Proposing a Framework for Strategic Positioning Using an Integrated Method

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Abstract: This article is to determine the company's strategy and its strategic positioning. At first, the most influential internal and external elements were detected with the help of the techniques of strategy formulation. Then using of Strengths, Weaknesses, Opportunities and Threats (SWOT) matrix, we formulated the primary organizational strategies. Using of fuzzy TOPSIS, priority score of strategies is specified. After that, strategies adapt to space matrix postures. Finally, this article uses the priority score of strategies in order to determine the strategic position of the company.

Keywords: Strategic planning, Strategic positioning, SWOT, Fuzzy TOPSIS, SPACE matrix.

I. INTRODUCTION

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 [1]. 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) that in this paper, the matrix of strengths, opportunities, weaknesses and threats are used. The third stage is called decision making stage that evaluates strategies derived from the previous steps.
II. RESEARCH METHODOLOGY

This research in terms of objective is practical and in terms of methods is descriptive and analytical. 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 LPG and CNG components. To measure the validity, the same questionnaires in other studies were used. Various stages of research and data analysis are shown in Figure 1.

II.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 [2]. 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 [3]. SWOT analysis summarizes the most important internal and external factors that may affect the organization’s future, which are referred to as strategic factors [2]. The external and internal environments

![Figure 1. Schematic diagram of the proposed model](image-url)
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 [4]. The obtained information can be systematically represented in a matrix; different combinations of the four factors from the matrix can aid in determination of strategies for long-term progress. When used properly, SWOT can provide a good basis for strategy formulation [2]. According to Table 1, SWOT matrix offers four types of strategies.

<table>
<thead>
<tr>
<th>Internal factors</th>
<th>Strengths (S)</th>
<th>Weaknesses (W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>External factors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opportunities (O)</td>
<td>SO Strategies</td>
<td>WO Strategies</td>
</tr>
<tr>
<td>Threats (T)</td>
<td>ST Strategies</td>
<td>WT Strategies</td>
</tr>
</tbody>
</table>

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.

II.2. Fuzzy sets and Fuzzy numbers
Fuzzy set theory, which was introduced by Zadeh [5] to deal with problems in which a source of vagueness is involved, has been utilized for incorporating imprecise data into the decision framework. A fuzzy set $\tilde{A}$ can be defined mathematically by a membership function $\mu_{\tilde{A}}(X)$, which assigns each element $x$ in the universe of discourse $X$ a real number in the interval $[0,1]$. A triangular fuzzy number $\tilde{A}$ can be defined by a triplet $(a, b, c)$ as illustrated in Fig 2.

![Figure 2](image-url)  

The membership function $\mu_{\tilde{A}}(X)$ is defined as
Basic arithmetic operations on triangular fuzzy numbers $A_1 = (a_1, b_1, c_1)$, where $a_1 \leq b_1 \leq c_1$, and $A_2 = (a_2, b_2, c_2)$, where $a_2 \leq b_2 \leq c_2$, can be shown as follows:

**Addition:**
$$A_1 \oplus A_2 = (a_1 + a_2, b_1 + b_2, c_1 + c_2) \quad (2)$$

**Subtraction:**
$$A_1 \ominus A_2 = (a_1 - c_2, b_1 - b_2, c_1 - a_2) \quad (3)$$

**Multiplication:** if $k$ is a scalar
$$k \odot A_1 = \begin{cases} (ka_1, kb_1, kc_1), & k \geq 0 \\ (kc_1, kb_1, ka_1), & k < 0 \end{cases}$$
$$A_1 \odot A_2 = \begin{cases} (a_1 a_2, b_1 b_2, c_1 c_2), & \text{if } a_1 \geq 0, a_2 \geq 0 \quad (4) \end{cases}$$

**Division:**
$$A_1 \oslash A_2 = \begin{cases} \left(\frac{a_1}{b_2}, \frac{b_1}{b_2}, \frac{c_1}{b_2}\right), & \text{if } a_1 \geq 0, a_2 \geq 0 \quad (5) \end{cases}$$

Although multiplication and division operations on triangular fuzzy numbers do not necessarily yield a triangular fuzzy number, triangular fuzzy number approximations can be used for many practical applications[6]. Triangular fuzzy numbers are appropriate for quantifying the vague information about most decision problems including personnel selection (e.g. rating for creativity, personality, leadership, etc.). The primary reason for using triangular fuzzy numbers can be stated as their intuitive and computational-efficient representation[7]. A linguistic variable is defined as a variable whose values are not numbers, but words or sentences in natural or artificial language. The concept of a linguistic variable appears as a useful means for providing approximate characterization of phenomena that are too complex or ill defined to be described in conventional quantitative terms [8].

**II.3. The Fuzzy TOPSIS method**
This study uses this method to obtain the value of priority and to rank strategies. TOPSIS views a MADM problem with m alternatives as a geometric system with m points in the n-dimensional space. The method is based on the concept that the chosen alternative should have the shortest distance from the positive-ideal solution and the longest distance from the negative-ideal solution. TOPSIS defines an index called similarity to the positive-ideal solution and the remoteness from the negative-ideal solution. Then the method chooses an alternative with the maximum similarity to the positive-ideal solution[9]. It is often difficult for a decision-maker to assign a precise performance rating to an alternative for the attributes under consideration. The merit of using a fuzzy approach is to assign the relative importance of attributes using fuzzy numbers instead of precise numbers. This section extends the TOPSIS to the fuzzy environment[10]. This method is particularly suitable for solving the group decision-making problem under fuzzy environment. We briefly review the rationale of fuzzy theory before the development of fuzzy TOPSIS. The mathematics concept borrowed from [11&12].

**Step 1: Determine the weighting of evaluation criteria**
A systematic approach to extend the TOPSIS is proposed to ranking strategies under a fuzzy environment in this section. In this paper the importance weights of various criteria and the ratings of qualitative criteria are considered as linguistic variables (as Table 2)[13].
Table 2. Linguistic scales for the importance of each criterion

<table>
<thead>
<tr>
<th>Linguistic variable</th>
<th>Corresponding triangular fuzzy number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very low (VL)</td>
<td>(0.0, 0.1, 0.3)</td>
</tr>
<tr>
<td>Low (L)</td>
<td>(0.1, 0.3, 0.5)</td>
</tr>
<tr>
<td>Medium (M)</td>
<td>(0.3, 0.5, 0.7)</td>
</tr>
<tr>
<td>High (H)</td>
<td>(0.5, 0.7, 0.9)</td>
</tr>
<tr>
<td>Very high (VH)</td>
<td>(0.7, 0.9, 1.0)</td>
</tr>
</tbody>
</table>

Step 2: Construct the fuzzy decision matrix and choose the appropriate linguistic variables for the alternatives with respect to criteria

$$\bar{D} = \begin{bmatrix} A_1 & x_{11} & x_{12} & \ldots & x_{1n} \\ A_2 & x_{21} & x_{22} & \ldots & x_{2n} \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ A_M & x_{m1} & x_{m2} & \ldots & x_{mn} \end{bmatrix}$$

$$i=1,2,\ldots,m; j=1,2,\ldots,n$$

$$\bar{x}_{ij} = \frac{1}{k}(x_{ij}^1 + x_{ij}^2 + \ldots + x_{ij}^k) \quad (6)$$

where \( x_{ij}^k \) is the rating of alternative \( A_i \) with respect to criterion \( C_j \) evaluated by \( K \) expert and

$$\bar{x}_{ij}^k = (a_{ij}^k, b_{ij}^k, c_{ij}^k)$$

Step 3: Normalize the fuzzy decision matrix

The normalized fuzzy decision matrix denoted by \( \bar{R} \) is shown as following formula:

$$\bar{R} = [\bar{r}_{ij}]_{mn}, \quad i=1,2,\ldots,m; \quad j=1,2,\ldots,n \quad (7)$$

Then the normalization process can be performed by following formula:

$$\bar{r}_{ij} = \frac{a_{ij}}{c_{ij}^+ + \sum_{j} c_{ij}^+} = \max_i c_{ij}$$

The normalized \( \bar{r}_{ij} \) are still triangular fuzzy numbers. For trapezoidal fuzzy numbers, the normalization process can be conducted in the same way. The weighted fuzzy normalized decision matrix is shown as following matrix \( \bar{V} \):

$$\bar{V} = [\bar{v}_{ij}]_{mn}, \quad i=1,2,\ldots,m; \quad j=1,2,\ldots,n \quad (8)$$

$$\bar{v}_{ij} = \bar{r}_{ij} \otimes \bar{w}_j \quad (9)$$

Step 4: Determine the fuzzy positive-ideal solution (FPIS) and fuzzy negative-ideal solution (FNIS)
According to the weighted normalized fuzzy decision matrix, we know that the elements $V_{ij}$ are normalized positive TFNs and their ranges belong to the closed interval $[0, 1]$. Then, we can define the FPIS $A^+$ and FNIS $A^-$ as following formula:

\[ A^+ = (\tilde{V}_1^+, \tilde{V}_2^+, \ldots, \tilde{V}_n^+) \]  
\[ A^- = (\tilde{V}_1^-, \tilde{V}_2^-, \ldots, \tilde{V}_n^-) \]

where $\tilde{V}_j^+ = (1,1,1)$ and $\tilde{V}_j^- = (0,0,0)$, $j=1,2,\ldots,n$

Step 5: Calculate the distance of each alternative from FPIS and FNIS

The distances ($d_i^+$ and $d_i^-$) of each alternative $A_i$ from $A^+$ and $A^-$ can be currently calculated.

\[ d_i^+ = \sum_{j=1}^{n} d(\tilde{V}_ij, \tilde{V}_i^+) \]  
\[ d_i^- = \sum_{j=1}^{n} d(\tilde{V}_ij, \tilde{V}_i^-) \]

Step 6: Obtain the closeness coefficient (CC) and rank the order of alternatives

The CC is defined to determine the ranking order of all alternatives once the $d_i^+$ and $d_i^-$ of each alternative have been calculated. Calculate similarities to ideal solution. This step solves the similarities to an ideal solution by formula:

\[ CC_i = \frac{d_i^-}{d_i^++d_i^-} \]  
\[ i=1,2,\ldots,m \]

According to the CC, we can determine the ranking order of all alternatives and select the best one from among a set of feasible alternatives.

II.4. The SPACE framework for strategic analysis

The Strategic Position and Action Evaluation (SPACE) framework developed by Rowe [14] achieves this integration by focusing upon two key strategic factors: strategic positioning and strategic responsiveness. Strategic positioning refers to the ability of an organization to place products and services in attractive markets competitively. Strategic responsiveness refers to the ability of the organization to marshal sufficient resources to cope with environmental change and instability. It’s clear that a strategically healthy firm is one that achieves both good positioning and responsiveness. The SPACE framework has been used in the literature to analyze a range of industries: biotechnology in the UK [15]; manufacturing in South Africa [16]; manufacturing in the UK [17]; professional football in England [18] and leisure centres in the UK [19]. The original SPACE model includes generic items that identify factors that determine responsiveness and positioning based upon such conventional strategic frame works as: the Boston Consulting Group (BGC) approach, ScenarioPlanning [20], McKinsey’s Industry’s Attractiveness/Company Strength Matrix. In this method, to determine the strategic position, four indicators are calculated that include financial strength, competitive advantage, industry attractiveness and macro environment. The first two indicators reflect local conditions, and other indicators show the status of the company's external environment. There are four strategic locations in the SPACE Matrix which include the following and illustrated in Fig 3:

Position 1: aggressive posture
Position 2: Conservative posture
Position 3: competitive posture
Position 3: Defensive posture
III. ANALYSIS OF DATA

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 3).

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 experts and managers were invited to survey about strategies. This research framework includes 23 evaluation criteria that include Strengths, weaknesses, Opportunities and threats. In addition, there are fourteen alternatives (strategies). After the construction of the hierarchy the different priority weights of each criteria, attributes and alternatives are calculated using the fuzzy TOPSIS approach. The comparison of the importance or preference of one criterion, attribute or alternative over another can be done with the help of the questionnaire. The method of calculating priority weights of the different decision alternatives is discussed following part.

Step 1: Determine the linguistic weighting of each criteria
We adopt fuzzy TOPSIS method to evaluate the weights of different criteria for ranking strategies. Following the construction of fuzzy TOPSIS model, it is extremely important that experts fill the judgment matrix. From the viewpoint of expert validity, the buildup of most of the operationalizations was based on the literature that caused them to have expert validity. This research applies the COA method to compute the BNP value of the fuzzy weights of each dimension:

To take the BNP value of the weight of $C_i$ as an example, the calculation process is as follows:

\[
BNP_{w_i} = [(U_{w_1} - L_{w_1}) + (M_{w_1} - L_{w_1})] / 3 + L_{w_1} = [(0.43 - 0.24) + (0.32 - 0.24)] / 3 + 0.24 = 0.33
\]

Then, the weights for the remaining dimensions can be found as shown in Table 4. Table 4 shows the relative weight of criteria, which obtained by fuzzy TOPSIS method. From the fuzzy TOPSIS results, we can understand the first two important factors for selecting maintenance strategy are $C_{17}$ (0.8533) and $C_{5}$ (0.64). Moreover, the less important factor is $C_{10}$ (0.2333).
**Table 3. SWOT matrix**

<table>
<thead>
<tr>
<th>Internal factors</th>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1. Having expertise and creative employees in the company</td>
<td>1. Lack of comprehensive and integrated information systems</td>
</tr>
<tr>
<td></td>
<td>2. Senior management interest in creativity and innovation</td>
<td>2. Low efficiency of existing processes</td>
</tr>
<tr>
<td></td>
<td>3. Existing management systems and Effective in reducing costs</td>
<td>3. Not institutionalize a culture of customer orientation</td>
</tr>
<tr>
<td></td>
<td>4. Company’s reputation and Credit</td>
<td>4. Low product variety</td>
</tr>
<tr>
<td></td>
<td>5. The high profit margins for products sold</td>
<td>5. Low R &amp; D budget</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6. Not institutionalized in the culture of teamwork</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>External Factors</th>
<th>Opportunities</th>
<th>SO strategies</th>
<th>WO strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1. Continuous growth in demand for products</td>
<td>1. Using the company's reputation and credit for attracting investment and skilled forces</td>
<td>9. Developing Homogeneous product through partnerships with suppliers</td>
</tr>
<tr>
<td></td>
<td>2. Possibility of exporting to neighboring countries</td>
<td>2. Using and training new management systems to improve productivity</td>
<td>10. Institutionalize customer-oriented culture in the company through financial and spiritual support</td>
</tr>
<tr>
<td></td>
<td>3. The availability of capable suppliers and consultants</td>
<td>3. Trying to attract demand and export products through partnerships with competitors, suppliers, etc.</td>
<td>11. Increasing the capital of the company by attracting capital from outside of the company and its optimal allocation</td>
</tr>
<tr>
<td></td>
<td>4. The availability of capable and expertise forces in the region</td>
<td>4. Using the employee's expertise and skill in product innovation and reduce costs</td>
<td>12. Using information systems and management to improve processes efficiency</td>
</tr>
<tr>
<td></td>
<td>5. Feasibility of implementing effective and efficient management system</td>
<td>5. Increasing variety of products to meet customer interests and to overcome rivals</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6. Feasibility of attracting investment from outside of the company</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>7. Government support</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Threats</th>
<th>ST strategies</th>
<th>WT strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6. Supporting creativity and innovation to meet the needs of customers and maintain profit margins</td>
<td>13. Increasing research and development budget</td>
</tr>
<tr>
<td></td>
<td>7. Attention to social responsibility to enhance company's reputation and credit</td>
<td>14. Benchmarking from competitors in the production and reduce costs</td>
</tr>
<tr>
<td></td>
<td>8. Utilization of resources and expertise forces to overcome sanction and challenges</td>
<td></td>
</tr>
</tbody>
</table>

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Table 4. Weights of each criterion

<table>
<thead>
<tr>
<th>Criterion</th>
<th>BNP</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>C_1</td>
<td>0.24, 0.32, 0.43</td>
<td>0.33</td>
</tr>
<tr>
<td>C_2</td>
<td>0.35, 0.40, 0.45</td>
<td>0.40</td>
</tr>
<tr>
<td>C_3</td>
<td>0.33, 0.44, 0.52</td>
<td>0.43</td>
</tr>
<tr>
<td>C_4</td>
<td>0.44, 0.46, 0.51</td>
<td>0.47</td>
</tr>
<tr>
<td>C_5</td>
<td>0.56, 0.64, 0.72</td>
<td>0.64</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>C_{19}</td>
<td>0.46, 0.56, 0.64</td>
<td>0.553</td>
</tr>
<tr>
<td>C_{20}</td>
<td>0.47, 0.52, 0.60</td>
<td>0.530</td>
</tr>
<tr>
<td>C_{21}</td>
<td>0.34, 0.36, 0.38</td>
<td>0.36</td>
</tr>
<tr>
<td>C_{22}</td>
<td>0.12, 0.34, 0.51</td>
<td>0.323</td>
</tr>
<tr>
<td>C_{23}</td>
<td>0.36, 0.42, 0.48</td>
<td>0.42</td>
</tr>
</tbody>
</table>

Step 2: Estimating the performance
This paper focuses on ranking strategy; so, we assume that the questionnaire has been collected completely and will start with building the dataset that is collected. The evaluators have their own range for the linguistic variables employed in this study according to their subjective judgments[21]. For each evaluator with the same importance, this study employs the method of average value to integrate the fuzzy/vague judgment values of different evaluators regarding the same evaluation dimensions. The evaluators then adopt linguistic terms (see Table 5), including “very poor”, “poor”, “fair”, “good” and “very good” to express their opinions about the rating of every person, based on the fuzzy data of the four persons listed in Table 6.

Table 5. Linguistic scales for the rating of each cluster policy

<table>
<thead>
<tr>
<th>Linguistic variable</th>
<th>Corresponding triangular fuzzy number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very poor (VP)</td>
<td>(0, 1, 3)</td>
</tr>
<tr>
<td>Poor (P)</td>
<td>(1, 3, 5)</td>
</tr>
<tr>
<td>Fair (F)</td>
<td>(3, 5, 7)</td>
</tr>
<tr>
<td>Good (G)</td>
<td>(5, 7, 9)</td>
</tr>
<tr>
<td>Very good (VG)</td>
<td>(7, 9, 10)</td>
</tr>
<tr>
<td>Very poor (VP)</td>
<td>(0, 1, 3)</td>
</tr>
</tbody>
</table>
Table 6. Subjective cognition results of evaluators towards the five levels of linguistic variables

<table>
<thead>
<tr>
<th></th>
<th>C1</th>
<th>C2</th>
<th>C3</th>
<th>...</th>
<th>C22</th>
<th>C23</th>
</tr>
</thead>
<tbody>
<tr>
<td>st_1</td>
<td>(3.40,3.60,3.70)</td>
<td>(2.60,2.90,3.00)</td>
<td>(4.10,4.50,4.50)</td>
<td>...</td>
<td>(6.30,6.70,6.80)</td>
<td>(5.20,5.20,5.30)</td>
</tr>
<tr>
<td>st_2</td>
<td>(0.00,0.00,0.00)</td>
<td>(4.10,4.10,4.40)</td>
<td>(5.60,5.70,6.30)</td>
<td>...</td>
<td>(3.50,3.60,3.60)</td>
<td>(4.00,4.10,4.10)</td>
</tr>
<tr>
<td>st_3</td>
<td>(4.70,4.70,5.60)</td>
<td>(5.30,5.30,5.50)</td>
<td>(5.60,5.70,5.70)</td>
<td>...</td>
<td>(5.00,5.00,5.10)</td>
<td>(2.90,3.70,4.30)</td>
</tr>
<tr>
<td>st_4</td>
<td>(6.80,6.80,6.90)</td>
<td>(4.00,5.10,5.30)</td>
<td>(4.50,5.20,5.40)</td>
<td>...</td>
<td>(0.00,0.60,1.40)</td>
<td>(0.00,0.20,0.90)</td>
</tr>
<tr>
<td>st_5</td>
<td>(5.80,6.10,6.20)</td>
<td>(5.10,5.20,6.40)</td>
<td>(4.30,5.20,5.30)</td>
<td>...</td>
<td>(0.00,0.00,0.00)</td>
<td>(0.00,0.00,0.00)</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>st_11</td>
<td>(0.00,0.00,0.00)</td>
<td>(0.00,0.00,0.00)</td>
<td>(0.00,0.00,0.00)</td>
<td>...</td>
<td>(1.60,2.60,2.90)</td>
<td>(0.90,1.80,2.60)</td>
</tr>
<tr>
<td>st_12</td>
<td>(0.00,0.00,0.00)</td>
<td>(0.00,0.00,0.00)</td>
<td>(0.00,0.00,0.00)</td>
<td>...</td>
<td>(0.00,0.00,0.00)</td>
<td>(0.00,0.00,0.00)</td>
</tr>
<tr>
<td>st_13</td>
<td>(0.00,0.00,0.00)</td>
<td>(0.00,0.00,0.00)</td>
<td>(0.00,0.00,0.00)</td>
<td>...</td>
<td>(0.00,0.00,0.00)</td>
<td>(0.00,0.00,0.00)</td>
</tr>
<tr>
<td>st_14</td>
<td>(0.00,0.00,0.00)</td>
<td>(0.00,0.00,0.00)</td>
<td>(0.00,0.00,0.00)</td>
<td>...</td>
<td>(0.00,0.00,0.00)</td>
<td>(0.00,0.00,0.00)</td>
</tr>
</tbody>
</table>

Table 7. Normalized fuzzy decision matrix

<table>
<thead>
<tr>
<th></th>
<th>C1</th>
<th>C2</th>
<th>C3</th>
<th>...</th>
<th>C22</th>
<th>C23</th>
</tr>
</thead>
<tbody>
<tr>
<td>st_1</td>
<td>(0.49,0.52,0.53)</td>
<td>(0.37,0.42,0.43)</td>
<td>(0.59,0.65,0.65)</td>
<td>...</td>
<td>(0.91,0.97,0.98)</td>
<td>(0.75,0.75,0.76)</td>
</tr>
<tr>
<td>st_2</td>
<td>(0.00,0.00,0.00)</td>
<td>(0.59,0.59,0.63)</td>
<td>(0.81,0.82,0.91)</td>
<td>...</td>
<td>(0.50,0.52,0.52)</td>
<td>(0.57,0.59,0.59)</td>
</tr>
<tr>
<td>st_3</td>
<td>(0.68,0.68,0.81)</td>
<td>(0.76,0.76,0.79)</td>
<td>(0.81,0.82,0.82)</td>
<td>...</td>
<td>(0.72,0.72,0.73)</td>
<td>(0.42,0.53,0.62)</td>
</tr>
<tr>
<td>st_4</td>
<td>(0.98,0.98,1.00)</td>
<td>(0.57,0.73,0.76)</td>
<td>(0.65,0.75,0.78)</td>
<td>...</td>
<td>(0.00,0.08,0.20)</td>
<td>(0.00,0.02,0.13)</td>
</tr>
<tr>
<td>st_5</td>
<td>(0.84,0.88,0.89)</td>
<td>(0.73,0.75,0.92)</td>
<td>(0.62,0.75,0.76)</td>
<td>...</td>
<td>(0.00,0.00,0.00)</td>
<td>(0.00,0.00,0.00)</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>st_11</td>
<td>(0.00,0.00,0.00)</td>
<td>(0.00,0.00,0.00)</td>
<td>(0.00,0.00,0.00)</td>
<td>...</td>
<td>(0.23,0.37,0.42)</td>
<td>(0.13,0.26,0.37)</td>
</tr>
<tr>
<td>st_12</td>
<td>(0.00,0.00,0.00)</td>
<td>(0.00,0.00,0.00)</td>
<td>(0.00,0.00,0.00)</td>
<td>...</td>
<td>(0.00,0.00,0.00)</td>
<td>(0.00,0.00,0.00)</td>
</tr>
<tr>
<td>st_13</td>
<td>(0.00,0.00,0.00)</td>
<td>(0.00,0.00,0.00)</td>
<td>(0.00,0.00,0.00)</td>
<td>...</td>
<td>(0.00,0.00,0.00)</td>
<td>(0.00,0.00,0.00)</td>
</tr>
<tr>
<td>st_14</td>
<td>(0.00,0.00,0.00)</td>
<td>(0.00,0.00,0.00)</td>
<td>(0.00,0.00,0.00)</td>
<td>...</td>
<td>(0.00,0.00,0.00)</td>
<td>(0.00,0.00,0.00)</td>
</tr>
</tbody>
</table>

Step 3: Normalize the fuzzy decision matrix
Using Eq. (7), we can normalize the fuzzy decision matrix as Table 7.

Step 4: Establish the weighted normalized fuzzy decision matrix
The forth step in the analysis is to find the weighted fuzzy decision matrix, and the resulting fuzzy weighted decision matrix is shown as Table 8.
Table 8. Weighted normalized fuzzy decision matrix

<table>
<thead>
<tr>
<th></th>
<th>C₁</th>
<th>C₂</th>
<th>C₃</th>
<th>...</th>
<th>C₂₂</th>
<th>C₂₃</th>
</tr>
</thead>
<tbody>
<tr>
<td>st₁</td>
<td>(0.11, 0.16, 0.23)</td>
<td>(0.13, 0.16, 0.19)</td>
<td>(0.19, 0.28, 0.33)</td>
<td>...</td>
<td>(0.10, 0.33, 0.50)</td>
<td>(0.27, 0.31, 0.36)</td>
</tr>
<tr>
<td>st₂</td>
<td>(0.00, 0.00, 0.00)</td>
<td>(0.20, 0.23, 0.00)</td>
<td>(0.26, 0.36, 0.47)</td>
<td>...</td>
<td>(0.06, 0.17, 0.26)</td>
<td>(0.20, 0.24, 0.28)</td>
</tr>
<tr>
<td>st₃</td>
<td>(0.16, 0.21, 0.34)</td>
<td>(0.26, 0.30, 0.00)</td>
<td>(0.26, 0.36, 0.42)</td>
<td>...</td>
<td>(0.08, 0.24, 0.37)</td>
<td>(0.15, 0.22, 0.29)</td>
</tr>
<tr>
<td>st₄</td>
<td>(0.23, 0.31, 0.43)</td>
<td>(0.20, 0.29, 0.33)</td>
<td>(0.33, 0.40, 0.00)</td>
<td>...</td>
<td>(0.00, 0.02, 0.10)</td>
<td>(0.00, 0.01, 0.06)</td>
</tr>
<tr>
<td>st₅</td>
<td>(0.20, 0.28, 0.38)</td>
<td>(0.25, 0.30, 0.59)</td>
<td>(0.20, 0.33, 0.39)</td>
<td>...</td>
<td>(0.00, 0.00, 0.00)</td>
<td>(0.00, 0.00, 0.00)</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>st₁₁</td>
<td>(0.00, 0.00, 0.00)</td>
<td>(0.00, 0.00, 0.00)</td>
<td>(0.00, 0.00, 0.00)</td>
<td>...</td>
<td>(0.02, 0.12, 0.21)</td>
<td>(0.04, 0.10, 0.18)</td>
</tr>
<tr>
<td>st₁₂</td>
<td>(0.00, 0.00, 0.00)</td>
<td>(0.00, 0.00, 0.00)</td>
<td>(0.00, 0.00, 0.00)</td>
<td>...</td>
<td>(0.00, 0.00, 0.00)</td>
<td>(0.00, 0.00, 0.00)</td>
</tr>
<tr>
<td>st₁₃</td>
<td>(0.00, 0.00, 0.00)</td>
<td>(0.00, 0.00, 0.00)</td>
<td>(0.00, 0.00, 0.00)</td>
<td>...</td>
<td>(0.00, 0.00, 0.00)</td>
<td>(0.00, 0.00, 0.00)</td>
</tr>
<tr>
<td>st₁₄</td>
<td>(0.00, 0.00, 0.00)</td>
<td>(0.00, 0.00, 0.00)</td>
<td>(0.00, 0.00, 0.00)</td>
<td>...</td>
<td>(0.00, 0.00, 0.00)</td>
<td>(0.00, 0.00, 0.00)</td>
</tr>
</tbody>
</table>

Step 5: Determine the fuzzy positive and fuzzy negative-ideal reference points
Then we can define the fuzzy positive-ideal solution (FPIS) and the fuzzy negative-ideal solution (FNIS) as: $A^+$ and $A^-$. This is the fifth step of the fuzzy TOPSIS analysis.

$A^+ = [(1,1,1)]$

$A^- = [(0,0,0)]$

Step 6: Ranking the alternatives
In order to calculate the closeness coefficients of each of the alternatives $d_i^+$ and $d_i^-$ calculation is used as an example as follows. Once the distances of cluster policy from FPIS and FNIS are determined, the closeness coefficient can be obtained with Eq. (14). The index $CC_i$ of first alternative is calculated as:

$$d_i^+ = 0.4132d_i^- = 1.7439$$

From the alternative evaluation results in Table 7, the best strategy is st₃.

$$CC_1 = \frac{0.4132}{0.4132 + 1.7439} = 0.2084$$

$CC_3 > CC_4 > CC_5 > CC_6 > CC_7 > CC_8 > CC_9 > CC_{10} > CC_{11} > CC_{12} > CC_{13} > CC_{14} > CC_{15}$

Table 9. Closeness coefficients and ranking

<table>
<thead>
<tr>
<th></th>
<th>St₁</th>
<th>St₂</th>
<th>St₃</th>
<th>St₄</th>
<th>St₅</th>
<th>St₆</th>
<th>St₇</th>
<th>St₈</th>
<th>St₉</th>
<th>St₁₀</th>
<th>St₁₁</th>
<th>St₁₂</th>
<th>St₁₃</th>
<th>St₁₄</th>
</tr>
</thead>
<tbody>
<tr>
<td>$d_i^+$</td>
<td>0.41</td>
<td>0.81</td>
<td>0.36</td>
<td>0.81</td>
<td>1.24</td>
<td>1.31</td>
<td>1.22</td>
<td>1.19</td>
<td>1.33</td>
<td>1.20</td>
<td>1.32</td>
<td>1.79</td>
<td>1.62</td>
<td>1.61</td>
</tr>
<tr>
<td>$d_i^-$</td>
<td>1.74</td>
<td>1.56</td>
<td>1.76</td>
<td>1.56</td>
<td>1.34</td>
<td>1.35</td>
<td>1.39</td>
<td>1.24</td>
<td>1.14</td>
<td>1.26</td>
<td>1.20</td>
<td>0.45</td>
<td>0.68</td>
<td>0.67</td>
</tr>
<tr>
<td>CC₁</td>
<td>0.80</td>
<td>0.65</td>
<td>0.82</td>
<td>0.65</td>
<td>0.51</td>
<td>0.50</td>
<td>0.53</td>
<td>0.51</td>
<td>0.46</td>
<td>0.51</td>
<td>0.47</td>
<td>0.20</td>
<td>0.29</td>
<td>0.29</td>
</tr>
<tr>
<td>Rank</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>6</td>
<td>9</td>
<td>5</td>
<td>7</td>
<td>11</td>
<td>8</td>
<td>10</td>
<td>14</td>
<td>12</td>
<td>13</td>
</tr>
</tbody>
</table>
After obtaining the score of strategies using fuzzy TOPSIS, strategies adapt to space matrix postures. A scan be seen in Figure 4, aggressive posture in space matrix consistent with SO strategy, because company has numerous strengths and using them is to take advantage of environmental opportunities. In conservative position, organization using their strengths to deal with environmental threats and seeks to maintain its position against environmental threats. In Figure 4 different postures of space matrix and strategies are shown.

![Figure 4. adapting strategies with postures of SPACE matrix](image)

After matching Space matrix and strategies, we use the scores which are obtained from fuzzy TOPSIS in order to illustrate the strategy position in space matrix. According to this method, strategies are sorted in ascending in each posture. A scan is seen in Figure 5, in aggressive posture, SO₃ is a best strategy. The best situation for the company is the aggressive posture with the score of 2.95. This shows that there are many opportunities for the company in the market and company can take advantage of this opportunity using its strengths. So the best strategy for this company is SO₃ that has the highest score and located in the aggressive posture.

**IV. CONCLUSION**

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. Since market environment changes constantly and companies will face new situations, Strategic positioning can be a good way to overcome these changes. In this paper, SWOT matrix is used to determine the company's strategies and using fuzzy TOPSIS, the score of strategies are also obtained. Finally, using of space matrix, optimal strategy in each posture is specified. In this paper, the best posture is the aggressive because the strategies that are situated in this posture have the highest score and show that the company has opportunities in the market. In the other hand, the optimal strategy in this situation is a SO₃ strategy. The proposed framework helps companies to apply the best strategies in different market conditions.
The authors would like to thank the anonymous reviewers and the editor for their insightful comments and suggestions.

References


