

Formulating and Ranking Strategies by Fuzzy TOPSIS Technique (Case study: Noavaran Abri Company)

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ABSTRACT

Nowadays formulating and ranking strategies are one of the most important tasks of top managers and CEOs. It makes them to make better decisions and lead their organizational into high performance and productivity. The purpose of the current paper is to formulate and rank strategies in Noavaran Abri Company. After reviewing on internal strengths and weaknesses and environmental opportunities and treatments, 20 strategies were formulated in base of WOT matrix. After that by applying Fuzzy TOPSIS and QSPM techniques, the formulated strategies were ranked and the same 3 ones were chosen but in different orders. Finally the results of utilizing AHP test shows that Fuzzy TOPSIS test is better and more proper technique to rank strategies. So the managers are advised to execute and implement strategies in terms of fuzzy TOPSIS order.

KEYWORDS: Strategy, SWOT matrix, fuzzy TOPSIS technique, QSPM, AHP technique.

1. INTRODUCTION AND PROBLEM STATEMENT

Today's one of the major challenges of the industry is to keep pace with global changes. These changes support the promotion of human needs and increase their expectations of life occurs. At the other view, spillovers are one of the most important elements of this change. Among these organizations are forced to use a set of strategies to achieve are their goals. Coordination and interoperability between enterprise strategies could create synergy between them (Dehdashti Shahrokh et al, 2013).

Parallel to global trend, utilizing strategic management tools and techniques has been enhanced (Sibbet, 1990). In today's competitive world, creating and implementing innovative and new strategies to utilize opportunities, seems so difficult. Definitely it can be claimed that each strategy is not useful for all organizations. If a strategy be favorite and proper for an organization, it is not appropriate for the other ones necessarily (Mehrmanesh et al, 2012).

Although lots of researches have been done in relation to implementing strategic management, but there was not a research about representing an organized method to meet existing inconsistencies to success and affective execution. It is necessary to mention organizations for executing their strategies are faced to some restrictions like lack of financial resources and enough time. So attending to mentioned cases and need to the techniques for prioritizing strategies, the current paper has been written.

In Noavaran Abri companies, managers believe that achieving to competitive advantage and compatibility will be realized just planning, ranking and managing strategies. So the leaders and managers are absolutely interested to formulating and ranking strategies. So the main questions of the research can be considered as:

- ❖ What are the strategies for Noavaran Abri Company?
- ❖ How is the prioritization of strategies in Noavaran Abri Company?

2. LITERATURE REVIEW

2.1. Strategic planning

The background of strategy concept returns to almost 340 years before Christ. One of the Chinese general who called Sun Tzu utilized the term "strategy" at the first time. He described the concept of strategy to overcome enemies in his book. But the beginning of today form of strategic planning is 1960s (Rahnema et al, 2012).

Application of strategic planning has a long history. "Strategy" is a Greek word from "stretago" root which contains "stratos" and "ego" meaning "army" and "leadership" accordingly. Strategic planning started as "general art" but is now known as "top manager's art". Strategic planning is decision-making process with the knowledge of present and future problems in view (Hoogstrw, 2008).

Also strategic planning has been defined as management speak for long term future planning. It concerns anything which will bring results in anything from 1 to 5 years or beyond. It's good management practice to enhance

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employees' head above the daily grind every now and then, and take action now to positively affect their future (Saeedi, 2010).

Strategy is derived from an organizations' vision and is placed in heart of process. It determines some things which are related to critical success factors (CSF). A critical success factor consists of "some limited factors which deeply affect on an industry or organization' success. In deed, CSFs are response of a simple question: what makes customers more satisfied? Generally it forms basic critical success factors (Eccles & Pyburn, 1992).

In deed, CSFs are utilized to determine level of improvement to achieve strategic goals. It facilitates transferring strategies and vision into technical indices. The real strategy is that people in organization be able to understand them (Shahin and Zairi, 2005).

In the current research, CSFs are utilized for ranking strategies as tools.

2.2. SWOT analysis

SWOT analysis as the most current techniques, distinguishes driving affective factors and analyzes strengths, weaknesses, opportunities and threats. It helps managers to maximize strength and opportunities points and minimize threats and weakness points. Also SWOT matrix tries to change weakness points to strength points and uses the scores of opportunities to reduce internal weakness points and external threats (Arslan, 2008). Internal and external environment contains all the internal and external variables of an organization or industry. Comprehensive analysis of environment contains the recognition of different kinds of internal and external forces which affect on organization like political, social, cultural and economical factors (Mehrmanesh et al, 2012).

SWOT Analysis is an absolutely useful framework for analyzing an organization or industry. It helps managers and leaders to improve their emphasis on the things which matter the most and take the greatest possible advantage of the opportunities available (Haghshenas Kashani et al, 2010).

The SWOT matrix contains 4 strategic homes:

- ❖ SO: the strategies for applying environmental opportunities using organization's strength;
- ❖ WO: the strategies for compensating weaknesses applying potential advantages of environmental opportunities;
- ❖ ST: the strategies for treatments prevention applying strengths and
- ❖ WT: the strategies to minimize disadvantages of treatments and weaknesses (Saeedi, 2010).

2.3. QSPM technique

One of the old prevalent techniques to prioritize and identify strategies relative attractiveness is quantitative strategic planning matrix. The matrix is utilized to rank the most important ones (Hastuti et al, 2007).

3. RESEARCH METHODOLOGY

The current strategies was done in a society includes 83 managers and experts of Noavaran Abri Company which are familiar to strategic planning.

For gathering data three separated questionnaires were applied. The first and second ones were designed for ranking strategies and the last one for comparing the techniques (QSPM and fuzzy TOPSIS).

For assessing questionnaires validity were asked for experts' opinions and to confirm its reliability Cronbach's alpha method has been used. The reliability results calculated which was above the reasonable threshold (0.7).

3.1. Fuzzy TOPSIS technique

Fuzzy situation is a kind of decision making space in which collected data is almost ambiguous. Ambiguous data does not have specified limitation and is defined as fuzzy data. Therefore decision making in base of the mentioned data is recognized as decision making in fuzzy condition. Fuzzy TOPSIS is a new technique in which decision making process will lead to accurate results in uncertainty situation. As the results of utilizing Fuzzy TOPSIS technique are more accurate than traditional ones, so in the current paper Fuzzy TOPSIS technique was applied to prioritize job satisfaction indices (Kalantari et al, 2012; Saeedi et al, 2012; a; Saeedi et al, b).

3.1. Fuzzy TOPSIS technique

Decision making process steps by fuzzy TOPSIS technique are shown below (Kalantari et al, 2013; Sabaghi et al, 2013; Saeedi et al, 2012; c):

Step 1: calculating weights vector w~j

$$\tilde{R} = \left[\tilde{r}_{ij} \right]_{m \times n}$$

(1)

Normalizing the calculated matrix

$B \subseteq \{1, \dots, n\}$ is related to benefit-based indices and $C \subseteq \{1, \dots, n\}$ is related to cost-based indices.

$$\tilde{r}_{ij} = \left(\frac{a_{ij}}{d_j^*}, \frac{b_{ij}}{d_j^*}, \frac{c_{ij}}{d_j^*}, \frac{d_{ij}}{d_j^*} \right), \quad j \in B \quad (2) \quad (3)$$

$$\tilde{r}_{ij} = \left(\frac{a_j^-}{d_{ij}^-}, \frac{a_j^-}{c_{ij}^-}, \frac{a_j^-}{b_{ij}^-}, \frac{a_j^-}{a_{ij}^-} \right), \quad j \in C$$

Step 2: so normalized weighted matrix is formed as follows:

$$\tilde{V} = [\tilde{v}_{ij}]_{m \times n}, \quad i = 1, 2, \dots, m, \quad j = 1, \dots, n \quad \tilde{v}_{ij} = \tilde{r}_{ij} \otimes w_j \quad (4)$$

Step 3: determining the fuzzy positive ideal solution (FPIS) and fuzzy negative ideal solution (FNIS) (formulas 5, 6):

$$\tilde{v}_j^- = \begin{cases} \min_{i=1, \dots, m} \tilde{v}_{ij}; & j \in B \\ \max_{i=1, \dots, m} \tilde{v}_{ij}; & j \in C \end{cases} \quad \tilde{v}_j^* = \begin{cases} \max_{i=1, \dots, m} \tilde{v}_{ij}; & j \in B \\ \min_{i=1, \dots, m} \tilde{v}_{ij}; & j \in C \end{cases}$$

$$FNIS = \{\tilde{v}_j^- \mid j = 1, \dots, n\} \quad FPIS = \{\tilde{v}_j^* \mid j = 1, \dots, n\}$$

Step 4: calculating the alternative positive and negative distances by applying formulas 7, 8 and 9:

$$D(\tilde{a}, \tilde{b}) = \sqrt{\frac{1}{4} [(a_1 - b_1)^2 + (a_2 - b_2)^2 + (a_3 - b_3)^2 + (a_4 - b_4)^2]} \quad (7)$$

$$d_i^* = \sum_{j=1}^n d(\tilde{v}_{ij}, \tilde{v}_j^*), \quad i = 1, \dots, m \quad (8)$$

$$d_i^- = \sum_{j=1}^n d(\tilde{v}_{ij}, \tilde{v}_j^-), \quad i = 1, \dots, m \quad (9)$$

Step 5: Calculating the relative closeness to the ideal solution.

$$Cc_i = \frac{d_i^-}{d_i^- + d_i^+} \quad (10)$$

4. Data analyzing

By making a meeting with managers and experts and utilizing Delphi and brain storming method organization's vision, long term goals, critical success factors, strengths, weaknesses, opportunities, treatments and related strategies were determined:

Vision: Creating an integrated system to plan and strategic analysis which helps managers to select the most important strategies.

Critical Success Factors:

1. technology management and improving level of technical knowledge
2. optimizing information systems and networks
3. optimizing purchasing, sales and marketing management
4. improving financial management and cost comprehensive management
5. optimizing human resource management and development and improving organizational culture

Long term goals:

1. Increasing production capacity up to 1.5 times with production diversity
2. Achieving maximum market share in producing car lifting glass
3. Achieving European Foundation Quality Management (EFQM)

4.1. SWOT analysis

Table 1: SWOT matrix

<p>W1: Not utilization of existence technology optimally</p> <p>W2: Not having maintenance and repairing systems</p> <p>W3: Weakness in human resource planning</p> <p>W4: Poor performance appraisal systems</p> <p>W5: Inconstancy in top managers' team</p> <p>W6: Not using information system for decision making</p> <p>W7: Not institutionalized industrial and security issues</p> <p>W8: Not having enough experience for cost leadership</p> <p>W9: Non segmenting market affectively</p> <p>W10: Not applying affective methods for functions for capital budgeting</p> <p>W11: Weakness in implementing reward and payment methods and control</p>	<p>S1: Having educational condition in organization</p> <p>S2: Having employees and managers' ability and commitment for changing</p> <p>S3: Having experienced employees</p> <p>S4: Applying affective policies and methods for quality controlling</p> <p>S5: Managers' beliefs to teamwork</p> <p>S6: Ability to provide needed capital for short-term periods</p> <p>S7: Having various research centers</p> <p>S8: measurability short term and long term goals</p> <p>S9: Utilization administrative automation and information systems</p> <p>S10: Growing organizational market share</p> <p>S11: Having high quality of productions</p> <p>S12: Having favorite relationship with stockholders and stakeholders</p>	
<ol style="list-style-type: none"> 1. Designing and establishment performance appraisal system 2. Designing organizational flexible structure 3. Acceleration in repairing and renewing company applying governmental credits 4. Institutionalizing security and work hygiene culture 5. Developing export to attract external market share and increasing sales 6. Designing and establishment marketing system (market researches, market planning,) 	<ol style="list-style-type: none"> 1. Institutionalizing EFQM approach in all organizational aspects 2. Facilitating purchasing process applying market controlling 3. Attract and develop educated young workforce to realize organization's future goals 4. Improving production efficiency 5. Utilizing primary material standards 	<p>O1: Executing 44th fundamental of general rule for specialization in governmental and mid-governmental organizations</p> <p>O2: government focus on credit supply for old factories to renew machineries and equipment</p> <p>O3: Easy access to forest resources rather internal rivals</p> <p>O4: possibility to attract stockholders' trust and satisfaction</p> <p>O5: Having various suppliers and customers</p> <p>O6: Having proper support of Iran National Industries Organization, Social Supply Insurance Organization and</p> <p>O7: Favorite image as one of the greatest industries in Guilan Province</p>
<ol style="list-style-type: none"> 1. Decreasing overload costs to achieve more productivity 2. Organizing employees' reward and income system 3. Improving repairing and maintenance system and utilization of precautionary maintenance (PM) 4. Optimal usage of financial tools to improve organization's financial stamina 	<ol style="list-style-type: none"> 1. Improving organizational culture emphasizing teamwork 2. Decreasing dependency to import segments applying capacity of internal suppliers 3. Improving industrial accounting comprehensive system 4. Continuance appraisal, measuring levels and manner of applying technology (updating technology) 5. Utilization differentiation and developing productions to maintain major internal market share 	<p>T1) Rival companies investment to increase productions and export to other countries</p> <p>T2) Negative influence of global economic tsunami and the resulting problem</p> <p>T3) Not serious supporting of officials in recent years to develop and improve the organization</p> <p>T4) The rivals' utilization of recycling system</p> <p>T5) Lack of primary resources because of environmental obstacles</p> <p>T6) Existing various obstacles in transferring technology and advanced machineries because of decreasing relationship between Iran and western countries</p>

Table 1 shows strengths, weaknesses, opportunities, treatments and related strategies in base of SWOT matrix. First by applying QSPM technique, formulated strategies were prioritized. The results are shown in table 2.

4.2. Ranking Strategies by QSPM technique

Table 2: The results of applying QSPM technique

Strategies	Final rank
Institutionalizing EFQM approach in all organizational aspects	1
Facilitating purchasing process applying market controlling	18
Attract and develop educated young workforce to realize organization's future goals	6
Improving production efficiency	12
Utilizing primary material standards	19
Designing and establishment performance appraisal system	3
Designing organizational flexible structure	2
Acceleration in repairing and renewing company applying governmental credits	14
Institutionalizing security and work hygiene culture	17
Developing export to attract external market share and increasing sales	8
Designing and establishment marketing system (market researches, market planning,)	4
Improving organizational culture emphasizing teamwork	15
Decreasing dependency to import segments applying capacity of internal suppliers	7
Improving industrial accounting comprehensive system	20
Continuance appraisal, measuring levels and manner of applying technology (updating technology)	5
Utilization differentiation and developing productions to maintain major internal market share	9
Decreasing overload costs to achieve more productivity	16
Organizing employees' reward and income system	10
Improving repairing and maintenance system and utilization of precautionary maintenance (PM)	13
Optimal usage of financial tools to improve organization's financial stamina	11

4.3. Ranking strategies by fuzzy TOPSIS technique

By utilizing fuzzy TOPSIS technique, the strategies were ranked again. The results are shown in table 3:

Table 3: The results of applying fuzzy TOPSIS technique

S_i	D_i^+	D_i^-	CC_i	Priority
S1	2.233524447	2.966309576	0.570462358	2
S2	3.433077089	1.740369127	0.336404218	20
S3	2.584651494	2.619572764	0.503355089	5
S4	3.089984654	2.067185329	0.400837152	10
S5	3.460752814	1.695030179	0.328762902	18
S6	2.333713872	2.84519263	0.549380961	3
S7	2.286906015	2.887985214	0.558076506	1
S8	3.207387706	1.942037825	0.377136792	12
S9	3.375124088	1.797351122	0.347483758	15
S10	2.743661518	2.393916055	0.465962026	7
S11	2.478639257	2.697182374	0.521111925	6
S12	3.225940924	1.945020057	0.376142861	14
S13	2.637216592	2.528470478	0.489474187	8
S14	3.518616089	1.655970449	0.320019858	19
S15	2.56400415	2.60867248	0.504317719	4
S16	2.798821867	2.409931755	0.462669562	11
S17	3.277510211	1.849394952	0.360723457	17
S18	2.826479549	2.331379005	0.452005223	9
S19	3.191276852	1.965064666	0.381096686	16
S20	2.997131566	2.082279794	0.409945099	13

As table 4 shows “Designing organizational flexible structure”, “Institutionalizing EFQM approach in all organizational aspects” and “Designing and establishment performance appraisal system” were selected as the most important one.

The results of applying QSPM and fuzzy TOPSIS techniques are different, so to comparison the results AHP technique was utilized.

4.3. AHP technique

To comparison to above techniques, long term goals were considered as criteria for categorizing techniques. Paired comparison matrix attending to organizational vision is shown in table 5:

Table 4: Paired comparison between long term goals

Vision	O ₁	O ₂	O ₃
O ₁	1	2	1.5
O ₂		1	2
O ₃			1

Table 5 shows final weights of organization’s long term goals. It was done to find the weights of long term goals affecting on choosing the mentioned techniques (QSPM and fuzzy TOPSIS).

Table 5: Final weights of long term goals

Long term goals	Weights
Increasing production capacity up to 1.5 times with production diversity	0.35223721
Achieving maximum market share in producing car lifting glass	0.33669564
Achieving European Foundation Quality Management (EFQM)	0.31106715

Table 6 shows that the third long term goal is the most important one. Now to compare the techniques in terms of long term goals, SAW technique was applied. Table 7 illustrates impact of each option than long term goals by applying experts’ opinions:

Table 6: paired priority ranked strategies rather first

Increasing production capacity up to 1.5 times with production diversity	Ranking by QSPM technique	Ranking by fuzzy TOPSIS technique
Ranking by QSPM technique	1	1/3
Ranking by fuzzy TOPSIS technique		1

Table 7: paired priority ranked strategies rather first

Achieving maximum market share in producing car lifting glass	Ranking by QSPM technique	Ranking by fuzzy TOPSIS technique
Ranking by QSPM technique	1	1/2
Ranking by fuzzy TOPSIS technique		1

Table 8: paired priority ranked strategies rather first

Achieving European Foundation Quality Management (EFQM)	Ranking by QSPM technique	Ranking by fuzzy TOPSIS technique
Ranking by QSPM technique	1	1/3
Ranking by fuzzy TOPSIS technique		1

At the end, final weights of each technique were calculated. The results of techniques ranking are shown in table 8:

Table 8: Final weights of applying AHP technique

Techniques	Weights
QSPM	0.31659322
Fuzzy TOPSIS	0.68340678

Inconsistency rate: 0.088

Table 8 shows that fuzzy TOPSIS technique get better results rather QSPM one.

5. Conclusion

In current paper, we tried to formulate and rank some strategies by 2 traditional and modern techniques and finally the techniques were comprised together by AHP one.

First of all, reviewing internal strengths and weaknesses and external opportunities and treatments, 20 strategies were formulated in base of SWOT matrix. After that the strategies were ranked by QSPM and fuzzy TOPSIS techniques. In QSPM one the strategies priority was as:

1. Institutionalizing EFQM approach in all organizational aspects
2. Designing organizational flexible structure
3. Designing and establishment performance appraisal system

And in fuzzy TOPSIS technique, the priority was as:

1. Designing organizational flexible structure
2. Institutionalizing EFQM approach in all organizational aspects
3. Designing and establishment performance appraisal system

Although the gotten strategies are the same, but their priorities were different from together. To choose the best technique, AHP technique was utilized.

The results of applying AHP one show that fuzzy TOPSIS technique is better one to rank strategies. The results are consistent to Mehrmanesh et al (2012) and Aligholi et al (2013) researches.

Attending to gotten results, some suggestions are proposed:

- ❖ To design organizational flexible structure, managers are advised to design new chart for the organization and job enrichment and rotation.
- ❖ Also to institutionalize EFQM approach, appropriate sub structure is required which needs all employees and managers participation and integration.
- ❖ To establish proper performance appraisal, it is necessary that managers feedback employees' performance to them and try to meet their weaknesses.

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