

# **DETERMINATION OF EFFECTIVE CRITERIA WEIGHT ON SATISFACTION WITH FUZZY SYNTHETIC EVALUATION AND GENETIC ALGORITHM**

## **(CASE STUDY: TRAVEL WEBSITES IN IRAN)**

Naser Yazdani<sup>\*1</sup>, Hamid Nayeypour<sup>2</sup>

<sup>1</sup> Assistant Professor, Department of Business Management, Faculty of Humanities, Shahed University, Tehran, Iran (\*Corresponding Author)

Email: [n.yazdani@shahed.ac.ir](mailto:n.yazdani@shahed.ac.ir)

<sup>2</sup>Student of Business Management, Faculty of Humanities, Shahed University, Tehran, Iran

### **ABSTRACT**

In competitive market, customer satisfaction based on electronic service quality (ESQ) is one of the main goals in tourism and hospitality industries. Many researchers studied it, they used various methods for determining importance of criteria in order to understand it, but most of these methods depended heavily on expert knowledge and customer perspective haven't been considered. Also they focused only on one group of customers and haven't considered different among them. In this study, we used fuzzy synthetic evaluation and genetic algorithm for determining importance of criteria in order to measure satisfaction of travel websites based on ESQ. The results show that different segments of customers have different opinions on the importance of various criteria and these different opinions depend on various reasons as time limitation, balance, privacy, knowledge of information technology and psychology and behavioral specifications. So for increasing competitive advantage, they must consider different segments of customers in their websites.

**Keywords:** E- Satisfaction, E- service quality, Fuzzy synthetic evaluation, Genetic algorithm.

### **INTRODUCTION**

The unprecedented growth of electronic shopping(e-shopping) among internet users in Various industries has increased over the past decade (Ip, Law & Lee, 2011, p. 234). Increased electronic service quality (ESQ) on the websites could assist to service providers in online companies to be more effective and appealing and help them to obtain more customers and higher level of customer satisfaction with better services delivery to each customer (Gronroos, Heinonen, Isoniemi & Lindholm, 2000, p. 250). Many researchers and online companies realize that issue of ESQ is foundation component for success in competition with other websites and not only website presence, website design and discount (Parasuraman, Zeithaml & Malhotra, 2005, p. 213). With the development of Internet penetration coefficient, travel websites (TWS) have a key role in tourism industry, which includes special information present, transaction facilitation for purchase, destination marketing, connections among travelers and whatever customers require for travel to various area of world (Law, Qi & Buhalis, 2010, p. 297).

Now days managers, researchers and service providers understand that customer satisfaction directly leads to repeat purchase and increased probably of making word of mouth (WOM) for e- shopping and number

of customers (Anderson, Fornell& Lehmann,1994, p.55). As a consequence, they pay more attention to issue of electronic satisfaction (e-satisfaction) for e-shopping in their websites (Fuchs, Abadzhiev, Svensson, Höpken&Lexhagen, 2013, p.121). The evaluation of e-satisfaction is one of the most challenging problems for TWS design based on ESQ (Ip et al.,2011, p.258). Many studies and researches have analyzed the specifications of websites, but most of them have focused on some of specifications without considering some details Such as taking into account different segments of customers (Ting, Wang, Bau& Chiang, 2013, p.284).

All segments of customers have different needs with regard to their satisfaction of TWS based on ESQ. In fact, importance of effective criteria on satisfaction for each customer is different with other customer (Buhalis& Law, 2008, p.616). This different needs, require advanced analytical techniques that would analyze the issue e-satisfaction in TWS based on ESQ (Ip, Law& Lee, 2012, p.264).

In this paper we will use fuzzy synthetic evaluation(FSE) and genetic algorithm(GA)for determining importance of criteria in order to understand e-satisfaction from TWS based on ESQ among segments of customers. Also, we will answer the following research questions:

1. Are there different needs on satisfaction criteria based on ESQ among different segments of customers?

If the answer is yes, the second question is as follow:

2. Why different segments of customers have different needs?

The remainder of this paper as: Reviewing the related literature, explaining the process FSE and GA, explaining the process of data collection and measures validation, showing results and discussion, proposing conclusion with limitation and suggestions for further research, respectively.

## **LITERATURE**

In this section, we explain concept of service quality, dimensions of ESQ and satisfaction.

ESQ is one of the most important researched issues in the field of marketing due to its relationship with cost, satisfaction and loyalty (Gounaris,Dimitriadis&Stathakopoulos, 2010, p.143). Key and crucial issue within related literature includes the dimensions of ESQ in service Websites.Ribbink,Riel,Liljander and Streukens(2004) divided dimensions of ESQ into five major criteria in e- commerce: Ease of use, E-scape (i.e. web site design), Responsiveness, Personalization or Customization, and Assurance. Also well-explained effects of these dimensions on e-satisfaction based on ESQ in online book and CD stores.

The ease of use is certainly a key component for customer usage of computer tools and technologies at the time of e-shopping (Ribbink et al., 2004, p.448), and it is important for new users who are familiar or unfamiliar with e-shopping (Geffen & Straub, 2000, p.19). In process of e-shopping, the e-scape dimension is the second component and is important because it is directly related to the user interface that, leads to visitor satisfaction (Parasuraman et al.,2005, p.230). The responsiveness is third component of ESQ. It measures website and company ability and willingness to provide service and respond quickly to customers' requests and suggestions when they have questions/problems in process of e-shopping (Zeithaml,Parasuraman&

Malhotraet, 2002, p.366). Fourth component is customization that it can be personalized to satisfy customers different needs (Srinivasan, Anderson &Ponnavolu, 2002, p.42). customization information always includes better and higher quality of information and does not include surplus to requirement information (Ha, 2004, p.337). Finally, latest ESQ dimension is assurance. The customers perceive security and privacy when they use service. Security and privacy are of serious issues for e-customers in cyberspace (Rust &Kannan, 2002, p.11). Fear of lack of security has a significant and negative impact on usability of

service in cyberspace (Kassim&Abdullah,2010, p.354). Privacy exists when customers can restrict the other use of self-personal information in website as name, address, tell and email (ribbink et al., 2004, p.448).

E-satisfaction is a pleasant/unpleasant sense of e-shopping (Jaiswal,Niraj&Venugopal, 2010, p.223). Many studies have confirmed that better service quality leads to higher level of e-satisfaction among customers in many service industries as telecommunications, hospitals, hotels, travel agencies and online services (Ganguli& Roy, 2011, p.172). In the literature, e-satisfaction model was defined by Szymanski & His (2000) among German online consumers. Studies on customers' satisfaction based on ESQ have used various statistical techniques for data analysis such as multiple linear regression(MLR), factor analysis, structural equation models(SEM)that obtained from research (Hao, Yu, Law& Fong,2015, p.234). Key element in Studies on customers' satisfaction based on ESQ is weigh of criteria. In most of study, it is determined by experts, and customer opinions haven't been considered. Advanced analytical methods such as neural network(NN), GA and synthetic fuzzy mathematics require in study tourism and hospitality industry as TWS. Artificial methods are suitable for studies in the field of TWS that integrate information related to customers from multiple dimensions (Law et al., 2010, p.311).

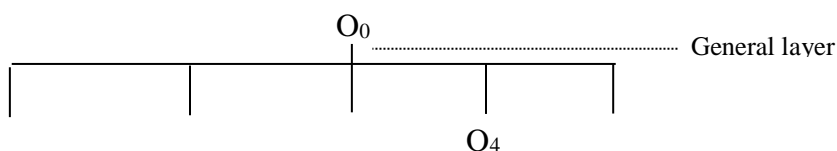
Most studies on tourist industry and customers' satisfaction have concentrated on the homogenous markets and have neglected the different segments of customers in marketplace and only a few studies have considered this different(Hao et al., 2015, p.232). Sources of satisfaction differ among different segments of customers. In other words, segments of customers have different requirement for satisfaction from shopping and criteria weight differ among them (Anselmsson,2006, p.115). Tourists can divide into different segments, degree of customers' satisfaction differ with other customers and market segmentation strategies can contribute to improve satisfaction prediction models (Yuksel&Yuksel, 2003, p.52). Hao et al. (2015) show that different segments of customers have quite different opinions on the importance of various criteria in travel agency.

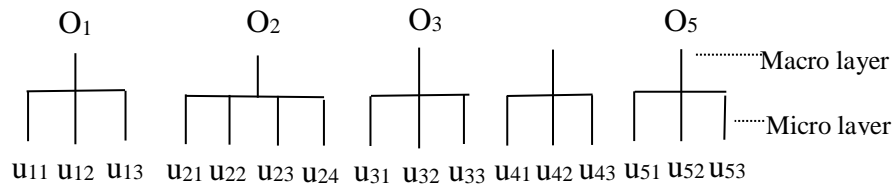
We need method that analyze importance of criteria in order to understand customers' satisfaction data with advanced analytical tools. Therefore, we propose a FSE and GA for determining importance of criteria in order to understand customers' satisfaction among different segments and their reasons for to have different needs.

## RESEARCH METHOD

### *FSE system*

E-satisfaction based on ESQ is a multidimensional model that can be framed using a multi criteria decision making(MCDM) problem. To illustrate multidimensional model of e- satisfaction, we use the model proposed by Ribbink et al. (2004). This model can analyze a three-layer system (hierarchical process) for evaluating e-satisfaction(Fig1). This criteria( $O_0$ ) considers the overall satisfaction determined by five major criteria: the combination criteria for assurance ( $O_1$ ), the combination criteria for ease of use ( $O_2$ ), the combination criteria for customization ( $O_3$ ), the combination criteria for responsiveness ( $O_4$ ) and the combination criteria for site design ( $O_5$ ). This hierarchical process decomposes from the final objective (General criteria) to more specific objectives (Macro layer criteria). Every Macro layer are determined by sets of decision questions  $u$  (Micro layer). For example, the criteria of ( $O_1$ ) is determined by survey 3 questions ( $u_{11}$ ,  $u_{12}$ ,  $u_{13}$ ). Finally, each question (micro layer) can be measured by a set of evaluation scores representing by typical 5-point Likert scale "very dissatisfied," "dissatisfied," "fair," "satisfied," and "Very satisfied," or typical 9-pointLikert scale.





**Fig 1.**the three-layer model for evaluation e- satisfaction based on ESQ in TWS

We consider the problem of evaluating customers' satisfaction based on ESQ as a problem of FSE. Fuzzy theory (Zadeh, 1965) was developed to deal with uncertainty problems. It has been widely applied to many fields such as decision-making and evaluation processes in imprecise situations or uncertainty of information (Dahiya, Singh, Gaur, Garg & Kushwaha, 2007, p.940). FSE uses fuzzy mathematics to transform unclear information and has various attributes concerning evaluation related criteria (Kuo&Chen, 2006, p.614).

### ***FSE process***

The FSE process is divided into six main steps.

Step 1: Determining an evaluation criteria set U

The first step is generally determining of criteria for study. In this study, we select model proposed by Ribbink et al. (2004).

$U = \{u_i\}, i = 1, 2, \dots, m.$

Step 2: Evaluating of criteria grade set V

Evaluation grades are of a typical 5-point Likert scale as "very dissatisfied," "dissatisfied," "fair," "satisfied," and "Very satisfied,"  $V = \{v_j\}, j = 1, 2, \dots, n$

Step 3: Evaluating to obtain membership functions matrix  $\tilde{R}$

If N person make appraisals of criteria  $u_i$  in U separately, the  $x_{ij}$  denotes the number of person who determine  $u_i$  as  $v_j$ , the sum of each list of numbers equals N,  $r_{ij} = x_{ij}/N$ , then we can derive the membership function( $\tilde{R}$ ). As a result, we obtain the appraisal matrix

$$\tilde{R} = (r_{ij})_{n \times m} = \begin{bmatrix} r_{11} & r_{12} & r_{13} & \dots & r_{1n} \\ r_{21} & r_{22} & r_{23} & \dots & r_{2n} \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ r_{m1} & r_{m2} & r_{mn} & \dots & r_{mn} \end{bmatrix} \quad (1)$$

Step 4: Determining weight of criteria  $\tilde{W}$

The weight values express the relative importance of criteria for decision making process. The several techniques are used for determining weight of criteria by many researchers: The direct determination method (DDM), the comparative matrix method (CMM), the analytical hierarchy process (AHP), the

circular comparison method (CCM), the fuzzy interval method (FIM), and the importance ordering method (IOM). Decision makers may select different methods for determining weighting coefficients according to their knowledge and experience (Feng& Xu,1999, p.5). In the other words, all of this methods rely heavily on expert perception and knowledge (Hao et al., 2015, p.234). We use GA for determining weights of criteria  $\tilde{w}$  among different segments of customer.

Step 5: Using the fuzzy operator to obtain vector  $\tilde{B}$

We use the fuzzy method to obtain vector  $\tilde{B}$ . It is the critical factor in FSE, which would affect the final evaluation results.

The overall evaluation score is obtained by the following equation:

$$\tilde{B} = \tilde{W} \circ \tilde{R} \quad (2)$$

where “ $\circ$ ” is the fuzzy composition operator. According to Feng&Xu (1999), four fuzzy composite operators are widely used.

Type 1 of operator: Considers only those important criteria.

According to type 1 of operator, only those criteria with the largest value determine the evaluation result. It operator is suitable to the evaluation in which single items are emphasized.

$$M(\wedge, V), b_j = \bigvee_{i=1}^m (a_k \wedge r_{kj}) = \max \{ \min(a_k, r_{kj}) \} \quad 1 < k < m \quad (3)$$

Type 2 of operator: Emphasizes important criteria (i).

Type 2 of operator provides a finer evaluation than Type 1 of operator, because some non-major criteria are included in the evaluation through the induced multiplication operation.

$$M(\cdot, v), b_j = \bigvee_{i=1}^m (a_k \cdot r_{kj}) = \max \{ a_k \cdot r_{kj} \} \quad 1 < k < m \quad (4)$$

Type 3 of operator: Emphasizing important criteria (ii).

Type 3 of operator considers non-major criteria in the evaluation similar to Type 2 of operator with a slightly different way and is suitable to the evaluation in which the result obtained from type 2 is indistinguishable

$$M(\wedge, \oplus), b_j = \bigoplus (a_k \wedge r_{kj}) = \sum_{k=1}^m \min(a_k, r_{kj}) \quad (5)$$

Type 4 of operator: Considers every single criterion overall.

Type 4 of operator requires the involves all criteria that are based on the weighting coefficients. and it is suitable to the evaluation in which all values must be accommodated.

$$M(\cdot, +), b_j = \sum_{k=1}^m \min(a_k, r_{kj}) \quad (6)$$

Step 6: Determination best operator.

For determining best operator, with compare compute overall satisfaction with survey overall satisfaction for each operator, we select operator that minimize fitness score.

### ***GA for determining importance of criteria***

GA is an optimization technique based on the principles of Genetics that first proposed by John Holland in the 1960s and developed by Holland, his students and colleagues in the 1960s and the 1970s (Mitchell, 1999, p.3). It can be considered as an optimization when other techniques such as gradient descent or direct analytical methods are less effective (Cui, Wong & Wan, 2015, p.32).

GA process takes four steps: 1) generating Initial population is the starting point for GA. 2) fitness value evaluation, it measures the quality of a solution and provide best solution for optimum detection. The evolution of the population is based on the principle of survival, we used Eq. (7) for determining weight of criteria in each layer (micro layer or macro layer) for segments of customers. S denote a set of parameters, including the values of weight of criteria,  $o_i$  denote to compute overall evaluation and d denote to survey overall evaluation for determining weight of criteria, we use following format:

$$\text{Min } e(s) = \sqrt{\sum_{i=1}^m (d * w_i - o_i)^2} \quad (7)$$

$$\sum_{i=1}^m w_i = 1, \quad 0 \leq w_i \leq 1 \quad i=1, 2, \dots, m \quad (8)$$

$e(S)$  is the Euclidean distance between the computed overall evaluation and the surveyed overall evaluation from satisfaction based on ESQ. 3) termination test, GA will be stopped if termination condition is satisfied, else it go to next steps. 4) generating new population with selection, crossover and mutation operators. We with selection operator ensure that the better members of the current population have a high probability for selection in order to create children for next generation. The crossover operator aims to generate new individuals that maintain some characteristics of their parents and at the same time extend the search space. The mutation operator maintains the diversity of the population and prevents premature convergence.

## **EMPIRICAL STUDY**

### ***Data collection***

To evaluate the performance of the proposed GA and FSE for determining weight of criteria, we designed questionnaire according to Ribbink et al. (2004). A questionnaire was designed to measure e-satisfaction based on ESQ. The questionnaire was divided into three main parts.

Part one consisted of a series of respondents' demographic characteristics such as sex, age and education. Part two began with the general information about to dimension of ESQ and Part three dealt with the respondents' assessment of the ESQ. Questionnaires were sent to target respondents. The study population consisted of customers with more than 3times of experience on popular TWS in Iran. The empirical study focused on three typical segment of customers, namely university students, white-collar employees and corporate managers. We obtained 675 questionnaires from customers in our study. Table 1 shows the demographic information on the respondents.

**Table1.** Characterization of the final sample

Variable	Frequency	%	Variable	Frequency	%
Age:			Education:		
(18-25)	105	15.60	Primary	108	16.00
(25-35)	123	18.20	Secondary	151	22.37
(35-45)	177	26.20	Higher	416	61.62
(45-55)	156	23.10	Segment:		
55+	114	16.90	Corporate managers	275	33.33
Sex:			University students	275	33.33
male	396	58.70	white-collar employees	275	33.33
female	279	41.30			

### Measures

In this section, we report the results that obtained from the assessments of reliability and validity for the measurement instrument. Our study adapted the performance perspectives scale (Ribbink et al.,2004) to measure weight of criteria. All scales were measured by using a 5-point Likert scale. For the measurement of survey scale reliability, we used Cronbach's alpha value. If Cronbach reliability coefficient is higher than 0.7, indicating adequate internal consistency(Nunnally,1978). Table 2 lists the measurements with their reliability indicators. Cronbach reliability coefficient for all constructs (three typical segment of customers)had a value above 0.7, indicating adequate internal consistency of the measures.

To make the extracted factors more interpretable, we used the Warimax with Kaiser normalization method for determining the number of factors. According to table 3, the exploratory factor results show that six factors with an eigenvalue greater than 1 for whole of customers emerge. These six factors explain 71.109 % of the total variance for whole of customers in the latent variable. Thus, The results show that the factor structure fits with our research model.

### Empirical specifications

We used MATLAB R2016a for solving Eq. (7).We set the initial parameter specifications with the parameter that Hao et al.(2015)have used. The other parameters were the default values in MATLAB. We used (population type= Double vector, fitness scaling=rank, elite children=2, termination condition=1000generetion, population size=100, selection operator=roulette wheel, crossover fraction=0.8 and mutation operator=two-point) in our study.

**Table 2.** Results of exploratory factor analysis

item	6(Esat )	5(Es)	4(Rs)	3(Cs)	1(As)
		2(Eou)			

As1	-0.022	0.124	0.127	0.208	-0.259	<b>0.802</b>
As2	0.009	-0.077	-0.170	0.399	0.056	
As3	-0.007	-0.099	-0.111	-0.121	0.161	<b>0.750</b>
Eou1	0.007	-0.078	<b>0.664</b>	-0.047	0.178	
Eou2	-0.098	-0.067	<b>0.719</b>	0.174	0.037	<b>0.774</b>
Eou3	0.102	0.034	<b>0.865</b>	0.048	-0.047	- 0.060
Eou4	0.053	0.042	<b>0.778</b>	-0.049	0.245	-
Cs1	0.169	0.069	0.132	0.046	<b>0.769</b>	0.157
Cs2	-0.100	-0.081	0.066	-0.067	<b>0.864</b>	- 0.022
Cs3	-0.129	-0.171	0.194	0.035	<b>0.768</b>	
Rs1	-0.031	-0.087	-0.011	<b>0.840</b>	0.004	0.116
Rs2	0.146	0.074	0.104	<b>0.787</b>	0.056	-
Rs3	-0.010	0.281	0.041	<b>0.759</b>	-0.067	0.128
Es1	0.015	<b>0.864</b>	0.033	0.041	-0.080	0.088
Es2	-0.139	<b>0.903</b>	-0.039	0.054	-0.051	
Es3	0.043	<b>0.886</b>	-0.068	0.096	-0.045	0.047
Esat1	<b>0.829</b>	-0.049	0.003	0.171	-0.088	- 0.082
Esat2	<b>0.896</b>	-0.010	0.045	-0.124	0.021	
Esat3	<b>0.844</b>	0.172	-0.069	-0.045	0.034	0.203
Esat4	<b>0.609</b>	-0.306	0.107	0.125	-0.032	0.196
						0.052
						0.007
						- 0.135



						-
						0.091
						0.111
						0.073
						-
						0.142
Eigenvalue	3.176	2.855	2.646	2.367	1.731	1.447
Variance	15.881	14.274	13.231	11.834	8.653	7.237
Acc. Vari%	15.881	30.155	43.386	55.219	63.872	<b>71.109</b>

Rotation Method: Varimax with Kaiser Normalization.

**Table 3.** Measurements with their reliability indicators

Service category	Service item	Alpha
Assurance		
As1	I feel secure about the electronic payment system of this company	
As2	This online company is trustworthy	0.731
As3	I feel secure when providing private information to this online company	
Ease of use		

Eou1	It is easy to get access to this company's web site	
Eou2	This site is user friendly	0.76 6
Eou3	Navigation on this site is easy	
Eou4	It is easy to find your way on this site	
Customization		
Cs1	I feel that my personal needs have been met when using this or doing transactions with this online store	
Cs2	This site provides me with information and products according to my preferences	0.75 3
Cs3	I feel that the online store has the same norms and values as I have	
Responsiveness		
Rs1	It is easy to get in contact with this online company	
Rs2	This online company is interested in feedback	0.75 6
Rs3	The online company quickly replies to requests	
E-scape		
Es1	The info on this site is attractively displayed	
Es2	The site layout and colors are appealing	0.88 5
Es3	I am satisfied with the site design	
E-satisfaction		
Esat 1	I am generally pleased with this company's online services	
Esat 2	The web site of this online company is enjoyable	0.82 0
Esat 3	I am very satisfied with this company's online services	

## RESULTS AND DISCUSSION

### Results

We analyzed the data on e-satisfaction based on ESQ with according FSE and GA. Table 4 shows weight of criteria (in micro layer) for three typical segments of customers that we analyzed.

**Table4.** Results of optimized criteria weights

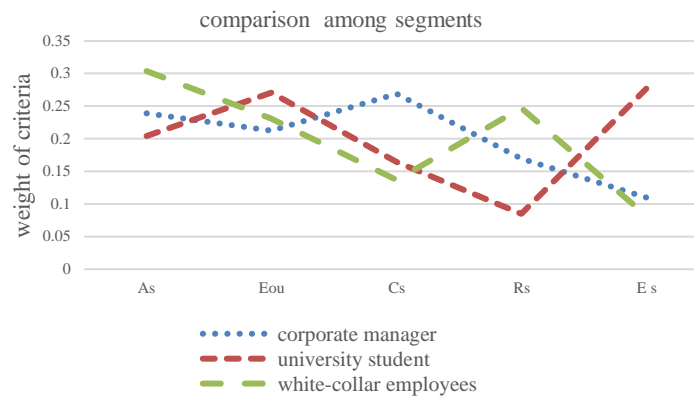
Criteria	University students	employees	managers	Criteria	University students	employees	managers
As1	0.565	0.563	0.487	Eou1	0.412	0.571	0.507
As2	0.325	0.091	0.312	Eou2	0.065	0.061	0.000
As3	0.110	0.346	0.201	Eou3	0.204	0.284	0.147
Cs1	0.669	0.300	0.301	Eou4	0.319	0.084	0.346
Cs2	0.233	0.574	0.550	Es1	0.328	0.592	0.570
Cs3	0.098	0.126	0.149	Es2	0.572	0.102	0.316
Rs1	0.162	0.261	0.601	Es3	0.100	0.306	0.114
Rs2	0.334	0.055	0.093				
Rs3	0.504	0.684	0.306				

For determining the best operator, we used table 5. In according to table 5, operator  $M(\cdot, v)$ ,  $M(\Lambda, v)$  and  $M(\cdot, v)$  had lowest fitness score among corporate managers, university students and white-collar employees, respectively. So we selected  $M(\cdot, v)$  operator for determining weight of criteria for corporate managers,  $M(\Lambda, v)$  operator for determining weight of criteria for university students and  $M(\cdot, v)$  operator for determining weight of criteria white-collar employees.

According to fig3, different segments of customers have various opinions on the importance of various criteria. For example, customization criteria (weight=.269), assurance criteria (weight=.238), ease of use criteria (weight=.213), responsiveness criteria(weight=.170) and e- escape criteria(weight=.11) have highest important, respectively for corporate managers. e-escape criteria (weight=.276), ease of use criteria (weight=.271), assurance criteria (weight=.204), customization criteria (weight=.164) and responsiveness criteria (weight =.085) have highest important, respectively for university students. Finally, assurance criteria (weight=.304), responsiveness criteria(weight=.247), ease of use criteria (weight=.231), customization criteria (weight =.137) and e-escape criteria(weight=.081) have highest important, respectively for white-collar employees.

**Table5.** Results of selecting composition operators in macro layer

segment	Operator	As	Eou	Cs	Rs	Es	Fitness score
corporate managers	$M(\Lambda, v)$	0.283	0.197	0.228	0.168	0.124	0.504
	$M(\Lambda, \oplus)$	0.245	0.225	0.211	0.186	0.133	0.316
	$M(\cdot, +)$	0.241	0.201	0.211	0.164	0.183	0.325
	$M(\cdot, v)$	<b>0.238</b>	<b>0.213</b>	<b>0.269</b>	<b>0.170</b>	<b>0.110</b>	<b>0.044</b>
university students	$M(\Lambda, v)$	<b>0.204</b>	<b>0.271</b>	<b>0.164</b>	<b>0.085</b>	<b>0.276</b>	<b>0.181</b>
	$M(\Lambda, \oplus)$	0.203	0.237	0.192	0.062	0.306	0.250
	$M(\cdot, +)$	0.183	0.296	0.147	0.044	0.330	0.274
	$M(\cdot, v)$	0.144	0.338	0.148	0.053	0.317	0.209
white-collar employees	$M(\Lambda, v)$	0.293	0.203	0.150	0.257	0.097	0.293
	$M(\Lambda, \oplus)$	0.330	0.199	0.140	0.229	0.102	0.212
	$M(\cdot, +)$	0.340	0.207	0.126	0.232	0.095	0.140
	$M(\cdot, v)$	<b>0.304</b>	<b>0.231</b>	<b>0.137</b>	<b>0.247</b>	<b>0.081</b>	<b>0.019</b>



**Fig2.**Comparison among different segments of customers

## DISCUSSION

We understood that different segments of customers had different opinions on the importance of various criteria. We found reasons in order to answer second question. We explain reasons for different opinions in three segments of customers. For this purpose, we contacted to segments of customers after they had written their phone number or email address in questionnaire. Three groups of customers agreed that e-shopping was more convenient than traditional shopping. For example, in peak traffic hours or when they are too busy working, with a few simple clicks they can buy at home or at office. If they buy traditionally, they should look for many stores or trap in traffic. Next advantage of e-shopping, customers receive a variety of options. In traditional shopping they enter the store, in this situation we have three case. In the first one, they find products or services with a reasonable price so they buy them, but if they find them with high price or lack of existence in store, they must look for another store for purchase and this means more cost. While e-shopping Provides a wide range of options for them. Most e-purchases have special discount that are rarely happen in traditional shopping.

There are a lot of reasons for why some customers have different opinions with other customers. We categorize this reasons as follow: time limitation, balance, privacy, knowledge of information technology, psychology and behavioral specifications. First, if there is time limitation, customization information is important criteria for satisfaction. Because of time limitation, most of corporate managers spent a little time for e-shopping, so, customization information had the greatest weight of criteria for their satisfaction. On the other hand, most of university students and white-collar employees had free time, so customization information wasn't important criteria for them. The balance and privacy is second reason. If there is no total balance limitation and misuse of personal information is important, assurance has great weight of criteria. So white-collar employees and corporate managers had enough balance and had fear of misuse of personal information, assurance was important criteria for their satisfaction, while, most of university students hadn't job, there was balance limitation for them and hadn't fear of misuse of personal information, then assurance wasn't important criteria among them. Knowledge of information technology is third reason. persons who are familiar to this, ease of use isn't important criteria. White-collar employees and corporate managers were familiar to this. But university students were not, then ease of use was important criteria for university students (most of them were from field of Lows, Philosophy and Divinity, so they were less familiar than white-collar employees and corporate managers to this). Responsiveness and e-scape completely depend on psychology and behavioral specifications of customers. Corporate managers usually didn't ask question/request of online website because they believed ask question or request as self-depreciation or they didn't interest to e-scape. But white-collar employees believed website reply to their question or request as Self-respect. E-scape was the most important criteria for student university because of their psychology and behavioral specifications. These reasons were different among segments of customers.

We compare our findings with the results of Ribbink et al.(2004).They suggest that As ( $\beta=.18$ ), Eou( $\beta=.23$ ), Cs( $\beta=.08$ ), Rs( $\beta=.14$ ) and Es( $\beta=.321$ ). Our results are almost same for university students with their findings. But there are several differences among white-collar employees and corporate managers with their findings. This difference might be attributed to differences of the psychology and behavioral specifications, culture and knowledge of information technology. Thus,we result that the different segments of customers have various opinions and these various opinions have crucial roles in determining levels of satisfaction based on ESQ.

## CONCLUSION

The purpose of the current study was for determining importance of effective criteria on satisfaction based on ESQ in Iranian TWS by GA and FSE. This study shows that different customers have different opinions on importance of criteria and their opinions depended on reasons as time limitation, total balance or privacy, knowledge of information technology, psychology and behavioral specifications.

The findings of this study can help TWS or e-service provider to increase their competitive advantage with other TWS in competitive market place. This study had five main limitations.

We considered several websites for our study. Different websites were evaluated by different customers, while all customers must have evaluated only a specified website in our study. Selection of one website for study is better to be considered in future researches. We selected several websites in our study, but we didn't compare different websites and sort them. It is better to be considered comparison among different websites and sorting them in future researches. Selection of target sample was third limitation for our study. We had selected four segment of customers before this study began. This four segment were Corporate managers, white-collar employees, university students and physicians. But some of physicians didn't reply to questionnaires. As result, we eliminated this segment of our research. More segments of customers as segment of teachers, athletes and (retirees in developed countries) is better to be considered in future researches. Fourth limitations were selection of artificial methods. Several methods existed in order for solving fitness function Eq. (7) as GA, NN, colony optimization and other methods. We used GA and FSE to solve Eq. (7). It is better to be considered comparison among different methods in order for determining the best method in future research. Finally, the present study was situated in Iran. Results only apply in Iran, each country has particular culture and our results may not be extended to other countries. It is better to be considered comprehensive comparison among different cultures in future research.

## REFERENCES:

- Anderson, E. W., Fornell, C., & Lehmann, D. R. (1994). Customer satisfaction, market share, and profitability: Findings from Sweden. *The Journal of Marketing*, 53-66.
- Anselmsson, J. (2006). Sources of customer satisfaction with shopping malls: A comparative study of different customer segments. *The International Review of Retail, Distribution and Consumer Research*, 16(1), 115-138.
- Buhalis, D., & Law, R. (2008). Progress in information technology and tourism management: 20 years on and 10 years after the Internet—The state of eTourism research. *Tourism Management*, 29(4), 609-623.
- Cui, G., Wong, M. L., & Wan, X. (2015). Targeting high value customers while under resource constraint: partial order constrained optimization with genetic algorithm. *Journal of Interactive Marketing*, 29, 27-37.
- Dahiya, S., Singh, B., Gaur, S., Garg, V. K., & Kushwaha, H. S. (2007). Analysis of groundwater quality using fuzzy synthetic evaluation. *Journal of Hazardous Materials*, 147(3), 938-946.
- Feng, S., & Xu, L. D. (1999). Decision support for fuzzy comprehensive evaluation of urban development. *Fuzzy Sets and Systems*, 105(1), 1-12.
- Fuchs, M., Abadzhiev, A., Svensson, B., Höpken, W., & Lexhagen, M. (2013). A knowledge destination framework for tourism sustainability: A business intelligence application from Sweden. *Turizam: znanstveno-stručni časopis*, 61(2), 121-148.

- Ganguli, S., & Roy, S. K. (2011). Generic technology-based service quality dimensions in banking: Impact on customer satisfaction and loyalty. *International Journal of Bank Marketing*, 29(2), 168-189.
- Gefen, D. a. S., D.W. . (2000). The relative importance of perceived ease of use in IS adoption: a study of e-commerce adoption. *Journal of the Association for Information System*, 1(8), 1-28.
- Gounaris, S., Dimitriadis, S., & Stathakopoulos, V. (2010). An examination of the effects of service quality and satisfaction on customers' behavioral intentions in e-shopping. *Journal of Services Marketing*, 24(2), 142-156.
- Gronroos, C., Heinonen, F., Isoniemi, K., & Lindholm, M. (2000). The NetOffer model: a case example from the virtual marketplace. *Management Decision*, 38(4), 243-252.
- Ha, H. Y. (2004). Factors influencing consumer perceptions of brand trust online. *Journal of Product & Brand Management*, 13(5), 329-342.
- Hao, J.-X., Yu, Y., Law, R., & Fong, D. K. C. (2015). A genetic algorithm-based learning approach to understand customer satisfaction with OTA websites. *Tourism Management*, 48, 231-241.
- Ip, C., Law, R. and Lee, H.A. (2011). A review of website evaluation studies in the tourism and hospitality fields from 1996 to 2009. *International Journal of Tourism Research*, 13(3), 234-265.
- Ip, C., Law, R., & Lee, H. A. . (2012). The evaluation of hotel website functionality by fuzzy analytic hierarchy process. *Journal of Travel & Tourism Marketing*, 29(3), 263-278.
- Jaiswal, A. K., Niraj, R., & Venugopal, P. (2010). Context-general and Context-specific Determinants of Online Satisfaction and Loyalty for Commerce and Content Sites. *Journal of Interactive Marketing*, 24(3), 222-238.
- Kassim, N., & Abdullah, N. A. (2010). The effect of perceived service quality dimensions on customer satisfaction, trust, and loyalty in e-commerce settings: A cross cultural analysis. *Asia Pacific Journal of Marketing and Logistics*, 22(3), 351-371.
- Kuo, Y.-F., & Chen, P.-C. (2006). Selection of mobile value-added services for system operators using fuzzy synthetic evaluation. *Expert Systems with Applications*, 30(4), 612-620.
- Law, R., Qi, S., & Buhalis, D. (2010). Progress in tourism management: A review of website evaluation in tourism research. *Tourism Management*, 31(3), 297-313.
- Mitchell, M. (1998). *An Introduction to Genetic Algorithms*. Cambridge, Massachusetts London, England: MIT Press.
- Numally, J. C. (1978). *Psychometric theory* (2th ed.). New York, NY.: McGraw Hill.
- Parasuraman, A., Zeithaml, V. A., & Malhotra, A. (2005). ES-QUAL a multiple-item scale for assessing electronic service quality. *Journal of service research*, 7(3), 213-233.
- Ribbink, D., Riel, A. C. R. v., Liljander, V., & Streukens, S. (2004). Comfort your online customer: quality, trust and loyalty on the internet. *Managing Service Quality: An International Journal*, 14(6), 446-456.
- Rust, R. T., & Kannan, P. (2002). *E-service: New directions in theory and practice*. Armonk, New York: M.E. Sharpe.
- Srinivasan, S. S., Anderson, R., & Ponnavaolu, K. (2002). Customer loyalty in e-commerce: an exploration of its antecedents and consequences. *Journal of Retailing*, 78(1), 41-50.
- Szymanski, D. M., & Hise, R. T. (2000). E-satisfaction: an initial examination. *Journal of Retailing*, 76(3), 309-322.
- Ting, P.-H., Wang, S.-T., Bau, D.-Y., & Chiang, M.-L. (2013). Website evaluation of the top 100 hotels using advanced content analysis and eMICA model. *Cornell Hospitality Quarterly*, 54(3), 284-293.
- Yuksel, A., & Yuksel, F. (2003). Measurement of tourist satisfaction with restaurant services: A segment-based approach. *Journal of vacation marketing*, 9(1), 52-68.
- Zadeh, L. A. (1965). Fuzzy sets. *Information and Control*, 8(3), 338-353.
- Zeithaml, V. A., Parasuraman, A., & Malhotra, A. (2002). Service quality delivery through web sites: a critical review of extant knowledge. *Journal of the Academy of Marketing Science*, 30(4), 362-375.