An Integration of MCDM Methods for Marketing Strategy Selection

Rohollah Yousefi

Masters of Executive Management, Sirjan Science and Research Branch, Islamic Azad University, Iran.

The main purpose of this paper is to propose a suitable model for determining the appropriate marketing strategy based on MCDM. Our proposed approach is based on AHP and TOPSIS methods. AHP method is used in determining the weights of the criteria by decision makers and then rankings of strategies are determined by TOPSIS method. A real case demonstrates the application of the proposed method.

1. Introduction

Many researches show the relationship between applied strategies and company performance, suggested that performance is influenced by adopted strategies (Cavusgil & Zou, 1994). Thus selecting an appropriate strategy can enhance corporate performance and provide a sustainable competitive advantage for the company. On the other hand, various strategic choices imply the need for a reasonable decision making framework (Wu, Lin, & Lee, 2010). Similarly in the marketing field, top managers are constantly faced with the problem of how to trade off competing strategic marketing decisions. For example should the company invest on advertising or loyalty programs, improve service quality or none of them? Such high-level decisions need something other than decision makers' own experience and intuition (Rust, Lemon, & Zeithaml, 2004). A marketing strategy decision can be classified as a multi-criteria decision-making (MCDM) problem. MCDM problem is a problem in which the decision maker intends to choose one out of several alternatives on the basis of a set of criteria. It can help users understand the results of integrated assessments, including tradeoffs among policy objectives, and use these results in a systematic and defensible way to develop policy recommendations (Safari & Ebrahimi, 2014). In this regard, the purpose of the current study is to model the marketing strategy decision-making problem as an MCDM problem and provide a three-step decision support framework to carefully assess marketing strategies. About using Fuzzy AHP and VIKOR method the following studies are cited: Chaghooshi et al (2014) applied fuzzy AHP and fuzzy VIKOR for supplier selection. In their paper, the weights of each criterion are calculated using Fuzzy AHP method. After that, Fuzzy VIKOR is utilized to rank the alternatives. Safari et al (2011) used fuzzy AHP and fuzzy TOPSIS for machine selection. Moradzadehfard et al (2011) applied GTMA and fuzzy AHP for ranking of automobile companies in Tehran Stock Exchange. Safari et al (2011) applied fuzzy AHP for formulation and ranking of Human Resource Management Strategies in Tehran Province gas Company.

Few studies consider determining the criteria for market strategy selection. The criteria which are chosen in this study are adopted ebrahimi et al (2015).

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Managerial capabilities (C₁)</td>
<td>Wu et. al, 2010</td>
</tr>
</tbody>
</table>
2. Research Methodology

In this paper, the weights of each criterion are calculated using AHP. After that, TOPSIS is utilized to rank the alternatives. Finally, we rank the Strategies based on these results.

2.1. AHP

Saaty (2000) has evolved the AHP which can enable decision makers to represent the interaction of multiple factors in complex situations. The process requires the decision makers to develop a hierarchical structure for the factors which are explicit in the given problem and to provide judgments about the relative importance of each of these factors, specify a preference for each decision alternative with respect to each factor. It provides a prioritized ranking order indicating the overall preference for each of the decision alternatives. An advantage of the AHP over other multi criteria decision making methods is that AHP is designed to incorporate tangible as well as non-tangible factors especially where the subjective judgments of different individuals constitute an important part of the decision process.

The main procedure of AHP using radical root method is as follows:

- Step 1: Determine the objective and the evaluation factors. Develop a hierarchical structure with a goal or objective at the top level, the factors at the second level, and the alternatives at the third level.
- Step 2: Find out the relative importance of different factors with respect to the goal or objective:
  - Construct a pair-wise comparison matrix using a scale of relative importance. The judgments are entered using the fundamental scale of the AHP as given in Table 1. Assuming \( N \) factors, the pairwise comparison of factor \( i \) with factor \( j \) yields a square matrix \( A_{1N \times N} \) where \( a_{ij} \) denotes the relative importance of factor \( i \) with respect to factor \( j \). In the matrix, \( a_{ii} = 1 \) when \( i = j \) and \( a_{ij} = 1/a_{ji} \).
  - Find the relative normalized weight \( (W) \) of each factor by calculating the geometric mean of \( i \)th row and normalizing the geometric means of rows in the comparison matrix.

Table 2. Relative importance of factors

<table>
<thead>
<tr>
<th>Relative importance ((a_{ij}))</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Equal importance of (i) and (j)</td>
</tr>
<tr>
<td>3</td>
<td>Moderate importance of (i) over (j)</td>
</tr>
<tr>
<td>5</td>
<td>Strong importance of (i) over (j)</td>
</tr>
<tr>
<td>7</td>
<td>Very strong importance of (i) over (j)</td>
</tr>
<tr>
<td>9</td>
<td>Absolute importance of (i) over (j)</td>
</tr>
<tr>
<td>2,4,6,8</td>
<td>Intermediate values</td>
</tr>
</tbody>
</table>
$GM_i = \left( \prod_{j=1}^{N} a_{ij} \right)^{1/N}$

(1)

and

$W_i = \frac{GM_i}{\sum_{i=1}^{N} GM_i}$

(2)

- Calculate matrix $A_3$ and $A_4$ such that $A_3 = A_1 \times A_2$ and $A_4 = A_3/A_2$
- Find out the maximum eigen value $\lambda_{max}$ which is the average of matrix $A_4$
- Calculate the consistency index, $CI = (\lambda_{max} - N) / (N - 1)$. The smaller the value of $CI$, the smaller is the deviation from the consistency.
- Obtain the random index (RI) for the number of factors used in decision making. Table 2 helps the users for this purpose (Saaty, 2000).
- Calculate the consistency ratio, $CR = CI / RI$. Usually, a CR of 0.1 or less is considered as acceptable as it reflects an informed judgment which could be attributed to the knowledge of the analyst about the problem under study.

- Step 3: The next step is to compare the candidate alternatives pairwise with respect to how much better (more dominant) in satisfying each of the factors. It is nothing but ascertaining how well each candidate alternative serves each factor. If there are $M$ numbers of candidate alternatives, then there will be $N$ number of $M \times M$ matrices of judgments since there are $N$ factors. Construct pairwise comparison matrices using a scale of relative importance. The judgments are entered using the fundamental scale $N$ of the AHP (Saaty, 2000). The steps are same as that suggested under Step 2. In the AHP model, both the relative and absolute modes of comparison can be performed. The relative mode can be used when users have prior knowledge of the factors for different alternatives to be used, or when quantitative data of the factors for different alternatives to be evaluated is not available. The absolute mode is used when data of the factors for different alternatives to be evaluated are readily available. In the absolute mode CI is always equal to 0 and complete consistency exists, since the exact values are used in the comparison matrices.

<table>
<thead>
<tr>
<th>Table 3. Random index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of factors</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>7</td>
</tr>
<tr>
<td>8</td>
</tr>
<tr>
<td>9</td>
</tr>
</tbody>
</table>

- Step 4: The next step is to obtain the composite weights for the alternatives by multiplying the relative normalized weight ($W_i$) of each factor (obtained in Step 2) with its corresponding normalized weight value for each alternative (obtained in Step 3) and making summation over all the factors for each alternative.

2.2. TOPSIS

The TOPSIS method is proposed in Chen and Hwang (1992), with reference to Hwang and Yoon (1981). The basic principle is that the chosen alternative should have the shortest distance from the ideal solution that maximizes the benefit and also minimizes the total cost, and the farthest distance from the negative-ideal solution that minimizes the benefit and also maximizes the total cost (Opricovic and Tzeng, 2003).
The TOPSIS method consists of the following steps:

Step 1: Calculate the normalized decision matrix. The normalized value $r_{ij}$ is calculated as

$$r_{ij} = \frac{X_{ij}}{\sqrt{\sum_{i=1}^{n}X_{ij}^2}}, \forall i,j$$  \hspace{1cm} (3)

Step 2: Calculate the weighted normalized decision matrix. The weighted normalized value $v_{ij}$ is calculated as

$$v_{ij} = w_ir_{ij}, \forall i,j$$  \hspace{1cm} (4)

Where $w_i$ is the weight of the $i^{th}$ criterion, and

$$\sum_{i=1}^{n}w_j = 1$$

Step 3: Determine the ideal and negative-ideal solution.

$$A^* = \{v_1^*, ..., v_m^*\} = \left\{(\max_i v_{ij} \mid j \in C_b), (\min_i v_{ij} \mid j \in C_c)\right\}$$  \hspace{1cm} (5)

$$A^- = \{v_1^-, ..., v_m^-\} = \left\{(\min_i v_{ij} \mid j \in C_b), (\max_i v_{ij} \mid j \in C_c)\right\}$$  \hspace{1cm} (6)

where $C_b$ is associated with benefit criteria and $C_c$ is associated with cost criteria.

Step 4: Calculate the separation measures, using the $m$-dimensional Euclidean distance. The separation of each alternative from the ideal solution is given as

$$S_i^+ = \sqrt{\sum_{j=1}^{m}(v_{ij} - v_{ij}^*)^2}, \forall i$$  \hspace{1cm} (7)

Similarity, the separation from the negative-ideal solution is given as

$$S_i^- = \sqrt{\sum_{j=1}^{m}(v_{ij} - v_{ij}^-)^2}, \forall i$$  \hspace{1cm} (8)

Step 5: Calculate the relative closeness to the ideal solution. The relative closeness of the alternative $A_i$ with respect to $A^*$ is defined as

$$RC_i^+ = \frac{S_i^-}{S_i^- + S_i^+}, \forall i$$  \hspace{1cm} (9)

Step 6: Rank the preference order.

The index values of $RC_i^+$ lie between 0 and 1. The larger index value means the closer to ideal solution for alternatives.
3. A Numerical Application of Proposed Approach

This paper, the proposed methodology that may be applied to a wide range of Strategies selection problems.

**AHP Method:**

First of all we form pair-wise comparison matrix, after that weights of all criteria are determined by the help of AHP. The priority of weights respect to main goal is calculated as (0.161, 0.085, 0.096, 0.137, 0.075, 0.231, 0.110, 0.043, 0.046, 0.012).

**TOPSIS:**

The weights of criteria are calculated by AHP up to now, and then these values can be used in TOPSIS. According to TOPSIS methodology, we obtained weighted normalized decision matrix. After that by following TOPSIS procedure steps and calculations, the ranking of suppliers are gained. The results and final ranking are shown in Table 4.

<table>
<thead>
<tr>
<th>Rank</th>
<th>alternatives</th>
<th>$R C_i^+$</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>$A_1$</td>
<td>0.322</td>
</tr>
<tr>
<td>2</td>
<td>$A_2$</td>
<td>0.456</td>
</tr>
<tr>
<td>5</td>
<td>$A_3$</td>
<td>0.314</td>
</tr>
<tr>
<td>1</td>
<td>$A_4$</td>
<td>0.589</td>
</tr>
<tr>
<td>3</td>
<td>$A_5$</td>
<td>0.412</td>
</tr>
</tbody>
</table>

According to Table 4, $A_4$ is the best alternative among others.

5. Conclusions

Proper and strong marketing strategy is essential for the survival and success of any business in the increasing complex, competitive environment of organizations. The purpose of this paper is to propose a suitable model for determining the appropriate marketing strategy. This paper illustrates an application of AHP along with TOPSIS in selecting best marketing strategy. A two-step AHP and TOPSIS methodology is structured here that TOPSIS uses AHP result weights as input weights. Then a real case study is presented to show applicability and performance of the methodology.

Acknowledgement

The authors wish to thank an anonymous referee for the valuable suggestions which considerably improve the quality of the paper.

References