

Determining the Right Combination of Price and Quality with Focus on Customer Loyalty to Miniature Power Switch

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Abstract

The Production and presentation of high-quality and low-price products plays an important part in the manufacturing industries, because the quality of the manufactured products is very important for the sustainability and profitability of such organizations and is a profitable strategy for the organization. Accordingly, due to the importance of this subject, the present research is an attempt to determine the right combination of variables in miniature power switch and prioritize them and examine the producing companies using Multiple –Attribute Decision-making (MADM) techniques so that it can select the right alternative and provide the officials with required planning in this field. The research method is a descriptive-survey one due to the nature of the work, and the population includes the managers and experts of distribution companies in Tehran city. Three series of questionnaires were distributed among those who were accepted by the company in terms of scientific and practical consideration, experience, and performance and who were capable of responding the questionnaire items. Results revealed that the most important criteria were on-time delivery of the product among the sub-criteria of service quality, service durability among the sub-criteria of product durability in price sub-criterion, and trustability among the sub-criteria of customer loyalty. It was finally shown that Pars Tavan Azma Company has the first priority among the companies producing miniature power switch, that is, it has the most appropriate price-quality combination.

Keywords: Quality, Price, Customer, Loyalty, Miniature Power Switch

1. Introduction

Today, customer plays an important part as the key factor in sustainability of firms and orientation of all goals, strategies and resources around the axis of customer retention and absorption. Maintaining and promoting customer loyalty for companies which are concerned about maintaining and developing their competitive position in the market is considered strategic challenge. Examining and identifying the factors affecting customer loyalty is important because customer loyalty or disloyalty determines the success or failure of firms. Loyal customers bring about higher efficiency of the organization and have a positive effect on long-term profitability and lead to customer loyalty because they have two features of “understanding the situation” and “trustability” and because they cost less for the company than introducing new customers to it (Hamidizadeh). Quality and price are two key elements in management decision-making in manufacturing industries because many consumers consider price as the criterion of quality and in contrast, many manufacturers and salespeople consider a higher price for their products in order to show to them that their products have a better quality. Obviously, marketplace is a very complex place for customers and brings about problems for them in purchase (Vakilipourtaklou). There are many cases in Iran’s Power Industry where the frequency of brands in the market leads to customers’ informational dominance on the market in relation to that product. The second case relates to the technical complexity of product which has made the qualitative evaluation of the product impossible for customers. The third case relates to urbanization of our societies which has provided an envelopment with many stores which all sell similar products and this can be said to have become more important since information technology has come into the market. At present, markets have developed and stores have increased but the time is very limited. Due to the importance of this subject, this research seeks to identify the components affecting the sales of miniature power switch and determine and prioritize the criteria using multi-criteria decision-making method. The research questions are written in the following way:

- To what extent is the relative importance of the main criteria of quality, price and customer loyalty using AHP Model?
- The products of which company have the best combination in terms of quality, price and customer loyalty using AHP and TOPSIS Models?

2. Research Goals

- Determining the components affecting the sales of miniature power switch
- Determining the relative importance of the effective criteria using AHP Model, ranking the producing companies based on the identified effective criteria using TOPSIS Model and determining the best combination of variables.

3. Research Methodology

The present research is an applied research in terms of purpose, and a descriptive survey in terms of data-collection method. It is a field study by nature. The process of doing this research can be divided into three steps. At the first step, the important indices in the price and quality of miniature power switch were determined through library studies and searches in the Internet, articles, dissertations and organizational documents in order to gain a complete understanding of the concepts and identification of the dimensions, and the result of this stage was 23 sub-criteria in three criteria of quality, price and customer loyalty. For

the selection of important sub-criteria from among a large number of the specified sub-criteria, questionnaire number one was formulated and distributed among a number of experts in the companies for rating. After analysis of the questionnaire via two-sentential test and by use of SPSS software, those sub-criteria which had the most importance were determined and some of the sub-criteria were omitted. In the next step, we used paired comparison in questionnaire number two in order to weight and prioritize the selected sub-criteria with AHP method and EXPERT CHOICE software and formulated questionnaire number three with the goal of prioritizing the alternatives using TOPSIS technique and made the questionnaire accessible to individuals. The data obtained from these questionnaires were used as the basis of multi-criteria decision-making techniques for prioritizing the better criteria and alternatives.

4. Data-collection Tools

A large part of the data in the present research was gathered through questionnaires. Three types of questionnaire were used in the research. The first type was based on Likert's scale and with 0.85 reliability, which was used to select the basic sub-criteria among the specified sub-criteria, and then administering the statistical test and specifying the basic criteria, we drew the decision tree by use of which the second questionnaire was distributed among 30 individuals for the paired comparison of the criteria and alternatives, weighting and prioritizing all criteria and alternatives. We used 1-9 time scale in doing the paired comparisons. Finally, the third questionnaire with 0.89 reliability was used for prioritizing the alternatives in the model, and personal judgments were changed into group ones using their geometric mean.

5. Statistical Population

Since multi-criteria decision-making methods especially Analytic Hierarchy Process (AHP) method have been limited for opinion assessment of experts, we identified 30 individuals who were accepted by the company in terms of scientific and practical consideration, experience, and performance and who were capable of responding the questionnaire items and three series of questionnaires were distributed among them. On the whole, 90 questionnaires were examined.

6. Research Findings

- The first question: To what extent is the relative importance of the main criteria of quality, price and customer loyalty using AHP Model?

Three main criteria (including quality, loyalty, and customer loyalty) have been identified in this research and the paired comparison matrix is shown in table 1.

Table 1: Paired Comparison Matrix Of The Main Criteria Of The Research

Table 2: Prioritizing The Research Criteria

Priority	Weight	Components	Row
3	0.131	Loyalty	1
1	0.661	Quality	2
2	0.208	Price	3

Graph 1: Prioritizing The Research Criteria

After making the model using Expert Choice Program and inserting the paired comparisons of the indices, the weight of the criteria were obtained, as shown in graph 1. As table 2 shows, the criterion of quality is the most important with relative weight of 0.661. Therefore, this criterion has the highest weight among the criteria of price, quality and loyalty, and the second priority goes to the criterion of price with relative weight of 0.208, and the last priority belongs to loyalty with relative weight of 0.131. The incompatibility rate of the paired comparisons has been obtained 0.05, and the comparisons are acceptable because the incompatibility rate is less than 0.10.

- **Weighting the research sub-criteria**
 - **Weighting the price sub-criteria**

Table 3: The Paired Comparison Matrix Of The Price Sub-Criteria

Table 4: Prioritizing The Research Criteria

Priority	Weight	Components	Row
1	0.75	How To Settle With Customers	1
2	0.25	Price	2

Graph 2: Prioritizing The Price Sub-Criteria

After making the model using Expert Choice Program and inserting the paired comparisons of the indices, the weight of the criteria were obtained, as shown in graph 2. As table 4 shows, the sub-criterion of how to settle with customers is the most important with relative weight of 0.75, and the sub-criterion of price is in the last priority with relative weight of 0.25. The incompatibility rate of the paired comparisons has been obtained 0.00, and the comparisons are acceptable because the incompatibility rate is less than 0.10.

➤ Weighting the sub-criteria of customer loyalty

Table 6: Prioratizing The Research Criteria

Priority	Weight	Components	Rank
2	0.317	Quality And Close Relationship With Customers	1
3	0.15	Customer Satisfaction	2
4	0.12	Brand And Good's Reputation	3
1	0.412	Trustability	4

Table 5: Paired Comparison Matrix Of The Sub-Criteria Of Loyalty

	KeifiatNazdiki	RezayatMoshtari	ShoratKala	GhabeliatEminan
KeifiatNazdiki		3.0	3.0	2.0
RezayatMoshtari			2.0	3.0
ShoratKala				2.0
GhabeliatEminan	Incon: 0.08			



Graph 3: Prioratizing The Sub-Criteria Of Loyalty

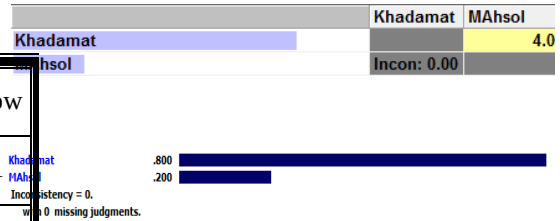
After making the model using Expert Choice Program and inserting the paired comparisons of the indices, the weight of the criteria were obtained, as shown in graph 3. As table 6 shows, the sub-criterion of trustability is the most important with relative weight of 0.412. Therefore, this criterion has the highest weight among the sub-criteria of loyalty, and the sub-criteria of customer-firm relationship are the next priorities with relative weights of 0.317 and 0.15 respectively. The sub-criterion of loyalty has the last priority with relative weight of 0.12. The incompatibility rate of the paired comparisons has been obtained 0.08, and the comparisons are acceptable because the incompatibility rate is less than 0.10.

➤ **Weighting quality sub-criteria**

Table 7: The Paired Comparison Matrix Of Quality Sub-Criteria

Table 8: Prioritizing The Research Criteria

Priority	Weight	Components	Row
11	0.8	Service Quality	1
2	0.2	Product Quality	2



Graph 4: Prioritizing The Sub-Criteria Of Price

After making the model using Expert Choice Program and inserting the paired comparisons of the indices, the weight of the criteria were obtained, as shown in graph 4. As table 8 shows, the s sub-criterion of service quality is the most important with relative weight of 0.8. Therefore, this criterion has the highest weight among the sub-criteria of quality, and the sub-criterion of service quality has the last priority with relative weight of 0.2. The incompatibility rate of the paired comparisons has been obtained 0.00, and the comparisons are acceptable because the incompatibility rate is less than 0.10.

➤ **Weighting the s sub-criteria of product quality**

Table 9: The Paired Comparison Matrix of Product Quality Sub-Criteria

	Garanti	Tatabogh	BasteBandi	Tayidi	Vizhegi	Amalkard	Davam	Zibae
Garanti		1.0	3.0	3.0	2.0	3.0	3.0	3.0
Tatabogh			2.0	4.0	2.0	2.0	4.0	1.0
BasteBandi				3.0	2.0	3.0	3.0	3.0
Tayidi					2.0	3.0	4.0	4.0
Vizhegi						2.0	3.0	3.0
Amalkard							2.0	2.0
Davam								3.0
Zibae	Incon: 0.09							

After making the model using Expert Choice Program and inserting the paired comparisons of the indices, the weight of the criteria were obtained, as shown in graph 5. As table 10 shows, the sub-criterion of durability is the most important with relative weight of 0.239. Therefore, this criterion has the highest weight among the sub-criteria of service quality, and the sub-criteria of performance, features, concordance, guarantee, aesthetics and certification are the next priorities with relative weights of 0.223, 0.119, 0.116, 0.113, 0.092 and 2.053 respectively. The sub-criterion of packaging has the last priority with relative weight of 0.045. The incompatibility rate of the paired comparisons has been obtained 0.09, and the comparisons are acceptable because the incompatibility rate is less than 0.10.



Graph 5: Prioratizing the Sub-Criteria of Product Quality

Table 10: Prioratizing the Sub-Criteria of Product Quality

Priority	Weight	Components	Row
5	0.113	Guarantee	1
4	0.116	Conformance	2
8	0.045	Packaging	3
7	0.053	Certification	4
3	0.119	Features	5
2	0.223	Performance	6
1	0.239	Durability	7
6	0.092	Aesthetics	8

➤ **Weighting the sub-criteria of service quality**

Table 11: Paired Comparison Matrix Of The Sub-Criteria Of Service Quality

Table 12: Prioratizing The Research Criteria

Priority	Weight	Components	Row
1	0.55	On-Time Delivery	1
3	0.21	Product Replacement	2
2	0.24	Treatment Way	3

	TahvilBeMoghe	TavizMahsol	NahveBarkhord
TahvilBeMoghe		3.0	2.0
TavizMahsol			1.0
NahveBarkhord	Incon: 0.02		



Graph 5: Prioratizing The Sub-Criteria Of Price

After making the model using Expert Choice Program and inserting the paired comparisons of the indices, the weight of the criteria were obtained, as shown in graph 6. As table 12 shows, the sub-criterion of on-time delivery is the most important with relative weight of 0.55. Therefore, this criterion has the highest weight among the sub-criteria of service quality, and the sub-criterion of staff's way of treating customers is the next priority with relative weight of 0.24. The sub-criterion of product institution has the last priority with relative weight of 0.21. The incompatibility rate of the paired comparisons has been obtained 0.08, and the comparisons are acceptable because the incompatibility rate is less than 0.10.

- **Weighting the research alternatives**
- **Weighting the miniature power switch manufacturing companies in terms of price criterion**

Table 14: Prioritizing The Research Criteria

Priority	Weight	Components	Row
4	0.125	Ista Tavan Sanat	1
3	0.138	Toos Fuse	2
5	0.105	F & G	3
2	0.272	Pars Tavan Azma	4
1	0.36	Pars Final	5

Table 13: Paired Comparison Matrix Of The Companies Based On Price Criterion

	IstaTavanS	TosFiuz	F & J	ParsTavan/	ParsFinal
IstaTavanSanat		1.0	2.0	4.0	3.0
TosFiuz			2.0	2.0	3.0
F & J				2.0	2.0
ParsTavanAzma					2.0
ParsFinal	Incon: 0.06				



Graph 6: Prioritizing The Companies In Terms Of Price Criterion

After making the model using Expert Choice Program and inserting the paired comparisons of the indices, the weight of the criteria were obtained, as shown in graph 7. As table 14 shows, Pars Final Company is the most important with relative weight of 0.36, and this company has the highest weight of all the companies. Pars Tavan Azma, Toos Fuse and Istavan Sanat are the next priorities with relative weights of 0.272, 0.138, and 0.125 respectively. The incompatibility rate of the paired comparisons has been obtained 0.06, and the comparisons are acceptable because the incompatibility rate is less than 0.10.

- **Weighting miniature power switch manufacturing companies in terms of how to settle with customers**

Table 16: Prioritizing The Research Criteria

Priority	Weight	Components	Row
3	0.161	Ista Tavan Sanat	1
5	0.12	Toos Fuse	2
4	0.138	F & G	3
1	0.346	Pars Tavan Azma	4
2	0.235	Pars Final	5

Table 15: Paired Comparison Matrix Of The Companies Based On The How To Settle With Customers

	IstaTavanS	TosFiuz	F & J	ParsTavan/	ParsFinal
IstaTavanSanat		1.0	1.0	2.0	1.0
TosFiuz			1.0	3.0	3.0
F & J				2.0	2.0
ParsTavanAzma					2.0
ParsFinal	Incon: 0.03				



Graph 7: Prioritizing The Companies In Terms Of Price Criterion

After making the model using Expert Choice Program and inserting the paired comparisons of the indices, the weight of the criteria were obtained, as shown in graph 8. As table 16 shows, Pars Tavan Azma Company is the most important with relative weight of 0.346, and this company has the highest weight of all the companies in terms of the criterion of how to settle with customers. Pars Final, Ista Tavan Sanat and Toos Fuse are the next priorities with relative weights of 0.235, 0.161, and 0.138 respectively. The incompatibility rate of the paired comparisons has been obtained 0.03, and the comparisons are acceptable because the incompatibility rate is less than 0.10.

- **Weighting miniature power switch manufacturing companies in terms of the criterion of brand reputation**

Table 18: Prioratizing The Companies In Terms Of Brand Reputation

Priority	Weight	Components	Row
5	0.097	Ista Tavan Sanat	1
2	0.246	Toos Fuse	2
1	0.329	F & G	3
3	0.213	Pars Tavan Azma	4
4	115	Pars Final	5

Table 17: The Paired Comparison Matrix Of The Companies In Terms Of Brand Reputation

	IstaTavanS	TosFiuz	F & J	ParsTavan/	ParsFinal
IstaTavanSanat		2.0	3.0	3.0	1.0
TosFiuz			1.0	2.0	1.0
F & J				2.0	4.0
ParsTavanAzma					3.0
ParsFinal	Incon: 0.07				



Graph 8: Prioratizing The Companies In Terms Of Brand Reputation

After making the model using Expert Choice Program and inserting the paired comparisons of the indices, the weight of the criteria were obtained, as shown in graph 9. As table 18 shows, F & G Company is the most important with relative weight of 0.239, and this company has the highest weight of all the companies in terms of the criterion of brand reputation. Toos Fuse, Pars Tavan Azma and Pars Final are the next priorities with relative weights of 0.246, 0.213, and 0.115 respectively. The incompatibility rate of the paired comparisons has been obtained 0.07, and the comparisons are acceptable because the incompatibility rate is less than 0.10.

- **Weighting miniature power switch manufacturing companies in terms of customer satisfaction criterion**

Table 20: Prioratizing The Companies In Terms Of Customer Satisfaction Criterion

Priority	Weight	Components	Row
4	0.169	Ista Tavan Sanat	1
1	0.37	Toos Fuse	2
2	0.227	F & G	3
3	0.175	Pars Tavan Azma	4
5	0.06	Pars Final	5

Table 19: Paired Comparison Matrix Of The Companies Based On Customer Satisfaction Criterion

	IstaTavan S	TosFiuz	F & J	ParsTavan/	ParsFinal
IstaTavanSanat		2.0	3.0	1.0	5.0
TosFiuz			3.0	2.0	4.0
F & J				1.0	3.0
ParsTavanAzma					3.0
ParsFinal	Incon: 0.08				



Graph 9: Prioratization Of The Companies In Terms Of Customer Satisfaction Criterion

After making the model using Expert Choice Program and inserting the paired comparisons of the indices, the weight of the criteria were obtained, as shown in graph 10. As table 20 shows, Toos Fuse Company is the most important with relative weight of 0.37, and this company has the highest weight of all the companies in terms of the criterion of customer satisfaction. F & G, Pars Tavan Azma and Istavan Sanat companies are the next priorities with relative weights of 0.227, 0.175, and 0.169 respectively. The incompatibility rate of the paired comparisons has been obtained 0.08, and the comparisons are acceptable because the incompatibility rate is less than 0.10

- **Weighting miniature power switch manufacturing companies in terms of trustability criterion**

Table 22: Prioratizing The Companies In Terms Of Trustability Criterion

Priority	Weight	Components	Row
4	0.148	Ista Tavan Sanat	1
1	0.279	Toos Fuse	2
2	0.271	F & G	3
3	0.246	Pars Tavan Azma	4
5	0.056	Pars Final	5

After making the model using Expert Choice Program and inserting the paired comparisons of the indices, the weight of the criteria were obtained, as shown in graph 11. As table 22 shows, Toos Fuse Company is the most important with relative weight of 0.279, and this company has the highest weight of all the companies in terms of the criterion of trustability. F & G, Pars Tavan Azma and Istā Tavan Sanat companies are the next priorities with relative weights of 0.271, 0.246, and 0.148 respectively. The incompatibility rate of the paired comparisons has been obtained 0.09, and the comparisons are acceptable because the incompatibility rate is less than 0.10.

- **Weighting miniature power switch manufacturing co in terms of the criterion of customer-firm relationship**

Table 24: Prioratizing The Research Criteria

Priority	Weight	Components	Row
2	0.174	Ista Tavan Sanat	1
3	0.14	Toos Fuse	2
5	0.11	F & G	3
1	0.456	Pars Tavan Azma	4
4	0.12	Pars Final	5

Table 21: Paired Comparison Matrix Of The Companies In Terms Of Trustability Criterion

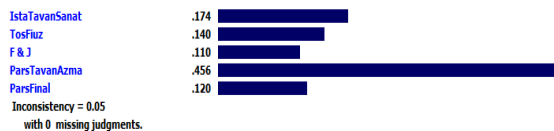
	IstaTavanS	TosFiuz	F & J	ParsTavan/	ParsFinal
IstaTavanSanat		2.0	3.0	3.0	6.0
TosFiuz			1.0	2.0	3.0
F & J				1.0	4.0
ParsTavanAzma					4.0
ParsFinal	Incon: 0.09				



Graph 10: Prioratizing The Companies In Terms Of Trustability Criterion

Table 23: Paired Comparison Matrix Of The Companies In Terms Of Customer-Firm Relationship

	IstaTavanS	TosFiuz	F & J	ParsTavan/	ParsFinal
IstaTavanSanat		2.0	2.0	4.0	1.0
TosFiuz			1.0	3.0	2.0
F & J				4.0	1.0
ParsTavanAzma					3.0
ParsFinal	Incon: 0.05				



Graph 11: Prioratizing The Companies In Terms Of The Criterion Of Customer-Firm Relationship

After making the model using Expert Choice Program and inserting the paired comparisons of the indices, the weight of the criteria were obtained, as shown in graph 12. As table 24 shows, Pars Tavan Azma Company is the most important with relative weight of 0.456, and this company has the highest weight of all the companies in terms of the criterion of customer-firm relationship. Ista Tavan Sanat, Toos Fuse and Pars Final companies are the next priorities with relative weights of 0.174, 0.14, and 0.12 respectively. The incompatibility rate of the paired comparisons has been obtained 0.06, and the comparisons are acceptable because the incompatibility rate is less than 0.10.

- **Weighting miniature power switch manufacturing companies in terms of aesthetics criterion**

Table 26: Prioratizing The Companies In Terms Of Aesthetics Criterion

Priority	Weight	Components	Row
4	0.075	Ista Tavan Sanat	1
3	0.129	Toos Fuse	2
2	0.354	F & G	3
1	0.404	Pars Tavan Azma	4
5	0.039	Pars Final	5

Table 25: Paired Comparison Matrix Of The Companies In Terms Of Aesthetics Criterion

	IstaTavanS	TosFiuz	F & J	ParsTavan/	ParsFinal
IstaTavanSanat		3.0	5.0	5.0	3.0
TosFiuz			3.0	5.0	3.0
F & J				1.0	8.0
ParsTavanAzma					8.0
ParsFinal	Incon: 0.04				



Graph 12: Prioratizing The Companies In Terms Of Aesthetics Criterion

After making the model using Expert Choice Program and inserting the paired comparisons of the indices, the weight of the criteria were obtained, as shown in graph 13. As table 26 shows, Pars Tavan Azma Company is the most important with relative weight of 0.404, and this company has the highest weight of all the companies in terms of the criterion of aesthetics. F & G, Toos Fuse and Ista Tavan Sanat companies are the next priorities with relative weights of 0.354, 0.129, and 0.075 respectively. The incompatibility rate of the paired comparisons has been obtained 0.04, and the comparisons are acceptable because the incompatibility rate is less than 0.10.

- Weighting miniature power switch manufacturing co in terms of product durability criterion

Table 28: Prioratizing The Companies In Terms Of Product Durability Criterion

Priority	Weight	Components	Row
3	0.169	Ista Tavan Sanat	1
4	0.1158	Toos Fuse	2
2	0.303	F & G	3
1	0.334	Pars Tavan Azma	4
5	0.036	Pars Final	5

Table 27: Paired Comparison Matrix Of The Companies In Terms Of Product Durability Criterion

	IstaTavanS	TosFiuz	F & J	ParsTavan/	ParsFinal
IstaTavanSanat		1.0	2.0	2.0	6.0
TosFiuz			2.0	3.0	6.0
F & J				1.0	7.0
ParsTavanAzma					7.0
ParsFinal	Incon: 0.02				
IstaTavanSanat	.169				
TosFiuz	.158				
F & J	.303				
ParsTavanAzma	.334				
ParsFinal	.036				

Inconsistency = 0.02
with 0 missing judgments.

Graph 13: Prioratizing The Companies In Terms Of Product Durability Criterion

After making the model using Expert Choice Program and inserting the paired comparisons of the indices, the weight of the criteria were obtained, as shown in graph 14. As table 28 shows, Pars Tavan Azma Company is the most important with relative weight of 0.034, and this company has the highest weight of all the companies in terms of the criterion of product durability. F & G, Istā Tavan Sanat and Toos Fuse companies are the next priorities with relative weights of 0.303, 0.169, and 0.158 respectively. The incompatibility rate of the paired comparisons has been obtained 0.06, and the comparisons are acceptable because the incompatibility rate is less than 0.10.

- Weighting miniature power switch manufacturing companies in terms of product performance criterion

Table 30: Prioratizing The Research Criteria

Priority	Weight	Components	Row
4	0.171	Ista Tavan Sanat	1
3	0.22	Toos Fuse	2
2	0.236	F & G	3
1	0.34	Pars Tavan Azma	4
5	0.033	Pars Final	5

Table 29: Paired Comparison Matrix Of The Companies In Terms Of Product Performance

	IstaTavanS	TosFiuz	F & J	ParsTavan/	ParsFinal
IstaTavanSanat		1.0	2.0	2.0	7.0
TosFiuz			2.0	3.0	6.0
F & J				1.0	7.0
ParsTavanAzma					7.0
ParsFinal	Incon: 0.07				



Graph 14: Prioratizing The Companies In Terms Of Product Performance Criterion

After making the model using Expert Choice Program and inserting the paired comparisons of the indices, the weight of the criteria were obtained, as shown in graph 15. As table 30 shows, Pars Tavan Azma Company is the most important with relative weight of 0.34, and this company has the highest weight of all the companies in terms of product performance criterion. F & G, Toos Fuse and Istas Tavan Sanat companies are the next priorities with relative weights of 0.236, 0.22, and 0.171 respectively. The incompatibility rate of the paired comparisons has been obtained 0.07, and the comparisons are acceptable because the incompatibility rate is less than 0.10.

- Weighting miniature power switch manufacturing companies in terms of the criterion of product features or properties

Table 32: Prioratizing The Research Criteria

Priority	Weight	Components	Row
4	0.089	Ista Tavan Sanat	1
3	0.101	Toos Fuse	2
2	0.32	F & G	3
1	0.46	Pars Tavan Azma	4
5	0.029	Pars Final	5

Table 31: Paired Comparison Matrix Of The Companies In Terms Of The Criterion Of Product Features Or Properties

	IstaTavanS	TosFiuz	F & J	ParsTavan/	ParsFinal
IstaTavanSanat		2.0	3.0	8.0	6.0
TosFiuz			4.0	7.0	4.0
F & J				1.0	9.0
ParsTavanAzma					9.0
ParsFinal	Incon: 0.08				



Graph 15: Prioratizing The Companies In Terms Of Product Features Of Properties

After making the model using Expert Choice Program and inserting the paired comparisons of the indices, the weight of the criteria were obtained, as shown in graph 16. As table 33 shows, Pars Tavan Azma Company is the most important with relative weight of 0.46, and this company has the highest weight of all the companies in terms of the criterion of product features or properties. F & G, Toos Fuse and Ista Tavan Sanat companies are the next priorities with relative weights of 0.32, 0.101, and 0.089 respectively, and Pars Final Company is the last priority with relative weight of 0.029. The incompatibility rate of the paired comparisons has been obtained 0.08, and the comparisons are acceptable because the incompatibility rate is less than 0.10.

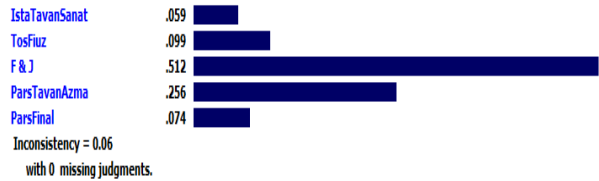
- **Weighting miniature power switch manufacturing companies in terms of certification rate criterion**

Table 34: Prioratizing The Companies In Terms Of Certification Rate Criterion

Priority	Weight	Components	Row
5	0.059	Ista Tavan Sanat	1
3	0.099	Toos Fuse	2
1	0.512	F & G	3
2	0.256	Pars Tavan Azma	4
4	0.074	Pars Final	5

Table 33: Paired Comparison Matrix Of The Companies In Terms Of Certification Rate

	IstaTavanS	TosFiuz	F & J	ParsTavan/	ParsFinal
IstaTavanSanat		2.0	6.0	6.0	1.0
TosFiuz			3.0	4.0	1.0
F & J				4.0	7.0
ParsTavanAzma					3.0
ParsFinal	Incon: 0.06				



Graph 16: Prioratizing The Companies In Terms Of Certification Rate Criterion

After making the model using Expert Choice Program and inserting the paired comparisons of the indices, the weight of the criteria were obtained, as shown in graph 17. As table 35 shows, F & G Company is the most important with relative weight of 0.512, and this company has the highest weight of all the companies in terms of the criterion of certification rate. Pars Tavan Azma, Toos Fuse and IstasTavan Sanat companies are the next priorities with relative weights of 0.256, 0.099, and 0.074 respectively, and Pars Final Company is the last priority with relative weight of 0.059. The incompatibility rate of the paired comparisons has been obtained 0.06, and the comparisons are acceptable because the incompatibility rate is less than 0.10.

- Weighting miniature power switch manufacturing companies in terms of appropriate packaging criterion

Table 35: Paired Comparison Matrix Of The Companies In Terms Of Appropriate Packaging Criterion

Table 36: Prioratizing The Research Criteria

Priority	Weight	Components	Row
4	0.117	Ista Tavan Sanat	1
3	0.173	Toos Fuse	2
2	0.178	F & G	3
1	0.488	Pars Tavan Azma	4
5	0.045	Pars Final	5

	IstaTavanS	TosFiuz	F & J	ParsTavan/	ParsFinal
IstaTavanSanat		2.0	1.0	5.0	3.0
TosFiuz			1.0	5.0	5.0
F & J				2.0	5.0
ParsTavanAzma					6.0
ParsFinal	Incon: 0.06				



Graph 17: Prioratizing The Companies In Terms Of Appropriate Packaging Criterion

After making the model using Expert Choice Program and inserting the paired comparisons of the indices, the weight of the criteria were obtained, as shown in graph 18. As table 37 shows, Pars Tavan Azma Company is the most important with relative weight of 0.488, and this company has the highest weight of all the companies in terms of the criterion of appropriate packaging. F & G, Toos Fuse and Istas Tavan Sanat companies are the next priorities with relative weights of 0.178, 0.173, and 0.117 respectively, and Pars Final Company is the last priority with relative weight of 0.045. The incompatibility rate of the paired comparisons has been obtained 0.06, and the comparisons are acceptable because the incompatibility rate is less than 0.10.

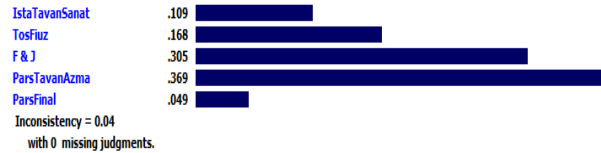
- **Weighting miniature power switch manufacturing companies in terms of concordance criterion**

Table 37: Paired Comparison Matrix Of The Companies In Terms Of Concordance Criterion

	IstaTavanS	TosFiuz	F & J	ParsTavan/	ParsFinal
IstaTavanSanat		2.0	3.0	3.0	3.0
TosFiuz			2.0	4.0	5.0
F & J				1.0	5.0
ParsTavanAzma					5.0
ParsFinal	Incon: 0.04				

Table 38: Prioratizing The Companies In Terms Of Concordance Criterion

Priority	Weight	Components	Row
4	0.109	Ista Tavan Sanat	1
3	0.168	Toos Fuse	2
2	0.305	F & G	3
1	0.369	Pars Tavan Azma	4
5	0.049	Pars Final	5



Graph 18: Prioratizing The Companies In Terms Of Concordance Criterion

After making the model using Expert Choice Program and inserting the paired comparisons of the indices, the weight of the criteria were obtained, as shown in graph 19. As table 39 shows, Pars Tavan Azma Company is the most important with relative weight of 0.369, and this company has the highest weight of all the companies in terms of the criterion of concordance. F & G, Toos Fuse and Istavan Sanat companies are the next priorities with relative weights of 0.305, 0.168, and 0.109 respectively, and Pars Final Company is the last priority with relative weight of 0.049. The incompatibility rate of the paired comparisons has been obtained 0.04, and the comparisons are acceptable because the incompatibility rate is less than 0.10.

- Weighting miniature power switch manufacturing companies in terms of guarantee criterion

Table 40: Prioratizing The Companies In Terms Of Guarantee Criterion

Priority	Weight	Components	Row
4	0.123	Ista Tavan Sanat	1
3	0.127	Toos Fuse	2
2	0.134	F & G	3
1	0.578	Pars Tavan Azma	4
5	0.037	Pars Final	5

Table 39: Paired Comparison Matrix Of The Companies In Terms Of Guarantee Criterion

	IstaTavanS	TosFiuz	F & J	ParsTavan/	ParsFinal
IstaTavanSanat		1.0	1.0	6.0	4.0
TosFiuz			1.0	5.0	4.0
F & J				5.0	5.0
ParsTavanAzma					9.0
ParsFinal	Incon: 0.03				



Graph 19: Prioratizing The Companies In Terms Of Guarantee Criterion

After making the model using Expert Choice Program and inserting the paired comparisons of the indices, the weight of the criteria were obtained, as shown in graph 20. As table 41 shows, Pars Tavan Azma Company is the most important with relative weight of 0.578, and this company has the highest weight of all the companies in terms of guarantee criterion. F & G, Toos Fuse and Istavan Sanat companies are the next priorities with relative weights of 0.134, 0.127, and 0.123 respectively, and Pars Final Company is the last priority with relative weight of 0.037. The incompatibility rate of the paired comparisons has been obtained 0.06, and the comparisons are acceptable because the incompatibility rate is less than 0.10.

- Weighting miniature power switch manufacturing co in terms of how to treat customers

Table 42: Prioratizing The Companies In Terms Of Staff's Way Of Treating Customers

Priority	Weight	Components	Row
3	0.087	Ista Tavan Sanat	1
2	0.097	Toos Fuse	2
4	0.087	F & G	3
1	0.641	Pars Tavan Azma	4
5	0.087	Pars Final	5

Table 41: Paired Comparison Matrix Of The Companies In Terms Of Staff's Way Of Treating Customers

	IstaTavanS	TosFiuz	F & J	ParsTavan/	ParsFinal
IstaTavanSanat		1.0	1.0	8.0	1.0
TosFiuz			1.0	5.0	1.0
F & J				8.0	1.0
ParsTavanAzma					8.0
ParsFinal	Incon: 0.01				



Graph 20: Prioratizing The Companies In Terms Of Staff's Way Of Treating Customers

After making the model using Expert Choice Program and inserting the paired comparisons of the indices, the weight of the criteria were obtained, as shown in graph 21. As table 43 shows, Pars Tavan Azma Company is the most important with relative weight of 0.641, and this company has the highest weight of all the companies in terms of the criterion of how to treat customers. Toos Fuse, Istavan Sanat and F & G companies are the next priorities with relative weights of 0.097, 0.087, and 0.087 respectively, and Pars Final Company is the last priority with relative weight of 0.087. The incompatibility rate of the paired comparisons has been obtained 0.06, and the comparisons are acceptable because the incompatibility rate is less than 0.10.

- Weighting miniature power switch manufacturing companies in terms of the criterion of inferior product replacement

Table 43: Paired Comparison Matrix Of The Companies In Terms Of The Criterion Of Inferior Product Replacement

	IstaTavanS	TosFiuz	F & J	ParsTavan/	ParsFinal
IstaTavanSanat		1.0	1.0	5.0	3.0
TosFiuz			1.0	5.0	3.0
F & J				5.0	3.0
ParsTavanAzma					9.0
ParsFinal	Incon: 0.01				

Table 44: Prioratizing The Companies In Terms Of The Criterion Of Inferior Product Replacement

Priority	Weight	Components	Row
2	0.126	Ista Tavan Sanat	1
3	0.126	Toos Fuse	2
4	0.126	F & G	3
1	0.574	Pars Tavan Azma	4
5	0.047	Pars Final	5



Graph 21: Prioratizing The Companies In Terms Of The Criterion Of Inferior Product Replacement

After making the model using Expert Choice Program and inserting the paired comparisons of the indices, the weight of the criteria were obtained, as shown in graph 22. As table 45 shows, Pars Tavan Azma Company is the most important with relative weight of 0.574, and this company has the highest weight of all the companies in terms of the criterion of inferior product replacement. Istavan Sanat, Toos Fuse and F & G companies are the next priorities with relative weights of 0.126, 0.126, and 0.126 respectively, and Pars Final Company is the last priority with relative weight of 0.047. The incompatibility rate of the paired comparisons has been obtained 0.06, and the comparisons are acceptable because the incompatibility rate is less than 0.10.

- Weighting miniature power switch manufacturing companies in terms of the criterion of on-time delivery of goods to customers

Table 46: Prioratizing The Companies In Terms Of The Criterion Of On-Time Delivery Of Goods To Customers

Priority	Weight	Components	Row
3	0.14	Ista Tavan Sanat	1
2	0.154	Toos Fuse	2
5	0.035	F & G	3
1	0.53	Pars Tavan Azma	4
4	0.14	Pars Final	5

Table 45: Paired Comparison Matrix Of The Companies In Terms Of The Criterion Of On-Time Delivery Of Goods To Customers

	IstaTavanS	TosFiuz	F & J	ParsTavan/	ParsFinal
IstaTavanSanat		1.0	5.0	5.0	1.0
TosFiuz			5.0	3.0	1.0
F & J				9.0	5.0
ParsTavanAzma					5.0
ParsFinal	Incon: 0.03				



Graph 22: Prioratizing The Companies In Terms Of The Criterion Of On-Time Delivery Of Goods To Customers

After making the model using Expert Choice Program and inserting the paired comparisons of the indices, the weight of the criteria were obtained, as shown in graph 23. As table 47 shows, Pars Tavan Azma Company is the most important with relative weight of 0.53, and this company has the highest weight of all the companies in terms of the criterion of on-time delivery of goods to customers. Toos Fuse, Istavan Sanat and Pars Final companies are the next priorities with relative weights of 0.154, 0.14, and 0.14 respectively, and F & G Company is the last priority with relative weight of 0.035. The incompatibility rate of the paired comparisons has been obtained 0.03, and the comparisons are acceptable because the incompatibility rate is less than 0.10.

- Selection of the best company from among the miniature power switch producing companies
- The second question: The products of which company have the best combination in terms of quality, price and customer loyalty using AHP and TOPSIS Models?

We have used TOPSIS technique in this study to select the best miniature power switch manufacturing company. The best miniature power switch manufacturing company is one which has the highest distance from the negative factors and the lowest distance from the positive factors.

The first step: identifying the criteria and alternatives

The main indicators (criteria) and alternatives have been identified. Therefore, the alternatives rating matrix has been formed based on the criteria. We have used 9-point Likert scale to rate the strategies based on each criterion. The score given to each miniature power switch manufacturing company based on the indices with regard to the geometric mean of the experts' views has been shown in table 47.

Table 47: TOPSIS Technique Decision Matrix

Pars	Pars	F & G	Toos	Ista	price
2.30	4.65	3.72	3.30	2.95	How to
2.31	4.78	4.88	3.30	1.16	Good's
4.52	4.31	3.68	3.65	3.11	Customer
2.56	4.72	4.63	3.31	2.93	trustabilit
2.88	4.48	3.78	3.98	3.30	Quality
2.98	4.32	3.59	2.58	3.63	aesthetics
4.82	4.72	4.82	3.58	3.52	Product
4.93	4.72	3.04	3.98	2.31	Product
2.55	2.54	3.58	3.68	3.57	Product
1.89	4.57	4.20	3.50	2.57	Certificat
2.24	4.54	2.58	3.65	3.54	Product's
2.66	4.64	2.80	3.44	3.40	concorda
3.05	3.08	3.06	3.14	2.78	guarantee
2.58	2.87	2.98	3.12	3.88	Way of
2.69	4.68	4.24	3.68	3.08	Inferior
2.14	4.61	4.37	3.98	3.21	On-time
2.66	4.87	4.11	3.78	3.24	

The second step: obtaining descaled matrix

In the second step, decision matrix has been descaled with inflation. Each descaled matrix is shown with N and each one of its element is shown with n_{ij} . Each n_{ij} is calculated by dividing the corresponding element in the initial matrix by the chi-square root of the elements of the corresponding column in the following way:

$$n_{ij} = \frac{a_{ij}}{\sqrt{\sum_{i=1}^m a_{ij}^2}}$$

Table 48: Descaled Decision Matrix

Pars Final	Pars Tavan Azma	F & G	Toos Fuse	Ista Tavan Sanat	price
0.30	0.60	0.48	0.43	0.38	How to
0.29	0.60	0.61	0.41	0.14	Good's
0.52	0.50	0.42	0.42	0.36	Customer
0.31	0.56	0.55	0.40	0.35	trustability
0.35	0.54	0.45	0.48	0.40	Quality
0.38	0.56	0.46	0.33	0.47	aesthetics
0.50	0.49	0.50	0.37	0.36	Product
0.56	0.54	0.35	0.45	0.26	Product
0.35	0.35	0.50	0.51	0.49	Product
0.24	0.59	0.54	0.45	0.33	Certificati
0.29	0.60	0.34	0.48	0.46	Product's
0.34	0.60	0.36	0.44	0.44	concordan
0.45	0.46	0.45	0.46	0.41	guarantee
0.37	0.41	0.43	0.45	0.56	Way of
0.32	0.56	0.51	0.44	0.37	Inferior
0.25	0.55	0.52	0.47	0.38	On-time
0.31	0.57	0.48	0.44	0.38	

The third step: obtaining weighted descaled matrix

In the third step, the descaled matrix (N) should be turned into weighted descaled matrix (V). We should have the weights of the indices in order to obtain weighted descaled matrix. The weight of each one of these indices has been calculated using AHP technique, as shown in table 52-4. For this purpose, the descaled matrix is multiplied by the square matrix whose main diagonal elements are the weights of the indices and whose other elements is zero. The resulting matrix is called weighted descaled matrix and is shown by V (Momeni & sharifi, 1389: 153).

Table 49: Weighted Descaled Matrix

Pars Final	Pars Tavan Azma	F & G	Toos Fuse	Ista Tavan Sanat	descaled matrix
0.021	0.042	0.034	0.030	0.027	price
0.015	0.032	0.032	0.022	0.008	with customers
0.032	0.030	0.026	0.026	0.022	reputation
0.018	0.033	0.033	0.023	0.021	satisfaction
0.024	0.037	0.031	0.032	0.027	trustability
0.026	0.037	0.031	0.022	0.031	with customers
0.015	0.015	0.015	0.011	0.011	aesthetics
0.038	0.037	0.024	0.031	0.018	durability
0.024	0.024	0.033	0.034	0.033	performance
0.012	0.030	0.027	0.023	0.017	features
0.016	0.032	0.018	0.025	0.025	rate
0.019	0.033	0.020	0.024	0.024	packaging
0.019	0.019	0.019	0.019	0.017	concordance
0.031	0.035	0.036	0.038	0.047	guarantee
0.000	0.000	0.000	0.000	0.000	treatment
0.000	0.000	0.000	0.000	0.000	replace
0.000	0.000	0.000	0.000	0.000	delivery

The fourth step: calculating the positive and negative ideals

At this step, a positive ideal (V^+) and a negative ideal (V^-) is calculated for each index. In the present decision matrix, all indices are of positive kind. Now, it is time to obtain positive and negative ideals for each index.

- For each positive index, positive ideal is the greatest number of the corresponding column in V matrix.
- For each positive index, negative ideal is the smallest number of the corresponding column in V matrix.
- For each negative index, positive ideal is the greatest number of the corresponding column in V matrix.
- For each negative index, positive ideal is the smallest number of the corresponding column in V matrix.
- For each negative index, negative ideal is the greatest number of the corresponding column in V matrix.

Table 50: The Positive And Negative Ideal Amount For Decision-Making

V+	0.042	0.032	0.032	0.033	0.037	0.037	0.015	0.038	0.034	0.030	0.032	0.033	0.019	0.047	0.000	0.000	0.000
V-	0.021	0.008	0.022	0.018	0.024	0.022	0.011	0.018	0.024	0.012	0.016	0.019	0.017	0.031	0.000	0.000	0.000

The fifth step: calculating the distance of each alternative from the positive and negative ideals

Table 51: Calculations Of D+ And D-

d-	d+	strategies
0.0247	0.04431	Ista Tavan Sanat
0.0312	0.03088	Toos Fuse
0.0392	0.02962	F & G
0.0536	0.01641	Pars Tavan Azma
0.0245	0.04905	Pars Final

The sixth step: calculating the ideal solution

At this step, each alternative's relative rate of closeness to the ideal solution is calculated. For this purpose, the formula is used:

$$CL_i^* = d_i^- / (d_i^- + d_i^+)$$

The value of CL is between zero and one. The closer this value to the number 1, the closer the strategy will be to the ideal answer, and the better it will be (Habibi, 1390).

Table 52: The Calculated Values Of CL

priority	score	strategies
4	0.35771	Ista Tavan Sanat
3	0.50237	Toos Fuse
2	0.56978	F & G
1	0.76544	Pars Tavan Azma
5	0.33332	Pars Final

7. Conclusion and Suggestions

The right combination of price and quality was investigated in this research with focus on customer loyalty to miniature power switch. Three series of questionnaires were distributed among 30 top managers and experts of the electricity- producing companies and the electricity- distributing companies who were a part of the main customers of this product. In the first questionnaire, using two-sentential test and SPSS software, 17 criteria including concordance, guarantee, certification, features, aesthetics, performance, durability, how to settle with customers, price, how to treat customers, replacement of inferior products, on-time delivery of goods to customers, customer-firm relationship, trustability, brand reputation, and customer satisfaction and packaging were confirmed as important criteria in the sales of miniature power switch, and it was shown via the second questionnaire and by use of AHP Model and EXPRESS CHOICE software in relation to the importance of the main criteria of quality, price and customer loyalty that the first priority goes to quality, the second priority belongs to price and the last one goes to customer loyalty. It was also shown in relation to the sub-criteria of price that how to settle with customers has the most importance. Therefore, it can be said that customers mainly pay attention to way of payment rather than price. In the sub-criteria of customer loyalty, trustability or organization's loyalty to the legal and ethical commitments are the most important, and in the sub-criteria of quality, service quality is highly important. Among the sub-criteria of service quality, on-time delivery of products is in priority, and among the sub-criteria of product quality, the sub-criterion of durability has had the highest weight and thus the first priority and the sub-criterion of packaging of miniature power switch is the least important. In terms of the rate of scores that the companies have received in terms of the criteria, Pars Final Company has received the highest score in terms of price and F & G Company has had the highest price and is in the last priority. Toos Fuse Company has received the highest score in terms of the criteria of trustability and customer satisfaction, and F & G Company has been shown to be of the most importance in terms of brand reputation, and Pars Tavan Azma Company has received the highest score in terms of the criteria of settling, customer-firm relationship, aesthetics, durability, performance, features, appropriate packaging, on-time delivery of goods, guarantee and how to treat customers. Finally, Pars Tavan Azma Company acted as the best company using TOPSIS Model and Excel software, meaning that this company had the best quality-price combination in terms of customer loyalty to miniature power switch. F & G Company had the second position and Toos Fuse had the third position, Istā Tavan Company had the fourth priority and Pars Final Company was in the last priority.

It is recommended that the raw materials and the pieces bought for the production of goods and products be examined and controlled in order to prevent from excessive expenses for inferior items imported to the company. Inspections should be directed toward the processes of construction in order to prevent from wasting materials, human resources and working time in the next stages if some kind of defect or problem occurs with the semi-manufactured product. For thorough, accurate, all round and efficient management, we need to plan, implement and establish a quality management system in our organization. Furthermore, it is advisable to pay attention to the customers' ideas and try to consider their views and stop blaming and doing face-threatening acts toward one's competitors and do fair and just competition in order to promote one's trustability beside the customers. The managers and authorities of companies are also required to focus their attention first on the most important criteria and then deal with the other criteria in order to increase their sales and promote customer loyalty. Future researchers can investigate miniature power switch product in terms of other factors including promotion, advertising, and distribution for sales or use prioritization with MADM techniques in future studies and the results should be compared at the end and combined using merge techniques.

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