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Model of production and marketing strategies in alignment with business strategy using QFD approach(case study: Iran khodro)

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ABSTRACT

In today's competitive world, organizations are expected to surpass the competitors and benefit from the resources and benefits. Therefore, organizations need to improve the current performance is felt more than ever that this requires to identify organizational optimal strategies, and consider all strategies simultaneously. In this study, to enhance competitive advantage and according to customer requirements, alignment between business, production and marketing strategies, House of Quality (QFD) approach has been used and zero-one linear programming model has been studied. First, the alignment between production and marketing strategies with business strategy, independent weights of these strategies is calculated. Then with using QFD approach the aligned weights of optimal strategies in each production and marketing field will be obtained and finally the aligned marketing strategies selection with the purpose of allocating budget and specialist human resource to marketing functions will be done that lead to increasing competitive advantage and benefit.

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Introduction

These days, performance measurement plays a critical point in organizations' success. In recent decade, some considers on different organizations dedicate that evaluation of organization performance for achieving organization strategy aims take in to account as a critical factor of success. Although many organizations, didn't develop their formal processes for performance evaluation (David & nigl, 2000)

We know that strategies in company level, determined the main path and direction for the company. In marketing level, both competitive and marketing strategies are competing for the aim of competitive situation development, way in market and marketing strategies at product level, for presenting tactics of achieving business aims.(Wind, 1983; Wilson ,1996)

Timothy Galpin in his book with the title of "making strategy work" mentioned evaluable purposes and wishes as a main factor of success practicing strategy (Galpin, 1997).

In past years, organizations faced serious challenges because of developing the organizations' performance evaluation for measuring the correct factors. The need is a system that makes a kind of alignment, among the historical number accurate, financial number and the future performance motivators, which support organizations for their performing and preparing distinguishable strategy (Niven & Paul, 2002).

According to rate of global and technical growth ,changes permanently effected on marketing environment. So the organization should always be with competitive advantage for keeping and improving its positions in market. So, for preparing the costumers' demands by knowing the best marketing strategy, the organizations should assemble appropriate production strategy, produce high quality productions with competitive price, and distribute them in the shortest time. In order to achieve the above aims, we should make a close connection between productions and marketing strategies, until by this way,

the necessary procedures are obtained for getting costumers' satisfaction and competitive advantage.

Today the scientist and researchers consider the organization factors' role of alignment in performance promotion (Delery & Doty, 1996).

Making alignment and evaluation for proving strategies is a necessary and critical factor. Alignment between strategies would be in order to better allocation of resources, controlling to create value and performance development, that it's achieved through the House of Quality (QFD) as an interface between production and marketing strategies with other major business areas. So, before applying QFD, first, it's necessary to choose existence strategies in automotive industry. Since the marketing product and business strategies selection should use group wisdom, hence we suggested identifying general strategies through literature, survey information and finally testing the accepted ones by experts through Delphi technique and Friedman test. QFD technique and AHP were used in order to rank marketing strategy and align with production and marketing strategies respectively. Accordingly, the present study first considers the past and the proposed model in this study has investigated in a case study for automotive Tehran.

Previous research

While the development of the organizational strategy has never been easy, Successful implementation of this strategy is really harder. In 1999, a survey article in Fortune magazine claimed that 70% of corporate executives fail is not the result of poor strategy. In fact the main reason is the weak implementation of strategy (Charan & Colvin, 1999). As mentioned above, according to the changes and dynamics of environment, Organizations should have a competitive advantage, in order to respond appropriately and maintain their position. In other words, customer demands change due to constant market dynamics in design of products. This problem

requires a systematic program, meaningly the integration of knowledge about both customer and market in process planning and product development, that should have (Wilemon, 1996).

According to Murray, it will be needed to have a broad strategy. On the other hand if we want to meet our diverse clients' needs, in which the ideal condition of clients is located in a small portion of this space, the Company should select the focused business strategy (Murray, 1998). As a result, in order to achieve customer satisfaction and competitive advantage, the relation between producing and communication marketing strategies must be created. This is possible by an appropriate tool, QFD which works in organizing product development. It should be noted that before implementing QFD in organization, at first the preliminary evaluation of organization's current system must be done and the gap between organization's current quality system, requirements and demands of the considered system analyzed. Then by Using QFD tool, internal and external customers will be identified. With having the proper perception of customers' wants and as a result presents these requests to the department of design and construction, it can be changed quality instrument to quality instrument (Gonzalez et al & J. Crowe et al). As the identification of new products uses to recognize the relationship between production and marketing strategy with business strategy, hence the alignment between marketing strategy and product quality through the QFD matrix must be established. In other words, the marketing department in regard with identify, evaluate and formulation of customer requirements, specifications and requirements, determine "what the product must be" and the engineering department determine "how the product can be align with expected customers' specifications". In this manner the organization would have competitive advantages, efficiency and cost less products. According to the literature, in 1969, Skinner declared that the competitive advantage should be implemented in order to achieve interconnectivity between marketing strategies and production strategies, both as the part of overall organization's strategy (Skinner, 1969).

Thus, in 1998, in a research, Hill et al announced that production and marketing strategies have a common requirement to support the chosen market and hence this is a basis for the alignment of these two strategies in organization (Hill, et. al, 1998). In 1999 the concept of production strategy was developed by marketing strategy. Also alignment between business strategies and functional strategies introduced as the most important achievement for the company's strategic objectives (Berry & Hill, 1999). Therefore in 2000 Hill provided a framework as an alignment approach. Hill, according to this methodology, Hill used marketing strategy to formulate the alignment of competitive priorities and production strategy (Hill, 2000). In 2001, the alignment model between business strategy and producing by complex products was effectively executed and the results implied that the alignment between these strategies has a significant impact on business performance (Sabherwal & Chan, 2001). In 2002 Chang concluded that the production and business strategies should be aligned with the effective performance of business and also the alignment between business and production strategies is usefull for performance improving. So there must be a great support for the alignment of business strategy and production strategy (Chang, 2002). The important relationship between production and marketing has been known since the late 1960s, when the Japanese, used QFD to design products in line with the desired features for customers.

As QFD has been known as an important part of the planning process and product development, it can bring growth and prosperity for the organization, for the aim of planning and development of products, which are appealing to new and existing customers (Griffin, 1992; Akao, 1990; Cohen, 1988; Hales, 1994). According to Swamidass, most books and articles discussed about these two strategies, are in a fragmented form. In these works, the empirical and practical researches are used less to prove necessity of relationship between marketing and production. However, the lack of empirical evidence doesn't affect the necessity of relationship between marketing and production (Swamidass, 2001). During the subsequent investigation, Carlo and Mora-Monge investigated the alignment between production and marketing strategy by QFD approach, in which, the relationship between these two strategies was performed by quality home matrix, for the aim of creating competitive advantage and with the help of customer voice (Gonzalez, et al, 2004).

The conceptual model

The conceptual model of this research is presented in figure 1. Figure 1: conceptual model, optimization Strategic weights model with a linear programming approach
Symbol signs of each strategy are presented in the following tables:

Business strategies preference		Business strategies Production Strategies
	Communication matrix	
		Production strategies preference

Production strategies Preference		Marketing strategies Production strategies
	Communication matrix	
		Marketing strategies preference

Table 1: Symbol of business strategie

Symbol	Business strategies that are used in automotive
B ₁	Supply products with lower prices
B ₂	Differentiated products, with the valuable features of the customer's perspective
B ₃	Focus on the Middle East market
B ₄	Continuous supply of new products and innovations in existing products
B ₅	Emphasis compliance of environmental requirements
B ₆	Entrepreneurial Development through a variety of businesses and opening new markets.
B ₇	Development of ICT-based systems
B ₈	Improving labor productivity
B ₉	Improving quality management system
B ₁₀	Partnerships with other companies to functional synergy

Table 2: Symbol of production strategies

Symbol	Production strategies that are used in automotive
P ₁	Taking advantage of new technology
P ₂	Increased flexibility of production lines
P ₃	Downward vertical integration with the aim of supply chain improvement
P ₄	Focus on mass production of goods
P ₅	Development of industrial patterns design in order to keep pace with modern design
P ₆	Increased capabilities and technical features of products in order to achieve customer demands and quality requirements
P ₇	Development of mechanized production lines to increase efficiency and reduce the interline slag
P ₈	Development activities to produce in world class
P ₉	Accelerate product supply
P ₁₀	Ongoing analysis of cost to reduce production costs and improve efficiency

Table 3: Symbol of marketing strategies

Symbol	Marketing strategies that are used in automotive
M ₁	Focuses on increasing brand basket value
M ₂	Development of distribution network to direct supply of produced goods
M ₃	Market development in new geographical areas
M ₄	Focus on increasing customer satisfaction and expand our loyal customers
M ₅	Penetrate in market in order to increase market share of existing products
M ₆	Profit-based Pricing
M ₇	Special position in market for any product with respect to a particular feature
M ₈	Designing and development of advertising campaigns, tailored to customers' media habits.
M ₉	Provide after sale's services
M ₁₀	Determination of sale's term with variety of facilities

The research goals

This study generally follows 8 objectives as the following:

- 1) Identify Business strategies in Tehran Automotive industry.
- 2) Prioritization of business strategies in Tehran Automotive industry.
- 3) Identify production strategies in Tehran Automotive industry.
- 4) Prioritization of production strategies in Tehran Automotive industry.
- 5) Identify marketing strategies in Tehran Automotive industry.
- 6) Prioritization of marketing strategies in Tehran Automotive industry.
- 7) Aligning marketing and production Strategies with business strategy in Tehran Automotive industry.
- 8) Provide a valid model for optimizing the alignment of production and marketing strategies with business strategy planning zero - one approach in Tehran Automotive industry.

The Research question

- 1) What are the Business, production and marketing strategies in what in Tehran Automotive industry?
- 2) How are the priorities of production strategies in Tehran Automotive industry?
- 3) How are the priorities of marketing strategies in Tehran Automotive industry?
- 4) How are the priorities of business strategies in Tehran Automotive industry?
- 5) How is the making production and marketing strategies aligned with business strategy, in Tehran Automotive industry?
- 6) Is it possible to provide an alignment optimization model for production, marketing and business strategy for Tehran Automotive industry?

The hypothesis of Research

- 1) Focus on the Middle East market strategy is the most important business strategy in Tehran Automotive industry.
- 2) A development activity to produce in world class strategy, is the most important production strategy in Tehran Automotive industry.
- 3) Penetrate in the market, in order to increase market share of existing products is the most important marketing strategy in Tehran Automotive industry.
- 4) Production and marketing strategies are aligned.
- 5) Production and business strategies are aligned.
- 6) Business and marketing strategies are aligned.
- 7) A presented mathematical model by zero-one linear programming is a valid model for the aim of assessing the alignment of production and marketing strategies with business strategy.

Methodology & Data Analysis

The present study is an applied research in the case of trend modeling and is classified as a descriptive- survey research, in terms of data gathering approach. In this study a questionnaire was used For data gathering.

Strategies identification: the following tests are used to identify production, marketing and business strategies.

✓ Delphi test

✓ Friedman test

The business strategies that are obtained by Delphi test:

- Focus on the Middle East market
- Emphasis on compliance of environmental requirements
- Supply the products with lower prices
- Entrepreneurial Development through a variety of businesses and opening new markets
- Differentiated products, with the valuable features of the customer's perspective

The production strategies that are obtained by Delphi test are as follows

- Development the activities to produce in world class
- Focus on mass production of goods
- Ongoing analysis of cost, to reduce production costs and improve efficiency
- Downward vertical integration with the aim of supply chain improvement

➤ Development of mechanized production lines, to increase the efficiency and reduce the interline slag

The marketing strategies that are obtained by Delphi test:

- Market development in new geographical areas
- Determination of sale's term with variety of facilities
- Development of distribution network to direct supply of produced goods
- Provide after sale's services
- Designing and development of advertising campaigns, tailored to customers' media habits.

H₀ hypothesis and H₁ hypothesis for business strategies are as follow for Friedman test:

$$H_0: B_1 = B_2 = B_3 = B_5 = B_6$$

$$H_1: B_1 \neq B_2 \neq B_3 \neq B_5 \neq B_6$$

H₀ hypothesis, expressed the principle which the degree of importance of all five identified business strategy in Tehran Automotive industry are the same and there is no difference between them. In table (1), the result of Friedman test including statistical characteristics and Chi square statistic, is presented.

As can be seen from table 1, by using Friedman test the χ^2 is equal to 33.986 in 0.95 of confident level. Since the value of the test statistic is greater than critical value, so H₀ is rejected and

therefore the H_1 is accepted, which indicates that there is a difference between the business strategies' importance.

Table 4: Friedman test output of business strategy

N	30
Chi-square	38.673
Df	4
Asymp. Sig.	.000

H_0 hypothesis and H_1 hypothesis for production strategies are as follow for Friedman test:

$$H_0: P_3 = P_4 = P_7 = P_8 = P_{10}$$

$$H_1: P_3 \neq P_4 \neq P_7 \neq P_8 \neq P_{10}$$

H_0 hypothesis, is expressed this principle that the degree of importance of all five identified business strategy in Tehran Automotive industry are the same and there is no difference between them. As can be seen in table (2) the result of Friedman test including statistical characteristics and Chi square statistic is presented. As it is considered in table 2 by using Friedman test the χ^2 is equal to 35.457 in 0.95 of confident level. since the value of the test statistic is greater than critical value, therefore the H_0 is rejected and H_1 is accepted, which indicates that there is difference between the production strategies' importance.

Table 5: Friedman test output of production strategy

N	30
Chi-square	35.457
Df	4
Asymp. Sig.	.000

H_0 hypothesis and H_1 hypothesis for marketing strategies are as follow for Friedman test:

$$H_0: M_2 = M_3 = M_8 = M_9 = M_{10}$$

$$H_1: M_2 \neq M_3 \neq M_8 \neq M_9 \neq M_{10}$$

H_0 hypothesis, expressed this principle that the degree of importance of all five identified business strategy in Tehran Automotive industry are the same without any difference between them. In table (3) the result of Friedman test containing statistical characteristics and Chi square statistic is presented. According to the table 3 by applying the Friedman test, the χ^2 is equal to 35.457 in 0.95 of confident level. Since the value of the test statistic is greater than critical value, therefore H_0 is rejected and H_1 is accepted and it means that there is difference between the marketing strategies' importance.

Table 6: Friedman test output of marketing strategy

N	30
Chi-square	51.182
Df	4
Asymp. Sig.	.000

Business strategies' prioritizing

In this step the strategies are prioritized by AHP. In this study to calculate identified business strategies' priority, Eigen vector technique is used. This step requires the identification of the relative importance. The relative importance of each strategy is determined based on the degree of priority of each strategy than other ones. This method is based on paired comparisons, and because of not existing the decision matrix, the paired comparisons is carried out by decision makers. It should be noted that this test is done by 3 decision makers.

As this paired comparison is done by a group of experts, in order to obtain the overall comparisons matrix, arithmetic average of these 3 opinions is used. Consistency rate of paired comparisons, obtained by experts' opinions arithmetic average is calculated and this Consistency rate is less than 0.1. So, experts' opinion is consistent and reliable. Because, respondents

were experts in the field of research, responses' weights are considered equally and without preference. Inconsistency rates on individual comments are received; normalized and arithmetic average is calculated. The results based on an Eigen vector technique is shown in the following tables:

Consistency rate of this matrix is equal to 0.04. Thus, the matrix has sufficient consistent rate. The prioritization results is shown in Table (5).

Constitution home of quality and create alignment between business and production strategies, and calculating production weights strategies.

In this study, first, the home of quality is constituted by using business strategy (WHATs) and production strategies (HOWs), and then the relationship between these strategies was identified based on feedback from three senior experts and using Likert's scale. In order to integrate the experts' opinions, the mean scores assigned to the communication matrix were used. Given the relative weights of the business strategy, before and during the application of analytic hierarchy process (AHP) has been identified. In this step, relative weight and absolute weight of aligned production strategy aligned absolute weight and relative weight (the weights of the most important production strategies) is calculated, based on entering the relative weights of business strategy in communication business and production strategy. In order to calculate the most important production strategies, the data obtained from the arithmetic mean multiply in business strategy weights obtained from AHP.

Constitution home of quality and create alignment between production and marketing strategies, and calculating marketing weights strategies.

In this study, first, the home of quality is constituted by using production strategy (WHATs) and marketing strategies (HOWs), and then the relationship between these strategies was identified based on feedback from three senior experts and using Likert's scale. In order to integrate the experts' opinions, the mean scores assigned to the communication matrix were used. Given the relative weights of the production strategy, before and during the application of analytic hierarchy process (AHP) has been identified. In this step, relative weight and absolute weight of aligned marketing strategy aligned absolute weight and relative weight (the weights of the most important marketing strategies) is calculated, based on entering the relative weights of business strategy in communication business and production strategy.

In order to calculate the most important production strategies, the data obtained from the arithmetic mean multiply in marketing strategy weights obtained from AHP.

Regarding the issues discussed in the current study, in order to minimize the distance weights and aligned strategies weights, marketing strategies gained during the QFD process was used as input for zero-one programming model. All of the above mentioned were done in order to take action to present a model of aligned strategy selection, removing the conflicting strategies and through this way minimizing the gap between current weight and aligned weight. It should be noted that This approach is not limited to certain strategies, also organizational strategy correction and aligned strategies selection in various areas of organization will be obtained by repeating few steps in this model. At this stage in order to align the production and marketing strategies with business strategy, a zero-one programming model was considered. The zero and one determine deselect or select any of the strategies.

Thus, it is considered with taking into account the budget, limited specialized manpower constraints in evaluation and strategies control areas to the strategy choose that will be followed by most of the action in alignment.

With this purpose, given that the individual weights of each strategies in three areas of production, marketing and business, during analytic hierarchy process and Friedman test was determined and also aligned weight of production and marketing strategies is obtained during QFD. In this linear programming model with aim of making minimum the differences between individual and aligned weights of each marketing strategy, in such that the budget constraint allocated to the marketing strategies basket and also specialized manpower constraints in order to implementation, control and evaluation Must be met.

Kth strategy $k=1$ the strategy is selected
 Kth strategy $k=0$ the strategy is not selected

$$\text{Min } Z = |AC_i - AL_i| \times K_i$$

s.t.

$$k_2 \times C_2 + k_3 \times C_3 + k_8 \times C_8 + k_{10} \times C_{10} \leq 200000$$

$$k_2 \times H_2 + k_3 \times H_3 + k_8 \times H_8 + k_{10} \times H_{10} \leq 200$$

$$K_2 + K_3 + K_8 + K_{10} \geq 2$$

$$K_2 + K_3 \leq 1$$

$$K_i = 0, 1 \quad i=2, 3, 8, 10$$

11. Conclusion

The results indicate that the optimal value of the objective function is 0.03312. Value column shows the values of the variables in the optimal solution of the model. So according to this optimal solution the optimal strategies are number 3

(Market development in new geographical areas) and number 10 (Determination of sale's term with variety of facilities). Reduced Cost column represents the coefficients of the variables in zero row of optimal table. As the reduced cost of each basic variable must be zero, for a non basic variable X, numbers in this column indicates that if 1 unit adds to the value of X, the size of optimal solution may be increase in a same quantity or make it worse (if other non basic variables stay zero).

In LINGO output for this problem, the reduced cost for Market development in new geographical areas strategy is equal to 0.003754. This means that if this strategy is selected, the gap between independent and aligned coefficients will increase 0.003754. As this amount is equal to the minimum distance in comparison with other marketing strategies, therefore Lingo's first choice is Market development in new geographical areas strategy. According to this the next choice must be number 8 strategy i.e. provide after sale's services. So this is considered in software output. The next Lingo's choice is number 10 strategy i.e. determination of sale's term with variety of facilities that it's due to consider constraint's model. Also, according to the designed model type and as the sensitivity analysis shows how the coefficients can be increased or decreased, Without changing in problem optimization basic (set of non-zero variables), sensitivity analysis of the zero and one model that has constant coefficient is meaningless and the results of model's output is limited to items listed above.

Table 7: Arithmetic means of paired comparisons matrices

Important business strategies in the automotive industry	B ₁	B ₃	B ₅	B ₆	Arithmetic average
B ₁	0.317	0.360	0.310	0.255	0.310
B ₃	0.251	0.285	0.406	0.255	0.299
B ₅	0.158	0.109	0.155	0.255	0.169
B ₆	0.251	0.227	0.123	0.203	0.201

Table 8: The weights of most important business strategies

Strategies' priority	Business strategies weights	Strategies
1	0.317	B ₁
2	0.308	B ₃
3	0.203	B ₆
4	0.171	B ₅

Table 9: Arithmetic means of experts' opinion

Business strategies				
B3	4.333	7	7.677	7.677
B1	3.677	3.677	5.667	4.333
B6	3.677	8.333	5	4.333
B5	6.333	4.333	1.667	1.667

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