Evaluating Consulting Firms Using VIKOR

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Abstract: Many companies usually ask for consulting firm service. Thus evaluating and selecting a suitable consulting firm becomes an important issue. In this article, a Multi-Criteria Decision Making (MCDM) problem is presented and a real-life international company is illustrated. The technique used in solution named *Vlse Kriterijumska Optimizacija I Kompromisno Resenje* in Serbian (VIKOR) is applied for ranking the consulting firms. Many quantitative criteria are considered to compare firms in order to rank them.
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1. Introduction

A consulting firm is a firm of experts providing professional advice to an organization for a fee. A consulting firm consists of consultants who are experts in their field. For some global consulting firms, their employees represent from many nationality. Usually, a consulting firm provides its service which is in core business discipline, from marketing to operations.

The merit of MCDM techniques is that they consider both qualitative parameters as well as the quantitative ones, MCDM includes many solution techniques such as Simple Additive Weighting (SAW), Weighting Product(WP) [6], and Analytic Hierarchy Process (AHP) [9].

In this paper, a real-life problem existed in multi-national company is presented. The company is wiling to introduce a new product to the Egyptian market; so it needs consultations concerning pricing strategy, marketing, and operations. The technique used so-called *Vlse Kriterijumska Optimizacija I Kompromisno Resenje* in Serbian (VIKOR), a branch of MCDM methods, is applied to rank selected consulting firms for the multi-national company. The rest of the paper is structured as following; in section 2 the VIKOR method is illustrated, section 3 is made for the consulting firm selection problem, the case study is presented in section 4, and finally section 5 is for conclusion.

2. Consulting Firms

To survive in tight competition in today's business world, a company usually develops a new product which is different from, or better than, that of its competitors. A crucial factor such as pricing must be determined when introducing a new product to the market because it is very sensitive to customers. Wrong pricing strategy for a new product developed from a heavy investment can lead a company into loss or even bankruptcy. However, determining the best pricing strategy for a new product is difficult and many factors must be considered [2].

Creplets *et al.* [3] analyzed theoretically and empirically the differences between consultants and experts in the framework of the knowledge-based economy in order to introduce the central concepts of epistemic community and community of practice.

Many criteria must be considered when evaluating consulting firms, some of them are qualitative, such as reputation, some are quantitative, such as firm size; moreover, criteria may have different importance. Therefore, how to comprehensively aggregate these criteria and importance weights becomes a critical issue in effectively evaluating consulting firms.

Some relevant works have been studied in the evaluation of consulting firms. However they did not talk detail about the other criteria that are supposed to be considered by a consulting firm such as the implementation cost and its knowledge. Wang and Chen [12] presented how human inputs (top management, users, and external consultants) are linked to communication effectiveness and conflict resolution in the consulting process, as well as the effects of these factors on the quality of the system implemented.

Altman indicated what should company consider and give guidelines in choosing the right consultancy [1]. Saremi *et al.*[8] used Nominal Group Technique (NGT) in deciding criteria for selecting the best consultant firm.

3. VIKOR

A MCDM problem can be concisely expressed in a matrix format, in which columns indicate criteria (attributes) considered in a given problem; and in which rows list the competing alternatives. Specifically, a MCDM problem with m alternatives (A_1, A_2, ..., A_m) that are evaluated by n criteria (C_1, C_2, ..., C_n) can be viewed as a geometric system with m

points in *n*-dimensional space. An element x_{ij} of the matrix indicates the performance rating of the i^{th} alternative A_i, with respect to the j^{th} criterion C_j, as shown in Eq. (1):

$$D = \begin{array}{c} \\ A_1 \\ A_2 \\ A_3 \\ \vdots \\ A_m \end{array} \begin{array}{c} \begin{array}{cccccc} C_1 & C_2 & C_3 & \cdots & C_n \end{array} \\ \begin{bmatrix} x_{11} & x_{12} & x_{13} & \cdots & x_{1n} \\ x_{21} & x_{22} & x_{23} & \cdots & x_{2n} \\ x_{31} & x_{32} & x_{33} & \cdots & x_{3n} \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ x_{m1} & x_{m2} & x_{m3} & \cdots & x_{mn} \end{bmatrix} \end{array} \quad (1)$$

The VIKOR method was introduced as an applicable technique to implement within MCDM [7]. It focuses on ranking and selecting from a set of alternatives in the presence of conflicting criteria. The compromise solution, whose foundation was established by Yu [13] and Zeleny [14] is a feasible solution, which is the closest to the ideal, and here "compromise" means an agreement established by mutual concessions.

The VIKOR method determines the compromise ranking list and the compromise solution by introducing the multi-criteria ranking index based on the particular measure of "closeness" to the "ideal" solution. The multi-criteria measure for compromise ranking is developed from the *Lp-metric* used as an aggregating function in a compromise programming method. The levels of regret in VIKOR can be defined as:

$$L_{p,i} = \{\sum_{j=1}^{n} [w_j (x_j^* - x_{ij}) / (x_j^* - x_j^-)]^p\}^{1/p}, \ 1 \le p \le \infty, \quad (2)$$

where $i = 1,2,\ldots,m$. $L_{1,i}$ is defined as the maximum group utility, and $L_{\infty,i}$ is defined as the minimum individual regret of the opponent.

The procedure of VIKOR for ranking alternatives can be described as the following steps [5]:

***Step 1*:** Determine that best x_j^* and the worst x_j^- values of all criterion functions, where $j = 1, 2,\ldots, n$. If the *jth* criterion represents a benefit then $x_j^* = \max_i f_{ij}$, $f_j^- = \min_i f_{ij}$.

***Step 2*:** Compute the S_i (the maximum group utility) and R_i (the minimum individual regret of the opponent) values, $i = 1, 2,\ldots, m$ by the relations:

$$S_i = L_{1,i} = \sum_{j=1}^{n} w_j (x_j^* - x_{ij}) / (x_j^* - x_j^-), \quad (3)$$

$$R_i = L_{\infty,i} = \max_j [\sum_{j=1}^{n} w_j (x_j^* - x_{ij}) / (x_j^* - x_j^-)], \quad (4)$$

where w_i is the weight of the j^{th} criterion which expresses the relative importance of criteria.

***Step 3*:** Compute the value Q_i, $i = 1,2,\ldots,m$, by the relation

$$Q_i = v(S_i - S^*) / (S^- - S^*) + (1-v)(R_i - R^*) / (R^- - R^*), \quad (5)$$

where $S^* = \min_i S_i$, $S^- = \max_i S_i$, $R^* = \min_i R_i$, $R^- = \max_i R_i$, and v is introduced weight of the strategy of S_i and R_i.

***Step 4*:** Rank the alternatives, sorting by the *S, R,* and *Q* values in decreasing order. The results are three ranking lists.

***Step 5*:** Propose as a compromise solution the alternative (A') which is ranked the best by the minimum *Q* if the following two conditions are satisfied:

C1. "Acceptable advantage":

$Q(A'') - Q(A') \ge DQ$, where A'' is the alternative with second position in the ranking list by *Q*, $DQ = 1/(m - 1)$ and *m* is the number of alternatives.

C2. "Acceptable stability in decision making":

Alternative A' must also be the best ranked by *S* or/and *R*. This compromise solution is stable within a decision making process, which could be: "voting by majority rule" (when $v > 0.5$ is needed), or "by consensus" ($v \approx 0.5$), or "with vote" ($v < 0.5$). Here, v is the weight of the decision making strategy "the majority of criteria" (or "the maximum group utility"). $v = 0.5$ is used in this paper. If one of the conditions is not satisfied, then a set of compromise solutions is proposed [5].

Recently, VIKOR has been widely applied for dealing with MCDM problems of various fields, such as environmental policy [10], data envelopment analysis [11], and personnel training selection [4].

4. Case Study

A multi-national manufacturing company must select a consulting firm to help determine the price for its new product. After preliminary screening, five alternative consulting firms are short-listed.

A committee is formed to conduct the evaluation and selection of the four alternative consulting firms. The committee set four criteria to be compared; three benefit criteria, the company size (C_1), potential profit (C_2), and expected growth (C_3). One cost criterion, the cost of the consulting (C_4) is also considered. All criteria considered are quantitative type. Table 1 shows the four criteria, their relevant weights assigned by the committee, and their computation units.

The management presented the data included in the decision matrix found in Table 2 showing the five firms, and their performance ratings with respect to all criteria.

Table 1. Criteria and their computation units

Criterion Index	Criterion Description	Computation Units	Weights
C_1	Company Size	No. of employees	0.35
C_2	Potential Profit	L.E.(Millions)	0.30
C_3	Expected Growth	Percentage	0.20
C_4	Cost	L.E.(Thousands)	0.15

Table 2. Decision matrix

	C_1	C_2	C_3	C_4
Firm1	1203	30.1	20%	842
Firm2	288	10.9	13%	905
Firm3	532	13.4	50%	767
Firm4	756	18.6	43%	792
Firm5	2897	50.4	18%	954

By applying the procedure of VIKOR, we can calculate the *S*, *R* and *Q* values as shown in Table 3 to derive the preference ranking of the candidates. Management should choose the third candidate because he has the minimum *S*, *R*, and *Q* values; also, the two conditions mentioned earlier in section 2 are satisfied.

Table 3. Ranking lists and scores

	S	***R***	***Q***	**Rank**
Firm1	0.6038	0.2273	0.3734	2
Firm2	0.9607	0.3500	1	5
Firm3	0.5983	0.3173	0.6234	4
Firm4	0.5866	0.2872	0.5294	3
Firm5	0.3230	0.1730	0	**1**

5. Conclusion

A VIKOR method is presented to evaluate and rank consulting firms introduced to a multi-national company. A real-life MCDM problem of a new manner is introduced. The VIKOR method is employed to rank the firms. The method might be combined to other techniques to solve this type of problems in further research.

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