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Design of a combined fuzzy model in codifying and ranking strategies

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Quantitative strategic planning matrix (QSPM) is an old and efficient method which is used for organizational strategic ranking. However, a new method of decision-making such as Fuzzy technique for order preference by similarity to ideal solution (TOPSIS) has attracted the attention of researchers and strategists. This is because of more reliance on the use of experts' opinions and increase in the reliability of the results. With respect to this, this article attempts to submit a new combined approach of codifying and ranking strategies. In this article which was accomplished in Chooka Company in Iran as a case study, information was obtained with respect to analysis of effective internal and external factors on the analysis matrix of strengths, weaknesses, opportunities and threats points, and its causes of codifying organization strategies. Firstly, it prioritized using QSPM technique. In addition, strategies from pair-wise matrix with key indices, weighting, increasing reliability, the simultaneous qualitative and quantitative criteria and the selected strategies prioritized via Fuzzy TOPSIS method results proved that Fuzzy TOPSIS method has greater advantages than the QSPM technique. Therefore it is more suitable for organizational strategies.

Key words: Strategic planning, strengths and weaknesses and opportunities and threats (SWOT) matrix, quantitative strategic planning matrix (QSPM), Fuzzy technique for order preference by similarity to ideal solution (TOPSIS), analytic hierarchy process.

INTRODUCTION

In today's world, direction of the basic and accelerated variety from a steady and predictable circumstance in the past to a wisely motivated, complicated and unstable environment at an informative revolutionary era, seems the most important thing.

One of the most important challenges together with the important discussion related to the top and high-ranked managers in the organizational system, is submitting a steady and codifying plan for existence and growth in such a comparative, complicated and hard circumstance with the point of view on internal and external, and forecasting the future of the organization. For this reason,

planning suitable strategies is one of the most important elements of top managers in an organization and is settled at the top of their duties.

Strategic planning processing is a coordinate between internal sources and external opportunities in an organization. The target of this process is to look through strategic window and determine opportunities that benefit the organization or responses to them. Therefore, strategic planning process is a kind of management containing coordinates between organizational abilities and present opportunities. These opportunities determine the time spent and the under assessment of the resources on the organization's investment.

At a strategic planning process, the following main processes should be done:

Organization index specifics and at the same time internal and external environment of organization will get

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under assessment. With respect to the information on this assessment, the analysis of the internal and external factors which are effective on the organization or converse on strengths, weaknesses, opportunities and threats point will be formulized through the use of a suitable method like SWOT.

With the use of results obtained from strategic codifying, the organization's strategic planning will suggest steps and processes of the executive program specified after prioritizing. Although, every step of strategic planning is important, the most important steps in this process are selection and formulization of suitable strategy. This is because in this step, the situation of an organization and effective factors on organization are evaluated.

The main problem is that any organization of any size that exists in the information age and electronic relations is confronted with fast changes and evolution. Therefore organizations should plan and manage their activities somehow in an environment which is strongly compatible in order to be successful and to survive. In this relation, the analysis of SWOT is an important supportive tool for decision-making and it normally uses as a method of analysis, systematic internal and external environment of the organization (Leskinen, 2006).

Although many researches in relation to the laying out of strategic management have been done, not much work has been done to provide a final technique to improve present inconsistencies. It needs to be mentioned that organizations are confronted with some limitations to performance such as deficit and inadequate time for implementation. Therefore, based on the above, it is necessary to present some techniques for the codifying and ranking of the organization strategies. In this paper, we try to look for the following. Firstly, what are the suitable strategies that can be used to overtake competitors in Chooka Company? Secondly, with respect to the present limitations, what are the ranking and prioritization of the strategies used in Chooka Company? Finally, does Fuzzy TOPSIS technique, which is one of the new techniques for ranking strategies, have preference over the traditional method like QSPM or not?

As usual, strategic-decisions-making is adopted by top managers on the basis of ability, understanding, judgment and experts' recommendations. This decision-making with respect to the complicated factors in organization will not be precise. Therefore managers should consider different priority aspects of strategies. In this research, Fuzzy TOPSIS technique is suggested for help to the top managers and should increase the rate of confidence. In this paper, researchers have tried to the design strategic planning method on the basis of Fuzzy approach, to prioritize strategies. In this way, with concentration on understanding and deep conceptual approach of the subject, performance obstacles could be detected and removed without any need of breaking them.

We could consider the problem of prioritizing the outcome strategies in strategic planning process as a multi-criteria decision-making problem. Multi-criteria decision-making techniques, multimedia analysis and data mining (MADM) have advantages that could assess different choices with miscellaneous criteria which do not have the same units. This is an important advantage compared to the traditional methods in which all criteria are converted to the same units. An important advantage of Fuzzy MADM techniques is that they are able to evaluate and analyze qualitative and quantitative criteria at the same time. TOPSIS is the most popular technique of MADM, which has been used in this paper with the aim of decision-taking and prioritizing strategies.

In this circumstance, the necessity for this research to submit to a Fuzzy methodology in prioritizing strategies is in order to increase the expectations of industries' beneficiaries and quality of production, and decrease the costs of production more than as revealed before.

LITERATURE REVIEW

Strategic planning

The use of strategic planning has a long history. "Strategy" is a Greek word from "stretago" which consists of "stratos" and "ego" meaning "army" and "leadership" respectively. Strategic planning started as "general art" but is now known as "top manager's art". Strategic planning is decision-making with the knowledge of present and future problems in view (Hoogstrw, 2008). SWOT method as the most current techniques, recognizes effective factors and analyzes strengths, weaknesses, opportunities and threats points. It helps to maximize strength and opportunities points and minimize threats points. In addition, it 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 contain all the internal and external variables of an organization. Comprehensive analysis of environment involves the recognition of different kinds of internal and external forces which affect on organization. These forces may be potentially stimulating for an organization or may become a potential limitation for performance and success of the organization. SWOT matrix shapes base information which is gathered orderly. The different arrangement of four factors-strengths, weaknesses, opportunities and threats in this matrix, which is used for determination of organizational strategies, is long-term (Jharkharia and Shankar, 2007).

Quantitative strategic planning matrix (QSPM)

The main objective of QSPM method is that of an

organization’s need for a systematic method of the assessment of internal and external environmental factors. In addition to this objective is the need to analyze the operational decision-making in the way of their strategic trend (David, 1985). Quantitative strategic planning matrix (QSPM) is used at the stage of strategic formulation. In this method it shows the strategy which is preferred (Hastuti, 2007). Inputs of this matrix include evaluation matrices of internal and external factors and strategies derived from the analysis of strengths, weaknesses, opportunities and threats points. This analytic method, by means of the relative attraction to specific strategy, needs a good judgment, experience and knowledge like most techniques and tools. In a research that was done in 2007, with the help of the analysis of matrix techniques, strengths, weaknesses, opportunities, threats and QSPM, safety strategy management, strategy of healthy and safe environment (HSE) were codified. This research was conducted in National Iranian Oil Company (NIOC). Ten strategies were prioritized which helped to establish and improve green environment in habitable areas, control and supervise the direction of decreasing conservatory gases.

In another research, with the help of analysis matrix techniques of strengths, weaknesses, opportunities, intelligent threat ions and QSTM, codified strategies planning for intelligent road transportation were improved. To codify strategies, analytic matrix of strengths, weaknesses and opportunities and threats points was used. In order to prioritize strategy, decision-making methods with multiple criteria from AHP process and QSTM method were used. Derived results were compared with “Espirman’s Coefficient”.

Decision- making of multiple Fuzzy methods

Decision-making process is finding the best situation from the present choices. Almost in all decision-making problems, the decision-maker confronts difficulties because of frequency criteria. That is, the decision-maker, while implementing a variety of choices wishes to reach more than one target (Zeleny, 1982).

In classic multiple criteria decision-making, the weight of criteria is quite recognized. Because of ambiguity and uncertainty in the decision-maker’s statement, data expression as absolute, is irrelevant. Since human judgment cannot express in precise numeric amounts the ambiguity, it cannot be used for classic decision-making techniques because of these kinds of decision-making problems. In recent years, many attempts have been made to remove such ambiguities and uncertainties which inevitably led to using Fuzzy sets theory in multi-criteria assessment (Chen, 1992).

Fuzzy theory was published by Professor Lotfizadeh in 1965. This theory is suitable for variable and incomparable conditions such that people’s judgments are

generally ambiguous with one degree significance on the language scale: “equal”, “relatively strong”, “very strong” and “extremely strong”. Fuzzy theory can help present ambiguity in voter’s language phrases (Semih, 2009). Usually, choices utility in comparison with all criteria is expressed in Fuzzy numbers called “Fuzzy utility” and measured by Fuzzy-decision-making evaluation methods. “Fuzzy utilities” are based on accompanying choices ranking (Yeh, 2004).

TOPSIS method, the one which is prioritized with respect to similarly positive ideal solution, has been recognized as one of the classic methods of MCDM developed by Hwang and Yoon in 1981 for the solution of MCDM problems. It was based on specifying ideals. Alternative choices which have the shortest distance from positive ideal should also have the longest distance from negative ideal (Hwang, 1981).

Decision-making processes

Based on Fuzzy TOPSIS technique, the process of decision-making is as follows:

- Process 1: obtaining weights factor $w_{\sim j}$
- Process 2: Normalizing obtained matrix from experts’ consideration. Theory in relation with strategies which is a new matrix is as follows:

$$\tilde{R} = [\tilde{r}_{ij}]_{m \times n} \tag{1}$$

$B \subseteq \{1, \dots, n\}$ $\{1 \dots n\}$ is related to the indices with profit (Formulation 2).

$C \subseteq \{1, \dots, n\}$ $\{1 \dots n\}$ is related to the indices with cost (Formulation 3).

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

$$\tilde{r}_{ij} = \left(\frac{a_j^-}{d_{ij}}, \frac{a_j^-}{c_{ij}}, \frac{a_j^-}{b_{ij}}, \frac{a_j^-}{a_{ij}} \right), \quad j \in C \tag{3}$$

- Process 3:
- Weighted matrix is formulation number 4:

$$\begin{aligned} \tilde{V} &= [\tilde{v}_{ij}]_{m \times n}, \quad i = 1, 2, \dots, m, \quad j = 1, 2, \dots, n \\ \tilde{v}_{ij} &= \tilde{r}_{ij} \otimes \tilde{w}_j \end{aligned} \tag{4}$$

Process 4:

1) Specifying positive Fuzzy ideal solution (FPIS) and negative Fuzzy ideal solution (FNIS) (formulation numbers 5 and 6):

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

$$FPIS = \{\tilde{v}_j^* | j = 1, \dots, n\} \quad (5)$$

$$FNIS = \{\tilde{v}_j^- | j = 1, \dots, n\} \quad (6)$$

Process 5:

Calculation or measuring distances with the help of Fuzzy Euclidean distance:

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

Distance of every strategy from positive ideal, calculates with formulation number 8:

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

Distance of every strategy from negative ideal, calculates unit.

Formulation number 9:

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

Process 5 calculation of relative approach to the ideal and ranking, uses formulation number 10:

$$CI_i = \frac{d_i^-}{d_i^- + d_i^*}, \quad (10)$$

From mixing an analysis of strengths, weaknesses, opportunities, threats and Fuzzy TOPSIS in 2008 by Celik et al. (2009) codifying and prioritizing strategies in five important ports of Turkey named Ezmir, Meercine, Hayder Pasha, Ambarly and Jam ports, have been used.

Six strategies, one of which is for all ports and each of the other five specialized for each mentioned port, have been suggested. With the implementation of these strategies, the competitive power of Turkish ports against European ports has increased (Celik et al., 2009).

Another research was conducted again by Celik et al. (2009) in 2008 for university personnel management department, process of development for education and training unit of naval force. In this research, form analysis of strengths, weaknesses, opportunities and threats points and Fuzzy TOPSIS were used in order to increase the efficiency of personnel allocation strategies (Celik et al., 2009). The AHP method is one of the MCDM techniques which is used for decision-making and selection of one choice among different choices of decision-making. This is used with respect to the indices that the decision-maker specifies. The AHP method prepares a structure and a frame for cooperation and group partnership in decisions-making or problem solving (Al Khalili, 2002). In other words, AHP is an efficient and effective tool in the structure modeling of multi-criteria problems, which have been used successfully in different management applications (WolfSlehner et al., 2005).

Kurttila (2000) obtained a combined method for the improvement of applicable SWOT analysis and correcting deficiencies related to measurement and assessment. A systematic approach could be developed on this ground. This method has been propounded as SWOT. In connection with AHP, SWOT method causes an improvement of applicable analysis. In fact, the main aim of using this method is prioritizing of strategies (Kurttila, 2000).

MATERIALS AND METHODS

Case study

A research work which has the view of collecting and applying data is a "descriptive-discovery" and could be called a "case study". However, a place where this form of research may be limited in its implementation is Wood and Paper Industry Company of Iran, located in Chooka.

Chooka Company was established in 1972 at kilometer six between two cities, Rezvanshahr and Talesh. Chooka Company consists of two industrial units- wood and paper products of the company which includes floating and craft brown paper, and all kinds of woods like boards and traverses. This research can also be used in other separate and independent organizations.

Conceptual model

After codifying the mission statement, drawing horizontal view and organizational macro targets, the revealed internal and external effective factors were discussed. With the help of AHP process, the weights of factors were obtained. Based on the results derived from internal and external factors assessment matrix, the situation of the organization in an operational environment was discussed. Also, the kind of strategies suitable for the organization was specified. After the recognition and evaluation of external and internal factors with the use of evaluation charts and with help of matrix of

Table 1. Vision and mission statements of “Chooka” company.

Vision statement of “Chooka” company	Mission statement of “Chooka” company
Target and view of this company is leading internal market on base of the most market share. Also, propounds as the largest producer of craft paper, liner and different kinds of wrapping paper in Iran and Middle East.	“Chooka” as the biggest, most ancient and most famous production of different kinds of wrapping paper, craft liner cartoons and other side-productions is active.
“Chooka” in the next ten years will be the biggest domestic exporting paper to the neighbor’s countries.	This company intends to concentrate on management and development of human resources. Also sources customer-oriented productions optimization coring environmental existence standards, using suitable techniques and utilization of specialist human forces, company should apply providing balancing of profits for interested customers.

strengths, weaknesses, opportunities and threats points, suitable strategies were determined. In this phase, in order to prioritize strategies, after obtaining the strategies and situation of the organization, two of the following methods were operated:

Method 1: Quantitative strategic planning matrix (QSPM)

The procedure here is that suitable strategies from matrix of strengths, weaknesses, opportunities and threats points are obtained at the top of the chart. Opportunities and external threats as well as internal strengths and weaknesses of the company located in the column on the right side of the chart. For every success key factor, one attractiveness score specifies the numeric quantities which are strategy attractiveness indicators.

Method 2: Fuzzy TOPSIS

In this phase, with respect to the designed questionnaire, submission of Fuzzy spectrum in the evaluation of strategies acceptability relative to the successful key indices was done, and the rate of the acceptability of every strategy was specified. Finally, after obtaining prioritized strategies from the two methods mentioned, another questionnaire was designed by the help of experts through AHP process, in order to assess and compare the obtained strategies from Fuzzy TOPSIS and QSPM methods.

Data analysis

In order to get expected results, the researchers submitted designed questionnaire to the statistical union to collect necessary information for codifying and prioritizing strategies. Then, after ranking the strategies with the two methods, QSPM and Fuzzy TOPSIS, obtained results from the structure of AHP process were compared and a set of the best strategies was selected. Chooka Company forms the statistical population of this research. With respect to the available questionnaire, mission statements, view and macro targets of the company, some sessions held with the experts and managers of the company were prepared and approved as in Table 1. Marco targets of Chooka Company up to the year 2014 are as follows:

- i. Increase of production capacity up to the pooling together of 200,000 tons of varieties of products.
- ii. Have access to the highest market share of wrapping papers (liner and wrapping test) in the country.
- iii. Achieve at least 15% of sales as profit.

iv. Win National Prize of Iran Quality, and European Foundation for Quality Management (EFQM).

v. Export at the rate of at least 10% of the productions.

Critical success factors in Chooka Company are recognized and codified as follows:

- A) Optimization of purchase, sales management and marketing management.
- B) Improvement of financial sources and comprehensive cost management.
- C) Optimization of management, improvement of human resources and promotion of organization culture.
- D) Promotion of the know-how level of technological management.
- E) Optimization of systems and intelligence networks (ICT)
- F) Formation of SWOT matrix to codify macro strategies of the internal and external environment of Chooka Company was reviewed and analyzed. Strengths, weaknesses, opportunities and threats points were diagnosed. The situation of the company was accessed at any sector.

According to the obtained results from internal and external assessment factor matrix, scores of 2.6 and 2.28 respectively show that the situation of the company, from the view of internal factor was relatively suitable, whereas, external factors were almost unsuitable. Finally, the most suitable strategies derived from the mentioned scores for implementation in SWOT matrix were codified and submitted (Table 2).

Prioritizing strategies with the use of QSPM and Fuzzy TOPSIS methods

Now it is time to prioritize obtained strategies derived from SWOT Matrix. According to the suggested method, Fuzzy TOPSIS technique has been chosen as one of the most powerful techniques of multi-criteria decision-making. The outcome of using this technique will be compared with the quantitative strategy planning method (QSPM).

Prioritizing of strategies with the use of QSPM method

In this stage, among the implementable strategies of the company which were obtained from SWOT matrix analysis, we have prioritized the best possible strategies with the help of QSPM.

The weight and score of every attractive strategy is shown in Table 3. Results obtained from prioritizing strategies with QSPM technique are shown in Table 4.

Table 2. SWOT Matrix of “Chooka” company.

Weakness points (W)	Strength points (S)	
<p>W1) company does not use present technology as optimization also present technology does not seem to be suitable.</p> <p>W2) Requirement and maintenance do not accomplish reasonably in company.</p> <p>W3) Company does not benefit from research centers (internal and external)</p> <p>W4) Performance assessment system in company is not suitable.</p> <p>W5) Company bah is weakly in human resource planning.</p> <p>W6) un stability is seen in top management team.</p> <p>W7) Company does not use system information for decision-marking managers.</p> <p>W8) Attention to the safety and industrial hygiene in company institutionalized.</p> <p>A W9) Spiritual situation of personnel is not excellent also, situation of personnel contracts in company is not clear.</p> <p>W10) company does not have experience of decreasing costs.</p> <p>W11) market partitioning has not sorted out effectively.</p> <p>W12) company does not benefit from marketing researches to enter to new markets.</p> <p>W13) Controlling and payment of salaries and bonus in company is not successful.</p> <p>W14) company does not benefit from effective spiritual for investment partitioning.</p>	<p>S1) Necessary educational bed exists in the company.</p> <p>S2) Managers have enough sight, obligation and ability to create transformation.</p> <p>S3) Company has experienced personnel.</p> <p>S4) Company uses effective methods and policies for quality control.</p> <p>S5) Company has access to the National and universal. Sewage filtration. (COD and BOD).</p> <p>S6) company in anayens believes in team work.</p> <p>S7) “chooka” company has the most capacity of wood and paper Iran and has Top technical experiences.</p> <p>S8) Company can afford necessary any investment for short- term period.</p> <p>S9) company has research centre.</p> <p>S10) short-term and long target of company is measurable.</p> <p>S11) Computer and information management is suitable and office Automation uses in company.</p> <p>S12) Company marketing managers have sufficient education and are experienced.</p> <p>S13) market share of the company is increasing.</p> <p>S14) company’s production supplied to the customers, have good quality.</p> <p>S15) Company has a good relationship with investors and shares.</p>	SWOT Matrix
(WO) Strategies	(SO) Strategies	Opportunities (O)
<p>1) Designing and settlement of assessment system performance (S)</p> <p>2) Designing of flexible organizational structure(S).</p> <p>3) Speedily in renovation and reconstruction project of company with the government credits beneficiary’s.</p> <p>4) Institutionalization of safety culture and hygienes.</p> <p>5) Production exports development to acquire external markets share and increase of sales.</p> <p>6) Designing and settlement of marketing system market</p>	<p>1) Institutionalization of “EFQM” approach at all organizational aspects.(s1)</p> <p>2) Purchase process facility with the use of catching market Control. (S2)</p> <p>3) Attraction and training of educated young forces for certainty of company’s future targets (S3)</p> <p>4) Improvement of production efficiency, with point of both speed and quality (S4).</p> <p>5) Usage of raw material standards (S5)</p>	<p>O1) Implementation of constitutional law number 44 on base of privatization in governmental and semi governmental.</p> <p>O2) Emphasize of tenth government on securing of worn out factories credits for renovation of machines and equipments.</p> <p>O3) situation of “chooka” company, which is located in north of Iran and access to the woods sources to the internal compactors.</p> <p>O4) satisfaction and trustful of shares and creditors of company during the recent years.</p> <p>O5) Having varieties of customers (suppliers) and guaranties and creation of stable companies with them.</p>

Table 2. Contd.

(WT) strategies	(ST) Strategies	Threatens (T)
1) decreasing costs in order to increasing productivity(S) 2) Organizing wages, salary, bonus system and personnel situations. 3) Improvement of repairs and maintenance system and using prevention (PM) (s). 4) Optimization of financial mechanism for strengthens structure company's financial (s).	1) Organizational Culture improvement with concentration on team-work(s). 2) Reduction of dependency woods sources with the help of feedback system settlement (O.C.C) (S). 3) Strengthen of industrial accountancy comprehensive system. 4) Permanent assessment and level determination and How to use technology (Design and up-dating technology) (S). 5) Usage of variety and production improvement for not missing internal market main share (s).	O6) Existence of young, creative educated forces in "Gilaan stale". O7) Enter of Iran to the world trade organization (WTO) in near future and access possibility to the new markets. T1) gradually increase of using polyethylene and propylene materials. Followed by decreasing of consuming growth of craft papers packing. T2) competitor companies investment, including "Chooka" in increasing of production and exporting to other countries. T3) effect of universal economic For casting continuation-in few next years and difficulties derived from T4) non-supportive of liables, seriously, during the last few years for development and progress of "Chooka" company. T5) Non-supportive of liable, seriously, during the last few years for development and progress of "Chooka" company. T5) usage of competitors from receding system of waits papers, (O.C.C) and their less dependent to the woods sources. Shortage of raw materials for biology limitations of emphasize of country's farms and woods organization to keep trees. T7) Non-payment of contract-personnel wages and salaries in the last few month and un satisfaction of company's personnel. T8) Existence of legal factors for factory development and increase of production because of contamination of factory for existence environment

Prioritizing strategies with the use of Fuzzy TOPSIS technique

In the real world because of incomplete data or inaccessible data, strategies are not definite but fuzzy. We have tried to use TOPSIS method with Fuzzy data for prioritizing selected strategies of SWOT matrix. Fuzzy amounts of language variables for acceptability of every strategy is shown in Table 5 (Chen, 2002).

Table 6 shows results obtained from the prioritization of strategies with Fuzzy TOPSIS technique. In Table 6, d_i^+ and d_i^-

is the distance of very choice from positive and negative ideal, respectively. The index CI_i is for strategies ranking with respect to d_i^+ and d_i^- . The higher the weight of the CI_i , the higher the priority of that strategy.

In order to facilitate the comparison of the outputs of the two methods, a set of prioritized strategies from both methods are shown in one table. Table 7 shows the prioritization of strategies with the use of the two methods, QSPM and Fuzzy methods.

Table 3. Attraction equivalent scores for every strategy.

No relation	Low	Medium	High	Very high
0	1	2	3	4

Table 4. Prioritizing strategies with QSPM.

Rank	Score	Strategy
1	4.39	S1
8	3.55	S2
7	3.72	S3
13	3.38	S4
9	3.55	S5
10	3.52	S6
4	3.91	S7
2	4.36	S8
18	2.86	S9
3	4.08	S10
15	3.12	S11
16	3.08	S12
11	3.44	S13
17	2.95	S14
6	3.73	S15
5	3.77	S16
19	2.84	S17
12	3.41	S18
20	2.6	S19
14	3.14	S20

Table 5. Language variables for weight determination of every criterion.

Very low (VL)	Low (L)	Medial low (ML)	Medial (M)	Medial high (MH)	High (H)	Very high (VH)
(0,0,1,2)	(1,2,2,3)	(2,3,4,5)	(4,5,5,6)	(5,6,7,8)	(7,8,8,9)	(8,9,10,10)

Table 6. Prioritizing strategies with Fuzzy TOPSIS technique.

Alternative	d_i^+	d_i^-	CI_i	Rank
S1) Institutionalization of EFQM approach in all sections of the organization.	2.234	2.966	0.570	1
S2) Facilitation of purchase process with the use of market control.	3.433	1.740	0.336	18
S3) Attraction and training of educated young forces for certainty of company's future targets.	2.566	2.655	0.509	5
S4) Improvement of production efficiency (from the point of view of speed and quality).	3.090	2.067	0.401	12
S5) Use of standard raw materials.	3.461	1.695	0.329	19
S6) Designing and settlement of performance evaluation system.	2.334	2.845	0.549	3
S7) Designing of deflected organizational structure.	2.287	2.888	0.558	2
S8) Speedy reconstruction and modernization of company project with the help of government credits.	3.189	1.978	0.383	14
S9) Institutionalization of safety and hygiene culture.	3.375	1.797	0.347	17
S10) Production export expansion, for catching foreign markets share and increase of sales.	2.744	2.394	0.466	8
S11) Designing and settlement of marketing system (that is market research and market schedule).	2.479	2.697	0.521	4

Table 6. Contd

S12) Organizational culture improvement with emphasis on teamwork.	3.226	1.945	0.376	15
S13) Decrease of reliance on wood with the help of settlement recovery system.	2.637	2.528	0.489	7
S14) Strengthening of comprehensive industrial accounting system.	3.519	1.656	0.320	20
S15) Continuous assessment of the level and quality of technology used.	2.564	2.609	0.504	6
S16) Development of the use of a variety of products in order not to miss internal market majority share.	2.799	2.410	0.463	9
S17) Decreasing costs and increasing efficiency.	3.244	1.915	0.371	16
S18) Organizing the salary and bonus conditions of personnel.	2.810	2.364	0.457	10
S19) Improving repair and maintenance system by using prevention tests.	3.173	2.001	0.387	13
S20) Optimizing the use of financial mechanisms for strengthening the financial structure of the company.	2.997	2.082	410	11

Table 7. Output comparison of GSPM and Fuzzy TOPSIS.

Strategy	Priority in QSPM method	Priority in Fuzzy method
S1	First	First
S2	Eighth	Eighteenth
S3	Seventh	Fifth
S4	Thirteenth	Twelfth
S5	Ninth	Nineteenth
S6	Tenth	Third
S7	Fourth	Second
S8	Second	Fourteenth
S9	Eighteenth	Seventeenth
S10	Third	Eighth
S11	Fifteenth	Fourth
S12	Sixteenth	Fifteenth
S13	Eleventh	Seventh
S14	Seventeenth	Twentieth
S15	Sixth	Sixth
S16	Fifth	Ninth
S17	Nineteenth	Sixteenth
S18	Twelfth	Tenth
S19	Twentieth	Thirteenth
S20	Fourteenth	Eleventh

The purpose of analytic prioritizing method is that prioritizing is the largest direction of assessment that creates different solutions for selecting the best prioritized strategies from every set of strategies on the basis of qualitative criteria. To reach this target, we should convert qualitative criteria to numerical quantities. This should be the basis of prioritized decision-makers. Here, which is the final phase of the analytical data, first, the relationship between sets of strategies (choices) and Chooka Company macro targets (criteria) are shown hierarchically in Figure 2. Then, with the help of the advice of AHP method experts, the best prioritized strategies were distinguished.

Figure 2 shows a hierarchical tree of relationship between macro targets and the set of prioritized strategies based on the two different methods. Finally, the results obtained from applying the AHP method were described via the calculations done by “expert choice” software (Table 8).

When pair-wise matrix was applied between the long-term targets of the company on the basis of effectiveness, it indicated

that in aiming to access the highest market share in the country’s wrapping paper with an approximate weight of 39%, the company was able to reach its target (Table 9). Tables 10 to 14 show comparative priorities from the sets of the first and second strategies to every target which were derived from experts opinions.

As shown in Table 15, the set of second strategies obtained from Fuzzy TOPSIS has higher priority compared to the set of strategies obtained from QSPM. Thus, it is more suitable for an organization.

RESULTS

According to the results obtained from the internal and external factors of the evaluation matrices, which are 2.6 and 2.28 respectively, the internal and external factors lie in the fifth place of the evaluation matrices. These kinds of strategies are more useful for a company that

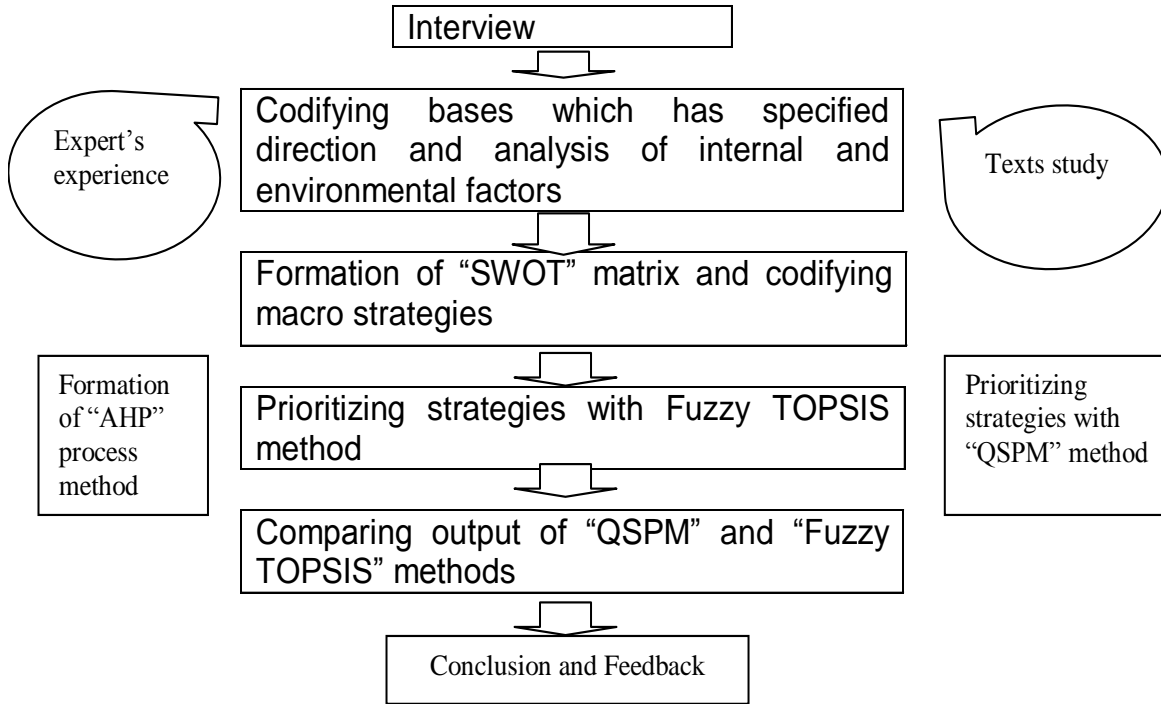


Figure 1. The performance stages of the research.

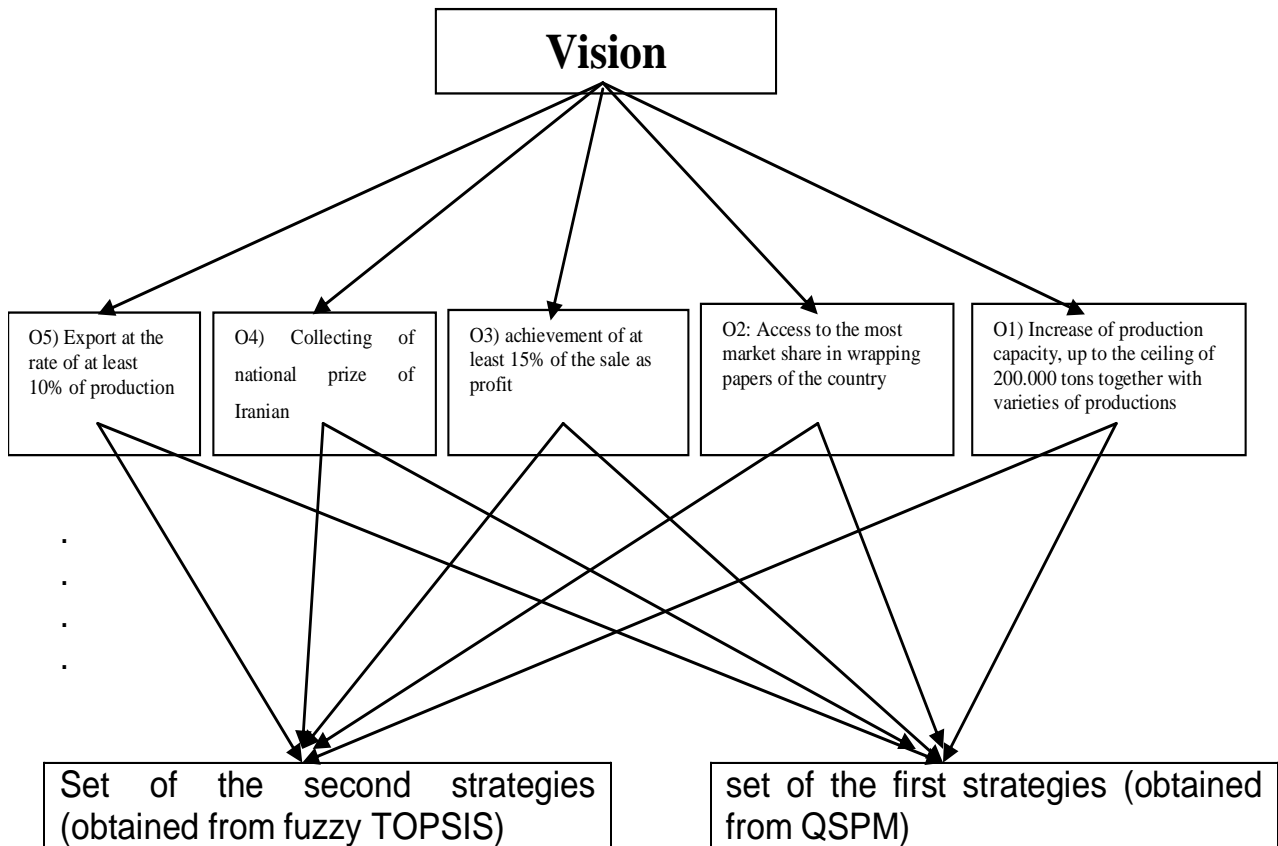


Figure 2. Hierarchy process of the relationship between macro goals and set of prioritized strategies via two methods.

Table 8. Targets pair-wise Matrix from the view of experts.

Vision	O1	O2	O3	O4	O5
O1	1	2	4	6	4
O2		1	7	8	6
O3			1	3	4
O4				1	¼
O5					1

Table 9. Obtained weights from pair-wise matrix between targets.

Organizational long-term targets	Weight
O1) Increase of production capacity up to the pooling together of 200,000 tons of varieties of products.	0.384
O2) Access to the highest market share of wrapping papers in the country.	0.385
O3) Achievement of at least 15% of the sales as profit.	0.121
O4) Winning of Iranian national prize.	0.037

Table 10. Comparative priorities of the first and second sets of strategies to the first target.

Increasing production capacity up to the pooling together of 200,000 tons of varieties of products	Set of the first strategies obtained from QSPM	Set of the second strategies obtained from Fuzzy TOPSIS
Set of the first strategies obtained from QSPM	1	1/5
Set of the second strategies obtained from Fuzzy TOPSIS		1

Table 11. Comparative priorities of the first and second sets of strategies to the second target.

Increasing production capacity up to the pooling together of 200,000 tons of varieties of products	Set of the first strategies obtained from QSPM	Set of the second strategies obtained from Fuzzy TOPSIS
Set of the first strategies obtained from QSPM	1	2
Set of the second strategies obtained from Fuzzy TOPSIS		1

Table 12. Comparative priorities of the first and second sets of strategies to the third target.

Increasing production capacity up to the pooling together of 200,000 tons of varieties of products	Set of the first strategies obtained from QSPM	Set of the second strategies obtained from Fuzzy TOPSIS
Set of the first strategies obtained from QSPM	1	1/3
Set of the second strategies obtained from Fuzzy TOPSIS		1

Table 13. Comparative priorities of the first and second sets of strategies to the fourth target.

Increasing production capacity up to the pooling together of 200,000 tons of varieties of products	Set of the first strategies obtained from QSPM	Set of the second strategies obtained from Fuzzy TOPSIS
Set of the first strategies obtained from QSPM	1	1
Set of the second strategies obtained from Fuzzy TOPSIS		1

Table 14. Comparative priorities of the first and second sets of strategies to the fifth target.

Increasing production capacity up to the pooling together of 200,000 tons of varieties of products	Set of the first strategies obtained from QSPM	Set of the second strategies obtained from Fuzzy TOPSIS
Set of the first strategies obtained from QSPM	1	3
Set of the second strategies obtained from Fuzzy TOPSIS		1

Table 15. Weights obtained from AHP process for the set of first and second strategies.

Set of strategies	Weight
Set of the first strategies obtained from QSPM	0.392805
Set of the second strategies obtained from Fuzzy TOPSIS	0.607195

implements with the aim of safety and maintenance of the present situation.

This situation is seen in both methods to show creditability to the applied analysis and this confirms the obtained results from both methods. After the implementation of the AHP process which targets the weight of the experts' idea in the selection of the strategies that were applied, a set of the extracted strategies from Fuzzy TOPSIS technique received the highest weight. This set of extracted strategies with respect to the strong influence it has on the first and third target was selected as having a higher weight in comparison to the QSPM. After applying recovery assessment, if necessary, some amendments should be made in order to reach the target. This methodology was implemented in Chooka Company. However, because of its high generalizability, it could be applied to all industries and companies whether they are production or service industries.

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