

Identification and Prioritization of Marketing Strategies in The Industrial and Manufacturing Companies to The Fuzzy Analytic Hierarchy Process

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Abstract: *Desicions made based on strategy determination commit the organization to provide special products for a specific period. Time can be saved by offering strategy, and difficulties of the path can decrease and ultimately tangible results in a rational period can be gained. In this survey, it is tried to rate the best strategies by identifying and leveraging marketing strategies in manufacturing and industrial companies to help them make their decisions. By reviewing the literature and examining the expert opinions, seven factors including strengths, weaknesses, opportunities, threats, focus on products, differentiation and cost leadership were recognized. Fuzzy AHP method is used to do the prioritization, and the results showed that opportunity criterion the first, weaknesses criterion the second, the strengths criterion the third, the focus on products criterion the forth, the differentiate criterion the fifth, the threats criterion the sixth, and the leadership in costs criterion gained the seventh place.*

Keywords: *Marketing Strategy, Multi-Criteria Decision Making, AHP Fuzzy*

INTRODUCTION

The downturn in the macroeconomy means reduction in gross production (GPD) or economic growth rate of a country for a sequential period. At the same time with a depression in the economy, the economic activities also enter a downward period which among them reduced employment rates and increased unemployment, reduced investment and reduction in shareholder benefits, reduced tendency to productive and industrial activities are the most important cases (Chyrany,et al.2014). What is eminent is that demand reduction follows downturn, yet this period can be considered as an opportunity and golden period for the marketing and advertising market. Because in such situations business enterprises do more efforts to focus on marketing activities and knowledge and marketing expertise finds more important and higher status in the continuation and survival of businesses (Fazeli,et al.2016). To reach success in the economic downturn period the mix and marketing system should be considered in the first place. The mix marketing services which in this survey are seen as marketing strategies, include product, price, location, distribution, personnel, assets, physical facilities and process (Rezaeian,et al.2015).

1. Necessity and importance of research

1. Competitive market conditions and increase in competitive practices of companies and organizations, have created the need for developing the marketing strategy. Developing a road map with focus on marketing in the companies can be a key to open many doors for executive practices in areas such as marketing and sales, public relations, advertising and customer affairs. In fact,

marketing is one of the most important subjects for preserving and developing organizations and reaching to the goal markets which are one of the most significant concerns of managers (piri,et al.2015). Managers of the organizations can see the result of their decisions in the form of strategy in the mirror of their criteria functions (Fazeli.2015) because strategy is a tool by which the organization can reach its long term goals. As an organization with infinite resources cannot be found, strategists should make their decisions on the point that which of these different strategies can be the most beneficial for the organization. Decisions made about determining strategies, commit the organization to offer specific products or services for a long period of time, to work in certain markets and finally use famous sources and technologies. Strategies determine the organization's competitive advantages in long term periods (Maghsoudy,et al.2016). You can save time and reduce the difficulties by a strategy and reach tangible results in a rational period (Mansoori,et al.2016).

2. Research History

Costing is one of the important aspects in the market and a key element in success or failure of the companies as documented by Abdi and Qalandari. So, the aim of this research is to study costing strategies and its relation with market activities in production and industrial companies in Urmia which among the eight introduced marketing processes, three cases (i.e. customer relationship management, customer service and the effectiveness of its activities and its relationship with costing strategies) were examined (Abdi,et al.2016).

In a survey done by Chyrany et al., elements affecting business functions of the companies are identified. Several studies noted that four categories of competitive advantage variables, marketing strategies, company resources and capabilities can affect the business performance of companies which are considered as independent variables in this study (Chyrany,et al.2014).

In the surveys by Maghsoudy and Jafar Zanjani, first, identifying and tracking key strategies in marketing in financial and credit industry was examined and then by the help of a AHP-SAW multi-criteria decision-making hybrid technique reasoning, rating of strategies was applied that by considering its scientific and educational structure, the ability to develop and apply in service and production processes for the financial and credit industry was provided. And they will be able to act successfully in decision making process as a classic managerial duty (Chyrany,et al.2014).

ShariatMadari et al. in a survey analyzed the strategies of the foreign exchange market of Iran by SWOT method and so rated them by ANP method [9].

During a research by Fazeli and Taheri KIA by using SWOT and AHP methods, they rated marketing strategies in petrochemical companies (Fazeli,et al.2016).

Yoosefi offered an appropriate model for determining a marketing strategy based on MCDM. Their suggestive method is based on AHP and TOPSIS method. The AHP method is used to determine the value of the criterion by decision makers and thus rating those strategies by applying TOPSIS method (Yousefi.2016).

Ahmadi and maleki offered a suited new model for determination of marketing strategy based on MSDM. In this framework, the fuzzy prioritization method is used to calculate the relative importance of these criteria. Then VIKOR method for rating purposes is used on the basis of selection criteria. The possibility of using the proposed model by using the framework in a real case is examined. In addition, this framework can be easily applied by marketing strategists in other ways (Ahmadi,et al.2016).

ANP and TOPSIS decision making method was used by Abdolmaleki and Aghaei to select the best strategies. They implemented this method in Emdad Khodro Company. Finally, they reached to this

conclusion that the most important factors for choosing the best marketing strategy are the abilities to innovate, to be manageable, the quality of company services discussed and to gain competitive advantages that the company can use [13].

3-1 Recognized Factors

Based on the survey history and use of expert opinions, 7 elements are selected as the main elements in selecting the marketing strategy in manufacturing and industrial companies.

1. Weaknesses points in marketing strategies
2. Strength points in marketing strategies
3. Threats in marketing strategies
4. Opportunities in marketing strategies
5. Differentiating products and services
6. Leadership in costs
7. Focus on products

3. Research Method

The analytical hierarchal process of one of the most comprehensive systems, designed for decision making with multiple criterias. As this technique allows formulation of the problem in a hierarchical way and has possibility to consider different quantitative and qualitative criteria in the problem. This process involves various options in decision making and offers the possibility of sensitivity analysis on criteria and sub-criteria. More ever, this method is based on a paired comparison which facilitates judgment and computation.

This research contains three below steps:

I. Creating a researching hierarchical Model

II. Using the development analysis method of Chang to obtain the weight and value of each of the paired comparison tables in Fuzzy AHP method

III. The final rating of criteria

1-4. Chang's Development Analysis Method

Before considering the Chang's development Analysis Method, the experts' fuzzy opinions should be merged. If there are k experts available for polling which offer a Fuzzy Point of $\tilde{x}_j = (a_i, b_i, c_i)$ compared to a pairwise comparison, then the integration of comments will be calculated using the formula below.

Relation 1

$$\left(\prod_{i=1}^n a_i \right)^{1/n} = \sqrt[n]{a_1 a_2 a_3 \dots a_n}$$

Suppose $\tilde{A} = \{\tilde{M}_{ij}\}$ is a Fuzzy Couple Comparison Matrix which is defined as below:

$$\tilde{A} = \begin{bmatrix} 1 & \tilde{M}_{12} & \dots & \tilde{M}_{1n} \\ \tilde{M}_{21} & 1 & & \tilde{M}_{2n} \\ \vdots & & \ddots & \vdots \\ \tilde{M}_{n1} & \tilde{M}_{n2} & \dots & 1 \end{bmatrix}$$

Then the relation of $\tilde{M}_{ji} = 1/\tilde{M}_{ij}$ is always true.

The stages of Chang's development analysis are as follow.

The first step: if $M_{gi}^1, M_{gi}^2, M_{gi}^m$ are the i^{th} development analysis values for desired m , thus extension of desired m Fuzzy compound for the i^{th} criteria is as bellow:

Relation 2

$$S_i = \sum_{j=1}^m M_{gi}^j \otimes \left[\sum_{i=1}^n \sum_{j=1}^m M_{gi}^j \right]^{-1}$$

In this formula, j represents each of ideals or desires. If $M_{gi}^j = (l_{ij}, m_{ij}, u_{ij})$, then $\sum_{j=1}^m M_{gi}^j$ based on Fuzzy sum operator on m desired development analyze is defined as bellow:

Relation 3

$$\sum_{j=1}^m M_{gi}^j = (l_{i1}, m_{i1}, u_{i1}) \oplus (l_{i2}, m_{i2}, u_{i2}) \oplus \dots \oplus (l_{im}, m_{im}, u_{im}) = \left(\sum_{j=1}^m l_{ij}, \sum_{j=1}^m m_{ij}, \sum_{j=1}^m u_{ij} \right) = (l'_i, m'_i, u'_i)$$

Also to reach $\left[\sum_{i=1}^n \sum_{j=1}^m M_{gi}^j \right]$ by applying Fuzzy sum operator, we can see:

Relation 4

$$\sum \sum M_{gi}^j = \sum_{i=1}^n \left(\sum_{j=1}^m l_{ij}, \sum_{j=1}^m m_{ij}, \sum_{j=1}^m u_{ij} \right) = \left(\sum_{i=1}^n l'_i, \sum_{i=1}^n m'_i, \sum_{i=1}^n u'_i \right)$$

$$\left(\sum_{i=1}^n \sum_{j=1}^m M_{gi}^j \right)^{-1} = \left(\frac{1}{\sum_{i=1}^n u'_i}, \frac{1}{\sum_{i=1}^n m'_i}, \frac{1}{\sum_{i=1}^n l'_i} \right)$$

So we have:

Relation 5

$$S_i = \sum_{j=1}^m M_{gi}^j \otimes \left[\sum_{i=1}^n \sum_{j=1}^m M_{gi}^j \right]^{-1}$$

$$(l'_i, m'_i, u'_i) \otimes \left(\frac{1}{\sum_{i=1}^n u'_i}, \frac{1}{\sum_{i=1}^n m'_i}, \frac{1}{\sum_{i=1}^n l'_i} \right) = \left(\frac{l'_i}{\sum_{i=1}^n u'_i}, \frac{m'_i}{\sum_{i=1}^n m'_i}, \frac{u'_i}{\sum_{i=1}^n l'_i} \right)$$

The second step: Calculating the degree of preference (amount of feasibility) S_i on S_k

If $S_i = (l_i, m_i, u_i)$ and $S_k = (l_k, m_k, u_k)$ are two Triangular fuzzy number, then the degree of preference of S_i On S_k which is showed by $V(S_i > S_k)$ is defined as bellow:

Relation 6

$$V(S_i > S_k) = \begin{cases} 1 & m_i \geq m_k \\ 0 & l_k \geq u_i \\ \frac{l_k - u_i}{(m_i - u_i) - (m_k - l_k)} & \text{otherwise} \end{cases}$$

The third step: Calculating the degree of preference (amount of feasibility) of one fuzzy S number which is greater than K Fuzzy number $S_i: i=1,2,\dots,k$, is defined as below:

Relation 7

$$V(S \geq S_1, S_2, \dots, S_k) = (V((S \geq S_1), (S \geq S_2), \dots, (S, S_k))) \\ = \min(V((S \geq S_1), (S \geq S_2), \dots, (S, S_k))) = \min V(S \geq S_i) \quad i = 1, 2, \dots, k$$

As we consider $k=1, 2, \dots, n$ for each $k \neq i$, and suppose $d'(A_i) = \min V(S_i, S_k)$, then Weight vector is as bellow:

Relation 8

$$W' = (d'(A_1), d'(A_2), \dots, d'(A_n))$$

The fourth step: Normalization of the vector W' and reaching to the normalized weight vector W .

Relation 9

$$W = (d(A_1), d(A_2), \dots, d(A_n))$$

2.4. Inconsistency Rate of AHP Fuzzy

Step 1: in the first step divide Fuzzy triangular matrix into two matrixes. The first matrix comprises of the

triangular judgments mean numbers $A^m = [a_{ijm}]$ and the second matrix contains geometric mean of upper and lower bounds of triangular numbers $A^g = \sqrt{a_{iju} \cdot a_{ijl}}$.

Step 2: Vector weight of each matrix by use of hourly method is as bellow:

Relation 10

$$w_i^m = \frac{1}{n} \sum_{j=1}^n \frac{a_{ijm}}{\sum_{i=1}^n a_{ijm}}$$

wherein:

$$W^m = [w_i^m]$$

$$w_i^g = \frac{1}{n} \sum_{j=1}^n \frac{\sqrt{a_{iju} \cdot a_{ijl}}}{\sum_{i=1}^n \sqrt{a_{iju} \cdot a_{ijl}}}$$

Where there is:

$$W^g = [w_i^g]$$

Step three: The largest special value for each matrix is calculated using the following relations:

Relation 11

$$\lambda_{\max}^m = \frac{1}{n} \sum_{i=1}^n \sum_{j=1}^n a_{ijm} \left(\frac{w_j^m}{w_i^m} \right)$$

$$\lambda_{\max}^g = \frac{1}{n} \sum_{i=1}^n \sum_{j=1}^n \sqrt{a_{iju} \cdot a_{ijl}} \left(\frac{w_j^g}{w_i^g} \right)$$

Step 4: Inconsistency Index is calculated by the bellow relations:

Relation 12

$$CI^m = \frac{(\lambda_{\max}^m - n)}{(n-1)}$$

$$CI^g = \frac{(\lambda_{\max}^g - n)}{(n-1)}$$

Step 5: To calculate the inconsistency rate (CR), the (CI) index id divided into randomized value index (RI). If the final amount be less than 0/1, the consistency and usable matrix is diagnosed.

5. Results and Data Analyze

5.1. Rating study criteria using AHP Fuzzy

In this study, to calculate value in paired comparisons, the verbal expressions and triangular fuzzy numbers in table 1 are used. Goose and Butcher method by relation 10 and 12 is used to control the inconsistency rate.

Table 1 - Verbal expressions and the corresponding triangular fuzzy numbers

Code Priorities		Fuzzy equivalent of priorities		
		Bottom limit	medium limit	Top limit
1	The same importance	1	1	1
2	The same till rather little more important	1	2	3
3	Rather more important	2	3	4
4	Rather more important till very important	3	4	5
5	Very important	4	5	6
6	Very important till so much important	5	6	7
7	So much important	6	7	8

8	So much till completely more important	7	8	9
9	Completely more important	8	9	10

In table 2 Integrated paired comparison matrix based on the relation for criteria is offered.

Table 2- paired comparison of criteria towards the target (Inconsistency rate: CRm: 0.01, CRg: 0.03)

	Weaknesses in marketing strategies	Strengths in marketing strategies	Threats in marketing strategies	Opportunities in marketing strategies	Differentiating products and services	Leadership in costs	Focus on products
Weaknesses in marketing strategies	(1,1,1)	(1.22,1.68,2.24)	0.72,0.91,1.) (23)	(0.65,0.9,1.38)	(1.06,1.54,2.19)	(0.81,1.04,1.3)	(0.87,1.23,1.68)
Strengths in marketing strategies	0.45,0.59,0.) (82)	(1,1,1)	0.79,1.15,1.) (65)	(0.72,0.97,1.37)	(0.86,1.34,1.97)	(0.74,1.01,1.44)	(0.7,0.94,1.29)
Threats in marketing strategies	0.81,1.1,1.3) (9)	(0.61,0.87,1.26)	(1,1,1)	(0.73,0.93,1.23)	(0.68,0.93,1.26)	(0.86,1.22,1.68)	(0.59,0.73,0.98)
Opportunities in marketing strategies	0.72,1.12,1.) (53)	(0.73,1.03,1.39)	0.81,1.07,1.) (37)	(1,1,1)	(1,1.47,2.01)	(0.92,1.34,1.83)	(1.15,1.53,2.03)
Differentiating products and services	0.46,0.65,0.) (94)	(0.51,0.75,1.16)	0.79,1.07,1.) (48)	(0.5,0.68,1)	(1,1,1)	(0.94,1.27,1.78)	(0.91,1.27,1.72)
Leadership in costs	0.77,0.96,1.) (24)	(0.7,0.99,1.35)	0.59,0.82,1.) (16)	(0.55,0.75,1.08)	(0.56,0.79,1.06)	(1,1,1)	(0.62,0.82,1.14)
Focus on products	0.59,0.81,1.) (15)	(0.78,1.06,1.42)	1.02,1.37,1.) (68)	(0.49,0.65,0.87)	(0.58,0.79,1.1)	(0.88,1.22,1.6)	(1,1,1)

To calculate weight of the table, Chang's development analyses method is used. The results of this method are presented below.

As noted in the trend algorithm of this method, first fuzzy numbers of each row are summed together. In the below, each row shows one fuzzy figure.

(6.33,8.3,11.02)
(5.27,7,9.54)
(5.28,6.79,8.8)
(6.34,8.56,11.18)
(5.1,6.69,9.08)
(4.79,6.13,8.03)
(5.34,6.9,8.83)

In the next step, all the numbers obtained in the previous step are summed with each other and then they will be reversed. In fact, all the fuzzy numbers are summed and then reversed in this step. The result is shown as bellow.

(38.45,50.37,66.48)

In the following, this reversal is multiplied in each row of the first step (sum of each row) to get the normalized merger values for each row. These numbers are S_i .

(0.1,0.16,0.29)
(0.08,0.14,0.25)
(0.08,0.13,0.23)
(0.1,0.17,0.29)
(0.08,0.13,0.24)
(0.07,0.12,0.21)
(0.08,0.14,0.23)

Now, each row should be compared to its lower rows. We assign number one to compare each row with respect to itself. The values of these comparisons are given below.

1.00	1.00	1.00	0.97	1.00	1.00
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1.00	1.00	1.00	0.83	1.00	0.86
0.98	1.00	1.00	0.79	0.97	0.82
1.00	1.00	1.00	1.00	1.00	1.00
0.97	1.00	0.79	0.99	0.96	0.82
0.89	0.92	0.70	0.91	0.88	0.73
1.00	1.00	0.80	1.00	0.99	0.83

Now we extract the final values from the previous step. Final values of each element is equal to minimum of each row. The raw and normalized values are shown in Table 3.

Table 3 - final criteria values

Criteria name	Raw values	Normalized values
Weaknesses in marketing strategies	0.973	0.165
Strengths in marketing strategies	0.832	0.141
Threats in marketing strategies	0.792	0.134
Opportunities in marketing strategies	1.000	0.170
Differentiating products and services	0.792	0.134
Leadership in costs	0.702	0.119
Focus on products	0.804	0.136

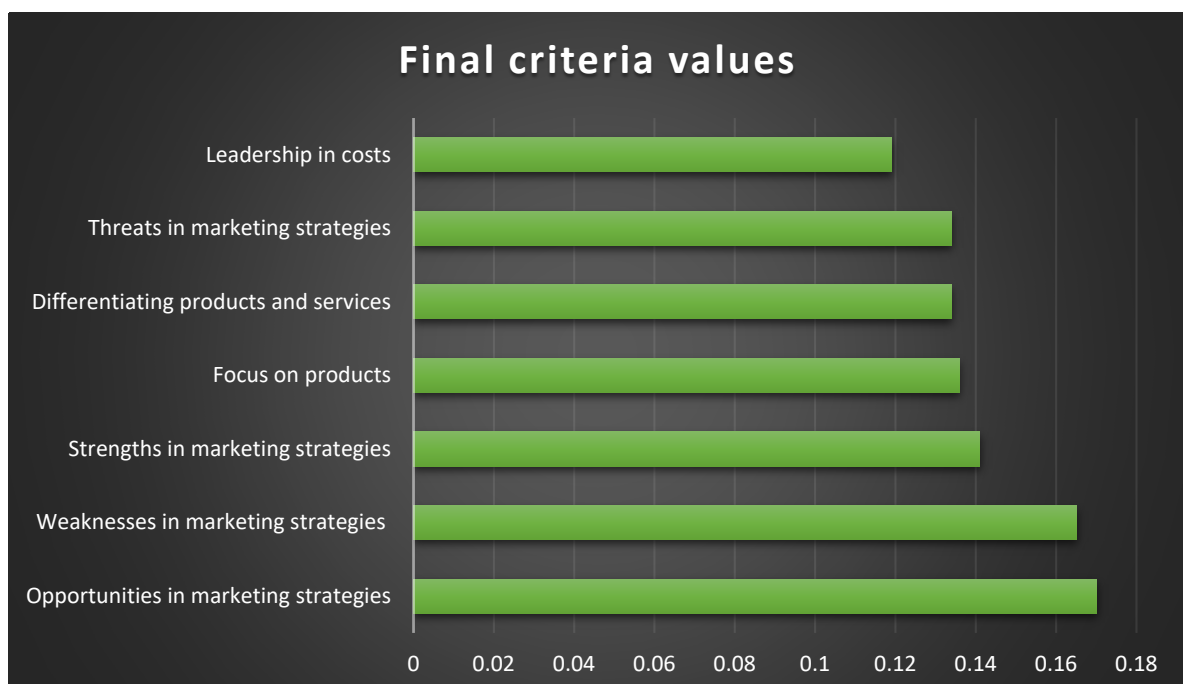


Table 1 – final criteria values

According to the table above, the following results are obtained:

1. The opportunities criteria with a value of 0.170 obtained first place.
2. The weakness criteria with a value of 0.165 obtained the second place.
3. The strength criteria with a value of 0.141 obtained the third place.
4. The Focus on products with a value of 0.136 obtained the fourth place.
5. The Differentiating criteria with a value of 0.134 obtained the fifth place
6. Threats criteria with a value of 0.134 obtained the sixth place.
7. The leadership criteria with a value of 0.119 obtained the seventh place.

6. Conclusion

The purpose of this research is to identify and prioritize marketing strategies in manufacturing and industrial companies so the problem was first expressed then the importance of research was studied and internal and external studies were reviewed then by using literature reviews and research and history question are from expert people, seven criteria were considered as marketing strategies, then to prioritize these factors, Fuzzy hierarchal analysis process (AHP Fuzzy) was used. The questionnaire was completed by the professors of University in the field of marketing and commerce and experts working in industrial and manufacturing companies. The results showed that the opportunities criterion with a value of 0.170 was first, the weaknesses criterion with a value of 0.165, was in the second rank, the strength criterion with value of 0.141 was in the third rank, the criterion of focusing on products with the value of 0.136, in the fourth, the differentiation criterion with 0.134, in the fifth, the threats criteria with a value of 0.134 was ranked sixth and the leadership criteria in costs with a value of 0.119 was ranked seventh.

6.1. Future researches

Considering the results of research, bellow subjects are suggested as Future researches:

- I. Use of other decision making methods such as fuzzy ANP and comparison with the results of this research
- II. Use of this approach in other companies such as service companies
- III. Use of SWOT matrix approach and multi-criteria decision making for Marketing strategies.

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