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## Integration of SWOT Analysis and TOPSIS Method In Strategic Decision Making Process

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### Abstract

*In today's highly competitive environment, organizations have to analyze their environments both internally and externally. In strategic management process SWOT analysis, which evaluates the strengths, weaknesses, opportunities and threats of an organization is one of the most common approaches for analyzing strategic decisions. When used appropriately, SWOT analysis can provide a good foundation for strategy formulation. However, SWOT analysis has some drawbacks in the measurement and evaluation steps in strategic decision-making process. In conventional SWOT analysis, the importance of the factors is not quantified to determine the effect of each factor on the proposed strategy. 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. While it does pinpoint the factors in the analysis, individual factors are usually described briefly and very generally. For this reason, SWOT analysis cannot comprehensively assess the strategic decision-making process. In this study, SWOT analysis is performed using TOPSIS ( the Technique for Order Preference by Similarity to Ideal Solution) , which allows to find the best alternative among possible strategic alternatives.*

Keywords: strategic decisions, Swot analysis, TOPSIS method

### 1. Introduction

SWOT (**S**trengths, **W**eaknesses, **O**pportunities and **T**hreats) analysis is one of the most common used approaches of a firm as part of the strategic planning process. By identifying its external opportunities and threats, an organization can exploit opportunities and counter threats. On the other hand, by identifying its internal strengths and weaknesses, an organization can build strategies upon its strengths and eliminate its weaknesses.

SWOT analysis summarizes the most important internal and external factors that may affect the organization's future, which are referred to as strategic factors. There are eight steps involved in constructing a SWOT matrix: (1) list the firm's key external opportunities, (2) list the firm's key external threats, (3) list the firm's key internal strengths, (4) list the firm's key internal weaknesses, (5) match internal strengths with external opportunities and record the resultant SO

strategies, (6) match internal weaknesses with external opportunities and record the resultant WO strategies, (7) match internal strengths with external threats and record the resultant ST strategies, and (8) match internal weaknesses with external threats and record the resultant WT strategies. When used appropriately, SWOT analysis can provide a good foundation for strategy formulation. However, SWOT analysis has some drawbacks in the measurement and evaluation steps in strategic decision-making process.

In conventional SWOT analysis, the importance of the factors is not quantified to determine the effect of each factor on the proposed strategy. 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. While it does pinpoint the factors in the analysis, individual factors are usually described briefly and very generally. For this reason, SWOT analysis cannot comprehensively assess the strategic decision-making process.

In this study, SWOT analysis is performed using TOPSIS( the **T**echnique for **O**rders Preference by **S**imilarity to **I**deal **S**olution) , which allows to find the best alternative among possible strategic alternatives. TOPSIS (**T**echnique for **O**rders Preference by **S**imilarity to **I**deal **S**olution) method is one of the useful multi-criteria decision making techniques and was firstly proposed Hwang and Yoon (1981). According to this technique, the chosen alternative should have the shortest distance from the positive ideal solution(PIS) and the farthest from the negative ideal solution(NIS).

## **2. Strategic Decision-Making Process**

Strategic management is crucial for all companies to withstand today's fierce market competition. It is related with decisions and actions taken by the business management for the realization of long-term activities of companies.

The three stages of strategic management process are the formulation of a strategy, the implementation of a strategy and evaluation of the strategy. At the beginning of the strategic management process, the companies must consider its internal and external environments. SWOT analysis is a extensively used tool for analyzing internal and external environments of companies. SWOT analysis evaluates the oppotunities, threats, strengths and weaknesses of a company.

According to the Table 1, SWOT matrix offers four types of strategies. The steps for the preparation fort he SWOT matrix are:

- 1) Preparing a list of major opportunities and threats external environment of the firm,
- 2) Preparing a list of major strenghts and weaknesses within the firm,
- 3) Compared to internal strengths with external opportunities and determining SO strategy or strategies,
- 4) Compared to the internal weaknesses with external opportunities and determining WO strategy or strategies,
- 5) Compared to internal strengths and external threats and determining ST strategy or strategies,

- 6) Reducing internal weaknesses and avoiding external threats and determining WT strategy or strategies.

**Table 1: SWOT matrix**

<b>Internal Factors</b>	<b>Strengths(S)</b>	<b>Weaknesses(W)</b>
<b>External Factors</b>		
<b>Opportunities(O)</b>	SO strategy	WO strategy
<b>Threats(T)</b>	ST strategy	WT strategy

**SO strategy:** Using the internal strengths and external opportunities will be determined,

**WO strategy:** Use of external opportunities, internal weaknesses can be reduced or eliminated,

**ST strategy:** Using internal strengths, external threats reduced or be removed,

**WT strategy:** Decreases the internal weaknesses and external threats are avoided.

### 3. TOPSIS Method

TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) method is one of the useful multi-criteria decision making techniques and was firstly proposed Hwang and Yoon (1981). According to this technique, the chosen alternative should have the shortest distance from the positive ideal solution (PIS) and the farthest from the negative ideal solution (NIS) in a geometrical (Euclidean) sense. The PIS is a solution that maximizes the benefit criteria and minimizes the cost criteria, whereas the NIS maximizes the cost criteria and minimizes the benefit criteria. The TOPSIS method takes into consideration simultaneously the distances to both the PIS and the NIS. The solution which is closest the PIS and farthest to NIS is the ideal solution.

The TOPSIS method has two main advantages. One of them is its mathematical simplicity and the other one is that it has very large flexibility in the definition of the choice set. The TOPSIS method evaluates the following decision matrix,

$$P = \begin{matrix} & C_1 & C_2 & C_3 & \dots & C_n \\ \begin{matrix} A_1 \\ A_2 \\ A_3 \\ \vdots \\ A_m \end{matrix} & \begin{bmatrix} x_{11} & x_{12} & x_{13} & \dots & x_{1n} \\ x_{21} & x_{22} & x_{23} & \dots & x_{2n} \\ x_{31} & x_{32} & x_{33} & \dots & x_{3n} \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ x_{m1} & x_{m2} & x_{m3} & \dots & x_{mn} \end{bmatrix} \end{matrix}$$

where  $A_i$  is the  $i^{\text{th}}$  alternative,  $C_j$  is the  $j^{\text{th}}$  criterion and  $x_{ij}$  is the performance measure of the  $i^{\text{th}}$  alternative in terms of the  $j^{\text{th}}$  criterion (Kandakoğlu et al, 2009, p.591). In the following the steps of TOPSIS method are given:

*Step 1:* Decision matrix is normalized by using following equation:

$$r_{ij} = \frac{a_{ij}}{\sqrt{\sum_{i=1}^m a_{ij}^2}}, \quad i = 1, \dots, m; \quad j = 1, \dots, n.$$

*Step 2:* Weighted normalized decision matrix is formed as:

$$v_{ij} = w_i * r_{ij}, \quad i = 1, \dots, m; \quad j = 1, \dots, n.$$

*Step 3:* PIS (positive ideal solution) and NIS (negative ideal solution) are determined as

$$A^* = (v_1^*, v_2^*, \dots, v_j^*, \dots, v_n^*) \quad \text{maximum values,}$$

$$A^- = (v_1^-, v_2^-, \dots, v_j^-, \dots, v_n^-) \quad \text{minimum values.}$$

*Step 4:* The distance of each alternative from PIS and NIS is calculated as:

$$d_i^* = \sqrt{\sum_{j=1}^n (v_{ij} - v_j^*)^2}, \quad i = 1, 2, \dots, m.$$

$$d_i^- = \sqrt{\sum_{j=1}^n (v_{ij} - v_j^-)^2}, \quad i = 1, 2, \dots, m.$$

*Step 5:* The closeness coefficient of each alternative ( $CC_i$ ) is calculated as:

$$CC_i = \frac{d_i^-}{d_i^* + d_i^-}.$$

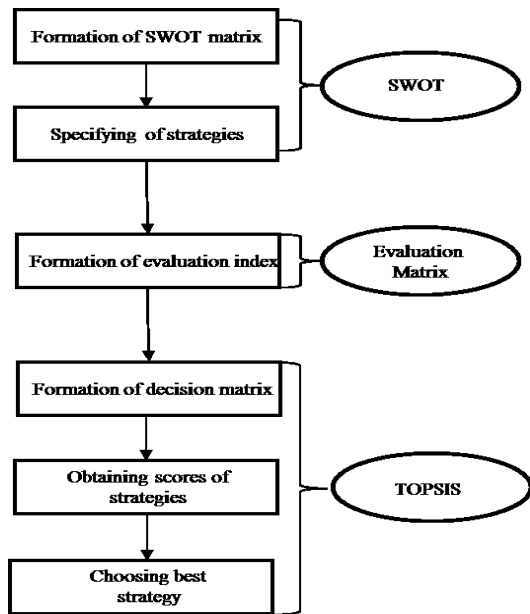
*Step 6:* The ranking of alternatives is determined by comparing  $CC_i$  values.

#### 4. An illustrative example

In this paper, the proposed model (Figure 1) was applied to a furniture firm which was producing and exporting home furnitures in Turkey. In this research, firm manager was invited to survey about strategies. This research framework includes 12 evaluation criteria that include strengths, weaknesses, opportunities and threats. In addition, there are four strategies.

The unified five-point system of Ying's (2010) is used. Using the five rating system, the firm manager scored the evaluation criteria. The scoring results are shown in the Table 2. There are no obvious differences of importance among evaluation indicators and it does not need to assign weights to them. So the original values can be directly used for TOPSIS calculations.

**Figure 1: Proposed Model**



**Table 1: Internal and External Strategic Factors of The Firm**

<b>Internal Factors</b>	<b>Strengths(S)</b> S <sub>1</sub> : Good management team S <sub>2</sub> : Quality of the products S <sub>3</sub> : Experience in furniture sector S <sub>4</sub> : Existence of high labour potential and cheap workforce	<b>Weaknesses(W)</b> W <sub>1</sub> : High raw material costs W <sub>2</sub> : Weak image of Turkish products W <sub>3</sub> : Shortcomings in the usage of new technologies and technology transfer W <sub>4</sub> : Structural deficiencies in investment and financing
<b>External Factors</b>		
<b>Opportunities(O)</b> O <sub>1</sub> : The strategic position of Turkey O <sub>2</sub> : Use and increase of design O <sub>3</sub> : Increase in consumers in Europe and possibility to export Europe countries O <sub>4</sub> : Government support in the sector	SO strategy <u>Provide distinctive and enhanced quality products according to cultural characteristics of European customers</u>	WO strategy <u>Attract foreign investment and use government support in order to improve technology</u>
<b>Threats(T)</b> T <sub>1</sub> : Chinese products T <sub>2</sub> : Changing demands of customers T <sub>3</sub> : Higher export prices T <sub>4</sub> : Inflation and currency rate fluctuations	ST strategy <u>Supporting innovations in order to response to the changing demands of customers</u>	WT strategy <u>Collaboration with suppliers and benchmarking with competitors' capabilities in the areas such as cost reduction and enhance quality</u>

**Table 2: Internal and External Strategic Factors of The Firm**

	SO	WO	ST	WT	MAX	MIN
S1	4	5	4	5	5	4
S2	5	1	3	1	5	1
S3	5	4	2	2	5	2
S4	3	1	3	4	4	1
W1	1	4	4	5	5	1
W2	1	1	3	4	4	1
W3	2	3	5	2	5	2
W4	1	5	3	1	5	1
O1	2	4	2	2	4	2
O2	5	3	5	1	5	1
O3	4	4	4	2	4	2
O4	3	5	4	1	5	1
T1	1	3	4	3	4	1
T2	4	2	5	2	5	2
T3	4	5	3	3	5	1
T4	3	5	3	4	5	2

Using TOPSIS method, importance value of each strategy and distance between negative ideal solution vector and positive ideal solution vector are calculated. Computed closeness coefficients (evaluation index) of each strategy and ranking of strategies according to their closeness coefficients are shown in following Table 3.

**Table 3: Internal and External Strategic Factors of The Firm**

	STRATEGIES			
	SO	WO	ST	WT
<b>Distance to the negative ideal solution</b>	8,185	9,381	9,274	6,856
<b>Distance to the positive ideal solution</b>	8,660	7,348	5,831	10,247
<b>Closeness Coefficients of Each Strategy</b>	0,449	0,561	0,614	0,401
<b>Ranking of Strategies</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>4</b>

According to the results, ST strategy (*Supporting innovations in order to response to the changing demands of customers*) is the best strategy which matches the best with the four elements of S, W, O and T and 12 strategic indicators, so ST strategy should choose.

## 5. Conclusions

Good performance of a firm depends on the results of correct interaction of the business management with its internal and/or external environment. To operate successfully in this respect, the firm must concentrate its future objectives and choose its appropriate strategy or strategies. Strategy selection is an important task for the firms.

In this paper, it has determined the best strategy for a furniture firm by combining SWOT with TOPSIS method. The findings show the following ranking of each strategy ST (0,614), WO(0,561), SO(0,449) and WT (0,401). According to the proposed model the best strategy in SWOT is *Supporting innovations in order to response to the changing demands of customers*. Future research could improve the using Fuzzy TOPSIS method to more effectively analyze uncertainty internal and external factors. Furthermore, other MCDM(multi-criteria decision making) techniques is applied in strategy selection process and the obtained results could be compared with SWOT-TOPSIS strategic analysis results.

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