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A Study on Effective Factors on Customer Satisfaction Using Neural Network

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ABSTRACT

The present study aimed at investigation on effective factors on customer satisfaction using artificial neural network. The model for this research was formed using variables such as service quality, service confrontation, involvement in relation, service value and customer satisfaction. The present research was functional in terms of purpose and the method was correlation. The data was gathered using questionnaire and simple random sampling of questionnaire and field approach. Using simple random sampling the questionnaire was distributed among tourists inhabited in international hotels of Iran and about 300 acceptable samples was collected. Then, data analysis was done using artificial neural network of 3-layered perception and regression analysis in SPSS software. The results showed that there is a positive and significant relation between service quality, service value, involvement in relation and customer satisfaction. Also, service confrontation has significant effect on service quality. According to the findings of research the relation between service quality and service value is confirmed and there is a significant relation between service confrontation and involvement in relation.

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INTRODUCTION

In today world customer satisfaction and its necessity is one of the issues receiving lots of attention and the most attractive in special service and marketing literature [10]. The success of business in today's competitive markets needs understanding and reverence of customers. Customers request continually and spent their money on extended collection of goods and selected services. So companies and organizations should patiently receive their feedback for their satisfaction and improve their productions and services in order to save their customers [16]. In fact, customer satisfaction is the basis of customer's monarchy and power [21, 30]. Accordingly this is clear why today investigations on customer satisfaction provides some reasons of selling or not selling products and services and determines the strong and weak points of the company and is a suitable criteria to compare the company with its rivals [27]. Recent researches confirmed that customer satisfaction has high positive effects on customer's loyalty [5]. This positive effect in its turn can cause improvement in organizations' financial operations [6]. The important matter is that the main reason for carrying out every activity in business is increasing benefits and measuring customer satisfaction and doing activities pertaining to the results of measurements will increase the organization's productivity and profitability [13]. Creating and maintaining customer satisfaction is the main purpose of businesses because as we mentioned earlier there is a strong and clear relation between customer satisfaction and profitability [7]. In the present research, one of the dimensions of tourism industry that is tourist and inhabiting them in international hotels is considered as a service industry which has intangible products. This is true from the point of view of some international theorists that tourism is the dominant industry in the third millennium. The truth is that the capacities of consumer's market is saturated of so many ordinary industrial products and climatic situations and natural sources of earth has not the required power to guarantee lots of industries to survive and develop. So we can see that tourism like the other service industries is the most powerful and the most safe sub branch among other sub branches that can provide lots of job opportunities and meaningful activities to inhabitants of earth and to support the development of macro economy of today's world in a peaceful atmosphere and free from natural and biological hazards in a powerful and developing way. In the moment, tourists instead of long settlements have short time inhabitations in their

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plans but they have increased their number of trips. They focus more on natural environments of their destination and expect more value on their price paid and request for more and better services. As a result of this fact, to being successful in tourism, a region should be constant in terms of economy, society and biologic and to obtain this constancy it should be carefully programmed and managed and take into consideration lots of matters [11]. But as we mentioned one of the most important matters pertaining to tourism is inhabitation of tourists, because they should be settled in some place in order for their needs to be met. Hence, since long time ago, there have been special places for inhabitation and resting of tourists provided all over the world and various countries. Here the basic justification for measurement and examination is providing information which can enable managers to make correct decisions in order to maximize customer satisfaction and as a result to improve maintaining customers [13]. The efforts to increase the customer's satisfaction in this industry requires using efficient approaches which result in precise understanding of the present situation and effective planning in order to improve the activities. For this reason measurement of customer satisfaction in selected samples seems to be essential and important. Now this research tries to answer this question: how much is customer satisfaction in service industry using neural network?

Theoretical Network And Research Hypotheses:

Service confrontations:

The term service confrontation is used recently and extensively in marketing and the underpinning philosophy is that, from the customer's point of view one of direct clues of service quality is demonstrated when confronting a service or an important moment. The customers put their evaluations based on their understandings of service confrontation due of inter personal nature of the services [8]. In a dimensional trend to the quality, service confrontation is among the objective criterions which are used to evaluate. Because of the fact, that it is considered that customers and employees use determined criterions to evaluate it. Different evaluations exist on the dimension of service confrontation. Dual evaluation which is consist of direct contact and formalities [4], A three dimensional criterion for evaluation of quality of service confrontation which is consist of civilization and agreement [28], seven dimensions for evaluating the quality of service confrontation is: tangibility, trust, guarantee, trustworthiness, individualization, formality and responsibility [22]. Also in a recent study carried out by some researchers about providing services in several countries it was shown that the quality of service confrontation is examined as the quality of physical goods, service quality, service escape and behavioral aims [15]. In other researches, the dimensions of service confrontation quality is considered and employees being professional, intimacy of employees with customers, civilization and merit of employees [14].

Service quality:

Service quality is rather a young scientific major which spends about two decades of research [3]. This term has different meaning for different people so in the first stage of improving service quality we should have a clear understanding of the concept "quality". In addition, the definition of this term is not only important in terms of meaning but more important is that it is guidance for employees' effort in the path toward achieving higher quality services. International standard organization, defines quality as the whole features and characteristics of product or service which can meet the needs of customer. Conceptual meaning of quality, distinguishes between human and mechanical quality. Mechanical quality consists of one dimension or objective feature or a hap, while human quality is composed of mental reaction of people to things. So the quality of a phenomenon has a high relativity coefficient which distinguishes between judgments [20]. So the first hypothesis is presented as below:

H1: there is a significant relation between service confrontation and service quality.

Customer satisfaction:

The term Satisfaction is composed of "satis" meaning efficient and "facere" meaning doing or making which is measured in different majors and levels of society [18]. As a result, satisfaction means requesting something that we were seeking up to the point that we gain it completely. In marketing literature, satisfaction is defined in several ways [1]. Customer satisfaction is only suitable for satisfaction in business and the domain of satisfaction of consumer is used for satisfaction in other fields. The domain of consumer satisfaction is wider than customer satisfaction [25]. We can mention that customer satisfaction is accepted as an important issue by lots of marketing managers and is one of the important topics of discussion in marketing. Although satisfaction is a dynamic and complicated structure [10], what is clear is that customer loyalty is maintained when an organization is able to maximize customer's satisfaction. And the customer satisfaction is achieved when an organization tries to improve its quality in services and communication. Customer's dissatisfaction causes some changes in flow and behavior of customer, and some negative oral advertisements and results in increase of complaints [32]. It should be mentioned that the price of maintaining the existing customer is lower than attracting a new customer, also the present customers have less prices compared to new customers [23, 17]. So the second hypothesis is presented as below:

H2: there is a significant relation between service quality and customer satisfaction.

Service value:

Value is customer's understanding of received benefits in turn of price spent on Rial, time and effort [30]. Quality of service is the focus on what is delivered to customers and the situation in which this is carried out [29]. Customer satisfaction is in fact an emotional reaction of clients to the gap between their expected services and received ones in real world [2]. Customer satisfaction is under the effect of service and production quality, price and situational factors [30] and also is affected by service value and customer's understanding and perception and the value of the thing he gives in turn of the thing he receives [31]. So service quality affects service value and customer satisfaction [6] but from another dimension, satisfaction also depends on service confrontation and this is not end with the connection between seller and buyer. Level of relation and the content of communication is also an important issue [24]. According statements above, we can present below hypotheses:

H3: there is a significant relation between service quality and service value.

H4: there is a significant relation between service value and customer satisfaction.

Involvement in relation:

The capacity of an institution in maintaining the relation with customer and the rank of institution or company depends mostly on paying attention to trends and interests of customers [9]. Service confrontation, individual contact and inter personal / social dimensions have stronger role in forming presuppositions of quality. So the below hypotheses are presented:

H5: there is a significant relation between service confrontation and involvement in relation.

H6: there is a significant relation between involvement in relation and customer satisfaction.

Neural network:

Artificial neural network system is a calculation approach which uses human techniques in learning and examples in problem solving. Neural network is identified and defined by communication pattern between different layers of network, number of neurons, number of layers, learning algorithm and functional equation of neuron. But there is no general rule about the standard size of these elements for every network and for every function. In most cases there is a innovated approach in which multi layer networks with different numbers of neurons in each layer, different rates of learning and activation equations are trained and then the best network is chosen. In learning phase, the network is trained through weight modulation to become able to predict or classify the target outputs correctly which is according to a collection of inputs [26]. Artificial neural networks are often compared with multi variable techniques (such as multiple linear regressions) as a tool for taking pattern from linearity or non linearity of data collections. Generally, neural network are more accepted than linear techniques in terms of correctness. Although artificial neural networks have their own special limitation, they have special advantages such as learning power, flexibility, consistency and knowledge detection [12].

Conceptual model of research:

According to theoretical backgrounds of research, the conceptual model of research is shown in fig1.

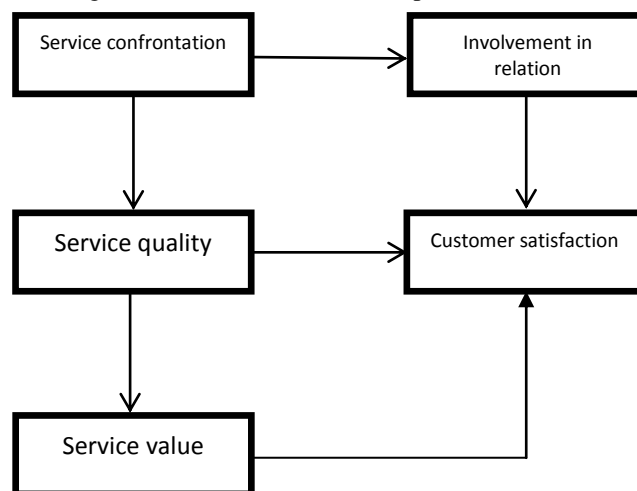


Fig. 1: Conceptual model of research Source

Methodology:

The present study is functional in terms of type and nature of question and research purposes. Data collection method is correlation-description and the approach used in data collection is field and library type. The literature pertaining to the topic is obtained using library approach and the data is collected using questionnaire. Population of the present study consist 750000 tourists inhabited in international hotels of Iran. Using simple random sampling we distributed 300 questionnaires among tourists. In table1 statistical description of demographic features of participants are presented. From 300 questionnaires, 169 male, 131 female (56.33% male and 43.67% female), 145 single and 155 was married (48.33% single and 51.67% married). Also families with 500-700 \$ salary had higher frequency (41%) and families with salaries higher than 900\$ had the lowest frequency of 7.33%.

Table 1: Statistical description of demographic features of participants

Demographic variable		F	%	Demographic variable		F	%
gender	men	169	56.33	education	AA and lower	6	12
	women	131	43.67		BA	81	60.33
age	-30	66	22		MA	3	24.33
	31-40	98	32.67		Ph.D	0	3.33
	41-50	109	36.33	Marital status	single	45	48.33
	51-	27	9		married	55	51.67
employment	employed	262	87.33	salary	Lower than 500\$	8	19.33
	unemployed	38	12.67		500-700	23	41
					700-900	7	32.33
					900\$ and higher	22	7.33

The research model is formed using variables such as service quality, service confrontation, involvement in relation, service value and customer satisfaction. The questionnaire includes 35 questions with 5 answer LIKERT scale. To measure the validity of questionnaires we used content and nominal validity. We make sure of selecting correct items with the help of instructors and consultants, in order to measure the variables in the level of population. To determine the reliability of questionnaire we use Cronbach alpha, the alpha obtained from SPSS18 software was higher than 0.7 which shows the reliability of questionnaire. Table2 shows Cronbach alpha and the number of questions related to variables.

Table 2: Variables and Cronbach alpha of variables

source	Cronbach alpha	questions	index	variable
Parasuraman et al., (1988)	0.914	1-9	Tangibility	Service quality
			Reliability	
			Assurance	
			Empathy	
Ruiz et al.,(2008)	0.986	10-16	-	Service value
	0.984	17-22	-	Customer satisfaction
Bakeret al.,(2007)	0.986	23-27	-	Relationship involvement
Jayawardhenaet al.,(2007)	0.901	28-35	Professionalism	Service encounter
			Civility	
			Friendliness	
			Competence	

To analyze data, fist we use one variable regression to investigate the existence of direct relation between variables and independent and dependent sub indices and then using artificial neural network, the importance degree of independent variables are determined. The used network in this research is multi layer perception whose initial layer consists of four variables: service confrontation, service quality, service value, involvement in relation. And the external layer is customer satisfaction. The variables gender, age, educational status, employment, marital status and salary are sub variables of research.

*Research Findings:**Hypotheses H1:*

The results of one variable regression is presented in table 3and4.modulus of t value is 145.430 which is higher than 1.96 and the significance level is lower than 0.05. So the null hypothesis in voided, that is service confrontation and service quality are in a significant, direct and positive relation.

Table 3: The results of significance of regression equation of direct relation between service confrontation and service quality

changes	Sum of squares	Degree of freedom	Mean of squares	F	Significance level
Regression	176.070	1	176.070	21149.832	0.000
Remained value	2.481	298	0.008		
total	178.551	299	-		

Table 4: the results of regression equation coefficient related to service confrontation variable in determining service quality variable

Variable	Non standard coefficients		Standard coefficient	T	Significance value
	B	Standard error	β		
Constant	0.022	0.022		0.985	0.325
Service confrontation	0.999	0.007	0.993	145.430	0.000

Tables 5 and 6 are the results obtained from the first hypothesis by artificial neural network. To examine this hypothesis we used 67.8% of data for network training and 32.2% for network examination. The total percent of correct prediction for training sample is 74.8% and for the isolated sample is 54.2%. If the pseudo possibility of prediction is higher than 0.5, the system reaction will be positive. The network had a hidden layer with 5 neurons. According to the output obtained in table4, service confrontation affects 0.384 on service quality.

Table 5: Possibility of correct prediction of variables

sample	Percentage of prediction
Training	74.8
isolated	54.2

Table 6: Importance estimation of independent and sub variables

Normalized importance	importance	variable
100%	0.384	Service confrontation
16.3%	0.063	Gender
25.8%	0.099	Age
35.4%	0.136	Education
24.9%	0.096	Employment
2.%	0.077	Marital status
38.3%	0.147	Family salary

Hypotheses H2:

The results of one variable regression is presented in table 7and8.modulus of t value is 53.828 which is higher than 1.96 and the significance level is lower than 0.05. So the null hypothesis is voided, that is service quality and customer satisfaction are in a significant, direct and positive relation.

Table 7: The results of significance of regression equation of direct relation between service quality and customer satisfaction

changes	Sum of squares	Degree of freedom	Mean of squares	F	Significance level
Regression	309.774	1	309.774	2897.420	0.000
Remained value	31.860	298	0.107		
total	341.634	299	-		

Table 8: the results of regression equation coefficient related to service quality variable in determining customer satisfaction variable

Variable	Non standard coefficients		Standard coefficient	T	Significance value
	B	Standard error	β		
Constant	-1.043	0.079	-	-13.226	0.000
Service confrontation	1.317	0.024	0.952	53.828	0.000

To examine this hypothesis we used 67.6% of data for network training and 32.4% for network examination. The total percent of correct prediction for training sample is 61.9% and for the isolated sample is 54.6%. The network had a hidden layer with 3 neurons. According to the output, service quality affects 0.392 on customer satisfaction.

Table 5: Possibility of correct prediction of variables

sample	Percentage of prediction
Training	61.9
isolated	54.6

Table 6: Importance estimation of independent and sub variables

Normalized importance	importance	variable
100%	0.392	Service quality
4%	0.016	Gender
14%	0.055	Age
41.8%	0.164	Education
25.2%	0.099	Employment
13.1%	0.051	Marital status
56.8%	0.223	Family salary

Hypotheses H3:

The results of one variable regression is presented in table 11 and 12. Modulus of t value is 60.147 which is higher than 1.96 and the significance level is lower than 0.05. So the null hypothesis is voided, that is service quality and service value are in a significant, direct and positive relation.

Table 11: The results of significance of regression equation of direct relation between service quality and service value

change	Sum of squares	Degree of freedom	Mean of squares	F	Significance level
Regression	248.249	1	248.249	36.17659	0.000
Remained value	20.449	298	0.069		
total	268.698	299	-		

Table 12: the results of regression equation coefficient related to service quality variable in determining service value variable

Variable	Non standard coefficients		Standard coefficient	T	Significance value
	B	Standard error	β		
Constant	-0.653	0.063	-	-10.334	0.000
Service confrontation	1.179	0.020	0.961	60.147	0.000

To examine this hypothesis we used 67.6% of data for network training and 32.4% for network examination. The total percent of correct prediction for training sample is 70.3% and for the isolated sample is 56.7%. The network had a hidden layer with 3 neurons. According to the output, service quality affects 0.4.6 on customer satisfaction.

Table 13: Possibility of correct prediction of variables

sample	Percentage of prediction
Training	70.3
isolated	56.7

Table 6: Importance estimation of independent and sub variables

Normalized importance	importance	variable
100%	0.406	Service quality
7.6%	0.031	Gender
20.7%	0.084	Age
44.7%	0.181	Education
25.7%	0.104	Employment
17.7%	0.072	Marital status
29.9%	0.122	Family salary

Hypotheses H4:

The result of one variable regression is presented in table 15 and 16. Modulus of t value is 56.101 which is higher than 1.96 and the significance level is lower than 0.05. So the null hypothesis is voided, that is service value and customer satisfaction are in a significant, direct and positive relation.

Table 15: The results of significance of regression equation of direct relation between service value and customer satisfaction

changes	Sum of squares	Degree of freedom	Mean of squares	F	Significance level
Regression	312.084	1	312.084	3147.274	0.000
Remained value	29.550	298	0.099		
total	341.644	299			

Table 12: the results of regression equation coefficient related to service value variable in determining customer satisfaction variable

Variable	Non standard coefficients		Standard coefficient	T	Significance value
	B	Standard error	β		
Constant	-0.194	0.061	-	-3.178	0.002
Service confrontation	1.078	0.019	0.956	56.101	0.000

To examine this hypothesis we used 67.3% of data for network training and 32.7% for network examination. The total percent of correct prediction for training sample is 72.8% and for the isolated sample is 55.1%. The network had a hidden layer with 4 neurons. According to the output, service quality affects 0.372 on customer satisfaction.

Table 17: Possibility of correct prediction of variables

sample	Percentage of prediction
Training	72.8
isolated	55.1

Table 6: Importance estimation of independent and sub variables

Normalized importance	importance	variable
100%	0.372	Service quality
16%	0.059	Gender
20%	0.074	Age
45%	0.167	Education
35.7%	0.133	Employment
19.4%	0.072	Marital status
33%	0.123	Family salary

Hypotheses H5:

The result of one variable regression is presented in table 20. Modulus of t value is 40.262 which is higher than 1.96 and the significance level is lower than 0.05. So the null hypothesis is voided, that is service confrontation and relationship involvement are in a significant, direct and positive relation.

Table 15: The results of significance of regression equation of direct relation between service confrontation and relationship involvement

changes	Sum of squares	Degree of freedom	Mean of squares	F	Significance level
Regression	248.641	1	248.641	1621.28	0.000
Remained value	45.709	298	0.153		
total	294.349	299	-		

Table 12: the results of regression equation coefficient related to service value variable in determining customer satisfaction variable

Variable	Non standard coefficients		Standard coefficient	T	Significance value
	B	Standard error	β		
Constant	-0.788	0.094	-	-8.337	0.000
Service confrontation	1.187	0.029	0.919	40.262	0.000

To examine this hypothesis we used 68% of data for network training and 32% for network examination. The total percent of correct prediction for training sample is 63.4% and for the isolated sample is 57.9%. The network had a hidden layer with 2 neurons. According to the output, service quality affects 0.678 on customer satisfaction.

Table 17: Possibility of correct prediction of variables

sample	Percentage of prediction
Training	63.4
isolated	57.9

Table 6: Importance estimation of independent and sub variables

Normalized importance	importance	variable
100%	0.678	Service quality
5.7%	0.039	Gender
17.7%	0.120	Age
10.1%	0.069	Education
9.3%	0.063	Employment
2.1%	0.014	Marital status
2.4%	0.016	Family salary

Hypotheses H6:

The result of one variable regression is presented in table above. Modulus of t value is 46.227 which is higher than 1.96 and the significance level is lower than 0.05. So the null hypothesis is voided, that is relationship involvement and customer satisfaction are in a significant, direct and positive relation.

Table 15: The results of significance of regression equation of direct relation between is relationship involvement and customer satisfaction

changes	Sum of squares	Degree of freedom	Mean of squares	F	Significance level
Regression	299.823	1	299.823	2136.943	0.000
Remained value	41.811	298	0.140		
total	341.634	299	-		

Table 24: the results of regression equation coefficient related to service value variable in determining customer satisfaction variable

Variable	Non standard coefficients		Standard coefficient	T	Significance value
	B	Standard error	β		
Constant	0.147	0.067	-	2.186	0.030
Service confrontation	1.009	0.022	0.937	46.227	0.000

To examine this hypothesis we used 67.8% of data for network training and 32.2% for network examination. The total percent of correct prediction for training sample is 65.8% and for the isolated sample is 55.2%. The network had a hidden layer with 4 neurons. According to the output, service quality affects 0.386 on customer satisfaction.

Table 17: Possibility of correct prediction of variables

Sample	Percentage of prediction
Training	65.8
Isolated	55.2

Table 6: Importance estimation of independent and sub variables

Normalized importance	importance	variable
100%	0.386	Service quality
11.4%	0.044	Gender
12.3%	0.047	Age
44%	0.169	Education
17.8%	0.068	Employment
23.4%	0.090	Marital status
50.6%	0.195	Family salary

Discussion and Conclusion:

The relation between service confrontation and service quality is confirmed between tourists inhabited in international hotels of Iran. The modulus of t value is 145.430 and higher than table value 1.69 and this shows that there is a direct and positive relation between service confrontation and service quality. According to the output obtained in table 4, service confrontation affects 0.384 on service quality. The findings of Gobbott and Hoss, Shostack [24], Solomon et al [24] and Dolen and Ruyter shows the relation between these two variables. The results of one variable regression is presented in table 7 and 8. modulus of t value is 53.828 which is higher than 1.96 and the significance level is lower than 0.05. So the null hypothesis is voided, that is service quality and customer satisfaction are in a significant, direct and positive relation. According to the output, service quality affects 0.392 on customer satisfaction. This is confirmed by Bitner and Hubbert, Bitner and Hubbert. The results of one variable regression is presented in table 11 and 12. modulus of t value is 60.147 which is higher than 1.96 and the significance level is lower than 0.05. So the null hypothesis is voided, that is service quality and service value are in a significant, direct and positive relation. According to the output, service quality affects 0.4.6 on customer satisfaction. This is consistent with the results obtained by Zeithaml [31], Sweeney, Geoffrey and Johnson, Parasuraman and Grewal [19]. The result of one variable regression is presented in table 15 and 16. Modulus of t value is 56.101 which is higher than 1.96 and the significance level is lower than 0.05. So the null hypothesis is voided, that is service value and customer satisfaction are in a significant, direct and positive relation. According to the output, service quality affects 0.372 on customer satisfaction. This is confirmed by Parasuraman and Grewal [19], Hallowell and Cronin et al [4].

The result of one variable regression is presented in table 20. Modulus of t value is 40.262 which is higher than 1.96 and the significance level is lower than 0.05. So the null hypothesis is voided, that is service confrontation and relationship involvement are in a significant, direct and positive relation. According to the output, service quality affects 0.678 on customer satisfaction. Researches such as Bitner and Tetreault, Czepiel, Shostack [24]. The result of one variable regression is presented in table above. Modulus of t value is 46.227 which is higher than 1.96 and the significance level is lower than 0.05. So the null hypothesis is voided, that is relationship involvement and customer satisfaction are in a significant, direct and positive relation. According to the output, service quality affects 0.386 on customer satisfaction. This is consistent with the findings of Gadde and Snehota [9] and Li and Nichols.

Suggestions Based on Results of Research:

Tourism industry and considering the inhabitation of tourists in this research is focused with the purpose of investigating the situations of hotels in Iran. Modern Hotel management is so young in Iran. Less than a decade is passed since the first hotel was built. However the history of hotel management education in Iran is shorter than that. Maybe this short history in managing hotels and hotel management training in Iran is caused the fact that today, hoteliers and foreign tourists on hotels suffer from lack of knowledge in this field. The most effect from lack of knowledge is focused on lack of management and investment in this section. This issue in macro section has caused hotel management not to develop in comparison to other conventional and regional rivals. The clear samples are Turkey, Emirate and Malaysia which could obtain a good portion of global tourism industry by updating the knowledge related to tourism. This is while wrong hotel management in Iran in some cases instead of being an opportunity in tourism development they have created so many impediments in its path. As an example wrong management in hotel management and being inattentive to economy and optimum usage of facilities, is one of the reasons of increasing prices and at last the increase in hotel prices in Iran compared to other countries which is caused bankruptcy and decrease in the ability of Iran against its foreign rivals. One of the most important issues considered today is decreasing number of tourists in Iran. Iran's international hotels are in a low rank in terms of service quality and global standards. Being inattentive to some issues can cause dissatisfaction of customers and foreign guests that as a result we would encounter the lack of travel services, tourism in hotels, no quick access to shopping centers and health care centers, no access to bank and monetary and post services, lack of literate, expertized, responsible and English speaking human forces, and no appropriate atmosphere. So it is suggested that service providers in this section have a correct understanding of their customer's expectations and with depicting service designations and global standards, reflect correct understandings. Because in future, the mild competition which is among service provider organizations especially hotel management centers in Iran will turn into competition storm and the situation will become severe for service providers who can not meet customer's needs and satisfaction.

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