



Identify and Ranking the Factors affecting Customer satisfaction in the carpet Industry (Case Study: Sahand Carpet Co.)

Kazemi Mostafa¹, Rajabi Batool¹ and Pirani Parvaneh²

¹Faculty of Economics and Business Administration, Ferdowsi University of Mashhad, IRAN

²University of Tehran, Qom College, IRAN

Available online at: www.isca.in

Received 23rd April 2013, revised 25th May 2013, accepted 3rd June 2013

Abstract

This study is investigating the factors affecting customer satisfaction in carpet industry, classifying of customer need in three categories of must-be, one-dimensional and attractive requirement in Kano model, also ranking factors in each category using TOPSIS. So, reviewing the literature and experts' ideas was used to indentify factors related customer satisfaction. Then a survey was conducted in due to classify and rank the factors. In the phase of identifying factors, study population was consisted of managers and experts who are active in carpet industry and in part of classification and ranking of factors affecting customer satisfaction, study population consisting of people who have come to branches of Sahand carpet co. in Gorgan city and have bought carpet. Questionnaire was used to collect data. SPSS software was used for data analysis and showed that the durability and perseverance are the most important factor and classified in must-be requirement. The most important factor in one-dimensional requirement and attractive requirement are respectively price and consistent with life style criteria.

Keywords: Customer satisfaction, must-be requirement, one-dimensional requirement, attractive requirement, Kano model and TOPSIS technique.

Introduction

One of the most important developments in the field of quality improvement approaches in the last decade of the twentieth century was measurement of customer satisfaction as one of the core requirements of quality management systems such as ISO 9000 or excellence awards, as Foundation for Quality Management model in Europe was also in Iran over the past decade with the introduction of quality management models and tools which have been developed to meet customer demands, issues such as customer satisfaction and attention to their needs have been emphasized.

Iran's carpet industry with a long history has particular role in the employment context, main contribution of non-oil exports and acceptance in Europe and global market. In the area of economic activity, carpet is kind of artistry industrial. It means that the products of this industry are not only evaluated based on meeting physical needs of the buyers (national and international buyer) but also some of artistic criteria would be considered¹.

Identification of the factors that have the greatest impact on customer satisfaction is very important in carpet industry and due to special role of the carpet industry in Iran's economy, companies should design and formulate particular strategic plan. Therefore, these companies must identify target markets based on their capital and technological facilities and competitive condition. Of course market research to obtaining information is inevitable. However, due to cultural, economical and social

differences, independent research should be done in each segment of the markets².

A special technique for measuring customer satisfaction is Kano model which is the main method and technique for measuring and classification of the factors affecting customer satisfaction in this study. Because Kano technique is mostly used for classification of customer needs, we used TOPSIS method as multi-criteria decision making techniques to rank factors. So this study aimed not only to identify and classify the factors affecting customer satisfaction in the carpet industry by the Kano model, but also to use TOPSIS technique ranking criteria.

Research literature: The latest national and international research in the textile industry can be briefly outlined as following:

In a study titled "Factors affecting consumers' attitude towards the various brands of carpet" by Ranjbarian and et al relationship between the expected attributes of carpet buyers point of views and their attitudes about various brands were investigated. Identified features include: advertising, perceived quality, price, brand reputation and aesthetic².

In another study in 2010, Tahamy studied customer satisfaction with the Nasaji Nemone Co. - a textile company- using CSM method. In this study the effect of independent variables such as product quality, fiber price, shipping, packaging and delivery on customer satisfaction as the dependent variable was examined³.

"Customer Satisfaction in textile industry" was carried out by the Academy of Management Studies in India in 2007-2006⁴. This study aimed to investigate the importance of the factors affecting customer satisfaction. Moreover factors affecting customer satisfaction include: ordering process, timeline of delivery, products quality, pricing of products, credit facility and grievance redressal mechanism have been identified.

Gocek et al in 2007 examined customer satisfaction in the textile industry. In this study the effect of independent variables such as brand, perceived quality and perceived service quality on customer satisfaction was analyzed. Results showed that textile companies should formulate the sales and marketing strategies based on the effect of independent variables on customer satisfaction. As Independent variables affect customer satisfaction vary according to the culture conditions, so cultural differences should be considered as important factor in formulating sales and marketing strategies⁵.

In 2008 Salerno-Kochan investigated consumer perception of the quality of textile products. In this study, product quality was considered synonymous with consumer satisfaction, also aimed to develop a customer satisfaction model in textile industry. In provided model factor affecting customer satisfaction as aesthetic, durability, quality of finishing, kind of fibers, kind and structure of fabric, trade name, price and fashion⁶.

HadjTaeib et al in 2010 modelled the consumer satisfaction with the new design in the textile industry. This model introduces an index that considers various criteria that affect consumer satisfaction with regard to their importance then the degree of consumer satisfaction can be measured. This index can be used on making decision to invest in new projects and before mass production, its flaws would be identified and so failure or additional costs can be avoided⁷. In this paper, consistent with life style, well-designed, multi-application, high quality and new designs being considered as factors that have impact on consumer satisfaction. Factors affecting customer's satisfaction have been shown in table -1.

Customer Satisfaction: A client may generally be satisfied or dissatisfied after receiving the service or the purchase and use of a product. Satisfaction is a positive feeling that arise when the person using the product or receiving service. This feeling is created from interaction of expectations of the customer and supplier performance.

If the goods and services received by the client are assessed to the level of expectations, sense of satisfaction will be developed. Customer will be delighted, if the quality of service and product is higher than the level of customer expectations and a lower level of service and goods will lead to customer dissatisfaction. Degree of satisfaction, dissatisfaction and delight in every time and in every case is different and depends on the relationship between the customer expectations and supplier performance in terms of quality of goods and services⁸.

Table-1
List of factors affecting customer's satisfaction

Item	Factor
1	Up to date design
2	Price
3	Prepayment to price proportion
4	Variety of design
5	Consistent with lifestyle
6	Perceived quality
7	Brand Loyalty
8	Consistent with relevant product standards
9	Prepayment process
10	Respond to complaints
11	Awareness and reputation
12	Brand value
13	Mistake and lose acceptance
14	Good design
15	Product durability
16	price-quality proportion
17	Pay off process
18	Quality of fibres
19	Respond quickly to complaints
20	Provide appropriate information from vendors
21	Consistent with market prices
22	Pervious company performance in terms of quality

Kano Model: In the late seventies of the twentieth century professor Noriaki Kano of Tokyo Rika university developed the model which has its roots in motivation-Hygiene theory (M-H theory), developed in 1959 by Frederic Herzberg. So far customer satisfaction was mostly seen as a one-dimensional construction - the higher the perceived product quality, the higher the customer's satisfaction and vice versa. Kano defined quality as two dimension concept. These two dimensions were. i. how fully functional some aspect of a product is. ii. how satisfied customer is. Considering the quality of product function and consumer satisfaction on two dimensional axes indicates that the definition of quality is much more sophisticated. Base on this definition three categories of quality have been developed: must-be quality, functional quality and attractive quality⁹.

Must-be quality: must-be quality is the product's basic required quality characteristics considered by the customers. If these needs are not satisfied, the customers will be very dissatisfied. In others words, when the customers care about these product's basic quality characteristics, even if the needs are satisfied, the customer satisfaction level still will not increase, because according to the customer's thought pattern, the think that satisfying the basic needs is a necessary factors. It can be seen that having the must-be quality will only allow the customers to not be dissatisfied with situation. Must-be quality is a clear market competitive factor; customers treat it as necessary factors. Customers will not only clearly request it, but also will consider it as a basic necessity before selecting the

product. If the product does not contain these criteria, the customers will not be interested in the product at all¹⁰.

One dimensional quality: the one dimensional quality's availability level is proportional to the customer satisfaction level which means that the higher its availability level, the higher the customer satisfaction level; however, for the opposite, it will be lower. One dimensional quality is a clear market competitive factor. Usually, a customer will clearly request that quality characteristics which are higher than other products, the customers will be happy to choose that products⁹.

Attractive Quality: Attractive quality has the biggest impact on customer satisfaction in the product quality characteristics. Usually, customers do not know or clearly express their needs regarding this. When the product has the attractive quality characteristics the customer will feel very happy and the happiness will increase with the availability level. However, even if the product does not have the attractive quality characteristics, the customer will not be dissatisfied because of this¹⁰.

Figure-1 shows the customer's need classification based on the Kano model.

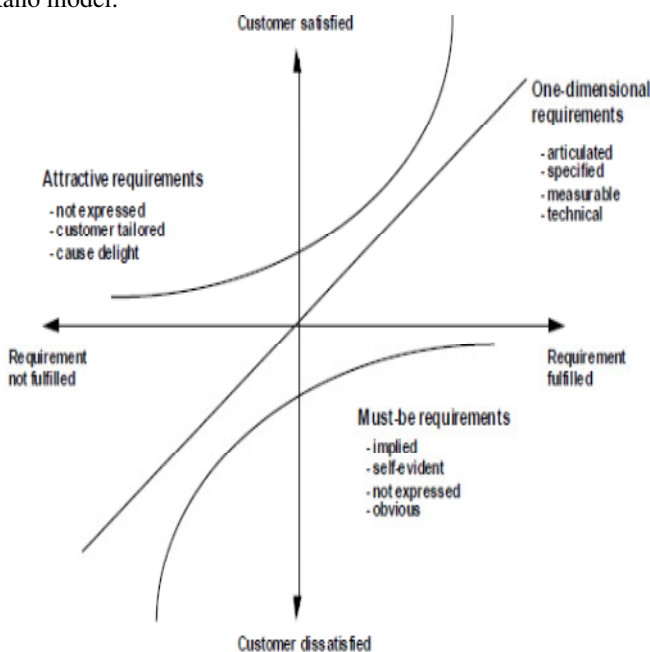


Figure-1
Kano's model of customer satisfaction

Steps of Kano Model: Step one: Identification of product or service requirements

The starting point in Kano model is determination of product requirements which will be done in explorative investigations. Griffin/Hauser found that only 20 to 30 customer interviews in

homogenous segments suffice to determine approximately 90 - 95% of all possible product requirements.

Many market research institutes use focus group interviews to determine product requirements, assuming that group dynamic effects enable a greater number of more diversified customer needs to be discovered. Compared with the expense, individual interviews seem to be more favorable. Customer interviews are useful for registering visible product requirements and customer problems, but when investigating potential new and latent product requirements they usually do not suffice. Especially attractive requirements are not expressed by the customer, as these are the features he does not expect¹¹. At this stage in order to understand the needs and demands of customers and the factors that affecting their satisfaction, in addition to search and explore the Internet and library resources and search in magazines and periodicals; Customer needs assessment questionnaire was used which was distributed among ten experts and managers. Achieved factors in this phase are underlying questions in Kano questionnaire.

Step two: Construction and distribution of the Kano questionnaire

Must-be, one-dimensional and attractive requirements as well as product requirements towards which the customer is indifferent can be classified by means of a questionnaire. For each product feature a pair of questions is formulated to which the customer can answer in one of five different ways. The first question concerns the reaction of the customer if the product has that feature (functional form of the question) the second concerns his reaction if the product does not have that feature (dysfunctional form of the question).

Kano evaluation table: By combining the two answers in the following evaluation table, the product features can be classified. The functional and dysfunctional features of questions converted to one response. Responses are classified in the Kano table on six categories. The Must-be requirements are indicated in table as M, O stands for one -dimensional features and A refers to the attractive features of products. These three features are the Kano model requirement level.

If combining the answers yields category I, this means that the customer is indifferent to this product feature. He/she does not care whether it is present or not. He/she is, however, not willing to spend more on this feature. Category Q stands for questionable result. Normally, the answers do not fall into this category. Questionable scores signify that the question was phrased incorrectly or that the person interviewed misunderstood the question or crossed out a wrong answer by mistake. If looking up the answer in the evaluation table yields category R, this product feature is not only wanted by the customer but he/she even expects the reverse. Table-3 shows Kano evaluation table.

Table-2
Functional and dysfunctional question in the Kano questionnaire

If the product has X requirement, how do you feel? (Functional form of the question)	If the product does not has X requirement, how do you feel?(Dysfunctional form of the question)
1. I like it that way 2. It must be that way 3. I am neutral 4. I can live with it that way 5. I dislike it that way	1. I like it that way 2. It must be that way 3. I am neutral 4. I can live with it that way 5. I dislike it that way

Table-3
Kano evaluation table

Customer requirements		Dysfunctional (negative) question				
		1.Like	2.Must be	3.neutral	4.live with	5.dislike
Functional (positive) question	1.Like	Q	A	A	A	O
	2.Must be	R	I	I	I	M
	3.neutral	R	I	I	I	M
	4.live with	R	I	I	I	M
	5.dislike	R	R	R	R	Q

Customer requirement is.

A: Attractive O: One-dimensional M: Must-be Q: Questionable R: Reverse I: Indifference

Step 3: Evaluation and interpretation. Collected questionnaire are used for analysis. After having combined the answers to the functional (positive) and dysfunctional (negative) question in the evaluation table, the results of the individual product criteria are listed in the table of results which shows the overall distribution of the requirement categories. The next step is to analysis and interprets the results.

Evaluation process of Kano model: The following possibilities are available for processing the results of a Kano survey: Evaluation according to frequencies

An overview of the requirement categories of the individual product or service requirements is gained from the table of results.

The easiest method is evaluation and interpretation according to the frequency of answers. If the individual product requirements cannot be unambiguously assigned to the various categories, the evaluation rule "M>O>A>I" is very useful.

When making decisions about product developments, primarily those features have to be taken into considerations which have the greatest influence on the perceived product quality. First those requirements have to be fulfilled which cause dissatisfaction if not met. When deciding which attractive requirements should be satisfied, the decisive factor is how important they are for the customer. This can be determined by using "self-stated-importance" in the questionnaire. If those two or three attractive requirements are fulfilled which are regarded as the most important ones per customer segment, the result is a package of product features which cannot be beaten.

Customer satisfaction coefficient (CS coefficient): The customer satisfaction coefficient states whether satisfaction can be increased by meeting a product requirement, or whether fulfilling this product requirement merely prevents the customer from being dissatisfied. Different market segments usually have different needs and expectations so sometimes it is not clear whether a certain product feature can be assigned to the various categories, it is especially important to know the average impact of a product requirement on the satisfaction of all the customers. The CS-coefficient is indicative of how strongly a product feature may influence satisfaction or, in case of its" non-fulfilment" customer dissatisfaction. To calculate the average impact on satisfaction it is necessary to add the attractive and one-dimensional columns and divide by the total number of attractive, one-dimensional, must-be and indifferent responses. For the calculation of the average impact on dissatisfaction you should add the must-be and one-dimensional columns and divide by the same normalizing factor

$$\text{Extent of satisfaction} = \frac{A + O}{A + O + M + I}$$

$$\text{Extent of dissatisfaction} = \frac{O + M}{(A + O + M + I) \times (-1)}$$

A minus sign is put in front of the CS-coefficient of customer dissatisfaction in order to emphasize its negative influence on customer satisfaction if this product quality is not fulfilled. The positive CS coefficient ranges from 0 to 1; the closer the value is to 1, the higher the influence on customer satisfaction. A positive CS-coefficient which approaches 0 signifies that there is very little influence. At the same time, however, one must also take the negative CS-coefficient into consideration. If it approaches -1, the influence on customer dissatisfaction is especially strong if the analyzed product feature is not fulfilled.

A value of about 0 signifies that this feature does not cause dissatisfaction if it is not met.

TOPSIS technique: TOPSIS was initially developed by Hwang and Yoon in 1981. In this technique, factors are evaluated and selected by individual or group. TOPSIS is based on the concept that the chosen alternative should have the shortest geometric distance from the positive ideal solution (the most important) and the longest geometric distance from the negative ideal solution (less important). In other words, the distance of a factor with positive and negative ideal is measured and the factors are ranked and prioritized based on the measurement¹³.

The TOPSIS process is carried out as follows: i. creation of evaluation matrix. Create an evaluation matrix consisting of alternatives and criteria, with the intersection of each alternative and criteria. ii. normalizing decision matrix. The matrix is then normalised to form the matrix using the normalization method and calculating the weighted normalized decision matrix. iii. determination of best and worst alternative. Determine the worst alternative and the best alternative which are respectively associated with the criteria having a positive impact, and the criteria having a negative impact. iv. Calculation of distance from best and worst alternative. Calculate the distance between the best alternative and worst alternative. v. Calculation of C_i and ranking alternative. Calculate the relative closeness to the idea solution and rank the alternatives in descending order. In other words, C_i is the higher; the higher is the degree of importance closeness of the alternative¹³.

$$C_i = \frac{D_i^-}{D_i^- + D_i^+}$$

Methodology

According to using Kano model and TOPSIS techniques in classification and prioritization of customer needs, the objective of this research is applied. Therefore, the data collection was conducted in two stages. In the first phase, factors affecting customer satisfaction has been identified with reviewing literature and experts ideas. But the second stage is a kind of descriptive – survey research because the needs of customer are classified and prioritized in this stage.

In order to collect data, two questionnaires were used. The first questionnaire was designed to identify factors influencing customer satisfaction which distributed among decision team (Comprised of executives and experts in carpet industry). The second questionnaire was Kano questionnaire. The questions used in the questionnaire were derived factor in the first questionnaire; and distributed between carpet buyers. In the next step criteria was classified using the Kano Model and was ranked using TOPSIS technique.

The population is comprised of all purchasers coming to the Sahand Carpet store in Gorgan in the research time span.

Sampling was non-random and Cochran formula used to determine the number of sample. Sample size was 196 people.

The reliability of the questionnaire was tested using Cronbach's alpha which was 0.85.

Results and Discussion

Classification of criteria using Kano model

Step 1: the data analysis based on the frequency modulation

This is the first and easiest method of analysis for Kano model. Based on this method, each feature, considering it's frequency from most to least can be classified. The result has been shown in the table- 4.

Step 3: data analysis- based on Customer satisfaction coefficient. The result has been shown in the table-5.

Ranking of factors affecting customer satisfaction

Once the criteria were classified and it was determined that each criteria in each requirement will be, ranking is done using the TOPSIS technique. We used TOPSIS to rank criteria in each requirement. The results have been shown in the table 6-8.

In this study, the factors affecting customer satisfaction in the carpet industry was identified, then Kano model is used to classify the must-be requirements, one-dimensional and attractive requirement. Ranking of each of these factors in each requirement category was done using TOPSIS technique. According to data achieved based on the classification and rankings of factors recommendations is provided to enhance customer satisfaction.

Based on the table-4 factors such as product durability, price-quality proportion, consistent with market prices, perceived quality, consistent with relevant product standards, provide appropriate information from vendors and brand loyalty are classified in must-be requirement. In the case of lack of these factors, customers will be dissatisfied, while considering these factors in product do not affect the customer's satisfaction. Therefore, in order to customer dissatisfaction, Sahand Carpet Co. should satisfy these factors in appropriate way and avoid additional costs for these factors.

According to table-4, factors such as price, good design, quality of fibres, prepayment to price proportion, prepayment process, pay off process, mistake and lose acceptance, respond to complaints, respond quickly to complaints, pervious company performance in terms of quality, awareness and reputation and brand value are categorized in one-dimensional requirement. This means that these factors have direct impact on customer satisfaction so should be provided in the best way. Based on table-7 the price and brand value respectively have the most and least effect on customer satisfaction.

Table-4
Data analysis based on the frequency modulation

Factor	Must-be	One-dimensional	Attractive	indifference	questionable	Reverse	category
Factor 1	6	70	89	31	0	0	A
Factor 2	7	155	25	9	0	0	O
Factor 3	9	139	30	18	0	0	O
Factor 4	9	55	72	59	0	1	A
Factor 5	7	75	98	16	0	0	A
Factor 6	99	58	26	13	0	0	M
Factor 7	79	65	31	21	0	0	M
Factor 8	98	68	9	16	0	5	M
Factor 9	12	114	37	33	0	0	O
Factor 10	11	108	52	25	0	0	O
Factor 11	6	79	69	42	0	0	O
Factor 12	7	78	52	59	0	0	O
Factor 13	19	110	50	17	0	0	O
Factor 14	3	153	30	10	0	0	O
Factor 15	126	51	9	10	0	0	M
Factor 16	125	28	22	12	9	0	M
Factor 17	18	112	55	11	0	0	O
Factor 18	32	146	13	5	0	0	O
Factor 19	9	106	50	24	7	0	O
Factor 20	80	7	60	40	5	4	M
Factor 21	112	37	24	13	8	2	M
Factor 22	39	92	48	17	0	0	O
Factor 23	48	87	37	24	0	0	O

Table-5
analysis based on the customer satisfaction coefficient

Factor	category	Satisfied	Dissatisfied
Factor 1	A	0.811	-0.388
Factor 2	O	0.918	-0.827
Factor 3	O	0.862	-0.755
Factor 4	O	0.651	-0.415
Factor 5	O	0.883	-0.536
Factor 6	M	0.429	-0.801
Factor 7	M	0.49	-0.735
Factor 8	M	0.403	-0.869
Factor 9	O	0.77	-0.643
Factor 10	O	0.816	-0.607
Factor 11	O	0.755	-0.434
Factor 12	O	0.663	-0.434
Factor 13	O	0.816	-0.658
Factor 14	O	0.934	-0.796
Factor 15	M	0.306	-0.903
Factor 16	M	0.267	-0.818
Factor 17	O	0.852	-0.663
Factor 18	O	0.811	-0.908
Factor 19	O	0.825	-0.608
Factor 20	M	0.358	-0.465
Factor 21	M	0.328	-0.801
Factor 22	O	0.714	-0.668

Table-6
Ranking criteria in must-be requirement using TOPSIS

Rank	Features	Importance %
1	Product durability	0.6082
2	price-quality proportion	0.6044
3	Consistent with market prices	0.5078
4	Perceived quality	0.5038
5	Consistent with relevant product standards	0.5015
6	Provide appropriate information from vendors	0.4018
7	Brand Loyalty	0.3464

Table-7
Ranking criteria in one-dimensional requirement using TOPSIS

Rank	Features	Importance %
1	Price	0.6090
2	Good design	0.6014
3	Quality of fiber	0.6007
4	Prepayment to price proportion	0.5158
5	Prepayment process	0.4984
6	Pay off process	0.4928
7	Mistake and lose acceptance	0.4920
8	Respond to complaints	0.4874
9	Respond quickly to complaints	0.4778
10	Pervious company performance in terms of quality	0.4705
11	Awareness and reputation	0.4523
12	Brand value	0.4451

Table-8
Ranking criteria in attractive requirement using TOPSIS

Rank	Features	Importance %
1	Consistent with lifestyle	0.5562
2	Up to date design	0.5418
3	Variety of design	0.4303

According to the table-4, factors such as consistent with lifestyle, up to date design and variety of design are classified in attractive requirement. It means that providing these factors will lead to customer pleasure.

Based on table-5, good design with CS coefficient (+0.934) and price-quality proportion with CS coefficient (+0.267) respectively have the most and least impact on customer satisfaction. According to table-5, quality of fibres with CS coefficient (-0.908) and up to date design with CS coefficient (-0.388) have the most and least impact on customer satisfaction, respectively.

Conclusion

The results of this study confirm that Sahand Carpet Co. can improve customer satisfaction in the three categories of the must-be, attractive and one-dimensional requirement. In this regard, according to a ranking criteria done by TOPSIS method, it can be specified that in each class, which are the most

important factors. So we focus and use these factors in planning for improvement in customer satisfaction area. i. Considering factors classified in the must-be requirement, it seems that durability of the products is the most important factor in preventing the emergence of dissatisfaction among customers. As there is the direct relationship between quality and durability, enhancing the product quality leads to more durability. So Sahand Carpet Co. should consider following points to improve product quality which ultimately leads to increase in product durability; Not using waste fiber, using the best mix of fiber (the length and elegance of fiber), using the optimal amount of water and oil for preparation of fibers, appropriate settings in the spinning room, appropriate yarn twist, optimal thermal stabilization, use proper sizing and the best finishing conditions. ii. Criteria ranking in one-dimensional requirement show that the most important factor from customer point of view is price. As we know in a monopolistic market the price are determined by market leader, so if even manufacture cut down its costs, cannot cut down its price because of competitor’s reaction. It is recommended that Sahand Carpet

Co. reform it sales and payoff process and increase flexibility in this area, some solution can be as flexibility in installment payment arrangements, reducing its interest of installment sales and .iii. Ranking the factors in attractive requirement indicate that consistent with life style is the most important factor in this category. Due to nature of the attractive requirement which result in the customer delight, it can be as a bargaining chip for any organization can convert company to the market leader and pioneer. With regard to different geographical regions, cultural conditions, weather and lifestyle, it is recommended various design to be submitted in accordance with the interests of all market segments, not only to preserve the market share but also to increase its share in competition.

References

1. Khorsand R.M., identify factors affecting the selection of carpets, *Journal of Scientific Society of Iran*, Tehran, Safar-Eshraghi Publishing, First Edition (2007)
2. Ranjbaran B., Jamshidian M. and Dehghan, Z., Factors affecting consumers' attitudes toward the various carpet brand in Isfahan, *JWSS Research Journal*, 23(1), (2008)
3. Tahamy M., *Quality Control Journal*. (4)45, 8-16 (2009)
4. Academy of Management Studies, "Customer Satisfaction Study for National Handloom Development Corporation, 2006-2007
5. Gocek I., Kursan S. and Beceren Y.I., World Academy of Science Engineering and Technology, (2007)
6. Salerno-Kochan R., *Fiber & Textile in Europe*, 16(4), 8-12 (2008)
7. HadjTaeib A., Msahli, A. and Sakli S., *Modeling and Simulation Systems Journal*, 1(1), 84-89 (2010)
8. Ksenia N., A study of customer satisfaction factors and employee satisfaction in the hospitality industry, Department of health education and recreation in the graduate school southern, Illinois university Carbondale, 1-5, (2009)
9. Berger C., et al Kano's methods for understanding customer defined quality, *Center of quality management journal*, (fall), 3-35 (1993)
10. Yen T-M., et al. Amend importance-Performance analysis method with Kano's model and DEMATEL, *Journal of applied sciences*, 9(10), 1833-1846 (2009)
11. Griggin A., Hauser J.R., The voice of customer, *Marketing science journal* (winter), 1-27 (1993)
12. Jahanshahloo G.R., Hosseinzadeh Lotfi F. and Izadikhah M., Extension of the TOPSIS method for decision-making problems with fuzzy data, *Applied Mathematics and Computation journal*, 181, 1544-1551 (2006)
13. Olson D.L., Comparison of Weights in TOPSIS Models, *Mathematical and Computer Modelling journal*, 1-7, (2004)