Vendor Selection via Fuzzy Analytic Hierarchy Process: A Case Study

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Abstract

Companies in order to attain the goals of competition have been increasingly considering better vendor selection approaches. Vendor selection problem (VSP) is a Multi Criteria Decision Making (MCDM) problems involving high degree of fuzziness. Fuzziness is involved in the multiple criteria used for selecting and ranking the best vendor. To solve this decision problem, Fuzzy Analytic Hierarchy Process applied to a situation involving the nationwide wholesale distribution of grocery products.

Key words

Analytical Hierarchy Process, Fuzzy Analytical Hierarchy Process, Vendor Aelection.

1 INTRODUCTION

In today's highly competitive environment, it is impossible for a company to successfully produce low-cost, high-quality products without satisfactory vendors. The right vendor is one who will meet and complement the organization's needs from its corporate culture to long-term future needs (Robinson & Kalakota, 2004).The vendor selection problem (VSP) is associated with deciding how one vendor should be selected from a number of potential alternatives (Dickson, 1966). This is due to the compelling need to evolve strategic alliances with the vendors. The material and equipment supplied from the vendors play an important role in the management of a supply chain.

The vendor selection problem is an unstructured, complicated, and multi- criteria decision problem. Over the past two decades, many studies have pointed out that the key is to set effective evaluation criteria for the vendor selection problem (VSP). Earlier works on vendor selection identified 23 criteria (i.e., price, delivery, quality etc.) for evaluating and selecting appropriate vendors and for deciding on the size of the order to be placed with each vendor (Chen & Tzeng, 2001). One possible way to solve this problem is by using multiple attribute decision making (MADM). Some examples of MADM models are the analytic hierarchy process (AHP), technique for order preference by similarity to ideal solution (TOPSIS), elimination and choice translating reality (ELECTRE), and preference ranking organization method for enrichment evaluation (PROMETHEE) (Triantaphyllou, 2000). In decision-making, especially when a high degree of fuzziness and uncertainties are involved, due to imperfections and complications of information processes the theory of fuzzy sets is one of the best tools of systematically handling uncertainty in decision parameters. Fuzzy AHP is an extension of conventional AHP and employs fuzzy set theory to handle uncertainty. In order to identify the criteria and for vendor selection of a company, we conducted a survey. The purpose of this survey is only to enumerate the critical success factors that will form the basis to identify the specific criteria to formulate the FAHP model.

2 STATEMENT OF THE PROBLEM

For most manufacturing firms, the purchasing of raw material and component parts from vendors constitutes a major expense. Raw material cost accounts for 40–60% of production costs for most US manufacturers. In fact, for the automotive industry, the cost of components and parts from outside vendors may exceed 50% of sales. It is vital to the competitiveness of most firms to be able to keep the purchasing cost to a minimum. In today's competitive operating environment it is impossible to successfully produce low-cost, high-quality products without good vendors (Wadhwa & Ravindran, 2007).

General Methods of Vendor Selection

Most commonly used methodologies for solving the vendor selection problem are as follows (Bhutta & Huq, 2002):

• Total cost approach: In the total cost approach, the quoted price from each vendor is taken as the starting point and then each constraint being considered is replaced by a cost factor and the business is awarded to the vendor with the lowest unit total cost (Monckza & Trecha, 1988).

• Multiple attribute utility theory (MAUT): MAUT is a vendor selection technique most useful when dealing with international vendor selection, as it is capable of handling multiple conflicting attributes inherent in international vendor selection (Min, 1994).

• Multi-objective programming: An additional flexibility of multi-objective approach is that it allows a varying number of vendors into the solution and provides suggested volume allocation by vendor. However, the process of obtaining solution through this method is complex (Kumar et al, 2002).

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• Total cost of ownership (TCO): TCO is a methodology and philosophy, which looks beyond the price of purchase to include many other purchase-related costs. The TCO models are further classified by usage: vendor selection and vendor evaluation (Degraeve & Roodhooft, 1999).

• Analytic hierarchy process (AHP): AHP is a good approach that can be used in a multifactor decision-making environment, especially when subjective and/or qualitative considerations have to be incorporated. AHP provides a structured approach for determining the scores and weights for the different criteria used in decision making (Kahraman, et al., 2003).

• TOPSIS: Another favorable technique for solving MCDM problems is the TOPSIS (technique for order performance by similarity to idea solution). TOPSIS is based on the concept that the optimal alternative should have the shortest distance from the positive idea solution (PIS) and the farthest distance from the negative idea solution (NIS). The concept of TOPSIS is rational and understandable, and the computation involved is uncomplicated. However, the inherent difficulty of assigning reliable subjective preferences to the criteria is worth noting (Hwang & Yoon, 1981).

•There are many other methods that focus on the multi-attribute aspect of the vendor selection problem (price, quality, flexibility, and delivery time); for instance, DEA models (Liu et al., 2000), GP models (Sharma et al., 1989), and fuzzy mixed integer goal programming model (Kumar et al., 2004).

Analytical Hierarchy Process

The AHP developed by Saaty (1980) is a multi-criteria methodology formulated to analyze a decision problem following a hierarchical structure. It is often used to model subjective decision making process based on multiple attributes (Saaty, 1997).

The application of AHP to solve a decision problem involves four main steps for a decision maker. The first step is to discompose the decision problem into a hierarchy map where the attributes and plans are present as inter-related elements. The second step involves the pair-wise comparison among the elements based on a nine point weighting scale to generate the input data. During this process, it is possible to know which alternative and attribute are more preferred and for how much greater. The data generated is aggregated according to the hierarchy map to its final value. The decision elements at the hierarchical map are used as a basis for formulating questions on the questionnaire. The decision plans are compared with each other according to each decision attribute. Hence, the decision attributes are compared among each other. The third step is based in the use of the pair-wise as input to create a comparison matrix, which follows the four main axioms underlying the theoretical validity of the comparison matrix. The fourth step involves the estimation and rating of the final weight of the decision plans based on the local priorities for each plan and attributes. By comparing the final values, it is possible to determine and suggest the most relevant plan (Saaty, 1997).

Fuzzy Sets Theory

Dr. Lotfy Zadeh, in 1965, proposed a theory called fuzzy sets. According to Zadeh's definition, a fuzzy set is a class of elements or objects that lack definite boundaries between them. The fuzzy sets theory is useful to define objects which are characterized by vagueness and uncertainty. Fuzzy sets theory is a multi valued theory where intermediate values are expressed in a range, such as high, moderate, or low, instead of yes or no, true or false as in the classical crisp logic theory. The fuzzy sets are defined by the membership functions. The fuzzy sets represent the grade of any element x of space X that have partial membership in A (where A is a fuzzy set). The degree to which an element belongs to the set, μ_A , is defined by the value between 0 and 1(Zadeh, 1965).

Dubois and Prade (1980) defined a triangle fuzzy number (TFN) as a special class of fuzzy number whose membership defined by three real numbers, expresses as (l, m, u) (Dubois & Prade, 1980).Where m is the most possible value of a fuzzy number A, also known as the modal (Tang & Beynon, 2007), l and u are the lower and upper bound, respectively. If the element falls before or beyond them, it will have no membership to the set. Note that $\mu(A(x)) = 0$, if $x < l$ and $x > u$ will have no membership in the fuzzy number A = (l, m, u) (Tang & Beynon, 2007) (Kahraman, et al., 2003).

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Here are some of the fuzzy arithmetic operations on triangular fuzzy numbers. Let A and B be two triangular fuzzy numbers where $A = (l_a, m_a, u_a)$ and $B = (l_b, m_b, u_b)$.

$$Addition : A + B = (l_a + l_b, m_a + m_b, u_a + u_b)$$
$$Subtraction : A - B = (l_a - l_b, m_a - m_b, u_a - u_b)$$
$$Multiplication : A.B = (l_a.l_b, m_a.m_b, u_a u_b)$$
$$Inverse A^{-1} = (\frac{1}{u_a}, \frac{1}{m_a}, \frac{1}{l_a})$$

Fuzzy Analytical Hierarchy Process

Over the years, there have been several questions raised about the theoretical validity, discrete numerical value (Vinod & Ganesh, 1996) and rank reversal problems (Belton & Gear, 1983) in the AHP. One such criticisms of the AHP is its inability to accommodate uncertainty in the decision making process. Critiques argue that it would be cognitively demanding to ask a decision maker to express his/her preference as a discrete numerical value in the pair wise comparison matrices. Interval based (Arbel & Vargas, 1992), fuzzy set based (VanLaarhoven & Pedrycz, 1983), and probability based (Saaty & Vargas, 1987) approaches have been suggested to overcome the inability of AHP to handle uncertainty. Fuzzy set theory based AHP approach is employed in this article since it is able to capture subjective preference of the decision maker and handle uncertainty at ease (Deng, 1999).

The first step in the decision making process is to break down a complex problem into a hierarchical structure. A typical fuzzy AHP problem is comprised of several levels of hierarchy, the top most level consists of the goal or the objective of the decision problem while the bottom most part consists of the alternatives that need to be chosen. In between there are several levels of hierarchy, which comprises of criteria, sub criteria, sub criteria, and so on.

The extent analysis FAHP is utilized, which was originally introduced by Chang (1996). The fuzzy scale regarding relative importance to measure the relative weights is given in Fig.1 and Table 1(Chang, 1996). Let $X = \{x_1, x_2, x_3, ..., x_n\}$ be an object set, and $G = \{g_1, g_2, g_3, ..., g_n\}$ be a goal set. According to the method of Chang's extent analysis, each object is taken and extent analysis for each goal is performed respectively. Therefore, m extent analysis values for each object can be obtained, with the following notations:

$$M_{gi}^1, M_{gi}^2, ..., M_{gi}^m$$
$$i = 1,2,...,n \qquad (1)$$

Where $M_{gi}^j (j = 1,2,...,m)$ all are TFNs.

1/2 1 3/2 2 5/2 3 7/2 RI

Fig. 1. Linguistic scale for relative importance (Kahraman et al., 2004).

Table1: Linguistic scales for preferences (Kahraman et al., 2004).

Linguistic scale for difficulty	Linguistic scale for importance	Triangular fuzzy scale	Triangular fuzzy reciprocal scale
Just equal	Just equal	(1, 1, 1)	(1, 1, 1)
Equally difficult (ED)	Equally important (EI)	(1/2, 1, 3/2)	(2/3, 1, 2)
Weakly more difficult (WMD)	Weakly more important (WMI)	(1, 3/2, 2)	(1/2, 2/3, 1)
Strongly more difficult (SMD)	Strongly more important (SMI)	(3/2, 2, 5/2)	(2/5, 1/2, 2/3)
Very strongly more difficult (VSMD)	Very strongly more important (VSMI)	(2, 5/2, 3)	(1/3, 2/5, 1/2)
Absolutely more difficult (AMD)	Absolutely more important (AMI)	(5/2, 3, 7/2)	(2/7, 1/3, 2/5)

The steps of Chang's extent analysis can be given as follows (Chang, 1996):

Step 1. The value of fuzzy synthetic extent with respect to the its object is defined as

$$S_i = \sum_{j=1}^{m} M_{gi}^{j} \otimes [\sum_{i=1}^{n}\sum_{j=1}^{m} M_{gi}^{j}]^{-1} \quad (2)$$

To obtain $\sum_{j=1}^{m} M_{gi}^{j}$, the fuzzy addition operation of m extent analysis values for a particular matrix is performed such as

$$\sum_{j=1}^{m} M_{gi}^{j} = (\sum_{j=1}^{m} l_j, \sum_{j=1}^{m} m_j, \sum_{j=1}^{m} u_j) \quad (3)$$

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and to obtain $[\sum_{j=1}^{n}\sum_{j=1}^{m} M_{gi}^{j}]^{-1}$, the fuzzy addition operation of $M_{gi}^{j}(j=1,2,\ldots,m)$ values is performed such as:

$$\sum_{i=1}^{n}\sum_{j=1}^{m} M_{gi}^{j} = (\sum_{i=1}^{n} l_i, \sum_{i=1}^{n} m_i, \sum_{i=1}^{n} u_i) \quad (4)$$

And then the inverse of the vector above is computed, such as

$$[\sum_{i=1}^{n}\sum_{j=1}^{m} M_{gi}^{j}]^{-1} = (\frac{1}{\sum_{i=1}^{n} u_i}, \frac{1}{\sum_{i=1}^{n} m_i}, \frac{1}{\sum_{i=1}^{n} l_i}) \quad (5)$$

Step 2. As $M_1 = (l_1, m_1, u_1)$ and $M_2 = (l_2, m_2, u_2)$ are two triangular fuzzy numbers, the degree of possibility of $M_2 = (l_2, m_2, u_2) \geq M_1 = (l_1, m_1, u_1)$ is defined as

$$V(M_2 \geq M_1) = \sup_{y \geq x}[\min(\mu_{M_1}(x), \mu_{M_2}(y))] \quad (6)$$

And can be expressed as follows:

$$V(M_2 \geq M_1) = hgt(M_1 \cap M_2) = \mu_{M_2}(d)$$

$$= \begin{cases} 1 & if m_2 \geq m_1 \\ 0 & if l_1 \geq u_2 \\ \frac{l_1 - u_2}{(m_2 - u_2) - (m_1 - l_1)} & otherwise \end{cases} \quad (7)$$

Fig. 2 illustrates Eq. (10) where d is the ordinate of the highest intersection point D between μ_{M_1} and μ_{M_2}. To compare M1 and M2, we need both the values of $V(M_1 \geq M_2)$ and $V(M_2 \geq M_1)$.

Step 3. The degree possibility for a convex fuzzy number to be greater than k convex fuzzy $M_i(i = 1,2,\ldots,k)$ numbers can be defined by

$$V(M \geq M_1, M_2, \ldots, M_k) = V[(M \geq M_1) and (M \geq M_2) and \ldots and (M \geq M_k)] = \min V(M \geq M_i), i = 1,2,3,\ldots,k \quad (8)$$

Assume that $d(A_i) = \min V(S_i \geq S_k)$ for $k = 1,2,\ldots,n; k \neq i$ then the weight vector is given by

$$W' = (d'(A_1), d'(A_2), \ldots, d'(A_n))^T \quad (9)$$

Where $A_i(i = 1,2,\ldots,n)$ are n elements.

Step 4. The normalized weight vectors are

$$W = (d(A_1), d(A_2), \ldots, d(A_n))^T$$

Where W is a non-fuzzy number (Chang, 1996).

Determing the Criteria and Sub Criteria

Dickson (1966) found that seven criteria, out of 23, were perceived as being the most important to buyers (Table 2). The seven criteria, in order, were quality, delivery, performance history, warranties and claims policies, production facilities and capacity, price, and technical capability (Dickson, 1966). As noted earlier, Webber, et al (1991), in their review of 74 vendor selection articles, identified six criteria as being most often mentioned. These six criteria, which varied somewhat from the earlier Dickson study, included: quality, delivery, price, facilities/capability, geographic location and technical capability. Webber, et al thus found that 'geographic location' had increased in importance (from a ranking of 20th to 5th), while 'performance history' and 'warranties and claims policies' were no longer perceived as being among the most critical vendor selection criteria(Weber et al., 1991).

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Their rankings were determined by the number of articles written in 21 leading business journals in regard to each criterion over a 25 year period. While this reflects the amount of research dedicated to each vendor selection criteria, it does not necessarily reflect the perceived importance that buyers place on the same criteria. In table 3, Summary of Important Vendor Selection Criteria Studies is shown.

Table 2: Vendor Selection Factors (Dickson, 1966).

Quality	Management and Organization
Delivery	Operating Controls
Performance History	Repair Services
Warranty & Claims Policies	Attitude
Production Facilities and Capacity	Impression
Price	Packaging Ability
Technical Capability	Labor Relations Record
Financial Position	Geographical Location
Procedural Compliance	Amount of Past Business
Communication System	Training Aids
Reputation and Position in Industry	Reciprocal Arrangements
Desire for Business	

Table 3: Summary of Important Vendor Selection Criteria Studies

Author(s)	Study Location	Number of Vendor Selection Criteria	Ranking of Top Vendor Selection Criteria
Ghymn (Weber et al., 1991)	USA	15	1. Delivery 2. Price 3. Dependability 4. Transportation Cost 5. Ordering/shipping Procedures 6. Quality
Ghymn & Jacobs (Ghymn & Jacobs, 1983)	Japan	17	1. Quality 2. Delivery 3. Price 4. Dependability 5. Product Safety
Ghymn & Jaffe (Ghymn & Jacobs, 1993)	Israel	19	1. Quality 2. Price 3. Delivery 4. Dependability 5. Product Features
Ghymn, Johnson & Zhang (Ghymn & Jaffe, 2003)	China	19	1. Quality 2. Price 3. Delivery
Ghymn, Liesch & Mattsson (Ghymn et al., 1993)	Australia	19	1. Quality 2. Dependability 3. Product Features

			4. Price 5. Delivery
Ghymn, Mattsson & Cho (Ghymn et al., 1999)	Sweden	19	1. Quality 2. Delivery 3. Price 4. Dependability
Ghymn, Srinil & Johnson (Ghymn et al., 2001)	Thailand	19	1. Quality 2. Price 3. Delivery
Thaver & Wilcock (Ghymn et al., 1993)	Canada	16	1. Price 2. Quality 3. Flexibility 4. Responsiveness 5. Communication

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This study applies Dickson's (1966) vendor selection criteria setting and its reduction to a smaller number of factors for the first time. It has been suggested that decision makers combine criteria into a smaller number of choices to simplify the decision process when selecting vendors. Based on an exploratory study, seven vendor selection criteria factors have been identified.

Constructing a Vendor Selection Model

Consider a company that want to buys sugar from 4 vendors. We propose that the best vendor can be evaluating by seven criteria. They are C_1: Commission, C_2: Facilities and Capacity, C_3: Geographic Location, C_4: Financial Position, C_5: Amount of past vendor, C_6: Reputation and Position in Industry, C_7: Communication. Fig 2. Represents the AHP hierarchy for the vendor selection problem. The hierarchy represents the various levels of the problem in terms of the overall goal, criteria, sub criteria and the decision alternative. Once the hierarchy is constructed for the problem perform the pair-wise comparison of elements in one level relative to a single element in a level immediately above it to derive local priorities of these elements that reflect their relative contribution to the subject of comparison. Tables 4-11 depict the various pair-wise comparison matrix between the criteria's and alternative with respect to various criteria.

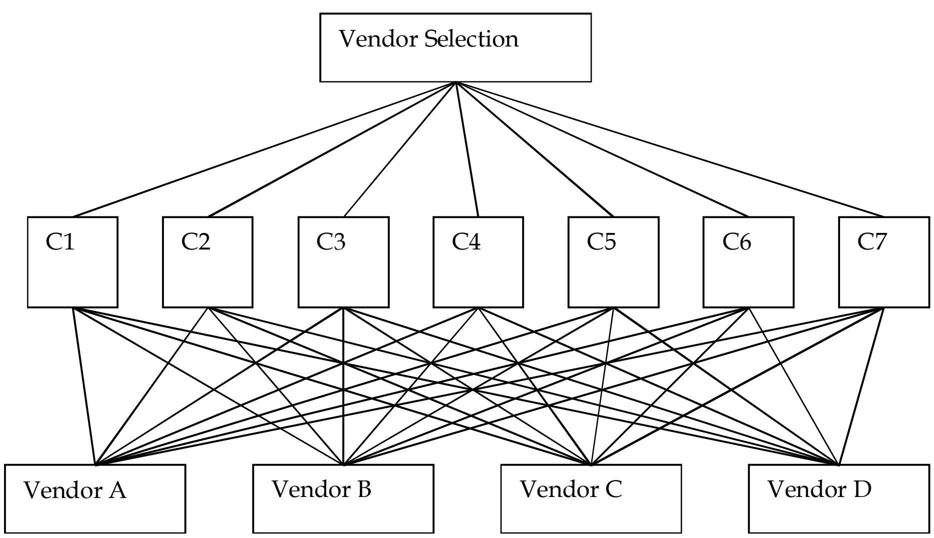

Fig 2. AHP hierarchy for the vendor selection problem

Table 4: the fuzzy evaluation matrix representing pair-wise comparison matrix of criteria

criteria	C1	C2	C3	C4	C5	C6	C7
C1	(1,1,1)	(3/2,2,5/2)	(3/2,2,5/2)	(1,3/2,2)	(1,3/2,2)	(1/2,1,3/2)	(1,3/2,2)
C2	(2/5,1/2,2/3)	(1,1,1)	(1/2,1,3/2)	(1/2,1,3/2)	(1,3/2,2)	(3/2,2,5/2)	(1/2,1,3/2)
C3	(2/5,1/2,2/3)	(2/3,1,2)	(1,1,1)	(2,5/2,3)	(1,3/2,2)	(3/2,2,5/2)	(1/2,1,3/2)
C4	(1/2,2/3,1)	(2/3,1,2)	(1/3,2/5,1/2)	(1,1,1)	(3/2,2,5/2)	(1,3/2,2)	(1,3/2,2)
C5	(1/2,2/3,1)	(1/2,2/3,1)	(1/2,2/3,1)	(2/5,1/2,2/3)	(1,1,1)	(1/2,1,3/2)	(1/2,1,3/2)
C6	(2/3,1,2)	(2/5,1/2,2/3)	(2/5,1/2,2/3)	(1/2,2/3,1)	(2/3,1,2)	(1,1,1)	(1/2,1,3/2)
C7	(1/2,2/3,1)	(2/3,1,2)	(2/3,1,2)	(1/2,2/3,1)	(2/3,1,2)	(2/3,1,2)	(1,1,1)

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Table 5: Evaluation of the alternative A,B,C,D to criteria C1

C1	Vendor A	Vendor B	Vendor C	Vendor D
Vendor A	(1,1,1)	(3/2,2,5/2)	(1/2,1,3/2)	(1,3/2,2)
Vendor B	(2/5,1/2,2/3)	(1,1,1)	(1/2,1,3/2)	(1,1,1)
Vendor C	(2/3,1,2)	(2/3,1,2)	(1,1,1)	(2,5/2,3)
Vendor D	(1/2,2/3,1)	(1,1,1)	(1/3,2/5,1/2)	(1,1,1)

Table 6: Evaluation of the alternative A,B,C,D to criteria C2

C2	Vendor A	Vendor B	Vendor C	Vendor D
Vendor A	(1,1,1)	(1/2,1,3/2)	(1/2,1,3/2)	(1,3/2,2)
Vendor B	(2/3,1,2)	(1,1,1)	(3/2,2,5/2)	(2,5/2,3)
Vendor C	(2/3,1,2)	(2/5,1/2,2/3)	(1,1,1)	(1,3/2,2)
Vendor D	(1/2,2/3,1)	(1/3,2/5,1/2)	(1/2,2/3,1)	(1,1,1)

Table 7: Evaluation of the alternative A,B,C,D to criteria C3

C3	Vendor A	Vendor B	Vendor C	Vendor D
Vendor A	(1,1,1)	(1/2,1,3/2)	(2,5/2,3)	(1,3/2,2)
Vendor B	(2/3,1,2)	(1,1,1)	(5/2,3,7/2)	(1,3/2,2)
Vendor C	(1/3,2/5,1/2)	(2/7,1/3,2/5)	(1,1,1)	(1/2,1,3/2)
Vendor D	(1/2,2/3,1)	(1/2,2/3,1)	(2/3,1,2)	(1,1,1)

Table 8: Evaluation of the alternative A,B,C,D to criteria C4

C4	Vendor A	Vendor B	Vendor C	Vendor D
Vendor A	(1,1,1)	(1/2,1,3/2)	(1,3/2,2)	(1/2,1,3/2)
Vendor B	(2/3,1,2)	(1,1,1)	(5/2,3,7/2)	(1,3/2,2)
Vendor C	(1/2,2/3,1)	(2/7,1/3,2/5)	(1,1,1)	(1/2,1,3/2)
Vendor D	(2/3,1,2)	(1/2,2/3,1)	(2/3,1,2)	(1,1,1)

Table 9: Evaluation of the alternative A,B,C,D to criteria C5

C5	Vendor A	Vendor B	Vendor C	Vendor D
Vendor A	(1,1,1)	(1/2,1,3/2)	(1/2,1,3/2)	(1/2,1,3/2)
Vendor B	(2/3,1,2)	(1,1,1)	(2,5/2,3)	(3/2,2,5/2)
Vendor C	(2/3,1,2)	(1/3,2/5,1/2)	(1,1,1)	(1/2,1,3/2)
Vendor D	(2/3,1,2)	(2/5,1/2,2/3)	(2/3,1,2)	(1,1,1)

Table 10: Evaluation of the alternative A,B,C,D to criteria C6

C6	Vendor A	Vendor B	Vendor C	Vendor D
Vendor A	(1,1,1)	(1/2,1,3/2)	(1,3/2,2)	(1/2,1,3/2)
Vendor B	(2/3,1,2)	(1,1,1)	(2,5/2,3)	(3/2,2,5/2)
Vendor C	(1/2,2/3,1)	(1/3,2/5,1/2)	(1,1,1)	(1/2,1,3/2)
Vendor D	(2/3,1,2)	(2/5,1/2,2/3)	(2/3,1,2)	(1,1,1)

Table 11: Evaluation of the alternative A,B,C,D to criteria C7

C7	Vendor A	Vendor B	Vendor C	Vendor D
Vendor A	(1,1,1)	(1/2,1,3/2)	(3/2,2,5/2)	(1/2,1,3/2)
Vendor B	(2/3,1,2)	(1,1,1)	(5/2,3,7/2)	(1/2,1,3/2)
Vendor C	(2/5,1/2,2/3)	(2/7,1/3,2/5)	(1,1,1)	(1/2,1,3/2)

Vendor D	(2/3,1,2)	(2/3,1,2)	(2/3,1,2)	(1,1,1)

The priority weights of alternatives are given in table 12 that resulted from applying FAHP. Based on the results, ranking of vendor is as: vendor B, vendor A, vendor C, vendor D. vendor B is the best.

Table 12: Results from the fuzzy AHP method

	C1	C2	C3	C4	C5	C6	C7	Alternative Priority Weight
Weight Alternative	.2	.17	.19	.04	.115	.129	.15	
Vendor A	.346	.276	.366	.264	.225	.27	.29	.3004
Vendor B	.183	.416	.396	.385	.373	.39	.344	.3427
Vendor C	.346	.243	.054	.117	.187	.122	.107	.1787
Vendor D	.124	.065	.183	.233	.214	.217	.258	.1712

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CONCLUSIONS

In this paper we study the vendor selection over distribution channel. It is asserted that the vendor selection is a critical factor to succeed a company and there is a need of formalized decision-making support. The vendor selection is formulated as a multiple criteria decision-making problem under uncertainty, where the imprecise decision maker's judgments are represented as fuzzy numbers. A new fuzzy programming method is proposed for assessment of the weights of evaluation criteria and weight of alternative VSP. The fuzzy modification of the AHP thus obtained is implemented for finding weight of all possible alternatives. The numerical example shows some of the advantages of the proposed fuzzy approach and its applicability to providing a valuable decision support in the VSP process.

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