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A New Approach for Customer's Satisfaction Measurement of Electronic Shops by FMADM Method

[1]Abouzar. Zangoueinezhad, [2]A.Bayat, [3]A. Ebrahimi,
[2]I.N. Kamalabadi and [4]P. Ahmadi

[1]Department of Industrial and System Management,
Tarbiat Modares University, Tehran, Iran
[2]Department of Engineering, Tarbiat Modares University, Tehran, Iran
[3]Department of Management, Shahed University, Tehran, Iran
[4]Department of Management, Tarbiat Modares University, Tehran, Iran

Abstract: Value creation and gaining sustainable competitive advantage and strategic superior have caused to pay attention to the customers and their satisfaction. It is shown that sailing in cyber space and information and communication technology have an essential role in improve and decline of electronic shopping. This paper presents a new approach for Customer Satisfaction Measurement (CSM) of electronic shopping by FMADM (Fuzzy Multi Attribute Decision Making) method. For this goal, we extract the customers' satisfaction metrics based-on Yi model. Afterward we present a five-step approach to measure the electronic shopping customers' satisfaction by FMADM method. Since many of our data are qualitative and such data might be ambiguous, we transform the qualitative terms into quantitative terms by using the fuzzy collections. This includes identifying and prioritization the key factors in increasing customers' satisfaction. This process is adopted in shopping centers in Iran and customers' satisfaction measurements are presented on 3-D diagram.

Key word: Customer's satisfaction measurement · Electronic shop · FMADM · Fuzzy approach

INTRODUCTION

One of the biggest contemporary challenges of management in service industries is providing and maintaining customer satisfaction. Service quality and customer satisfaction have increasingly been identified as key factors in the battle for competitive differentiation and customer retention. Lam and Zhang [1] claim that overwhelming customer demand for quality products and service has in recent years become increasingly evident to professionals in the tourism industry. Among all customer demands, quality service has been increasingly recognized as a critical factor in the success of any business [2-3]. Customer satisfaction is different from perceived service quality. Service quality is the customers' attitude or global judgment of a company's service over time, while customer satisfaction refers to a specific business transaction [1]. Service management literature argues that customer satisfaction is the result of a customer's perception of the value received in a transaction or relationship-where value equals perceived service quality relative to price and customer acquisition costs [4-5], relative to the value expected from transactions or relationships with competing vendors [6].

The main goal of this paper is presentation a model for CSM of electronic shopping by FMADM method.

The satisfaction is always used to measure the customer cognition of the product, service, job and environment and so on. Cardozo [7] is the earlier scholar who investigated customer satisfaction and suggested that satisfaction can increase the repurchase intentions. Hirschman [8] identified that the dissatisfied customers will complain or switch. Oliver [9] described that the process of satisfaction judgments are reached in the expectancy-disconfirmation framework. Firstly, buyers have expectations of a specific product or service prior to purchase. Secondly, consumption reveals a perceived quality level which is influenced by expectations. Third, perceived quality may either confirm or disconfirm the expectations prior to purchase. Fourthly, expectations and

Corresponding Author: Abouzar Zangoueinezhad, Department of Industrial and System Management, Tarbiat Modares University, Tehran, Iran,

the perceived level of disconfirmation positively affect satisfaction. Reichheld and Sasser [10] premised that improved service quality leads to higher customer satisfaction, which brings customer intention/loyalty, which raises enterprise profits [11-12].

Recent years, the EC has vigorous developed. In 2005 there were approximately 59.8 billion NT dollars for which goods/services was purchased by EC and traveling commodities occupies above six tenths in Taiwan. The EC scale could reach to 89.3 and 131 billion NT dollars respectively in 2006 and 2007 based on the estimated by Market Intelligence Center (MIC). The CAGR (Compound Annual Growth Rate) is 48% during the period of 2005 to 2007. Cheung and Lee (2005) defined the web-satisfaction as "the overall affective evaluation a user has regarded his or her experience related with the Website". A lot of literatures applied the information quality (IQ) and system quality (SQ) to measure the web-satisfaction. High IQ has been found to be related with system use and user satisfaction. DeLone and McLean [13] pointed out that accuracy, relevance, understanding ability, completeness, currency, dynamism, personalization and variety are the factors used to measure IQ. Szymanski and Hise [14] and Janda *et al.* [15] mentioned that IQ is an essential determinant of consumer satisfaction with internet shopping. McKinney *et al.* [16] measured the IQ by relevance, timeliness, reliability, scope and perceived usefulness. Negash *et al.* [17] measured IQ by informativeness and entertainment dimensions. Informativeness involves information accuracy, relevance, timeless, convenience and completeness. Entertainment involves whether the interface is entertaining, enjoyable, pleasing, fun and exciting. SQ is focused on the outcome of the interaction between the user and the system. DeLone and McLean [13] premised that SQ is a main attribute associated with user satisfaction in the EC. They used usability, availability, reliability; adaptability and response time to measure the SQ. McKinney *et al.* [16] determined four dimensions of SQ to measure the satisfaction, i.e. access, usability, navigation and interactivity. Zeithaml *et al.* [6] adopted the perceived convenience and perceived control to measurement web-satisfaction.

Measuring Customer Satisfaction: Throughout the literature, customer satisfaction was measured in different ways. One measure consists of responses to a single question on the customer-satisfaction Questionnaire: ''Overall, how satisfied are you withy?'' Responses for all satisfaction questions were made on 1-7 Likert-type scales labeled ''very satisfied'' (1) and ''very dissatisfied'' (7) at each extreme. The problems associated with the use of a single response variable were mitigated by the simplicity of the question. Satisfaction withkey elements of both service and price (measured independently as the ''service index'' and the ''price index'') was developed from theories found in service management literature [18-19]. Simplified, these theories state that the perceived value is a function of perceived quality and price and that differing levels of perceived value result in differing levels of customer satisfaction. Many researchers have

Developed multi-attribute scales for measuring customer satisfaction in hospitality professions [20-22]. Oh and Parks [23] conducted a critical review of customer satisfaction research and suggested that the expectancy disconfirmation is widely accepted and applied conceptually in the study of customer satisfaction. Positive disconfirmation occurs when the product or service is better than the customer expects, resulting in satisfaction, whereas with negative disconfirmation, the product or service is worse than the customer expects, resulting in dissatisfaction. Schall [24] describes best practices for measuring guest satisfaction and loyalty.

Electronic Stores: With the expansion of Internet, tools have been built to help vendors to set up Web stores, building the store databases and managing the order processing and payment transactions. These tools typically do not focus on issues like the personalization of the interaction with the customers. However, Web stores are characterized by two main features: Since they are accessed by heterogeneous users, they should satisfy different preferences in the suggestion of goods; this ability requires filtering capabilities, to identify the items suited to the specific customer. So, these stores are close to the applications in the information filtering area, where several recommender systems have been developed to exploit user models in the personalized selection of items [25-27]. Since they are hypermedia systems, they should meet the users' interaction needs. Benyon [28] explains that users differ in many parameters, like status, expertise and preferences, which should be taken into account to improve the usability of systems. For instance, to increase the flexibility of the interactions, the product descriptions should be tailored to the users' expertise and interests [29] and the users' preferences on interaction media should be accounted for [30]. This work is developed in the project "Servizi Telematici Adattativi" (http://www.di.unito.it/seta), carried on at the Dipartimento di Informatica of the University of Torino within the national initiative "Cantieri Multimediali", granted by Telecom Italia The issue of tailoring information to the user has been deeply analyzed in the flexible hypermedia research, where a major distinction was made between personalizing the navigation task and the description of the information items to be presented [31]. Some researchers, like [32], have focused on the dynamic adaptation of the hypertextual structure to users with different backgrounds. Others, like Milosavljevic *et al*. [33] and Hirst *et al*. [34], have focused on the dynamic generation of text tailored to the system's user. However, an analysis of the electronic sales reveals other issues to be faced in an on-line store: e.g. the user should be assisted while browsing the catalog and selecting items to purchase; the system should keep track of her actions, to remember which items she has analyzed and other data useful to identify her real needs. On top of this, the product description should be planned to highlight the information most important to the user, so that she can easily compare products and decide which one to buy; finally, the properties having the greatest impact on her might be highlighted to convince her to buy the items [35].

Various techniques have been used to select interesting items in environments where heterogeneous information sources are exploited, or little information is available about the user's needs [36-37]. We believe that, while those techniques are suited to deal with large-scale applications, such as information retrieval on the Web, virtual stores can benefit from the presence of motivated users1 and a constrained information space. Products can be carefully defined and classified, so that the search task is performed in the presence of significant information about the hyperspace nodes. For these reasons, we believe that knowledge-intensive approaches, where detailed user profiles are built and items and descriptions are selected on the basis of a deep evaluation of the user's needs, are promising in the development of Web stores.

Satisfaction Measurment Methodologies: An overview of expectancy disconfirmation models: The approach of psychology and consumer behavior analysis is based on the assumption that satisfaction is a mental condition of the customer. The performance evaluation of a provided product or service (or some of their characteristics) is quite subjective and for this reason it should be linked with some comparison standards. A generic model of consumer behavior analysis considers the working on a customer's mind as a ''black box'', implying that consumer's psychology mediated the impact of performance observations on satisfaction judgments [38].

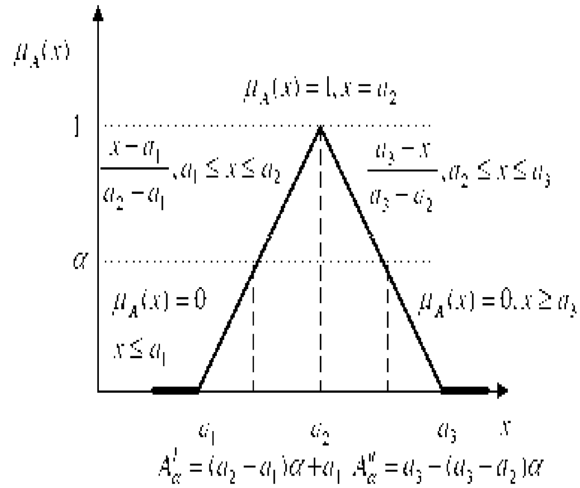

Fig. 1: A positive triangular fuzzy number, its membership function and α-cut

Fuzzy Numbers and Linguistic Variables: In this section, some basic definitions of fuzzy sets, fuzzy numbers and linguistic variables are reviewed [39-42]. The basic definitions and notations below will be used throughout this paper until otherwise stated.

Definition 1: A fuzzy set Ã in a universe of discourse X is characterized by a membership function $\mu_{\tilde{A}}(X)$ that shown in Fig. 1.

Which associates with each element x in X a real number in the interval [0,1]. The function value $\mu_{\tilde{A}}(X)$ is termed the grade of membership of x in Ã.

Definition 2: A fuzzy number is a fuzzy subset in the universe of discourse X that is both convex and normal. Figure 4 shows a fuzzy number ñ in the universe of discourse X that conforms to this definition.

Definition 3: A positive triangular fuzzy number (TFN) Ã can be defined by a triplet $\tilde{A}=(a_1,a_2,a_3,)$. Shown in Fig. The membership function is defined as:

$$\mu_A(X) = \begin{cases} 0, & x \prec a_1 \\ \dfrac{x-a_1}{a_1-a_2}, & a_1 \le x \le a_2 \\ 1, & x = a_2 \\ \dfrac{x-a_3}{a_2-a_3}, & a_2 \le x \le a_3 \\ 0, & x \prec a_3 \end{cases}$$

A non-fuzzy number r can be expressed as (r, r, r). The a-cut of the fuzzy number Ã which can be denoted by $A_\alpha = [A_\alpha^1, A_\alpha^u]$, is shown in the Fig. 4.

Given any two positive TFNs, $\tilde{m} = (m_1, m_2, m_3)$ and $\tilde{n} = (n_1, n_2, n_3)$, some main operations of fuzzy numbers $\tilde{m}$ and ñ can be expressed as follows:

$$\tilde{m}(+)\tilde{n} = (m_1 + n_1, m_2 + n_2, +m_3 + n_3)$$
$$\tilde{m}(-)\tilde{n} = (m_1 - n_1, m_2 - n_2, -m_3 - n_3)$$
$$\tilde{m} \otimes \tilde{n} \cong (m_1 n_1, m_2 n_2, m_3 n_3)$$
$$\tilde{m}(\div)\tilde{n} \cong \left(\frac{m_1}{m_3}, \frac{m_2}{m_2}, \frac{m_3}{m_1}\right)$$

Definition 4: A linguistic variable is a variable whose values are

Expressed in linguistic terms [43]. The concept of a linguistic variable is very useful in dealing with situations, which are too complex or not well defined to be reasonably described in conventional quantitative expressions [43]. For example, ''weight'' is a linguistic variable whose values are very low, low, medium, high, very high, etc. Fuzzy numbers can also represent these linguistic values.

Electronic Customers Needs: According to Yi [44] studies which are focused on this article, customer satisfaction affected by three factors: product satisfaction, sale process satisfaction, after sale service satisfaction. Fig. 2 shows relations among them. For more study about index, we extract more sub-criteria with attention to literature review (Table 1).

Proposed Model: In this part, our model which consists of following steps is represented for CSM of electronic shops. Our model has five steps:

Stage 1: Fuzzy screening of criteria: The fuzzy screening approach proposed by Yager has three advantages in decision-making: (1) the method is effective and efficient in screening alternatives with limited or incomplete information because it allows requisite aggregations; (2) the technique will only require the preference opinion of the decision-maker which will be expressed in a linguistic scale in linear order, such as high, medium, low; (3) the technique is based on the fuzzy set theory. In this research, a screening procedure is formulated in which a fuzzy implication operator is applied to obtain the overall linguistic value for each alternative.

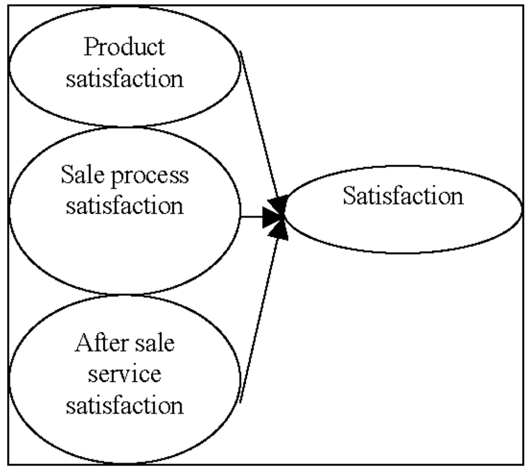

Fig. 2: Yi model

Table 1: Sub-criteria of Yi model

After sale	Sale process	Product
Service satisfaction	satisfaction	satisfaction
Delivery time	Navigation	Product quality
Referral management	shopping convenience	Product price
Warranty	accessibility	Product packing
Problem solving	Loading speed	Product information
	Security	Product reliability
	User friendly	
	Reputation	
	Liquidation	

The intention for fuzzy screening of criteria in this step is choosing more important and effective criteria in specifying CS and doing more accurate examination on them. in the other word, effective and non-effective criteria in CS can be distinguished from each other using process of fuzzy screening problem. A fuzzy screening problem consists three parts. First part is a collection of deciding choices between which we are to choose a subclass for more examination.

$$A = \{a_1, a_2, a_3, \ldots.. a_n\}$$

Second part is a collection of criteria that evaluation is done based on them.

$$C = \{c_1, c_2, c_3, ...c_n\}$$

Third part is a group of expert persons (or panel group) that their opinions are involved in screening.

$$E = \{e_1, e_2, e_3, ...e_n\}$$

Each expert person should represent its opinion for each choice that is an accomplished person should state to what extent will satisfy different criteria. This evaluation for satisfying criteria by choices is done in the from of following scale elements(s).

S_7	Outstanding (OU)
S_6	Very high (VH)
S_5	High (H)
S_4	Medium (M)
S_3	Low (I)
S_2	Very low (VH)

Additionally, each expert person should represent importance degree of different criteria in its view in the from of “S” scale. Next step in this process is unit evaluation of each expert person for its choice. For this, minus measure of importance should specify as following form:

$$Neg(S_i) = S_{7-i+1}$$

Then unit score of choices is calculated by each expert person in the following form:

$$U_{ik} = \min\{Neg(l_{kj}) U \Pi_{ikj}\}$$
$$i = 1, 2, ..., m \;,\quad k = 1, 2, ..., r$$

Then unit score of choices is calculated by each expert person in the following from: where U_{ik} is unit score of expert person k related to "I"th choices, lkj is importance degree of "jth" criterion in the view of "kth" expert person and $\prod_{ikj}$ indicates amount of possibility for satisfying. "jth" criterion by "I th" choice in the view of "kth" person.

Result of first stage of screening process is obtaining unit scores of expert persons to different choices.

$$\{U_{ik}\} = (U_{i1}, U_{i2}, ...U_{ir}\}$$

where U_{ik} states unit evaluation of "i th "by" kth "expert person. " r " shows whole number of expert persons.

In second stage of screening process combination of done evaluations by expert persons will be dealt with so that a general evaluation of each choice will be obtained. The first step in this stage is to specify a function of opinions consensus (Q) for body of deciding. This function states that agreement of how many of expert persons is needed so that one choice will be accepted and penetrate through screening process. After choosing an appropriate function of opinions consensus, now OWA operator (Yager algorithm) can be used for agreement of expert persons. here for each of "m" choices, a unit score is represented by "Kth" (k = 1,2,…….r) expert person. Now for each of choices, unit evaluation of expert persons should be arranged failingly:

$$U_i = \max{}_j \{Q(j) \wedge B_{ij}\} \qquad i = 1, 2, ..., m$$

Where: B_{ij} States "jth" of highest score of method "i" that general evaluation of method "i" can be computed according to it:

Q (j) states how much decider feels that patronage of at least j expert persons is needed.

$Q(j) \wedge B_{ij}$ Can be considered as weight-giving to "jth" of good score of choice B_{ij} (i) according to

Decider’s request (which needs patronage of j expert persons Q (j).

Max operator plays role of addition in method of ordinal numerical averaging.

Stage 2: Determining relative importance (weight-giving) of chosen criteria of first stage, using fuzzy AHP technique: The traditional AHP needs exact judgments. In addition, due to the complexity and uncertainty involved in real world decision problems, it is sometimes unrealistic or even impossible to perform exact comparisons. Since fuzziness and vagueness are common characteristics in many decision-making problems, a good decision-making

Model needs to tolerate ambiguity or vagueness. Decision makers often provide uncertain responses rather than precise judgments and the transformation of qualitative preferences to point estimates may not be sensible; hence, linguistic values, whose membership functions are usually characterized by triangular fuzzy numbers, can be utilized to estimate preference ratings instead of conventional numerical equivalence method. Due to the fact that uncertainty should be considered in some or all of the pair-wise comparison values, the pair-wise comparison under traditional AHP, which needs to select arbitrary values in the process, may not be appropriate. It is therefore more natural or realistic that a decision maker is allowed to provide fuzzy judgments instead of precise comparisons. A number of methods have been developed to deal with fuzzy comparison matrices. For example, Chang proposed an extent analysis method, which sums up each row of a fuzzy comparison matrix, normalizes them and then compares them by defining a degree of possibility of one fuzzy number being greater than or equal to another one. The extent analysis method gives crisp weight estimates for fuzzy comparison matrices. Zhu *et al*. made a discussion on the extent analysis method and improved the formulation of possibility degree for comparing two triangular fuzzy numbers. Leung and Cao proposed a fuzzy consistency definition with consideration of a tolerance deviation and determined fuzzy weights via α-level sets and the extension principle. Buckley *et al*. directly fuzzified Saaty's original procedure of computing weights in hierarchical analysis to get fuzzy weights. Csutora and Buckley proposed a Lambda-Max method, which is the direct fuzzification of the well-known kmax method. Wang *et al*. presented a modified fuzzy logarithmic least square method (LLSM) for fuzzy analytic hierarchy process. Numerous research papers have been done with the application of fuzzy AHP. The application of fuzzy AHP has become popular in recent years, too.

In this article we use extended hierarchy (EA) model of Chang. This model and its TFN described at previous parts of this paper.

Stage 3: Electronic shops rating by fuzzy TOPSIS: In this stage, we further extended to the concept of TOPSIS to develop a methodology for solving shop selection problems in fuzzy environment. Considering the fuzziness in the decision data and group decision-making process, linguistic variables are used to ratings of each alternative with respect to each criterion based on Fig. 3. We can convert the decision matrix into a fuzzy decision matrix and construct a weighted-normalized fuzzy decision matrix once the decision-makers' fuzzy ratings have been pooled. According to the concept of TOPSIS, we define the fuzzy positive ideal solution (FPIS) and the fuzzy negative ideal solution (FNIS). And then, a vertex method is applied in this paper to calculate the distance between two fuzzy ratings. Using the vertex method, we can calculate the distance of each alternative from FPIS and FNIS, respectively. Finally, a closeness coefficient of each alternative is defined to determine the ranking order of all alternatives. The higher value of closeness coefficient indicates that an alternative is closer to FPIS and farther from FNIS simultaneously.

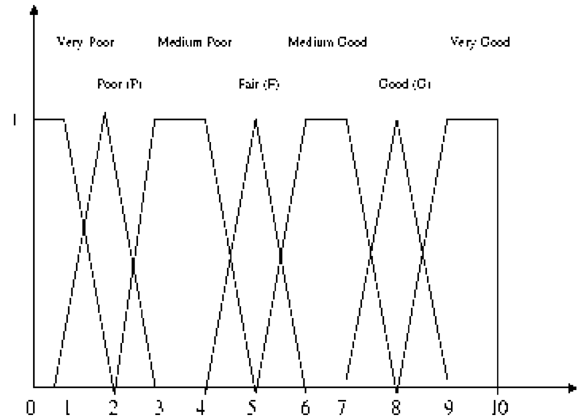

Fig. 3: Linguistic variables for Importance weight of each criterion

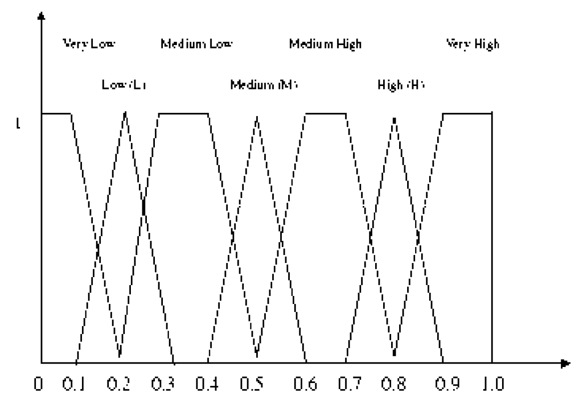

Fig. 4: Linguistic variables for ratings

A systematic approach to extend the TOPSIS is proposed to solve the supplier-selection problem under a fuzzy environment in this section. In this paper the ratings of qualitative criteria are considered as linguistic variables. Because linguistic assessments merely approximate the subjective judgment of decision-makers, we can consider linear trapezoidal membership functions to be adequate for capturing the vagueness of these linguistic assessments [45]. These linguistic variables can be expressed in positive trapezoidal fuzzy numbers, as in Fig. 5 and 6. It is suggested in this paper that the decision-makers use the linguistic variables shown in Fig. 4 to evaluate the importance of the criteria and the ratings of alternatives with respect to qualitative criteria. For example, the linguistic variable ''Medium High (MH)'' can be represented as (0.5,0.6,0.7,0.8)

Stage 4: Defuzzification of fuzzy criteria: in this step, fuzzy numbers of criteria which were determined in step three will be turned to certain numbers using fuzzy theory according to main components CS.

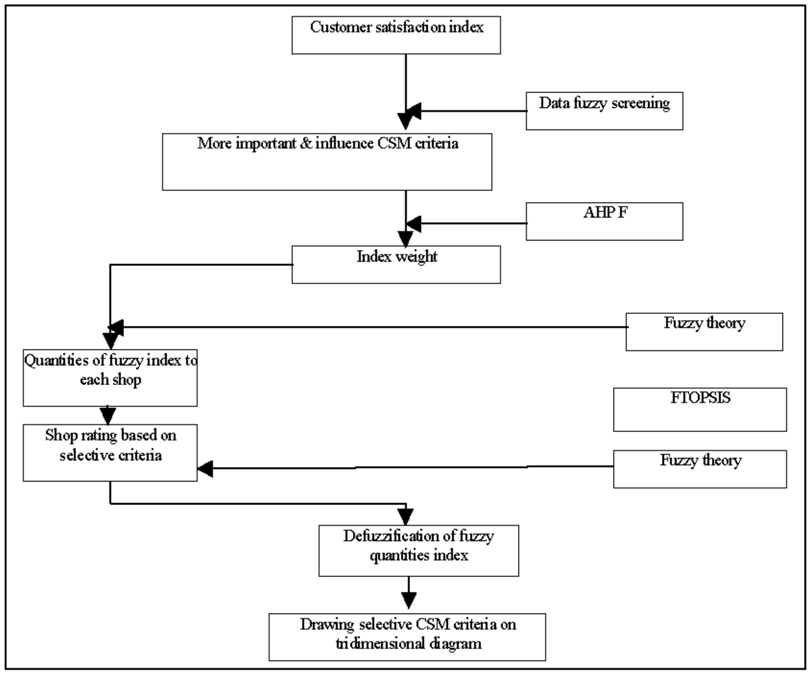

Fig. 5: Suggested technique and its performance stages

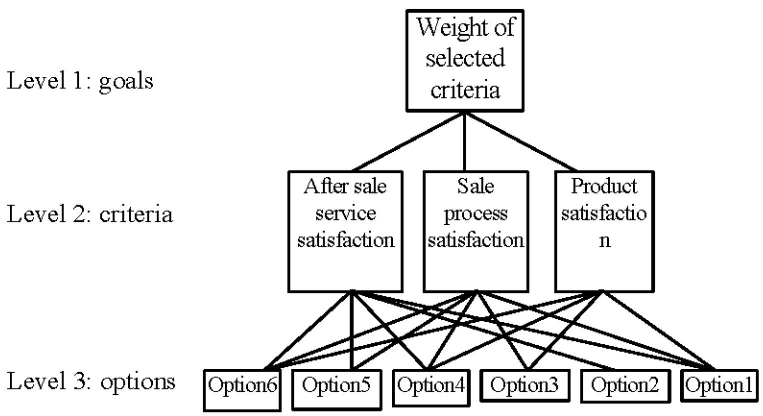

Fig. 6: Criteria hierarchy

Stage 5: Drawing CSM on three-dimensional diagram in this Stage, after determining certain numbers of each main components in electronic shop satisfaction, we drawing the position of each electronic shop satisfaction on three-dimensional diagram. Each Dimension represent a main factor of electronic shop satisfaction.

Assumptions of Suggested Technique: Evaluation and improvement: suggested technique is a technique for measuring customer satisfaction and tries to identify strengths and weakness of those criteria so that by means of this, performance ideals for customer satisfaction of organization will be determined.

Comprehensive evaluation: the technique aims at measuring CS and determining strategic criteria for this.

Designing Suggested Technique: Position of every shop among other: suggested technique gives this opportunity so that measuring will be done using amounts all of effective criteria and also opinions of all persons who are responsible and customer of product.

Fuzziness: Today's world is full of change that continuation of processes does not make begin certain of past problems possible. So tendency toward using Fuzzy logic in management literature and operational research is alto. in suggested technique fuzzy logic is used because of it's high efficiency.

Table 1: Whole variables based on Yi model

Criteria	Ui	Values
Product quality	3	L
Product price	4	M
Product packing	2	VL
Product information	3	L
Product reliability	5	H
Navigation	3	L
Convenience	4	M
Accessibility	3	L
Loading speed	3	L
Security	5	H
User friendly	4	M
Reputation	2	VL
Liquidation	3	L
Delivery time	3	L
Referral management	3	L
Warranty	5	H
Problem solving	3	L

Table 2: Selected criteria

Value s	Ui Quantities	Options (i)
4	M	Product price
5	H	Product reliability
4	M	Security
5	H	Convenience
4	M	Guarantee
5	H	user friendly

Innovation and Charastics of Suggested Technique: Innovation and characteristics of suggested technique are clarified in three categories:

Designing suggested technique 2) performing suggested technique and 3) suggested technique as managerial tool.

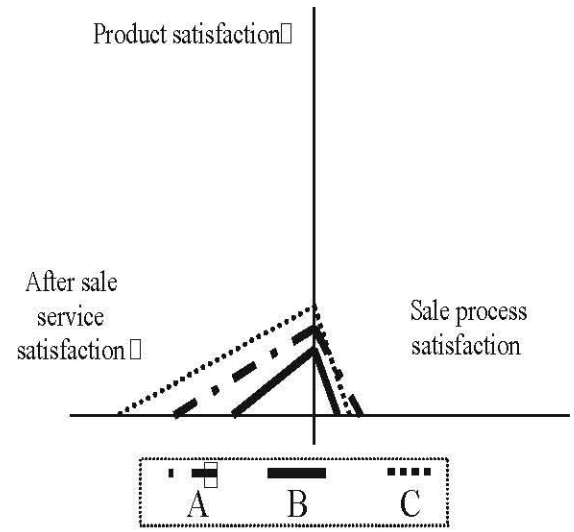

Fig. 7: Drawing CSM on three-dimensional diagram

Flexibility: CSM technique has a high flexibility in designing in a way that superior management as main decider can decrease or increase number of stages or changes weights of criteria.

Simplify and Convenience: Implementation of this technique is not expensive and time-wasting. In addition, it will prepare much general information for stores deciders and also because of its understandable and fluent algorithm and its easy application.

Multiple: In designing suggested technique, several purpose in stuck on mind: 1) determining measuring customer satisfaction 2) presenting strategic situation of each shop against to the competitor shop 3) examining the situation and existing performance of shops 4) presenting a frame for determining aims and ideals of performance.

Table 3: Fuzzy data

Index	Fuzzy quantities for shop 1 (A)	Fuzzy quantities for shop 2 (B)	Fuzzy quantities for shop 3 (C)
Product price	2 8 12	489 189 10	122 3 6
Product reliability	77 411 511	111 156 556	223 5 8
Convenience	8 5 216	167 3 6	15 4 7
Security	1 233 533	223 5 8	133 3 6
User friendly	267 567 867	6 9 10	933 223 623
Guarantee	223 5 8	223 623 923	267 567 867

Table 4: Fuzzy quantities

Criteria	Shop (A)	Shop (B)	Shop (C)
Product satisfaction	0.33 0.75 1.2	0.73 0.283 0.015	0.18 0.45 0.9
Sale process satisfaction	0.13 0.32 0.15	0.433 0.999 0.086	0.18 0.39 0.24
After sale service satisfaction	2.72 5.64 1.18	4.925 5.738 4.32	2.144 4.33 3.974

Table 5: Criteria relative importance in AHP

Criteria	Criteria weight (Wi)
Product satisfaction	0.341
Sale process satisfaction	0.394
After sale service satisfaction	0.265

Table 6: Rating shop centers

Degree	Option	Rank
83.3	Shop 1 (A)	1
82.1	Shop 2 (B)	2
78.81	Shop 3 (C)	3

Table 7: Quantity of criteria

	Criteria		
Option	Product satisfaction	Sale process satisfaction	After sale service satisfaction
Product price	0.243	0.219	0.091
Product reliability	0.225	0.261	0.009
Convenience	0.188	0.023	0.253
Security	0.220	0.095	0.275
User friendly	0.014	0.141	0.163
Guarantee	0.110	0.261	0.216

Table 8: Defuzzy quantities

Shops	Product satisfaction	Sale process satisfaction	After sale service satisfaction
Shop (A)	0.761	0.338	3.189
Shop (B)	0.388	0.239	1.689
Shop (C)	0.511	0.398	2.517

Implementation of Suggested Technique

- Understandable and instruct able: simplify accompanied with having consistent and strong logic have mode suggested technique understandable for organization managers and acceptance probability for them is very high.
- Extendibility: Some special and limited assumption in this technique is not pointed so the technique is extendable in all of criteria and shops.

Proposed Model Implimentation in 3 Large Iranians Electronic Store

Stage 1: Fuzzy screening of criteria: In this stage, after criteria screening by EXCEL software, six criteria was selected to next stage. All of our criteria illustrate on Table 1 and our important criteria which are exaggerated by questionnaire illustrate on Table 2 (each degree more than 3).

Stage 2: Determining relative importance (weight-giving) of chosen criteria of first step, using fuzzy AHP technique: According to previous section about AHP our hierarchy illustrate in Fig. 8.

After analysis of these criteria, we examine the weight of criteria according to Table 3-5.

Step 3: Electronic shops rating by fuzzy TOPSIS: After gathering the questionnaire we find fuzzy number of data. Table 6 shows this data.

Afterward we rating three shops by fuzzy TOPSIS. We used FDM software in this step.

Stage 4: Defuzzification of fuzzy criteria: in this step, fuzzy numbers of criteria in step three will be turned to certain number.

We use fuzzy theory according to main CS components. Tables 7 and 8 illustrate this step. We use TFN and Fuzzy Tech in this stage.

Step 5: Drawing CSM on three-dimensional diagram: in this step we draw on three dimensional diagrams.

CONCLUSION

Many practitioners and researchers have presented the advantages of CSM. In order to increase the competitive advantage, many companies consider that a well designed and implemented CSM is an important tool.

Therefore, CSM criteria selection problem becomes the most important issue to implement a successful CSM. In general, CSM criteria selection problems adhere to uncertain and imprecise data and fuzzy-set theory is adequate to deal with them. In a decision-making process, the use of linguistic variables in decision problems is highly beneficial when performance values cannot be expressed by means of numerical values. In other words, very often, in assessing of possible criteria with respect to importance weights, it is appropriate to use linguistic variables instead of numerical values. Due to the decision-makers' experience, feel and subjective estimates often appear in the process of CSM criteria selection problem, an extension version of TOPSIS and AHP in a fuzzy environment is proposed in this paper. The fuzzy AHP method can weigh the critical criteria for CSM and fuzzy TOPSIS method can deal with the ratings of both quantitative as well as qualitative criteria. It appears from the foregoing sections that fuzzy TOPSIS method may be a useful additional tool for the problem of CSM criteria selection. In fact, the fuzzy

TOPSIS method is very flexible. According to the closeness coefficient, we can determine not only the ranking order but also the assessment status of all possible criteria.

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