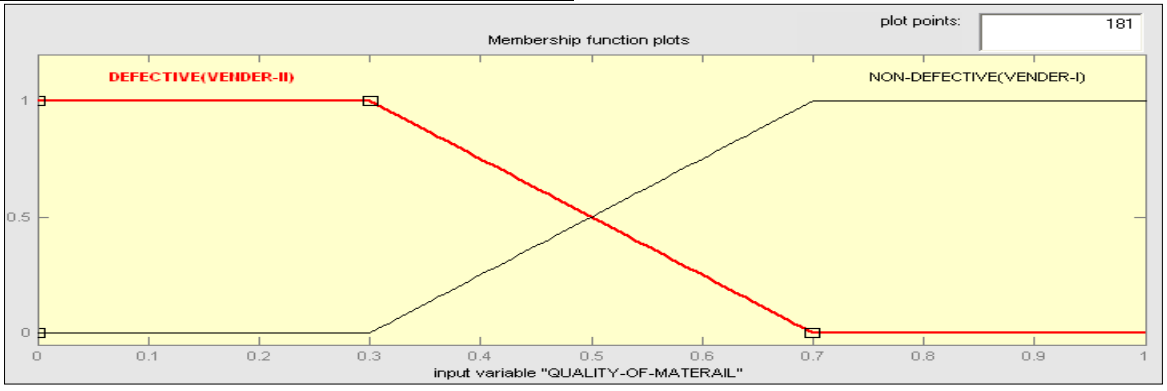

Fig. 1: Fuzzification of QOM (RDA)

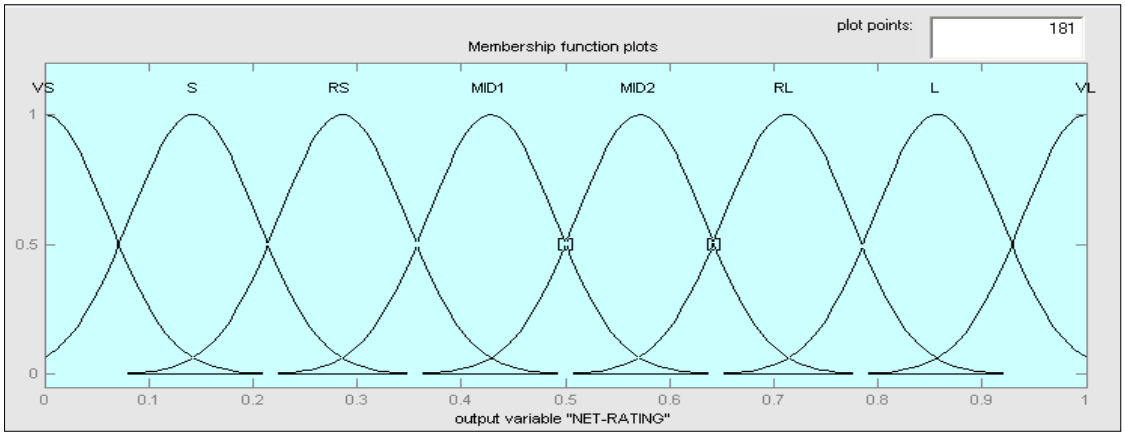

Fig. 2: Fuzzification of Net- rating (RDA)

C. The Rule Viewer

As shown in Figure 3, the Rule viewer displays the fuzzy process. Each row of plots corresponds to one rule and each Arm of plots corresponds to either an input variable (Yellow) or an output variable (Blue). Here, putting the input (0.5 0.5 0.2).

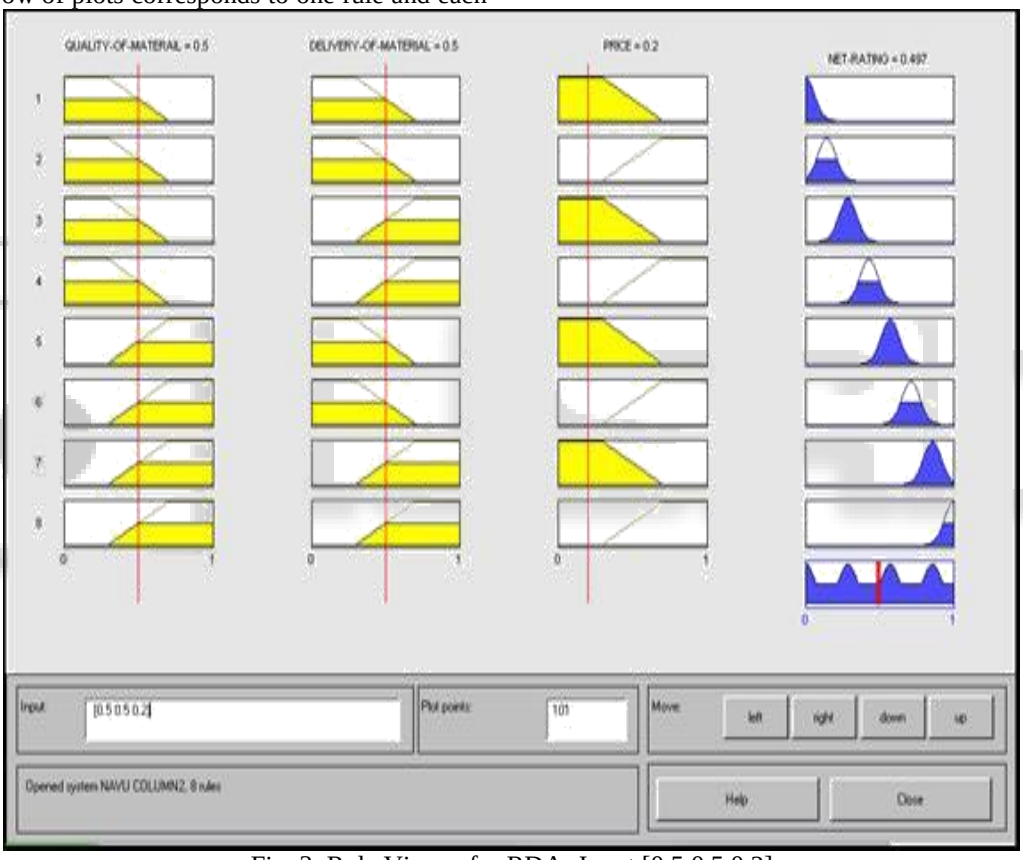

Fig. 3: Rule Viewer for RDA -Input [0.5 0.5 0.2]

D. The Surface Viewe

The surface view of DOM v/s QOM v/s Net- rating (Price= 0.8), QOM v/s Price v/s Net- rating (DOM= 0.5) and DOM v/s Price v/s Net- rating (QOM= 0.5) are in figure. 4, 5, 6 respectively.

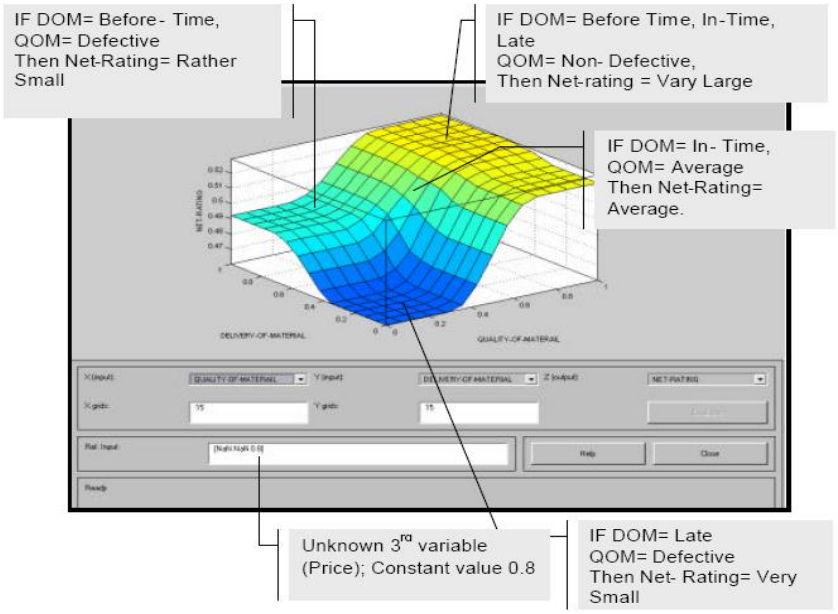

Fig. 4: 3D - Surface for DOM v/s QOM v/s Net- rating with Price = 0.8 (RDA)

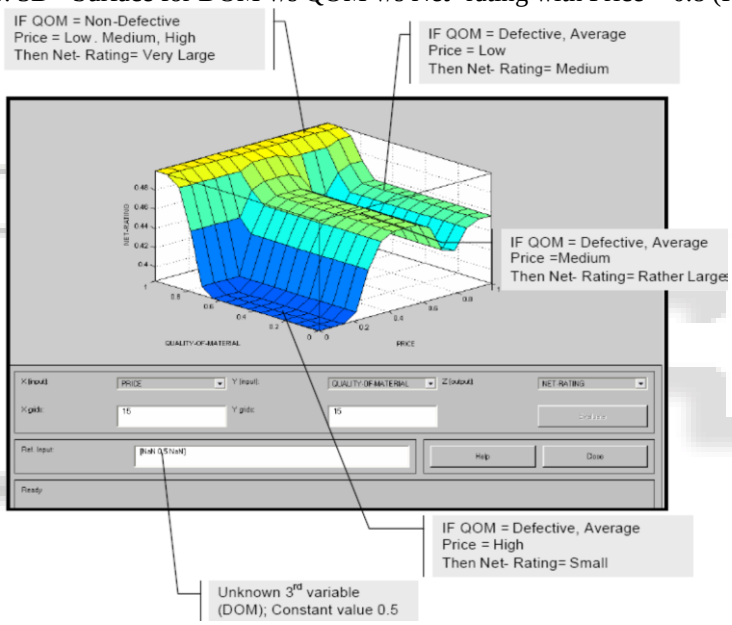

Fig. 5: 3D - Surface for QOM v/s Price v/s Net- rating (RDA) with DOM= 0.5

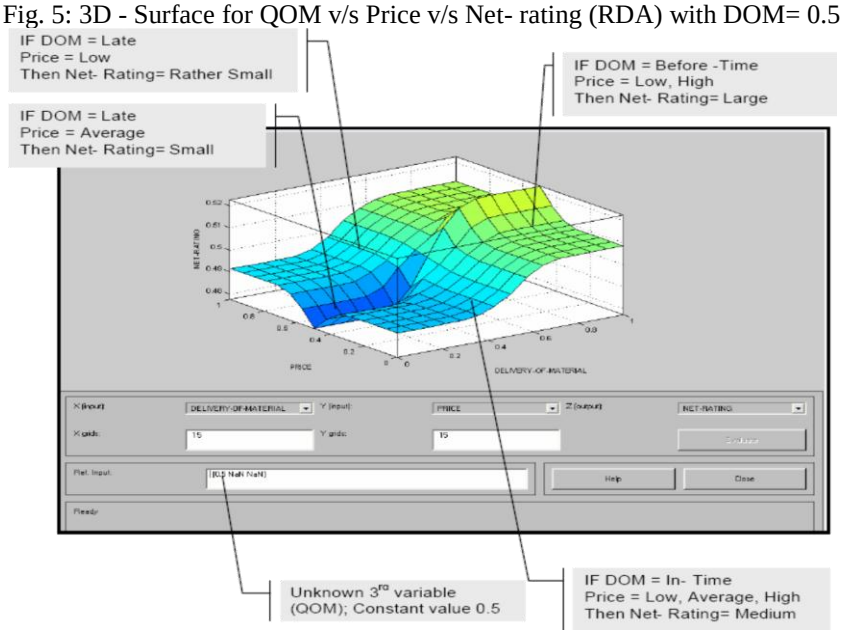

Fig. 6: 3D- Surface for DOM v/s Price v/s Net- rating (RDA) with QOM = 0.5

III. CONCLUSION & DISCUSSION

Based on the present study following conclusions are made

1) For selecting the potential vendor one can consider at least three selection criteria Delivery of Material, Quality of Material, Price as input variables to a Fuzzy Inference System (FIS).
2) Experts' view plays an important role hence they must be considered before Fuzzification in FIS modelling. Many factors as suggested by experts may be considered in arriving at a final decision for a particular vendor.
3) Fuzzy Inference System may be easily incorporated in decision making by involving input variables, membership function to obtain subsequent Net-rating after Diffuzzification.
4) Fuzzy Inference System offers 3D-Surface view, which distinguishes potential vendor from others thus, may be incorporated in selection mechanism.

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