# Formulation and Prioritization of Strategies in Tile and Ceramic Industry: A Case Study

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**Abstract**: This paper is conducted in Ehsan Tile Company in order to formulate and priority strategies. In this paper, we use the combination of qualitative and quantitative methods. At first, the most influential internal and external elements were detected with the help of the techniques of strategy formulation. Using the Strengths, Weaknesses, Opportunities and Threats (SWOT) matrix, we formulated the primary organizational strategies. Then, the Decision Making Trial and Evaluation Laboratory (DEMATEL) is used for obtaining the existing relations between the SWOT. After obtaining the relationship between the SWOT, Using analytic network process (ANP) and Formation of super-matrix, weights (SWOT) are obtained. Finally, VIKOR is used to priority the strategies. In addition, we prioritize our strategies with the TOPSIS method and the results are compared with VIKOR method.
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## 1. Introduction

Organizations to survive in today's rapid and turbulent environment need to develop coherent long-term plans. Strategic management can be understood as the collection of decisions and actions taken by business management, in consultation with all levels within the organization, to determine the long-term activities of the organization (Houben et al., 1999). Many approaches and techniques can be used to analyze strategic cases in the strategic management process (Dincer, 2004). Important ways in Strategy formulation can be classified in three-step decision framework. Tools or methods presented in this framework are suitable for a variety of organizations and help strategies that identify, evaluate and choose strategists. The first phase strategy includes internal factors evaluation matrix (IFE), external factors evaluation matrix (EFE) and the matrix of competition (CPM). In the first stage that is called input stage, the main information needed to develop strategies is determined. Evaluation matrix of internal factors, formulate and evaluate strengths and weaknesses of carpet industry. Evaluation matrix of external factors and the matrix of competition identified and evaluated the main external factors, environmental opportunities and threats (Lee, 2008). The next step, pay attention to the types of strategies and want to establish a kind of balance among the main causes of domestic and foreign industry. Methods or tools in the second stage are used as follows: threats, opportunities, weaknesses and strengths (SWOT) Matrix, Strategic Position and Action Evaluation Matrix (SPACE), Boston Consulting Group Matrix (BCG), internal and external factors (IE) Matrix and the general strategy matrix (GSM). The third stage is called decision making stage that evaluates strategies derived from the previous steps. Among them, Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis, which evaluates the opportunities, threats, strengths and weaknesses of an organization, is the most common (Hill and Westbrook, 1999). When used properly, SWOT can provide a good basis for strategy formulation (Kajanus et al., 2004). SWOT analysis is not without weaknesses in the measurement and evaluation steps (Hill and Westbrook, 1999). In conventional SWOT analysis, the magnitude of the factors is not quantified to determine the effect of each factor on the proposed plan or strategy (Masozera, 2006). In other words, SWOT analysis does not provide an analytical means to determine the relative importance of the factors, or the ability to assess the appropriateness of decision alternatives based on these factors (Kajanus et al., 2004).

In this paper, we use SWOT matrix for formulating strategies. The combination of SWOT with the MCDM techniques presents a suitable framework to formulate and priority the strategies.

## 2. Research methodology

This research in terms of objective is practical and in terms of methods is descriptive and analytical and the branch of case study. For gathering data, both library and field methods are used. For writing literature, library techniques, scientific journals and databases are used. But the main data has been gathered through interviews with senior managers and

experts of company that manufactures tile. To measure the validity, the same questionnaires in other studies were used.

### 2.1. SWOT analysis

SWOT analysis is an important support tool for decision-making, and is commonly used as a means to systematically analyze an organization's internal and external environments (Kangas and Kurtila, 2003).By identifying its strengths, weaknesses, opportunities, and threats, the organization can build strategies upon its strengths, eliminate its weaknesses, and exploit its opportunities or use them to counter the threats. The strengths and weaknesses are identified by an internal environment appraisal while the opportunities and threats are identified by an external environment appraisal (Dyson, 2004).SWOT analysis summarizes the most important internal and external factors that may affect the organization's future, which are referred to as strategic factors (Kangas and Kurtila, 2003). The external and internal environments consist of variables which are outside and inside the organization, respectively. The organization's management has no short-term effect on either type of variable (Houben and Lenie, 1999). The obtained information can be systematically represented in a matrix; different combinations of the four factors from the matrix (Houben and Lenie, 1999) can aid in determination of strategies for long-term progress. When used properly, SWOT can provide a good basis for strategy formulation (Kangas and Kurtila, 2003). According to Table 1, SWOT matrix offers four types of strategies.

**Table 1**: SWOT matrix

| Internal factors / External factors | Strengths (S) | Weaknesses (W) |
|---|---|---|
| Opportunities (O) | SO Strategies | WO Strategies |
| Threats (T) | ST Strategies | WT Strategies |

SO strategies: Using the internal strengths and external opportunities will be determined.
WO strategies: Use of external opportunities, internal weaknesses can be reduced or eliminated.
ST strategies: Using internal strengths, external threats reduced or be removed.
WT strategies: Decreases the internal weaknesses and external threats are avoided.
For the preparation of SWOT Matrix, six steps must be passed:

1. Preparing a list of major opportunities and threats external environment organizations using PESTEL, Porter Five Forces Competitive models.
2. Prepare a list of the major strengths and weaknesses within the organization using the Porter value chain, EFQM, BSC models.
3. Compared to internal strengths with external opportunities and determining SO strategies.
4. Compared to the internal weaknesses with external opportunities and determining WO strategies
5. Compared to internal strengths and external threats and determining ST strategies
6. Reducing internal weaknesses and avoiding external threats

### 2.2. The Decision Making Trial and Evaluation Laboratory (DEMATEL)

All factors in a complex system may be either directly or indirectly related; therefore, it is difficult for a decision maker to evaluate a single effect from a single factor while avoiding interference from the rest of the system (Liou et al., 2007). In addition, an interdependent system may result in passive positioning; for example, a system with a clear hierarchical structure may give rise to linear activity with no dependence or feedback, which may cause problems distinct from those found in non-hierarchical systems (Tzeng, Chiang, & Li, 2007).

To avoid such problems, the Battelle Geneva Institute created DEMATEL in order to solve difficult problems that mainly involve interactive man-model techniques as well as to measure qualitative and factor-linked aspects of societal problems (Gabus & Fontela, 1972). In addition, DEMATEL has been utilized in numerous contexts, such as industrial planning, decision-making, regional environmental assessment, and even analysis of world problems (Huang, Shyu, & Tzeng, 2007); in all cases, it has confirmed interdependence among criteria and restricted the relations that reflect characteristics within an essential systemic and its developmental trends (Liou et al., 2007).

The foundation of the DEMATEL method is graph theory. It allows decision-makers to analyze as well as solve visible problems. In doing so, decision-makers can separate multiple measurement criteria into a cause and effect group to realize causal relationships much more easily. In addition, directed graphs, called digraphs, are much more helpful than directionless graphs since they depict the directed relationships among subsystems. In other words, a digraph represents a communication network or a domination relationship among entities and their groupings (Huang et al., 2007).

The steps in DEMATEL are as follows (Liou et al., 2007):

Step 1: Calculate the initial average matrix by scores. Sampled experts are asked to point the direct effect based on their perception that each element i exerts on each other element j, as presented by $a_{ij}$, by utilizing a scale ranging from 0 to 4. No influence is represented by 0, while a very high influence is represented by 4. Based on groups of direct matrices from samples of experts, we can generate an average matrix A in which each element is the mean of the corresponding elements in the experts' direct matrices.

Step 2: Calculate the initial influence matrix. After normalizing the average matrix A, the initial influence matrix D, $[d_{ij}]_{n\times n}$ is calculated so that all principal diagonal elements equal zero. In accordance with D, the initial effect that an element exerts and/or acquires from each other element is given. The map depicts a contextual relationship among the elements within a complex system; each matrix entry can be seen as its strength of influence. This is depicted in Fig. 1; an arrow from d to g represents the fact that d affects g with an influence score of 1. As a result, we can easily translate the relationship between the causes and effects of various measurement criteria into a comprehensible structural model of the system based on influence degree using DEMATEL.

Step 3: Develop the full direct/indirect influence matrix. The indirect effects of problems decreases as the powers of D increase, e.g., to $D^2$, $D^3$,... , $D^\infty$, which guarantees convergent solutions to the matrix inversion. From Fig. 1, we see that the effect of c on d is greater than that of c on g. Therefore, we can generate an infinite series of both direct and indirect effects. Let the $(i, j)$ element of matrix A be presented by $a_{ij}$, then the direct/indirect matrix can be acquired by following Eq. (1) through (4)

$$D = s * A, \quad s > 0 \tag{1}$$

Or

$$[d_{ij}]_{n\times n} = s[a_{ij}]_{n\times n}, \ s > 0, \ i, j \in \{1,2,\dots,n\} \tag{2}$$

$$s = Min\left[\frac{1}{\max_{1\le i\le n}\sum_{j=1}^{n}|a_{ij}|}, \frac{1}{\max_{1\le i\le n}\sum_{i=1}^{n}|a_{ij}|}\right] \tag{3}$$

And

$$\lim_{m\to\infty} D^m = [0]_{n\times n} \quad where\ D = [d_{ij}]_{n\times n}, \quad 0 \le d_{ij} < 1 \tag{4}$$

The total-influence matrix T can be acquired by utilizing Eq. (5). Here, I is the identity matrix

$$T = D + D^2 + \cdots + D^m = D(I - D)^{-1} \quad \text{when } m \to \infty \tag{5}$$

If the sum of rows and the sum of columns is represented as vector r and c, respectively, in the total influence matrix T, then

$$T = [t_{ij}], \ i, j = 1,2,\dots,n, \tag{6}$$

$$r = [r_i]_{n\times 1} = \left(\sum_{j=1}^{n} t_{ij}\right)_{n\times 1} \tag{7}$$

$$c = [c_j]'_{1\times n} = \left(\sum_{i=1}^{n} t_{ij}\right)_{1\times n} \tag{8}$$

where the superscript apostrophe denotes transposition.

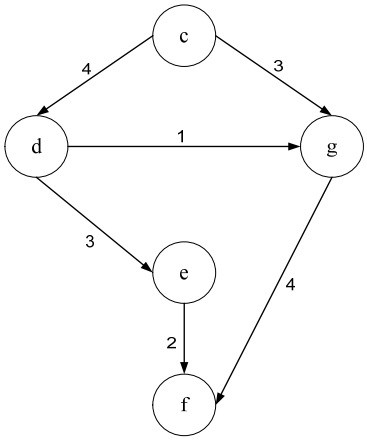


**Fig 1:** An influential map

If $r_i$ represents the sum of the ith row of matrix T, then $r_i$ presents the sum of both direct and indirect affects of factor i on all other criteria. In addition, if $c_j$ represents the sum of the jth column of matrix T, then $c_j$ presents the sum of both direct and indirect affects that all other factors have on j. Moreover, note that $j = i(r_i + c_i)$ demonstrates the degree to which factor i affects or is affected by j. Note that if $(r_i - c_i)$ is positive, then factor i affects other factors, and if it is negative, then factor i is affected by others (Liou et al., 2007; Tzeng et al., 2007).

Step 4: Set the threshold value and generate the impact relations map. Last, we must develop a threshold value. This value is generated by taking into account the sampled experts' opinions in order to filter minor effects presented in matrix T elements. This is needed to isolate the relation structure of the most relevant factors. In accordance with the matrix T, each factor $t_{ij}$ provides information about how factor i affects j. In order to decrease the complexity of the impact relations-map, the decision-maker determines a threshold value for the influence degree of each factor. If the influence level of an element in matrix T is higher than the threshold value, which we denote as p, then this element is included in the final impact relations map (IRM) (Liou et al., 2007).

**2.3. Analytic network process (ANP)**

Saaty (1996) stated that the feedback approach, a generalization of the idea of a hierarchy, is used to derive priorities in a system with interdependent influences. Saaty also pointed out that an ANP model is implemented by following three steps. All the interactions among the elements should be evaluated by pairwise comparisons in order to construct the framework of the problem. In addition, a supermatrix – a matrix of the influences among the elements – should be obtained based on these priority vectors. The supermatrix is derived from the limiting powers of the priorities to calculate the overall priorities, and thus, the cumulative influence of each element on every other element with which it interacts is obtained (Saaty and Vargas, 1998). The generalized supermatrix of a hierarchy with three levels – which is used in this paper – is as follows:

$$W = \begin{array}{c} \\ c_1 \\ c_2 \\ c_3 \end{array} \begin{array}{c} \begin{array}{ccc} c_1 & c_2 & c_3 \end{array} \\ \begin{bmatrix} w_{11} & w_{12} & w_{13} \\ w_{21} & w_{22} & w_{23} \\ w_{31} & w_{32} & w_{33} \end{bmatrix} \end{array} \quad (9)$$

W is a partitioned matrix because its entries are composed of the vectors obtained from the pairwise comparisons. Since W is a column stochastic matrix, its limiting priorities depend on the reducibility and cyclicity of that matrix. If the matrix is irreducible and primitive, the limiting value is obtained by raising W to powers such as in Eq. (10) in order to obtain the global priority vectors (Saaty and Vargas, 1998).

$$\lim_{k\to\infty} w^k \quad (10)$$

Finally, after the supermatrix is assured of being column stochastic, it is raised to a sufficiently large power until convergence occurs (Saaty, 1996). In other words, the supermatrix is then raised to limiting powers to become $\mathbf{W}^{2K+1}$, where k is an arbitrarily large number to capture all the interactions and to obtain a steady-state outcome.

**2.4. VIKOR method**

The VIKOR method is a compromise MADM method, developed by Opricovic .S and Tzeng (Opricovic,1998; Opricovic, S. and Tzeng, G. H., 2002) started from the form of Lp-metric :

$$L_{pi} = \left\{ \sum_{j=1}^{n} \left[ w_j \left( f_j^* - f_{ij} \right) / \left( f_j^* - f_j^- \right) \right]^p \right\}^{1/p} \quad 1 \le p \le +\infty ; i = 1,2, \dots I$$

The VIKOR method can provide a maximum ‘‘group utility’’ for the “majority’’ and a minimum of an individual regret for the ‘‘opponent’’ (Opricovic,1998; Opricovic, S. and Tzeng, G. H., 2002 ; Serafim Opricovic and Gwo-Hshiung Tzeng,2004).

1) Calculate the normalized value

Assuming that there are m alternatives, and n attributes. The various I alternatives are denoted as $x_i$. For alternative $x_j$ , the rating of the jth aspect is denoted as $x_{ij}$, i.e. $x_{ij}$ is the value of jth attribute. For the process of normalized value, when $x_{ij}$ is the original value of the ith option and the jth dimension, the formula is as follows:

$$f_{ij} = x_{ij} / \sqrt{\sum_{j=1}^{n} x_{ij}^2} \quad , i = 1,2, \dots, m \, ; j = 1,2, \dots , n \quad (11)$$

2) Determine the best and worst values

For all the attribute functions the best value was $f_j^*$ and the worst value was $f_j^-$, that is, for attribute J=1-n, we get formulas (12) and (13)

$$f_j^* = \max \quad f_{ij} \, , i = 1,2, \dots, m \quad (12)$$

$$f_j^- = \min \quad f_{ij} \, , i = 1,2, \dots, m \quad (13)$$

Where $f_j^*$ is the positive ideal solution for the jth criteria $f_j^-$ is the negative ideal solution for the jth criteria. If one associates all $f_j^*$, one will have the optimal combination, which gets the highest scores, the same as $f_j^-$.

3) Determine the weights of attributes

The weights of attribute should be calculated to express their relative importance.

4) Compute the distance of alternatives to ideal solution

This step is to calculate the distance from each alternative to the positive ideal solution and then get the sum to obtain the final value according to formula (14) and (15).

$$S_i = \sum_{j=1}^{n} w_j (f_j^* - f_{ij}) / (f_j^* - f_j^-) \quad (14)$$

$$R_i = \max_j \left[ w_j (f_j^* - f_{ij}) / (f_j^* - f_j^-) \right] \quad (15)$$

Where $S_i$ represents the distance rate of the ith alternative to the positive ideal solution (best combination), $R_i$ represents the distance rate of the ith alternative to the negative ideal solution (worst combination). The excellence ranking will be based on $S_i$ values and the worst rankings will be based on $R_i$ values. In other words, $S_i$, $R_i$ indicate $L_{1i}$ and $L_{*i}$ of $L_p$-metric respectively.

5) Calculate the VIKOR values $Q_i$ for i=1,2, … ,m, which are defined as

$$Q_i = v \left[ \frac{S_i - S^*}{S^- - S^*} \right] + (1 - v) \left[ \frac{R_i - R^*}{R^- - R^*} \right] \quad (16)$$

Where $S^- = \max_i S_i$ $S^* = \min_i S_i$ , $R^- = \max_i R_i$ $R^* = \min_i R_i$ , and v is the weight of the

strategy of "the majority of criteria'' (or ''the maximum group utility''). $[(S - S^*)/(S^- - S^*]$ represents the distance rate from the positive ideal solution of the ith alternative's achievements In other words, the majority agrees to use the rate of the ith.$[(R - R^*)/(R^- - R^*]$ represents the distance rate from the negative ideal solution of the ith alternative; this means the majority disagree with the rate of the ith alternative. Thus, when the v is larger (>0.5), the index of $Q_i$ will tend to majority agreement; when v is less (<0.5), the index $Q_i$ will indicate majority negative attitude; in general, v = 0.5, i.e. compromise attitude of evaluation experts.

6) Rank the alternatives by $Q_i$ values

According to the $Q_i$ values calculated by step (5), we can rank the alternatives and to make-decision.

**3. Data analysis**

In this study, first an external environment analysis is performed by an expert team familiar with the operation of the organization. In this way, those SWOT sub-factors which affect the success of the organization but cannot be controlled by the organization are identified. In addition, an internal analysis is performed to determine the sub-factors which affect the success of the organization but can be controlled by the organization. In based on these analyses, the strategically important sub-factors, i.e. the sub-factors which have very significant effects on the success of the organization, are determined. Using the SWOT sub-factors, the SWOT matrix and alternative strategies based on these sub-factors are developed (Table 2).

**Table 2**: SWOT matrix

| Internal factors / External Factors | Strengths | Weakness |
|---|---|---|
| | 1. Efficient management, Specialists and educated forces and Using management systems<br>2. Reputation, credibility and experience in tile industry<br>3. High profit margins, diversity and quality of products and introduce new products to market<br>4. Utilization of efficient infrastructure and availability of raw materials and energy needed | 1. Using old technology to produce and High maintenance, repairing and depreciation costs<br>2. Dependence on foreign suppliers in the supply of parts, raw materials and equipment<br>3. Low efficiency and effectiveness of processes<br>4. Not institutionalized culture of customer orientation and teamwork among employees |
| Opportunities | SO strategies | WO strategies |
| 1. High demand in the country for tile and changing the culture of society toward consumerism<br>2. Existing extensive and attractive markets in neighboring countries and the possibility of export to them<br>3. Existing rules and regulations to support private sector in the country and government support<br>4. Possibility of utilizing specialists in the community and attracting investment from outside of the company | 1. Introducing the brand company in neighboring countries and Provide diverse and high quality products according to their cultural characteristics<br>2. Use of specialized and skilled personnel to innovation in manufacturing and marketing products<br>3. Using experience company and information management systems to improve efficiency, quality and variety of products to compete in markets abroad | 7. Institutionalize a culture of customer orientation and teamwork to succeed in domestic and foreign markets<br>8. Attract foreign investment and use government support in order to improve technology and reduce dependence on overseas<br>9. Provide distinctive and unique products to dominate certain sectors and markets with high profitability |
| Threat | ST strategies | WT strategies |
| 1. Iran sanctions and problems created<br>2. Constantly changing demands and interests of customers<br>3. Powerful rivals inside and outside of the country and the | 4. Supporting research and development, marketing research and innovations in order to identify and respond to the diverse and changing needs of customers<br>5. Using the Experience Company, | 10. To consider the sanctions and the economic challenges as an opportunity to reduce dependence on overseas and replace existing systems<br>11. Using modern technologies and |

| | | |
|---|---|---|
| possibility of entry new competitors<br>4. Inflation, currency rate fluctuations and economic instability in the country | creativity and innovation and expertise forces in order to overcome the difficulties sanctions and economic challenges<br>6. Benchmarking of competitors' capabilities in the areas of production, marketing, cost reduction, quality, etc. | increasing processes efficiency in order to reduce costs and maintain the company profitability<br>12. Collaboration with suppliers and Benchmarking of competitors to reduce the problems of technology, reduce costs and enhance quality |

In this paper the strengths and weaknesses, opportunities and threats are criteria which are used for evaluation and ranking of strategies. In this research, 15 company experts and managers were invited to survey about strategies. This research framework includes 16 evaluation criteria that include Strengths, weaknesses, Opportunities and threats. In addition, there are 12 alternatives (strategies). After the construction of the hierarchy, the weights are calculated using DEMATEL and ANP. Then, Strategies have been prioritized with VIKOR. The proposed method is as follows.

Step 1: To determine the relationship between the SWOT using DEMATEL technique

At this stage, In accordance with Eq. (1) through (3), we next generated the normalized direct-relation matrix D from A. After that, Eq. (5) is used to calculate the total influence matrix T, as show in Table 3.

**Table 3**: T matrix

| | $C_1$ | $C_2$ | $C_3$ | … | $C_{14}$ | $C_{15}$ | $C_{16}$ |
|---|---|---|---|---|---|---|---|
| $C_1$ | 0.03 | 0.03 | 0.02 | … | 0.03 | 0.03 | 0.03 |
| $C_2$ | 0.04 | 0.04 | 0.02 | … | 0.03 | 0.04 | 0.04 |
| $C_3$ | 0.04 | 0.04 | 0.02 | … | 0.04 | 0.04 | 0.04 |
| ⋮ | ⋮ | ⋮ | | | | | |
| $C_{14}$ | 0.09 | 0.09 | 0.04 | … | 0.08 | 0.09 | 0.10 |
| $C_{15}$ | 0.08 | 0.08 | 0.04 | … | 0.07 | 0.08 | 0.09 |
| $C_{16}$ | 0.07 | 0.07 | 0.03 | … | 0.06 | 0.07 | 0.08 |

Step 2: Formation super-matrix and calculation of weight using ANP

In this stage, we used ANP to calculate the weights. Relations between the SWOT that is obtained by Matrix T, Used as input for the super-matrix. Then we calculate the weights. Calculated Weights are shown in table 4.

**Table 4**: The criteria weights

| Goal | Evaluating Dimensions | Criteria | Global Weights | Alternatives |
|---|---|---|---|---|
| Selecting the best strategy | Strengths | $C_1$ | 0.02 | Strategies |
| | | $C_2$ | 0.02 | |
| | | $C_3$ | 0.03 | |
| | | $C_4$ | 0.05 | |
| | Weaknesses | $C_5$ | 0.07 | |
| | | $C_6$ | 0.06 | |
| | | $C_7$ | 0.06 | |
| | | $C_8$ | 0.07 | |
| | Opportunities | $C_9$ | 0.08 | |
| | | $C_{10}$ | 0.08 | |
| | | $C_{11}$ | 0.09 | |
| | | $C_{12}$ | 0.09 | |
| | Threats | $C_{13}$ | 0.09 | |
| | | $C_{14}$ | 0.07 | |
| | | $C_{15}$ | 0.07 | |
| | | $C_{16}$ | 0.06 | |

Step 3: To obtain the decision matrix and Calculate the weighted values

In this paper, VIKOR method is used to prioritize the strategies. In the beginning, we create the decision matrix. Then, we normalize the values via Eq. (11). Then, weighted normalized matrix is formed by multiplying each value with their weights. All weighted values that form each criterion are aggregated to form Table 5. Then, the values in Table 5 and the weights of each main criterion are multiplied to form Table 6.

**Table 5**: Total values of main criteria

| $A_i - C_j$ | $C_1$ | $C_2$ | $C_3$ | ... | $C_{14}$ | $C_{15}$ | $C_{16}$ | |
|---|---|---|---|---|---|---|---|---|
| $St_1$ | 4.25 | 5.64 | 6.42 | ... | 6.24 | 6.96 | 6.18 | 22.05 |
| $St_2$ | 6.52 | 5.83 | 4.54 | ... | 3.55 | 3.68 | 4.45 | 17.42 |
| $St_3$ | 4.20 | 6.70 | 4.65 | ... | 4.82 | 4.50 | 5.28 | 18.49 |
| | | | | | | | | |
| $St_{10}$ | 5.27 | 2.45 | 3.61 | ... | 5.65 | 2.22 | 3.87 | 16.86 |
| $St_{11}$ | 4.54 | 3.64 | 4.85 | ... | 5.20 | 3.15 | 4.25 | 17.99 |
| $St_{12}$ | 5.33 | 5.52 | 4.9 | ... | 5.22 | 4.55 | 3.22 | 17.09 |

**Table 6**: Total weighted values of main criteria

| $A_i - C_j$ | $C_1$ | $C_2$ | $C_3$ | … | $C_{14}$ | $C_{15}$ | $C_{16}$ |
|---|---|---|---|---|---|---|---|
| $St_1$ | 0.020 | 0.009 | 0.001 | … | 0.021 | 0.004 | 0.003 |
| $St_2$ | 0.000 | 0.003 | 0.017 | … | 0.052 | 0.041 | 0.019 |
| $St_3$ | 0.017 | 0.000 | 0.014 | … | 0.029 | 0.029 | 0.000 |
| | | | | | | | |
| $St_{10}$ | 0.006 | 0.020 | 0.030 | … | 0.000 | 0.070 | 0.035 |
| $St_{11}$ | 0.013 | 0.015 | 0.006 | … | 0.018 | 0.054 | 0.030 |
| $St_{12}$ | .007 | 0.004 | 0.000 | … | 0.012 | 0.021 | 0.060 |

Step 4: Rank the alternatives

The ranking of the strategies are shown in table 7. As it can be seen in Table 7, the best strategy for this company is $st_6$ (Benchmarking of competitors' capabilities in the areas of production, marketing, cost reduction, quality, etc.).

**Table 7**: Ranking of strategies according to Qi values

| alternatives | $E_i=\Sigma e_i$ | $F_i=Max(e_i)$ | $Q_i$ | Ranking |
|---|---|---|---|---|
| $St_1$ | 0.450 | 0.090 | 0.500 | 4 |
| $St_2$ | 0.549 | 0.073 | 0.768 | 9 |
| $St_3$ | 0.529 | 0.088 | 0.861 | 10 |
| $St_4$ | 0.515 | 0.085 | 0.756 | 7 |
| $St_5$ | 0.453 | 0.070 | 0.249 | 2 |
| $St_6$ | 0.455 | 0.052 | 0.022 | 1 |
| $St_7$ | 0.478 | 0.067 | 0.336 | 3 |
| $St_8$ | 0.551 | 0.090 | 1.000 | 12 |
| $St_9$ | 0.500 | 0.075 | 0.553 | 6 |
| $St_{10}$ | 0.504 | 0.090 | 0.765 | 8 |
| $St_{11}$ | 0.482 | 0.080 | 0.524 | 5 |
| $St_{12}$ | 0.546 | 0.085 | 0.911 | 11 |
| Min | 0.451 | 0.052 | | |
| Max | 0.551 | 0.090 | | |

## 4. Comparing the results of VIKOR and TOPSIS

In this paper, we also prioritized our strategies with the TOPSIS method, so that we compare the results with VIKOR. The results of both methods and ranking of strategies are shown in Table 8.

**Table 8**: The results of VIKOR and TOPSIS

| strategies | $Q_i$ | Ranking by VIKOR | $CC_i$ | Ranking by TOPSIS |
|---|---|---|---|---|
| $St_1$ | 0.500 | 4 | 0.683 | 2 |
| $St_2$ | 0.768 | 9 | 0.422 | 9 |
| $St_3$ | 0.861 | 10 | 0.505 | 8 |
| $St_4$ | 0.756 | 7 | 0.582 | 4 |
| $St_5$ | 0.249 | 2 | 0.656 | 3 |
| $St_6$ | 0.022 | 1 | 0.764 | 1 |
| $St_7$ | 0.336 | 3 | 0.526 | 6 |
| $St_8$ | 1.000 | 12 | 0.306 | 12 |
| $St_9$ | 0.553 | 6 | 0.512 | 7 |
| $St_{10}$ | 0.765 | 8 | 0.352 | 11 |
| $St_{11}$ | 0.524 | 5 | 0.553 | 5 |
| $St_{12}$ | 0.911 | 11 | 0.357 | 10 |

As it can be seen in Table 8, using of both methods, $st_6$ is selected as the best strategy. In TOPSIS method, the highest value of $CC_i$ (0.764) is related to $st_6$ and In VIKOR method, the lowest value of $Q_i$ (0.022) is related to $st_6$.

## 5. Conclusion

Strategic management can be understood as the collection of decisions and actions taken by business management, in consultation with all levels within the organization, to determine the long-term activities of the organization (Houben et al., 1999). Increasing complexity of activities and environment has caused managers to understand the traditional planning will not be able to solve their problems and the smallest neglecting has a consequence. Hence strategic management in organizations has been proposed and managers with the help of strategic management want to find the proper orientation in order to lead their organizations. In this paper, SWOT matrix is used to determine the company's strategies and DEMATEL and ANP is used to calculate the weights. Then, the strategies are ranked by VIKOR. In this paper, the best strategy is $st_6$. The proposed framework helps companies to select the best strategies and response to market situation.

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