

## Providing a suitable model for supplier selection in outsourcing using Fuzzy VIKOR decision making method

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### ABSTRACT

Outsourcing or providing services from outside the organization has a long history and all manufacturing and industrial companies use the types of outsourcing models. However, outsourcing needs a more intelligent and informed decisions in the organizations. In outsourcing decisions besides the strategic issues, the considerations of cost and profit, efficiency and risk aspects associated with supplier quality, the reliability of delivery and promotion times is also considered. When these factors are considered together, the decision to outsource can be a very complex and sensitive decision that affect the profitability, investment and competitive position. In this study, we offer a Fuzzy model in line with selecting a supplier after investigating the criteria influencing the supplier selection. Finally, regarding the importance of subject, we will analyze the results while conducting a case study.

**Key words:** Outsourcing, Supplier, Multiple Criteria Decision Making, Fuzzy Theory

### Introduction

If the local organization to be defined as an organized entity that has some governmental characteristics and also has administrative, financial and political autonomy and its purpose is to provide public services to local people with maximum efficiency and effectiveness [1]. The organizations always search the new ways to develop and increase their competitive advantage. Outsourcing is one of these ways that can through decreasing and controlling the performing costs organization focus on core capabilities, profiting from experts who are not in the organization, improving the quality of work and etc. leads to more competitiveness [3].

For organizations, outsourcing decision makings due to its strategic requirements is along with very considerations [2]. Such a decision can be enumerated as an important factor in attracting the profits and therefore has an important portion in financial health of the company. In front of it, there are evidences that indicate the organizations failure in performing the outsourcing. One of the important failure reasons in the process of organizational outsourcing is the improper supplier selection [7]. Therefore, in this paper after investigating the effective criteria on the supplier selection, we will offer a model for selecting the supplier. Regarding to this that selecting the supplier in the process of

outsourcing is the multi- criteria decision making issue and on the other hand, existence of an ambiguity and non- specific preferences of individuals, the use of fuzzy logic is inevitable, therefore in this research, the main indices of supplier was identified and the fuzzy multi- criteria decision method making were prioritized.

### 2. Literature review:

#### 2.1 Outsourcing:

For persons who are involved in the production and manufacturing, the question of " what should be made in inside and what should be purchased from outside?" is not a new question [5]. The theoretical principles of outsourcing refer to the meaning of transaction cost. This concept for the first time by Coase in 1937 was proposed and then revived by the transactions cost theory of Williamson. In this theory, transactions cost is the only criteria of outsourcing [11]. Therefore, most of the researchers have offered some methods and approaches from the last decade up to now that within them, outsourcing decision in addition to the cost criterion will be considered from the strategic perspective [8]. Therefore, initially Prahalad & Hamel offered the relation of core capabilities and outsourcing. In their perspective, core capabilities are the collective

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learning in organizations, particularly in the method of coordinating the various manufacturing skills and integration of multiple technologies [17].

This capability is the real source of competitiveness advantage and will help the company in introducing the new products and services to the market. Hence, the activities which are in the scope of the company main capabilities must be made inside and other activities can be considered for the outsourcing [4].

According to Corbett, outsourcing is the restructuring the core capabilities and external relations of the organization. In the viewpoint of Schnider, Jans and Zuckweiler, outsourcing is the provision of services outside the organization while the outsourcing represents the goods production or services, relying on resources within the organization [9].

2.2 outsourcing criteria:

Since outsourcing has a short and long time effects on the organization, hence in order to decision making for performing this action needs some criteria [14]. Hill in his model emphasized on two main factors of "organization capability" and "significance rate" [14]. Our purpose of organization capability is a collection of software and hardware facilities and sources that are requisite for performing a task [6]. On the other hand, significance scales refer to the sensitivity and role that mentioned activity has in the effectiveness and efficiency of the organizations [13]. In other words when an activity is very significant for the organization and organization in performing it has a special capability, there is not a need for outsourcing, in front of it some activities which are more significant for the organization has not sufficient capability in performing it, are the best choice for outsourcing [10].

Craige also has presented a model for choosing the different outsourcing strategies in the companies. In this model, on the effective role of two main elements of strategic "Importance of Activity" and "organization capability" in its implementation has been emphasized too [11].

2.3 VIKOR method:

VIKOR method is as one of the applied techniques and applicable in the multi variable decision making [12]. This method focuses on the

ranking and choosing from one collection of choices with inconsistent criteria [12]. A peaceful solution for an issue with a number of inconsistent criteria that can help to the determiner to achieve the final decision [16].

A peaceful solution that its foundation was made by Zeleni is a possible way that can lead to an ideal method. VIKOR method determines the peaceful prioritization and peaceful solution by presenting the multi-criteria prioritization index based on a criterion close to the ideal solution. This method includes the following steps: first of all determining the best rank of  $f_i^+$  and worst rank  $f_i^-$  for all criteria. Then  $S_j$  and  $R_j$  can be calculated from the following equations [15].

$$S_j = \sum_{i=1}^n w_i \frac{(f_i^+ - f_{ij})}{(f_i^+ - f_i^-)} \quad S_j \in [0,1]$$

$$R_j = \max (w_i \frac{(f_i^+ - f_{ij})}{(f_i^+ - f_i^-)}) \quad R_j \in [0,1]$$

In the other step, the values of  $Q_j$  can be calculated by the following equation [15]:

$$Q_j = \frac{v(S_j - S^+) + (1-v)(R_j - R^+)}{(S^- - S^+) + (R^- - R^+)}$$

In this equation,  $v$  is the weight of decision making strategy or maximum utility of group. Then, we sort incrementally each one of the values of  $S$ ,  $R$ , and  $Q$  and finally suggest the peaceful solution [15].

3. Methodology:

Our research method regarding the object is applied and regarding the collecting data is descriptive –survey. The collecting data tool is a questionnaire. The method of collecting data in the questionnaires is the DELPHI method. To determine the validity of questionnaire was used of the Cranach’s Alpha coefficient. That according to this that the calculated coefficient is equal to 0.714, then its stability can be confirmed.

Since the more a decision making to be involved in the human source and complex systems, the more fuzzy phenomenon is dominant in the system, we use of the fuzzy method to rank the suppliers. The statistical population case is the Damsan Rayaneh Co. that is one of the ten superior company about the Network Security in Iran. Our cases in a random way selected and include all the experts of Damsan Rayaned Co. (98 individuals). Therefore by analyzing the questionnaires, the most important criteria of suppliers are as the following:

Table 1: Supplier’s selection criteria from the experts' perspective

criteria
Quality
cost
Timely delivery
flexibility
support

**Table 2:** Analysis of experts' using the method of fuzzy VIKOR

choice	
A	(0.1955,0.5433,1)
B	(0.155,0.491,1)
C	(0.1784,0.5213,1)
D	(0.088,0.45,1)
E	(0.1391,0.4625,1)
F	(0.0748,0.364,1)
choice	
A	(0.3168,0.6392,0.88)
B	(0.2772,0.5882,0.82)
C	(0.2772,0.5882,0.82)
D	(0.2772,0.5882,0.82)
E	(0.3132,0.6068,0.94)
F	(0.1056,0.34,0.6864)

Finally, we were ranked suppliers:

**Table 3:** Suppliers' final ranking

Choice		Rank
F	(0.0902,0.352,0.8432)	1
D	(0.1826,0.5164,0.91)	2
C	(0.226,0.55205,0.91)	5
B	(0.2161,0.5369,0.91)	3
E	(0.22615,0.53465,0.97)	4
A	(0.25615,0.59125,0.94)	6

Therefore, if we want to select the best choice among the 6 choices according to the presented method, the supplier **F** will be the best choice.

#### 4. Data analysis:

In this section, after selecting the criteria and investigating the experts' comments based on the fuzzy VIKOR method that its explanation in section 2.3 were addressed, we are going to select the selective criteria that following results were obtained.

#### Conclusion:

Organizations are in a century that the information has a determinative role in their destiny such that, if the information to be reached timely and accurate to the hands of organization managers, accurate decisions will be taken and quick and correct decisions will help to the organizations in line with agility. This agility helps the organization react quickly to the environmental changes and finally the competitiveness of organization against the competitors and providing the resources and adaptability to the customer's needs to be increased.

Doubtlessly, in the turbulent and evasive environments, the outsourcing strategy is a strategic necessity that enumerated in life of government and non-government organizations to rely on the outside resources of organizations in the fields that have not sufficient efficiency and effectiveness. In outsourcing decisions beside the strategic issues, cost and profit considerations, efficiency aspects in relation with the supplier quality, reliability of delivery and development times also must be considered.

When these factors are considered together, outsourcing decision can be a hard and complex decision that affects the profitability, investment and competitiveness position. A wrong decision can lead to spend more costs, wasting the opportunities and customers and market share or even the whole company failure. On the other hand, in the outsourcing parallel with developing a set of selective choices, effective factors scope in the prosperity and promoting the outsourced activity are developed such that often this scope is beyond the administrative limits or even effectiveness of organization.

The recent research offered a framework in relation with effective solution of the evaluation object of suppliers in the process of outsourcing through the multi criteria fuzzy method. VIKOR method helped to decision making in achieving a peaceful way that has the extreme public desirability for the majority and minority of regret and penitence for defiant and importance weights of criteria and choices by triangle fuzzy numbers have been performed. Using this method, the ambiguity due to the evaluation has been ruined and an effective evaluation process has been done.

Regarding the performed studies, reasoning and judgments of human source have an important role in choosing the supplier. Therefore, the more a decision to be involved in human source and complex systems, the more fuzzy system is dominant in our system. Generally, the offered methodology can remove all the shortages in the case of choosing the suppliers in the process of outsourcing and lead to improve and take advantage from the process of outsourcing.

Although this method in choosing the supplier in the process of outsourcing has been used, but it can be used in other issues of decision making that decision maker is faced with uncertainty.

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