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A New Strategy In Supplier Selection Process By Utilizing FANP As An Appropriate Tool

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Abstract

Nowadays, Supply Chain Management (SCM) is a vital issue which companies are forced to deal with. Considering SCM processes, supplier selection is prominent and the affection of supplied raw materials and assembled parts on end users satisfaction cannot be denied. The presented paper focuses on second layer suppliers which have been overlooked in supplier selection procedures. Therefore the process has performed by considering some features of suppliers in second layer. The model is solved using FANP method which has been fed with real data and results represented that features of second layer suppliers are as important as first layer's.

Keywords: Supply Chain Management (SCM), Multi Criteria Decision Making (MCDM), Supplier Selection, Fuzzy Analytic Network Process (FANP)

1. Introduction

Nowadays, competitive business environment has forced companies to satisfy customers who demand for more variety of products, lower cost, better quality and faster response (Vendrembse et al, 2006). In each manufacturing process, the decision maker faces with a high number of parameters which affect the final cost of the product. To diminish the cost, the decision maker should do a tradeoff among the parameters and after performing the tradeoff the decision maker will learn about those parameters that play remarkable role in increasing the cost of production. One of these important parameters is the price of raw materials and component parts which comprise the bulk of the product cost, reaching up to 70% in some cases in most industries (Ghobadian *et al*, 1993). So when the cost of raw materials or component parts dominates the product cost, supplier selection becomes a crucial process for the company to maintain or lower the cost while holding the quality of the products (Wu *et al*, 2009). There can be found so many articles which have considered supplier selection as an important MCDM problem in supply chain management which contains tangible and intangible factors. If process is done correctly, a higher quality and longer lasting relationship will be more attainable (Lee, 2009). In other word, selection of wrong supplier could be enough to upset the company's financial and operational position, whereas selecting the right suppliers significantly reduces purchasing cost, improves competitiveness in market and enhances end user satisfaction (Önüt *et al*, 2009).

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Supplier selection is a fundamental issue in supply chain and heavily contributes to the overall supply chain performance. In previous decades, supplier selection problem has been noticed as an important problem in both industry and science. First related papers in supplier selection can be traced back to the 1950s when applications of linear programming and scientific computations were at their beginning. The first recorded supplier selection model is that used by the National Bureau of Standards in the United States of America to find the minimum cost way for awarding procurement contracts in the Department of Defense (Aissaoui N *et al*, 2006). In 2001 a review was published by Deboer, Labro and Morlacchi focused on methods supporting supplier selection (De boer L *et al*, 2001), in 2007 a comprehensive review on supplier selection and order lot sizing methods was done by Aissaoui and her colleagues (Aissaoui N *et al*, 2007) and the latest review on supplier selection was performed by William, Xiaowei and Parsanta, they review multi criteria decision making approaches for supplier evaluation and selection process (William HO *et al*, 2010).

There are so many papers which have presented various methods and procedures. Most of them are MCDM methods such as mathematical programming (MP), goal programming (GP), heuristic algorithms such as genetic algorithm (GA), etc, with the aim of simplifying the process with more accuracy and also seeking some other objectives such as the order quantity, capacity, etc. the mathematical programming (MP) includes linear programming (LP) and combination linear programming. Goal programming (GP) has been studied and applied in supplier selection by so many researchers such as Muralidharan *et al* (2002), Weber *et al* (1998), Lee (2009).

The AHP method introduced by Saaty, has many applications in supplier selection process since many researchers have utilized it and its derivatives like FAHP and ANP in their articles. As William mentioned in his article, AHP and ANP have been applied in ten articles from 78 (about 13 percent) international journal articles which were reviewed (William HO *et al*, 2010). As an instance, Kokangul *et al* (2008) utilized AHP with non linear programming and, also, multi objective programming to create a procedure for selecting supplier which contains such parameters like capacity, discount, etc.

In our survey about different methods of supplier selection, we could find no article which evaluates the supplier from the second layer supplier's point of view. In presented article, align with considering the aforementioned view point; the FANP has been applied in selection of suppliers. The other sections of this paper are as following:

The proposed Framework of selecting suppliers by considering features of the second layer suppliers is introduced in section 2. Section 3 is a review of two methods which are very common in MCDM, Classic ANP and Fuzzy ANP. Introduction of proposed FANP for supplier selection is mentioned in section 4. Applying aforementioned method to one of the examples from Industry and analyzing results attained is presented in section 5 and finally, conclusion and references are discussed in section 6 and 7 respectively.

2. Proposed framework of selecting suppliers by considering 2nd layer suppliers features

Firstly, it is considered that there exists an industrial unit with the aim of manufacturing final products and distribute them directly to market and deliver to end users. Therefore the main manufacturer assembles some parts and components parts to make a final product. By assuming that the main manufacturer requires N parts, N can be separated into two groups. The first group refers to those parts which are standard parts and manufactured in large amounts such as screws and are directly used in production line. The second group represents those parts which the amount of their production might not be the same for different products (such as brake pads and gearboxes in different vehicles) and the main focus of this article is on this kind of parts. Let n be a subset of N that contains number of parts which are belonged to second part, then P_i demonstrated the i^{th} part of n; so the main manufacturer require at least n different supplier in order to run production lines. By considering that the number of suppliers for different parts can be unequal, so the main manufacturer may face to so many suppliers. Let presume that the main manufacturer is in contact with m supplier for supplying each part, and then S_{ij} shows the j^{th} supplier of i^{th} part. It is obvious that each part of n parts requires k raw materials in order to be produced at the 1st layer supplier's plants (R is used to represent raw materials) which each of the raw material has its own suppliers (2nd layer).

As an instance, it can be assumed that the main manufacturer produces passenger cars as its final products, so it requires brake pads (as one of the required parts) and there are numerous suppliers which supply and manufacture brake pads (1st layer of suppliers). Since 11 raw materials such as metal, aluminum oxide are needed, so R_{li} represents the l^{th} raw material for the i^{th} part. Each raw material has different sources to be supplied and suppliers in 1st layer ought to be connected to aforementioned sources in order to manufacture the products. It is considered that each of K raw materials, which has a definite role in production, has h suppliers in 2nd layer, so Pr_{tli} explains the t^{th} supplier of l^{th} raw material for the i^{th} part. In order to better understanding this concept, a figure is provided which depicted the sequence of 1st and 2nd layer of suppliers Fig. 1.

The parameters of the Fig. 1. are as follows:
N: number of whole required parts, n: number of required part with two layers of suppliers, N-n: number of required standard parts, P_i: i^{th} required part from n ($i=1,2,\dots,n$), S: First layer suppliers, m: number of 1st layer suppliers for each part, S_{ji}: the j^{th} supplier for i^{th} part ($j=1,2,\dots,m$), R: required raw material for each part, K: number of required raw material for each part, R_{Li}: the l^{th} raw material which is required for i^{th} part ($L=1, 2,\dots, k$), P_r: second layer suppliers, h: number of suppliers for each raw material, Pr_{tLi}: the t^{th} supplier of l^{th} raw material for i^{th} part ($t=1,2,\dots,h$)

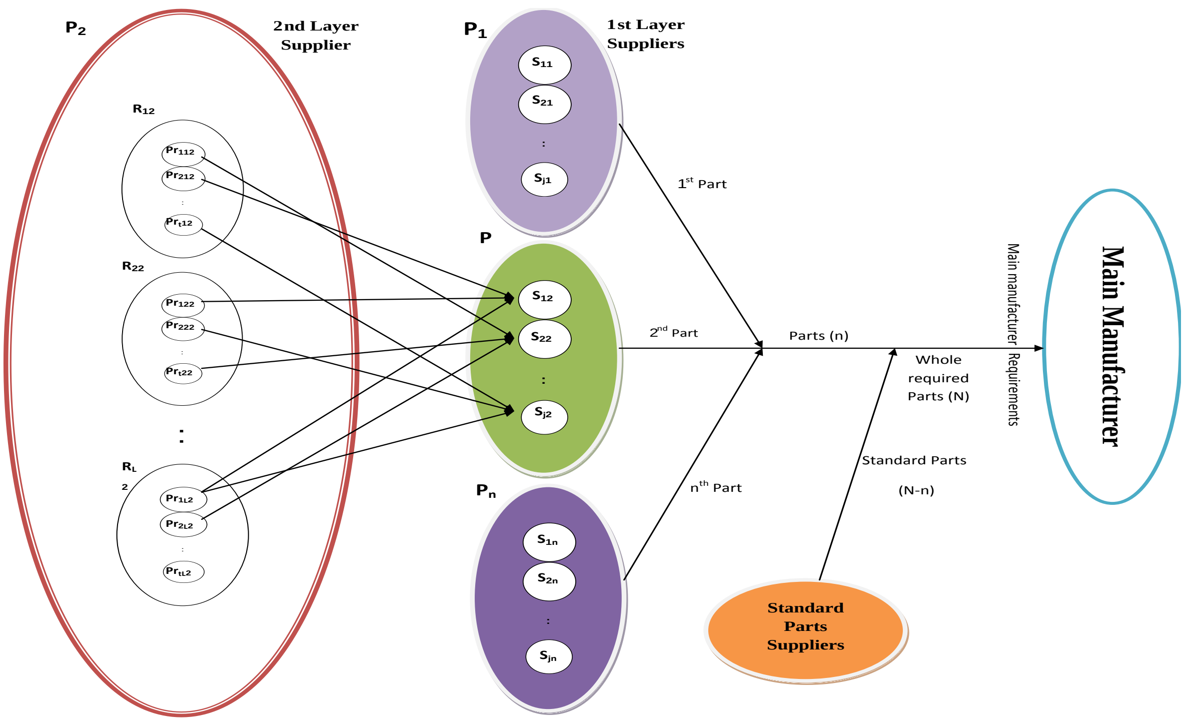

Fig. 1. The sequence of 1st and 2nd layer suppliers

3. Review on ANP and Fuzzy ANP methods

3.1. Analytic Network Process (ANP)

In addition to the merits of AHP, Most of decision making problems can not be building as hierarchical because of dependencies, influences between and within clusters specially in complex system. For filling this gap and providing a more generalized model, the analytic network process (ANP) extends the AHP to problems with dependencies and feedback among the criteria and alternatives by using a ‘‘supermatrix’’ approach (Saaty, 1996). A two-way arrow among different levels of attributes may schematically represent the interdependencies in an ANP model. If interdependencies are present within the same level of analysis, a looped arc may be used to represent it.

The application of the ANP to the complex problem usually involves following steps:

1. Model construction: Break down the complex problem into a number of small constituent elements and then structure the elements in a network form.

2. Calculation of W_i : Assuming there are n number of criteria, denoted as (C_1,...,Cn), its pairwise comparison matrix would be A = (a_{ij}), in which a_{ij} represents the relative significance of C_i to C_j. Then, by using the row vector average normalization proposed by Saaty (1996), the approximate weight W_i of C_i is calculated as follows:

$$W_i = \frac{\sum_{j=1}^{n} (a_{ij} / \sum_{i=1}^{n} a_{ij})}{n}, \quad i,j=1,2,\ldots,n \tag{1}$$

3. Consistency test: same as AHP method, CR of each pairwise comparison matrix should be less than 0.1, to be acceptable.

4. Limiting the weight supermatrix for the weights.

ANP uses supermatrix to deal with the relationship of feedback and interdependence among the criteria. If there is no interdependent relationship among the criteria, the pairwise comparison value would be 0. In contrast, if an interdependent and feedback relationship exists among the criteria, then such value would no longer be 0 and an unweighted supermatrix <u>M</u> will be achieved. If the matrix does not conform to the principle of column stochastic, the decision maker can provide the weights to adjust it into a supermatrix that conforms to the principle of column stochastic, and it will become a weighted supermatrix M. We then get the limited weighted supermatrix M^* based on Eq. (2) and allow for progressive convergence of the interdependent relationship to achieve the precise relative weights among the criteria (Tseng *et al.*, 2008).

$$M^* = \lim_{k\to\infty} M^k \tag{2}$$

3.2. Fuzzy Analytic Network Process (FANP)

Both AHP and ANP methods deal only with comparison ratios which are crisp. However, uncertain human judgments with internal inconsistency obstructing the direct application of the ANP are frequently found. To cope with this problem, various authors proposed many fuzzy AHP methods (Van Laarhoven and Pedrycz, 1983; Buckley, 1985; Chang, 1992, 1996;

Cheng, 1997; Deng, 1999; Leung and Cao, 2000; Mikhailov, 2004). These methods are systematic approaches to the alternative selection and justification problem by using the concepts of fuzzy set theory and hierarchical structure analysis. because of fuzzy nature of the comparison process which leads to unable to explicit preferences, Decision makers usually find that it is more confident to give interval judgments than crisp value judgments. achieving a conclusion is sometimes impractical and unclear to acquire exact judgments in pairwise comparisons.

FANP method adapts the subjectivity of human judgment as being expressed in natural language. Reaching a conclusion is sometimes impractical and unclear to acquire exact judgments in pairwise comparisons. The words used in the science of decision-making are always unclear and fuzzy. Fuzzy based method, FANP, is able to meet required formation for uncertain and vague pairwise comparisons. FANP has some additional advantages according to the conventional ANP method. It gives more practical results in pairwise comparison process. Therefore the method uses a linguistic scale which helps the decision maker or the expert and provides a more flexible approach in reaching a conclusion. FANP method gives better illumination and learning in decision-making process.

Below main advantages of the FANP against classical ANP are given (Mikhailov and Singh, 2003b)

- It better models the ambiguity and imprecision associated with the pairwise comparison process.
- It successfully derives priorities from both consistent and inconsistent judgments.
- It is cognitively less demanding for the decision makers.
- It is an adequate reflection of the decision-makers' attitude toward risk and their degree of confidence in the subjective assessments.

In this study, we use Chang's extent analysis method (kahraman *et al*, 2006) because the steps of this approach are easier than the other fuzzy AHP approaches.

4. Proposed supplier selection model

The proposed model to select superior supplier is composed of following steps:

Step 1: Identify the factors and sub-factors to be used in the model (Metin and Ihsan, 2008).

Step 2: Structure the ANP model hierarchically (goal, factors, sub-factors) (Metin and Ihsan, 2008).

Step 3: Determine the local weights of the criteria, sub-criteria and each alternatives with each sub-criteria, by using pairwise comparison matrices (assume that there is no dependence among the factors). The fuzzy scale regarding relative importance to measure the relative weights (Kahraman *et al*., 2006) is given in Fig. 3 and Table 1.

Step 4: Determine the global weight of the sub-criteria considering interdependence among them to resolve the effects of the interdependence that exists between them by matrix w_c which is defined by multiplying matrix B with matrix w_2^T (H.-J. Shyur, 2006).

B: inner dependence matrix of each factor with respect to the other factors.

The decision makers examine the impact of all criteria on each other by using pairwise comparisons as well. Various pairwise comparison matrices are constructed to show for each of the criterion. These pairwise comparison matrices are needed to identify the relative impacts of criteria interdependent relationships. The normalized principal eigenvectors for these matrices are calculated and shown as column component in interdependence weight matrix of criteria B, where zeros are assigned to the eigenvector weights of the sub-criteria from which a given sub-criterion is given.

w_2^T : Local weights of factors matrix, determined in step 3

Step 5: Measure the sub-factors. Linguistic variables proposed by Cheng et al. (1999) are used in this step. The membership functions of these linguistic variables are shown in Fig.4, and the average values related with these variables are shown in Table 2. By using this evaluation scale, the linguistic variables can take different values depending on the structure of the sub-factor.

Step 6: Calculation of *gw*sv* by synthesizing the results from previous two steps is as follows: Calculate the weight of each supplier by using the simple additive weighting method.

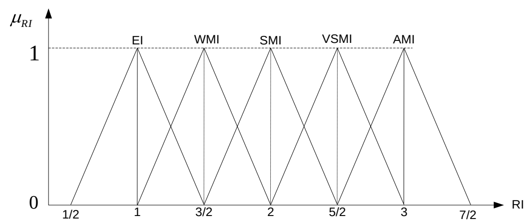

Fig. 3. Linguistic scale for relative importance (Kahraman et al., 2006).

Table 1. Linguistic scales for difficulty and importance.

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)

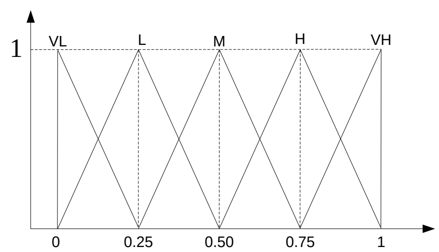

Fig. 4. Membership functions of linguistic values for performance indicator rating.

Table 2. Linguistic values and mean of fuzzy numbers.

Linguistic values	The mean of fuzzy number
Very High (VH)	1
High (H)	0.75
Medium (M)	0.5
Low (L)	0.25
Very Low (VL)	0

5. Case Study

This case was a joint program between an academic team from the university and an industrial team. The proposed supplier selection method has been applied in one of automotive companies named PARSKHODRO and Renault Pars, Mega Motor, Sazeh Gostar and Saipa Press are considered suppliers for the case Fig. 2. Therefore, for the application, a decision committee is established from three managers of the company, each from a different department, and the authors of this paper. Preferred suppliers are selected by using the proposed fuzzy ANP model:

Step 1: In this step 7 criteria, 21 sub-criteria and 4 suppliers, are evaluated by the decision committee

Step 2: The ANP model formed by the factors and sub-factors determined in the first step is shown in Fig. 5. ANP model is composed of four stages. In the first stage, there is the goal of determining sub-factor weights. There are factors, sub-factors and suppliers related to them in second, third and fourth stages respectively.

Step 3: In this step, local weights of the factors and sub-factors which take part in the second and third levels

of ANP model, are calculated. Pairwise comparison matrices are formed by the decision committee by using the scale given in Table 1. For example FINANCIAL criterion and QUALITY criterion are compared using the question ‘‘How important is FINANCIAL criterion when it is compared with QUALITY criterion?” and the answer ‘‘Weakly more important (WMI)”, to this linguistic scale is placed in the relevant cell against the triangular fuzzy numbers (1/2,2/3,1). All the fuzzy evaluation matrices are produced in the same manner. Pairwise comparison matrices are analyzed by the Chang’s extend analysis method (Section 3.2.1) and local weights are determined. The local weights for the factors are calculated in a similar fashion to the fuzzy evaluation matrices, as shown under Table 3. Pairwise comparison matrices are given in Tables 3-4 together with the local weights. Using the computed relative importance weights, the inner dependence matrix of the factors is constituted in Table 5. Global weight of sub-criteria and FANP computation of overall weight index for alternatives are given in Table 6 and 7 respectively.

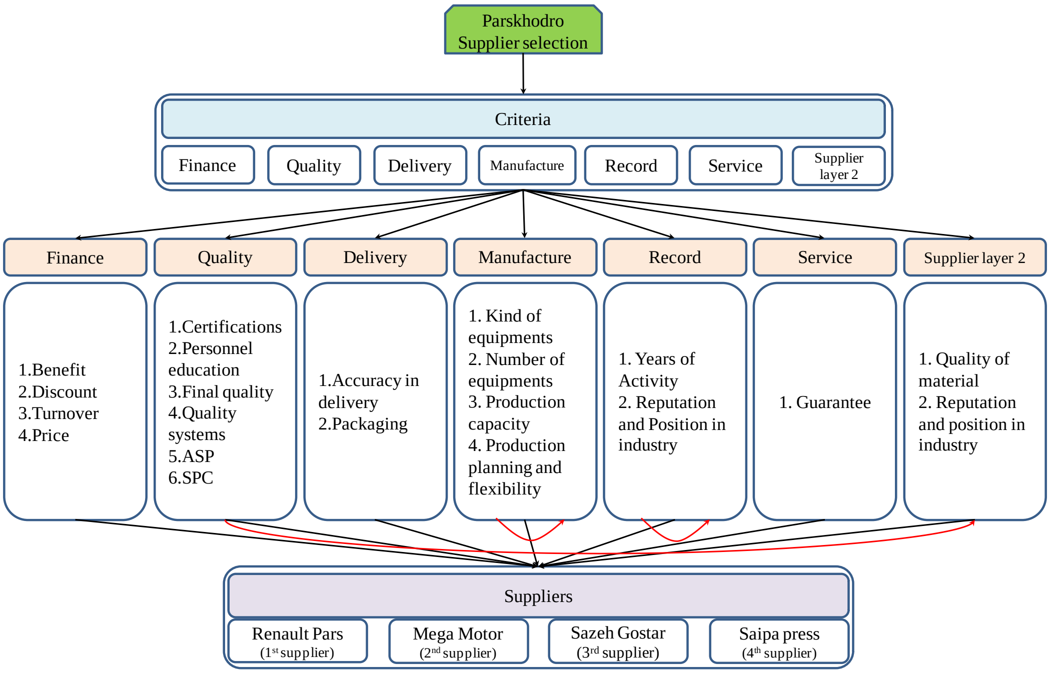

Fig 5. Network of proposed supplier selection model

Table 3. Local weights and pairwise comparison matrix of main factors

Criteria	Financial	Quality	Delivery	Manufacture	Service	Record	Layer2	Weights
Financial	(1,1,1)	(1/2,2/3,1)	(3/2,2,5/2)	(1,3/2,2)	(2,5/2,3)	(1,3/2,2)	(1,3/2,2)	0.208
Quality	(1,3/2,2)	(1,1,1)	(3/2,2,5/2)	(1,3/2,2)	(3/2,2,5/2)	(1,3/2,2)	(1,3/2,2)	0.214
Delivery	(2/5,1/2,2/3)	(2/5,1/2,2/3)	(1,1,1)	(1/2,2/3,1)	(1,3/2,2)	(1,3/2,2)	(2/5,1/2,2/3)	0.104
Manufacture	(1/2,2/3,1)	(1/2,2/3,1)	(1,3/2,2)	(1,1,1)	(1,3/2,2)	(1,3/2,2)	(1/2,2/3,1)	0.144
Service	(1/3,2/5,1/2)	(2/5,1/2,2/3)	(1/2,2/3,1)	(1/2,2/3,1)	(1,1,1)	(1,3/2,2)	(1/2,2/3,1)	0.081
Record	(1/2,2/3,1)	(1/2,2/3,1)	(1/2,2/3,1)	(1/2,2/3,1)	(1/2,2/3,1)	(1,1,1)	(1/2,2/3,1)	0.075
Layer 2	(1/2,2/3,1)	(1/2,2/3,1)	(3/2,2,5/2)	(1,3/2,2)	(1,3/2,2)	(1,3/2,2)	(1,1,1)	0.173

Table 4. Local weights and pairwise comparison matrix of Financial sub-factors

Financial	Benefit	Discount	Price	Turnover	Weights
Benefit	(1,1,1)	(2/3,1,2)	(2/5,1/2,2/3)	(1,1,1)	0.189
Discount	(1/2,1,3/2)	(1,1,1)	(2/3,1,2)	(1/2,1,3/2)	0.253
Price	(3/2,2,5/2)	(1/2,1,3/2)	(1,1,1)	(3/2,2,5/2)	0.370
Turnover	(1,1,1)	(2/3,1,2)	(2/5,1/2,2/3)	(1,1,1)	0.189

Table 5. The inner dependence matrix of the factors with respect to ‘‘production planning and flexibility”

Manufacture	Kind of equipment	Number of machine	Weights
Kind of equipment	(1,1,1)	(1,3/2,2)	0.68
Number of machine	(1/2,2/3,1)	(1,1,1)	0.32

Step 4: Global weight of factors, by multiplying matrix B with matrix w_2^T, is given in table 6.

Table 6. Global weight of sub-criteria

Matrix B	Ben	Dis	Pri	Tur	Cer	Edu	FQ	Q.S	ASP	SPC	Acc	Pac	K.M	N.M	P.C	P.P.	N.A.Y	Rep	Gua	Q.M	Rep2	w_2^T	global w
Ben	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.189	0.189
Dis	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.253	0.253
Pri	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.370	0.370
Tur	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.189	0.189
Cer	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.074	0.074
Edu	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.009	0.009
F.Q.	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.262	0.131
Q.S	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.149	0.149

ASP	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0.227	0.113
SPC	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.279	0.279
Acc	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0.500	0.500
Pac	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.500	0.500
K.M	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.34	0	0	0	0	0	0.196	0.326
N.M	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.16	0	0	0	0	0	0.154	0.214
P.C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0.271	0.271
P.P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0.379	0.190
N.A.Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.33	0	0	0	0.500	0.667
Rep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.33	0	0	0	0.500	0.167
Gua	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1.000	1.000
Q.M2	0	0	0	0	0	0	0.5	0	0.5	0	0	0	0	0	0	0	0	0	0	1	0	0.684	0.929
Rep2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.33	0	0	1	0.316	0.482

Step 5: Measure the global weight of sub-factors (gw)

Table 7. FANP computation of overall weight index for alternatives.

Criteria	weight	Sub-crirteria	global w	scale value	GW*SV	s1	s2	s3	s4
Financial	0.208	Ben	0.189	0.75	0.142	0.271	0.250	0.271	0.209
		Dis	0.253	0.75	0.189	0.299	0.224	0.252	0.224
		Pri	0.370	1	0.370	0.250	0.271	0.271	0.209
		Tur	0.189	0.5	0.094	0.224	0.224	0.299	0.252
Quality	0.214	Cer	0.074	0.5	0.037	0.226	0.270	0.189	0.315
		Edu	0.009	0.5	0.004	0.214	0.239	0.233	0.314
		F.Q.	0.131	1	0.131	0.000	0.000	0.500	0.500
		Q.S	0.149	0.75	0.112	0.191	0.191	0.232	0.385
		ASP	0.113	0.5	0.057	0.276	0.217	0.190	0.317
		SPC	0.279	0.75	0.209	0.270	0.226	0.189	0.315
Delivery	0.104	Acc	0.500	0.75	0.375	0.252	0.224	0.299	0.224
		Pac	0.500	0.5	0.250	0.292	0.122	0.293	0.293
Manufacture	0.144	K.M	0.326	0.5	0.163	0.224	0.252	0.299	0.224
		N.M	0.214	0.5	0.107	0.247	0.237	0.270	0.247

		P.C	0.271	0.75	0.203	0.342	0.158	0.158	0.342
		P.P	0.190	0.75	0.142	0.209	0.271	0.250	0.271
Record	0.081	N.A.Y	0.667	0.75	0.500	0.250	0.250	0.250	0.250
		Rep	0.167	0.75	0.125	0.474	0.175	0.175	0.175
Service	0.075	Gua	1.000	0.5	0.500	0.299	0.252	0.224	0.224
Supplier in layer 2	0.173	Q.M2	0.929	1	0.929	0.500	0.500	0.000	0.000
		Rep2	0.482	0.5	0.241	0.342	0.158	0.342	0.158

Step 6: The calculation of aggregated weights for each supplier

Table 8. Comparison of the results of three methods

Supplier	FANP	Rank
1	0.312	1
2	0.276	2
3	0.208	3
4	0.203	4

As it can be perceived by the table 8 we have computed the outcomes of FANP in order to be able to rank suppliers among each other the table shows that the company should contract to the 1st supplier as the best supplier.

6. Conclusion

In literature, there are so many supplier selection methods which include both MADM and MODM, but none of them did ever enunciated that a supply chain (SC) can have more than one layer of suppliers and the other layers can be very effective in total quality of SC and total cost incurred by supply chain. Also the influence of the price of raw materials on the prime cost is an undeniable issue which might result in lowering customer satisfaction and decrease in sale and benefit. The presented article consists of two main two main parts which the first one reveals a new approach of selecting suppliers by having a glance on suppliers who are placed in the previous layer of the first suppliers named as second layer suppliers and the second includes considered criteria and the appropriate tool for solving the introduced approach.

In the second part there are 21 sub-criteria which are extracted from 6 main criteria. These criteria formed a network in order to select the best supplier and ANP was considered to be a solution tool. But because of the vague nature of data, we preferred to utilize fuzzy set theory to conquest the uncertainty and ambiguity, so the FANP has been used as the proper tool.
Then the proposed model has been applied in one of the automotive related companies which supplying parts for OEM's is its mission. The model has been solved by one of the common MCDM methods, FANP. The results attained from the case shows that the new introduced procedure can make the supplier selection process more accurate and also it shows a new point of view which has been misled up to now.

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