New SWOT Analysis on top of the Fuzzy HOQ

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ABSTRACT

The main goal of this study is introduced the new SWOT approach to strategy formulation. In this study, strengths, weaknesses, opportunities and threats are ranked using a modified Fuzzy QFD approach. SWOT analysis is done on the roof of house of quality to acquire strategies formulation. Then all possible strategies are extracted and weighed. Finally main strategies are selected using Pareto principle and the expert team defines the final strategies of the organization and prioritizes them. In modified fuzzy QFD, impact of competitor's situation, customer needs, relation among of needs and relation among of internal and external factor calculated numerically and used in SWOT factor analysis. In this study uncertain verbal variables are used therefore all calculations are done in Fuzzy environment. The result of this case study and the proposed systematic approach shows the number of strategies can be decreased to 9 by quantifying SWOT factor analysis and relations on the roof of HOQ (House of Quality) and this can stop qualitative analysis for making strategies. Also the organization can detect and control the customer needs, their importance and the situation of its rivals.
KEY WORDS: Strategic Management, QFD, Fuzzy Environment, Customer Needs, Pareto Principle.

INTRODUCTION

Strategic management has been used widely by all enterprises to withstand fierce market competition. Strategic management process consists of three stages: 1) Formulation, 2) Implementation, 3) Evaluation, [1].

One of the most important tools for strategy formulation is a SWOT analysis [2, 3]. The SWOT analysis is based on the aggregation of the internal (Strengths and Weaknesses) and external (opportunities and threats) factors for adapting strategies [4]. The internal factors examine all aspects of the organization, such as: personnel, facilities, location, products and services in order to identify the organizations Strengths and Weaknesses. The external factor scans the political, economical, social, technological and competitive environment with a view to identifying opportunities and threats [5].

Despite that origins of SWOT back to 1960[2], but this approach yet applied in many organization with another techniques [6, 7, 8, 9, 10, 11, 12]. Because, its have a number of problems: SWOT analysis dose not provide an structural way to determine the relative important of the factors [6, 9], there is no priority for various factor and strategies [4], if the number of factor are more, number of adapted strategies will be increased [4] and basically, SWOT is based on quality analysis, capacities and skills of strategists.

Regarding the mentioned problems this study aims to find a systematic model for solving the above problems. Quality Function Deployment (QFD) [13] which is used in the field of quality management is applied as the base of this study due to its capabilities on clarifying the customer needs, inspecting the situation of rivals, having a rule for weighing the customer needs and technical characteristics and its possibility to make relationship among technical characteristics. In this study the relations among customer needs are clarified as well as the relations among technical characteristics of HOQ (House of Quality) and the relations are quantified contrary to the QFD method. Also in the technical characteristic part, internal and external factors of the organization are put, weighed and prioritize according to the approach of this study. Most of the decision making variables in SWOT analysis are verbal therefore calculations are done in fuzzy environment [14]. We name this method as Modified Fuzzy QFD. In the end SWOT analysis is done on the roof of HOQ.

Results of the case study show only 9 cross are selected as final strategies; they are weighed so that the organization can select strategies with high priority.

MATERIALS AND METHODS
The approach of this study

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Mission change in organizations leads to new goals and formulating new strategies. In this study SWOT analysis is done on the roof of HOQ using modified Fuzzy QFD and strategies are selected in the end based on the weights of different crosses. This approach is showing in the Fig. 1.
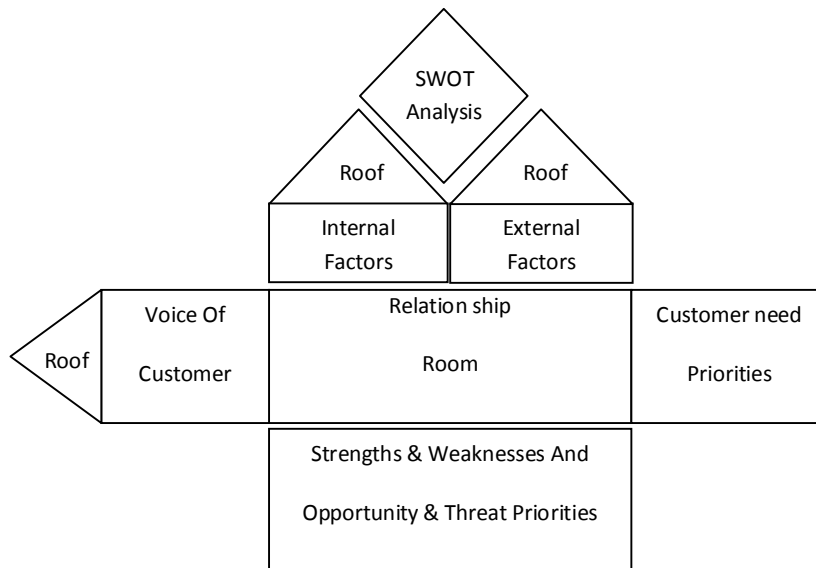

Figure 1: Research Approach

1- In order to prepare strategies for an organization it is necessary to have a team of experts that has a complete knowledge on different parts of organization. Members of this team have an active process in all four steps of preparing, implementing, evaluating and feedbacks moreover members should receive some education about the concept of management terms and strategic programming.

2- First the expert team should detect customer needs and classify them if it is possible. This can be done by interviewing customers, visiting the factory site and the customer's complaints. Then the degree of importance and the estimated customer needs are acquired using questionnaire. This questionnaire is distributed among customers of the organization and customers of the organization and customers of the main rival of the organization.

3- Another duty of the expert team is detecting strengths, weaknesses, opportunities and threats of the organization. Strengths and weaknesses (internal factors) which are controlled factors can be found by inspecting all different branches of organization like management, financial, accounting, research and development, technical unit, marketing etc. opportunities and threats (external factors) can be detected by analyzing political, economical, social, technological and environmental factors. In this study first members of the expert team are asked to an individually analysis on internal and external factors of the organization. Then in the next meeting each of the members explain about their factors and in the end of the meeting all factors are distributed among the members so that the strategy team has a better command on the final result. In the final meeting the team will agree on strengths, weaknesses, opportunities and threats of the organization.

4- In this step HOQ will be completed using the applied model.
4-1-Ranking and weighting of needs
a) Finding the importance of customer requirements: If the customer needs are classified the weights of group needs are accepted otherwise the weights acquired by questionnaire show the degree of importance in HOQ. Fuzzy range is used in this study regarding uncertain and verbal variables. The weights of group needs can be achieved using Eq. 1. W is the weight or importance of each requirement from the customer perspective and CIR is the customer importance rating of each need and n is the number of people who answer the questioners.

$$\widetilde{W}_i = C\widetilde{I}R_i = \frac{\sum_{j=1}^{n} \widetilde{I}R_j}{n} \quad (1)$$

b) Clarifying the organization and its competitor's situation: Customer needs, the organization and its competitors situation can be estimated by the results of questionnaire using Eq. 2. CCSR is the current customer satisfaction ratio.

$$CC\widetilde{S}R_i = \frac{\sum_{j=1}^{n} \widetilde{S}R_j}{n} \quad (2)$$

c) Targeting the needs: In a competitive situation organizations try to stay above their competitors and offer better products. The expert team assigns targets for each needs based on resources, facilities and technological capabilities. These are customer oriented strategic targets in the organization and should be regarded for successful strategic performance of the organization.

d) Improvement ratio (IMR): Improvement ratio shows the extent of improvement comparing with the current situation and achieved by dividing the goals to the current customer satisfaction ratio.

e) Primary weights of needs: Primary weights of needs can be obtained by multiplying improvement ratio from the previous part and the importance of needs (Eq. 3).

$$P\widetilde{R}W_i = C\widetilde{I}R_i \otimes I\widetilde{M}R_i \quad (3)$$

f) Final customer weights of needs: There maybe relationships among customer needs. The degree of relationships can be obtained by members of the expert team. Fuzzy range is used for verbal and uncertain relations and final weights of demands are achieved using Eq. 4. The achieved weights are for group needs in order to achieve the weights of each need normalized importance of needs are multiplied in the weights of each group needs.

$$FC\widetilde{R}W_i = P\widetilde{R}W_i \oplus (\sum_{u=1,u \neq i}^{N} P\widetilde{R}W_i \otimes \widetilde{X}_{iu}) \quad (4)$$

g) Customer Requirements ranking: For ranking of requirements first we normalize final weights Eq. 5 and then we use Eq. 6 for defuzzification [15]. If we show fuzzy numbers by A (l, m, u) then we have:

$$rl_{ij} = \frac{al_{ij}}{\sqrt{\sum_{i=1}^{m} au_{ij}^2}} \qquad rm_{ij} = \frac{am_{ij}}{\sqrt{\sum_{i=1}^{m} am_{ij}^2}} \qquad ru_{ij} = \frac{au_{ij}}{\sqrt{\sum_{i=1}^{m} al_{ij}^2}} \quad (5)$$

$$A = \frac{l + 2m + u}{4} \quad (6)$$

4-2-Ranking and weighting of strengths, weaknesses, opportunities and threats
a) Raw weights: In this approach, strengths, weaknesses, opportunities and threats of the organization are located in the technical characteristics part of HOQ, the extent of their relationships and the customer needs are weighed. The factors presented in the technical characteristics part are selected by the environmental analysts (expert team). This is done by the opinion of each member on weights and a fuzzy average from then factors above average are finally selected.

b) Primary weights of internal and external factors: The relations among customer needs and strengths, weaknesses, opportunities and threats of the organization (R) are put in the House of Quality by the opinions from members of the expert team. Then primary weights are achieved by adding the multiplication of each raw weight acquired from step a (4-2) in the normalized weights of each need. Eq. 7 and 8 is used in this part.

$$IF\widetilde{P}W_j = IF\widetilde{R}W_j \oplus (\sum_{i=1}^{m} \widetilde{R}_{ij} \otimes NFC\widetilde{R}W_I) \quad (7)$$

$$EF\widetilde{P}W_j = EF\widetilde{R}W_j \oplus (\sum_{i=1}^{m} \widetilde{R}_{ij} \otimes NFC\widetilde{R}W_I) \quad (8)$$

c) Final weights of internal and external factors: In this approach the effects of relations between strengths with weaknesses and opportunities with threats (T) on each factor is calculated. The degrees of relations are obtained by opinions of the expert team using Eq. 9 and 10.

$$IF\,\tilde{F}\,W_{\,j} = IF\,\tilde{P}\,W_{\,j} \oplus (\sum_{i=1}^{m} \tilde{T}_{jy} \otimes IF\,\tilde{P}\,W_{\,j}) \quad (9)$$

$$EF\,\tilde{F}\,W_{\,j} = EF\,\tilde{P}\,W_{\,j} \oplus (\sum_{i=1}^{m} \tilde{T}_{jy} \otimes EF\,\tilde{P}\,W_{\,l}) \quad (10)$$

d) Ranking strengths, weaknesses, opportunities and threats: Ranking is done according g (4-1) but internal and external factors are ranked separately.

5- SWOT analysis: Acquired weights in this approach for strengths, weaknesses, opportunities and threats are more comprehensive than the other methods because the effects of customer needs and situation of rivals are used as the following steps:

a) Clarifying relations between internal and external factors of the organization: Relations among internal and external factors (Z) are considered for making strategies. These relations are clarified by the expert team.

b) Weights of double crosses: the weights of relations and double crosses are computed in the roof of HOQ using Eq. 11. **SW** is the weight of strategy or crosses.

$$S\,\tilde{W}_{\,q} = F\,\tilde{W}IF_{\,j} \otimes F\,\tilde{W}EF_{\,l} \otimes Z_{\,jl} \quad (11)$$

c) The weights of multi crosses: Multi crosses are also used for making strategies like double crosses and the organization can use its resources in a more proper way by combining these factors. In the selection of multi crosses there should be relations among all factors. These relations are clearly seen using the approach of this study in HOQ Weights of these relations is achieved by multiplying the final weights of factors to each other.

d) Ranking the crosses: The achieved fuzzy numbers are normalized using Eq. 5 and finally defuzzified for ranking using Eq. 7.

e) Selecting final crosses: Numbers of main strategies are confined because of internal constraints therefore final crosses that lead to strategies are selected using Pareto principle.

f) Making strategies: In this step the expert team must select main strategies from different crosses which is not a difficult task regarding a few numbers of remained crosses so after brain storming meetings strategies of the organization are finally formulated.

RESULTS

Case study

Concerning the mission change of Petrokaran factory formulating new strategies is done by the proposed approach of this study. Petrokaran is a producer of raw film for petrochemical industries and is located in the center of Iran. According to the approach of this study first an expert team consisting of five top managers. In the first step the team of experts detects and classifies customer needs. In this part 45 similar needs between customers are classified in to 9 groups.

1- Size (6 needs): 2- Shape (8 needs): 3- Quality of films (4 needs): 4- Print quality (5 needs): 5- Packing (4 needs): 6- Physical and mechanical characteristics (4 needs): 7- After sail services (4 needs): 8- Way of selling (4 needs): 9- Wastage (1 need)

Then the members start analyzing internal and external environment of organization according to part 3 and finally 32 strengths, weaknesses, opportunities and threats are extracted for the organization.

HOQ will be completed after finding customer needs and internal, external factor analysis. Degree of importance achieved by the results questionnaire and the Fuzzy average of each group need is calculated using Eq. 1 and presented in Table 2. Situation of organization and its competitors **(C1, C2 and C3)** is obtained using the second part of organization and calculated using Eq. 2 defuzzification results are shown in Fig. 2.
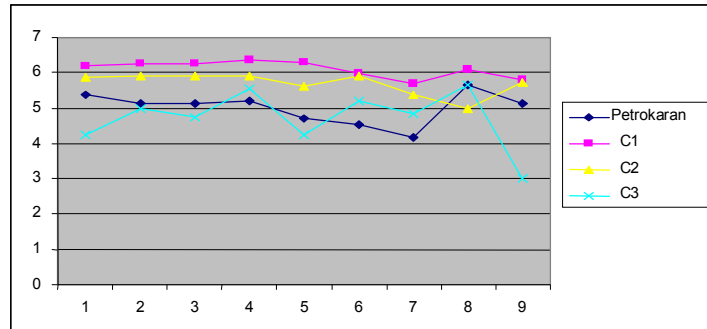
Figure 2: Situation of organization and its competitors

In this step the expert team assigns goals for needs according to Table 1. (For the first 7 groups according to the best rival and for the last 2 groups ahead of the best competitor according to the organization potential). Then improvement ratio is calculated (Table 2) primary weights are acquired and presented in Fig. 3. The degree of relations among customer needs is cleared by the expert team using Table 3 and final weights of group needs are calculated and ranked (Fig. 3).

Table 1: Goals of need

				Goals				
GN 1	GN 2	GN 3	GN 4	GN 5	GN 6	GN 7	GN 8	GN 9
(5.3, 6.3, 6.9)	(5.4, 6.4, 6.9)	(5.4, 6.4, 6.8)	(5.5, 6.5, 7)	(5.5, 6.5, 6.9)	(5.1, 6.1, 6.8)	(4.7, 5.7, 6.6)	(6, 7, 7)	(5, 6, 7)

Table 2: Improvement ratio

				Improvement ratio				
GN 1	GN 2	GN 3	GN 4	GN 5	GN 6	GN 7	GN 8	GN 9
(0.83, 1.17, 1.6)	(0.9, 1.24, 1.7)	(0.9, 1.25, 1.7)	(0.9, 1.24, 1.7)	(0.97, 1.38, 1.8)	(0.9, 1.34, 1.9)	(0.9, 1.37, 2.1)	(0.9, 1.24, 1.5)	(0.81, 1.17, 1.7)

Table 3: Value of R relation among needs

Symbol	⊖	-	+	⊕
Value	(0, 0, 0.3)	(0, 0.3, 0.5)	(0.3, 0.5, 0.7)	(0.5, 0.7, 1)

PRW	FCRW	NFCRW	CRISP	RANK
(4.62, 7.65, 10.77)	(9.21, 20.72, 37.79)	(0.064, 0.288, 1.159)	0.4499	5
(4.92, 8.22, 11.56)	(7.94, 16.61, 32.78)	(0.056, 0.231, 1.005)	0.3804	6
(4.81, 8.19, 11.27)	(7.18, 13.75, 27.46)	(0.05, 0.191, 0.842)	0.3186	8
(5.09, 8.27, 11.47)	(6.71, 12.84, 28.57)	(0.047, 0.179, 0.876)	0.32	7
(5.25, 8.83, 12.27)	(11.13, 25.42, 46.33)	(0.078, 0.353, 1.421)	0.5513	4
(5.37, 9.13, 13.14)	(11.92, 25.38, 47.51)	(0.083, 0.353, 1.457)	0.6615	3
(5.31, 9.36, 14.5)	(14.87, 33.72, 73.21)	(0.104, 0.469, 2.249)	0.8217	2
(5.17, 8.33, 10.46)	(6.76, 13.01, 20.61)	(0.047, 0.181, 0.632)	0.2603	9
(4.73, 7.95, 11.84)	(16.92, 38.96, 78.4)	(0.118, 0.542, 2.404)	0.9016	1

Figure 3: Need priority-Part of HOQ

The acquired weights in the previous step are for group needs, in order to achieve weights of each need the importance of 45 needs are normalized defuzzified and multiplied in the weights of group needs. For example the weight of first need is: 0.155182*0.4499= 0.069816443

Ranking internal and external factors of organization:

All 50 factors cannot be presented in HOQ. Therefore opinions from members of expert team are valued according to fuzzy numbers in Table 4 and in the end factors above fuzzy average of opinions are selected. 32 factors in this part and their weights are presented in Table 5. These are actually raw weights of each factor.

Table 4: Decision making variable values

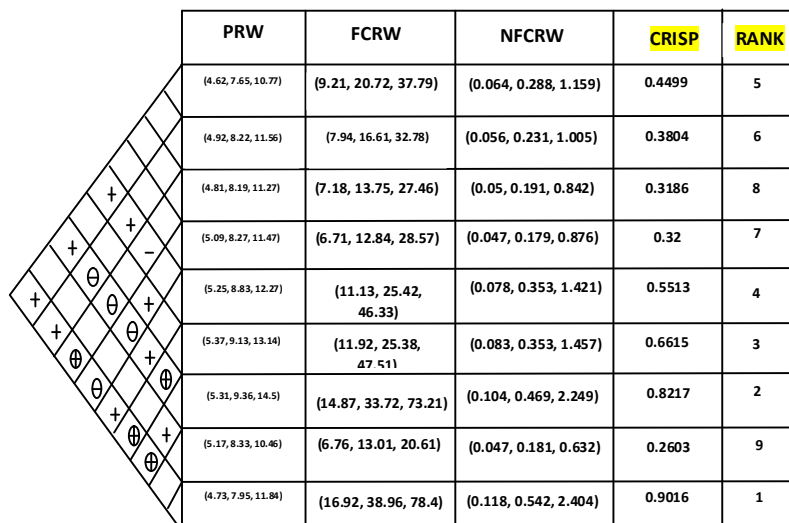| Variable	VLL	VL	ML	M	MH	VH	VHH
Value	(1, 1, 2)	(1, 2, 3)	(2, 3, 4)	(3, 4, 5)	(4, 5, 6)	(5, 6, 7)	(6, 7, 7)

Expert team completes relation matrix (Table 6) according to values of Table 4. Raw weights, primary weights, final weights and ranking of internal and external factors are calculated according to equations of part 4 and are presented in Fig. 4.

Table 5: Primary weight of internal & external factor

Factor	S1	S2	S3	S4	S5	S6	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	O1	O2	O3	O4	O5	O6	O7	O8	T1	T2	T3	T4	T5	T6	T7	T8
DM	VH	VH	VH	VH	H	VH	VH	H	H	H	VH	VH	VH	H	H	H	VH	VH	MH	MH	VH	VH	VH	MH	VH	H	H	VH	MH	VH	L	VH
DM	VH	VH	VH	H	H	VH	VH	VH	VH	MH	MH	H	VH	VH	H	VH	H	H	MH	H	H	H	H	H	VH	H	H	MH	H	MH	H	H
DM3	VH	VH	VH	NH	H	H	VH	H	MH	VH	MH	VH	H	VH	M	VH	ML	MH	L	MH	MH	VH	MH	MH	MH	MH	H	ML	MH	M	VH	H
DM	VH	VH	VH	M	VH	ML	VH	H	M	VH	VH	VH	VH	VH	H	VH	VH	L	VH	VH	VH	VH	VH	VH	MH	ML	M	L	M	VL	VH	VH
DM	VH	VH	VH	MH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	H	MH	ML	H	L	MH	VH	H	H	VH	MH	MH	M	L	M	VH	VH	H
RW	(6, 7, 7)	(6, 7, 7)	(6, 7, 7)	(4.4, 5.4, 6.2)	(5.4, 6.4, 7)	(4.8, 5.8, 6.4)	(6, 7, 7)	(5.4, 6.4, 7)	(4.8, 5.8, 6.4)	(5.6, 6.6, 6.8)	(5.2, 6.2, 6.6)	(5.6, 6.6, 7)	(5.6, 6.6, 7)	(5.8, 6.8, 7)	(3.8, 4.8, 5.8)	(5.8, 6.8, 7)	(4.2, 5.2, 5.8)	(4.8, 5.8, 6.6)	(2, 3, 4)	(5, 6, 6.6)	(5.4, 6.4, 6.8)	(5.6, 6.6, 7)	(4.8, 5.8, 6.6)	(5.2, 6.2, 6.8)	(4.2, 5.2, 6)	(3.8, 4.8, 5.8)	(4.4, 5.4, 6.2)	(2.4, 3.4, 4.4)	(4.2, 5.2, 6)	(2.8, 3.6, 4.6)	(5.8, 6.8, 7)	(5.4, 6.4, 7)

Table 6: Relation matrix

Factor	S1	S2	S3	S4	S5	S6	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	O1	O2	O3	O4	O5	O6	O7	O8	T1	T2	T3	T4	T5	T6	T7	T8
GN1	M	ML		H				L	M			H	M			L					H		M		M						H	
GN2	M	ML		H				L	M			H	M			L					H		M		M						H	
GN3	M	ML		H		M		L	M			H	M			L					H		M		M						H	
GN4	M	ML		H				H	M	M	M					L					H		M		M						H	
GN5	M	ML		H						M		H	M	VH																		
GN6	M	ML		H	VH			VH	H	VH	M		VH	H	H		M			VH		M		M	VH	H	VH	VH			VH	
GN7					VH	H	H	H	VH	H	H		VL		H			M	VH	M	M	VH			L							VH
GN8			VH			VH	VH		VH	VH				VH				VH	VH	VH		VH	VH			VH			VH		VH
GN9	VH	VH		VH		VH		VH			H	VL	VL	H	M	VH	M	VH			VH		M			VH		H	VH		VH

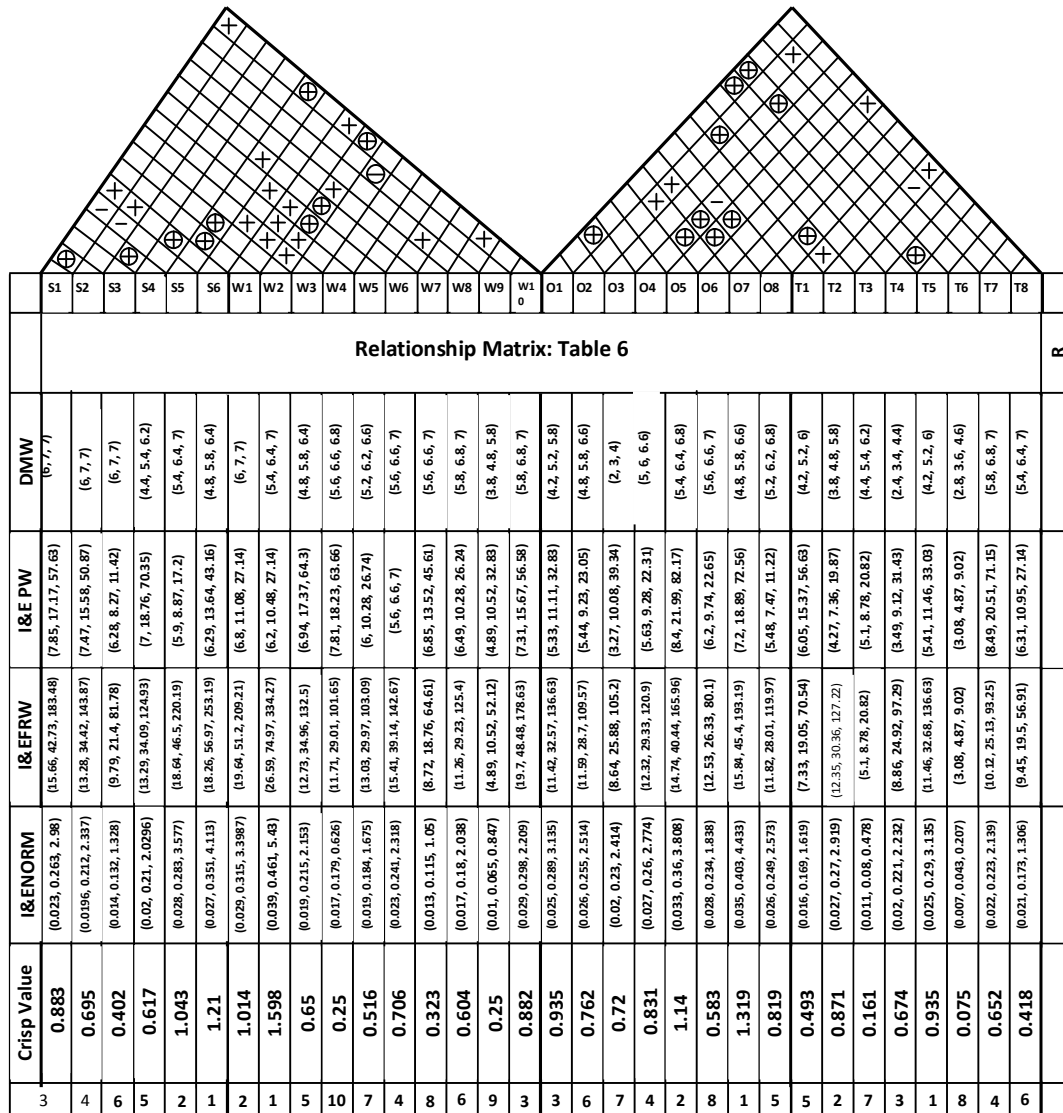|	S1	S2	S3	S4	S5	S6	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	O1	O2	O3	O4	O5	O6	O7	O8	T1	T2	T3	T4	T5	T6	T7	T8
Relationship Matrix: Table 6																																
DMW	(6,7,7)	(6,7,7)	(6,7,7)	(4.4,5.4,6.2)	(5.4,6.4,7)	(4.8,5.8,6.4)	(6,7,7)	(5.4,6.4,7)	(4.8,5.8,6.4)	(5.6,6.6,6.8)	(5.2,6.2,6.6)	(5.6,6.6,7)	(5.6,6.6,7)	(5.8,6.8,7)	(3.8,4.8,5.8)	(5.8,6.8,7)	(4.2,5.2,5.8)	(4.8,5.8,6.6)	(2,3,4)	(5,6,6.6)	(5.4,6.4,6.8)	(5.6,6.6,7)	(4.8,5.8,6.6)	(5.2,6.2,6.8)	(4.2,5.2,6)	(3.8,4.8,5.8)	(4.4,5.4,6.2)	(2.4,3.4,4.4)	(4.2,5.2,6)	(2.8,3.6,4.6)	(5.8,6.8,7)	(5.4,6.4,7)
I&E PW	(7.85,17.17,57.63)	(7.47,15.58,50.87)	(6.28,8.27,11.42)	(7,18.76,70.35)	(5.9,8.87,17.2)	(6.29,13.64,43.16)	(6.8,11.08,27.14)	(6.2,10.48,27.14)	(6.94,17.37,64.3)	(7.81,18.23,63.66)	(6,10.28,26.74)	(5.6,6.6,7)	(6.85,13.52,45.61)	(6.49,10.28,26.24)	(4.89,10.52,32.83)	(7.31,15.67,56.58)	(5.33,11.11,32.83)	(5.44,9.23,23.05)	(3.27,10.08,39.34)	(5.63,9.28,22.31)	(8.4,21.99,82.17)	(6.2,9.74,22.65)	(7.2,18.89,72.56)	(5.48,7.47,11.22)	(6.05,15.37,56.63)	(4.27,7.36,19.87)	(5.1,8.78,20.82)	(3.49,9.12,31.43)	(5.41,11.46,33.03)	(3.08,4.87,9.02)	(8.49,20.51,71.15)	(6.31,10.95,27.14)
I&EFRW	(15.66,42.73,183.48)	(13.28,34.42,143.87)	(9.79,21.4,81.78)	(13.29,34.09,124.93)	(18.64,46.5,220.19)	(18.26,56.97,253.19)	(19.64,51.2,209.21)	(26.59,74.97,334.27)	(12.73,34.96,132.5)	(11.71,29.01,101.65)	(13.03,29.97,103.09)	(15.41,39.14,142.67)	(8.72,18.76,64.61)	(11.26,29.23,125.4)	(4.89,10.52,52.12)	(19.7,48.48,178.63)	(11.42,32.57,136.63)	(11.59,28.7,109.57)	(8.64,25.88,105.2)	(12.32,29.33,120.9)	(14.74,40.44,165.96)	(12.53,26.33,80.1)	(15.84,45.4,193.19)	(11.82,28.01,119.97)	(7.33,19.05,70.54)	(12.35,30.36,127.22)	(5.1,8.78,20.82)	(8.86,24.92,97.29)	(11.46,32.68,136.63)	(3.08,4.87,9.02)	(10.12,25.13,93.25)	(9.45,19.5,56.91)
I&ENORM	(0.023,0.263,2.98)	(0.0196,0.212,2.337)	(0.014,0.132,1.328)	(0.02,0.21,2.0296)	(0.028,0.283,3.577)	(0.027,0.351,4.113)	(0.029,0.315,3.3987)	(0.039,0.461,5.43)	(0.019,0.215,2.153)	(0.017,0.179,0.626)	(0.019,0.184,1.675)	(0.023,0.241,2.318)	(0.013,0.115,1.05)	(0.017,0.18,2.038)	(0.01,0.065,0.847)	(0.029,0.298,2.209)	(0.025,0.289,3.135)	(0.026,0.255,2.514)	(0.02,0.23,2.414)	(0.027,0.26,2.774)	(0.033,0.36,3.808)	(0.028,0.234,1.838)	(0.035,0.403,4.433)	(0.026,0.249,2.573)	(0.016,0.169,1.619)	(0.027,0.27,2.919)	(0.011,0.08,0.478)	(0.02,0.221,2.232)	(0.025,0.29,3.135)	(0.007,0.043,0.207)	(0.022,0.223,2.139)	(0.021,0.173,1.306)
Crisp Value	0.883	0.695	0.402	0.617	1.043	1.21	1.014	1.598	0.65	0.25	0.516	0.706	0.323	0.604	0.25	0.882	0.935	0.762	0.72	0.831	1.14	0.583	1.319	0.819	0.493	0.871	0.161	0.674	0.935	0.075	0.652	0.418
	3	4	6	5	2	1	2	1	5	10	7	4	8	6	9	3	3	6	7	4	2	8	1	5	5	2	7	3	1	8	4	6

Figure 4: Ranking of internal & external factor-Part of HOQ

After finding the weights of each factor on the roof of HOQ the expert team clarifies relations and their degrees according to Table 4 for SWOT analysis (Fig. 5).

According to relations shown in Fig. 5 all crosses that can take part in making strategies are obtained. The weights of crosses can be easily calculated by Eq. 11. Final results are presented in Table 7.

Table 7: Rank of crosses

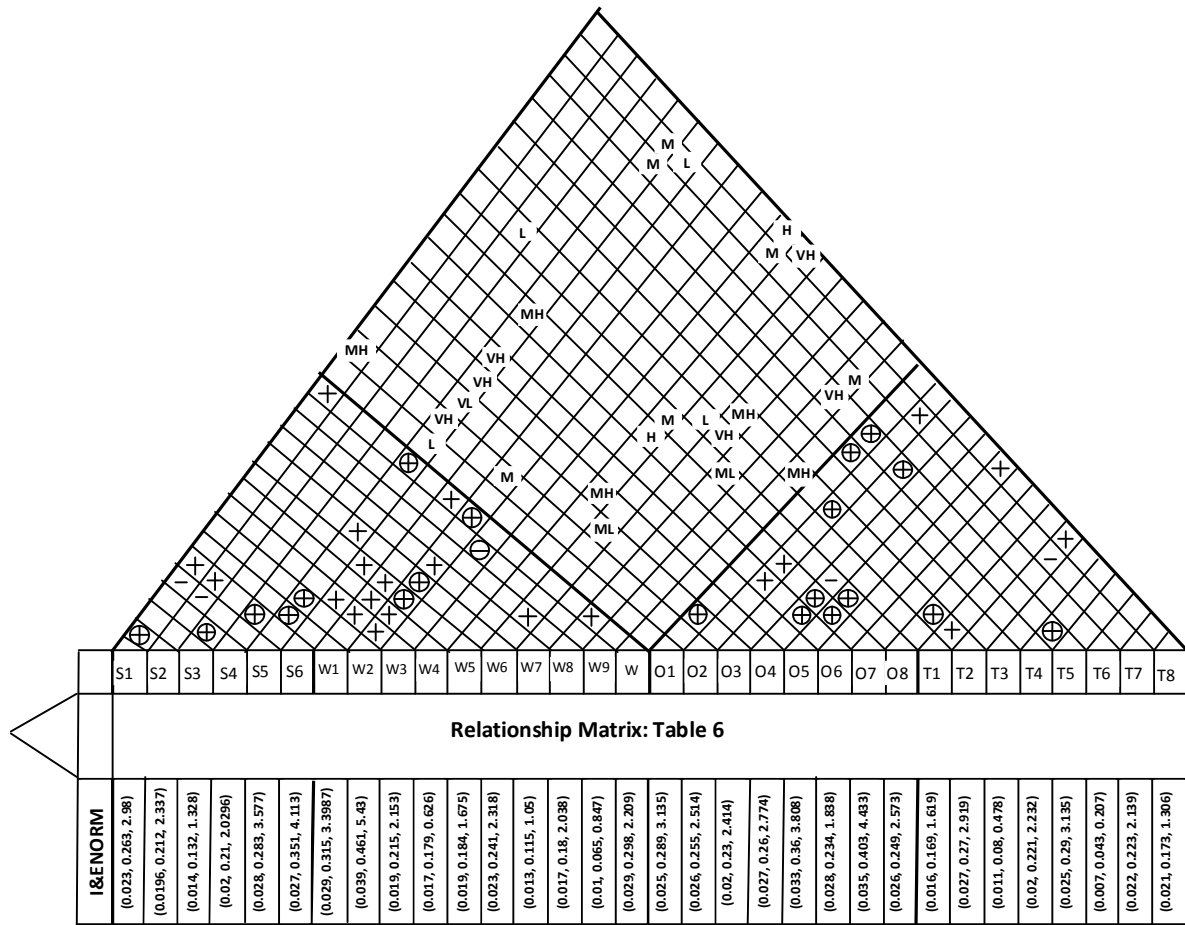| Cross	S5O5O7	S5O4O7	S5O2O7	S1S5O2	W2O2	W5O4O8	W5O7	W10T2	S5O1O3	S5T7	W7T1T2
Weight	48.266	41.695	40.187	27.4	17.301	15.194	13.215	12.908	12.842	9.693	7.715
Rank	1	2	3	4	5	6	7	8	9	10	11
Cross	S6T7	W6O3	W8O8	W9T5	W5T8	W6T1	S3T1	W4T7	W4T8	S5T6	W9T6
Weight	6.678	5.676	5.667	4.711	3.939	2.854	2.184	1.753	1.523	0.951	0.225
Rank	12	13	14	15	16	17	18	19	20	21	22

Figure 5: SWOT analysis on top of HOQ

In fact the organization cannot practically implement 22 strategies so 9 strategies are selected using Pareto Principle. In the end expert team extracts strategies regarding the achieved results. Selected factor for strategy formulation showed in Table 8.

Table 8: Selected factors

S1: Multi professional personnel	O3:Same film & product production
S5: Over 30 type of laboratorial product	O4:Suitable location
W2: Frequently management changes	O5:Stability spec
W5: Insufficient advertisements	O7:There are many polymer plant in country
W10:Lack of professional personnel in some department	O8:Possibility delivery to the Persian golf district
O2:Possibility of buying a new machine	T2: Increased cost in case of inflammation

1-Producing various products regarding customer need analysis
2-Taking part in new internal markets
3-Increasing production by investing in new internal markets
4-Using opinions from personnel to enhance quality
5-Following the schedule
6-Extended advertisement using a web site
7-Applying active marketing methods
8-Enhancing technical and scientific capabilities of organization
9-Producing unique and diverse products
The above strategies are achieved by the expert team and researcher of this study.

CONCLUSION

The proposed model gives methods for practicing strategies as well as weighing crosses that lead to strategies. Concerning the importance of customer needs finding their weights can help organizations to cut untargeted or low efficient costs. Organizations can easily compare themselves with competitors by collecting information from rivals in short time periods.

In different models of SWOT crosses are usually analyzed qualitatively but in this model a more pragmatic analysis is proposed by quantifying factors. In traditional methods of QFD only qualitative relations among technical characteristics are presented but relations between internal and external factors of organization are quantitatively presented in this study. Moreover relations between customer needs are quantitatively analyzed.

In SWOT analysis 18*18 different possible crosses should be regarded according to the number of internal and external factors but in this study only 22 crosses are ranked.

Only 9 strategies are made for organization using Pareto and ranked strategies stop the waste of organization's resources.

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