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The Linear Assignment Method for Ranking of Organizations with Service Quality Approach: A Case Study of Hotels in City of Isfahan

Hadi Shirouyehzad[1], Mohammad Mehdi Tavakoli[1], Mostafa Badakhshian[2]

[1] Department of Industrial Engineering, Najafabad Branch, Islamic Azad University, Najafabad, Iran
[2] Department of Industrial and Mechanical Engineering The University of Concordia, Montreal, Quebec, Canada

A R T I C L E   I N F O

A B S T R A C T

One of the most important issues in modern societies is to provide better services and evaluation of provided services. Service organizations are always looking to increase their level of customer satisfaction. In this context, Service quality and service quality gaps analysis are taken into account. In this paper a method developed for ranking service organization based on the services quality approach and multi attribute decision making tools. In this method, options are organizations and the indicators are service quality gaps. However, other than gaps the perception of service quality is considered as a separate indicator. The weight of indicators are calculated by paired comparisons tools and experts panel results. Linear assignment method is used to rank the options. The developed method is used to rank seven hotels in city of Isfahan. The results show that the implemented method ranked the Abbasi hotel as first and Kosar hotel as last in the ranking.

1. Introduction

In today's global environment, companies not only have to compete with domestic and foreign companies, it is also very important, they have to provide services consistent with their customers' expectations. They should create a competitive advantage for their own services. In this case it motivats organizations to improve their service quality and to meet customer needs and expectations [1]. Recently the issue of service quality is taken into account as a global business and it takes a market value about 20 percent of world trade. One of the main parts of economy is service sector. In the developed countries with the resources of industry, mining and agriculture, importance of services as a development criteria is the main consideration [2, 3, 4]. Consistent preferable service quality can be consider as a main criteria which distinguish services institution from competitors. Most service institutions have realized the fact that by

offering services with high quality can be a strong competitive advantage. Advantage that will lead to higher sales and profits. To achieve this goal, service providers just have to consider the customers' expectations or even go precedence of customers' expectations. Customers often compare services provided by a firm with their expected services. They go back to the institution if the provided services are more than or at least in the level of their expected services [5].

The main characteristics of the services which can be considered is simultaneous processes of production, distribution and consumption at the same time, creating value in the interaction between buyer and seller, no inventory, non-proprietary, or inalienable and that is why in recent years has taken in to attention by researchers. [3].

In marketing literature, service quality is the overall assessment of the customer from services which company's providing. Perceived service quality also means assessing the comparison between the quality which customer expected service to receive and the quality of services that they received [5].

One of the most well-known global models used to measure service quality is SERVQUAL model. SERVQUAL model was introduced by Parasvramn et al. in 1985, and it has five dimensions: (i) the physical and tangible factors (physical appearances of facilities, equipment, personnel and communication tools), (ii) the reliability (ability to provide the services promised reliable), (iii) the responsibility (staff willingly to assist the customers and providing emergency services), (iv) the guarantee (the knowledge and competencies of employees and their ability to convey trust and confidence to the customers) and (v) the empathy and sympathy (individual attention to customers' demands) [6].

According to importance of the customer and quality of provided services, in most of organization, the performance measurement and prioritizing of organization units with service quality approach is done. Multi attribute decision making is one of the most popular methods used to prioritize organizations units with the service quality approach. Multi attribute decision making methods prioritize available options using several criteria. The purpose of these approaches is to support the decision-makers to select a choice between several options. In this way, the final result may be inconsistent with the results of each of the criteria and no option falls to satisfy all the criteria [7]. The linear assignment method is one of the multi-criteria decision-making models and compensation models which the output is a set of ranks, so that the necessary coordination is in the best way. In this method all the options will be ranked based on the criteria scores, and then place the final ranking of the options is determined using a linear process. This method is based on the n dimension standard Simplex property, while taking into account all the arrangements implicitly, claim the optimum solution in a convex space [8].

In this research we are looking into ranking of the hotels in city of Isfahan and for this purpose we first specified the service quality criteria and then we measured the specified criteria. Experts' panel evaluated the criteria weights and then criteria ranking is done using linear assignment method. In continue the recent related literature has been reviewed then we explained step by step the linear assignment method which is used to solve the problem and finally the results has been discussed.

2. Literature Review

The service units ranking using multi criteria decision models with service quality approach are taken into account in recent literature. Some of them have been reported in continue.

Chow and Luk [9] developed a method in which service quality could be measured by AHP. Their findings showed that empathy has the highest priority from customers' point of view in service quality evaluation of a fast food restaurant. Tangibles and assurance were also identified as the second and third important dimensions, respectively. Tsai [10] applied DEA cross-efficiency evaluation to analyse star-rated hotel productivity. Input variables used in Tsai's study included the number of hotels, the amount of fixed assets, and the number of hotel employees receiving training, while output variables included total revenue and the occupancy percentage. Shuai and Wu [11] evaluated hotels' website in Taiwan regarding internet marketing. In this study, DEA and grey entropy were applied to analyse the influence of internet marketing on hotel performance. Findings of their study revealed that internet marketing can affect the operating performance of tourist hotels. Neves and Lourenco [12] applied DEA in order to select the most suitable strategies which may improve the performance of hotel companies. Results of their research proved that a focused strategy is better than a diversification strategy. In their study, a great part of the hotels were identified under decreasing return-to-scale. Chou et al. [13] used a fuzzy weighted SERVQUAL method to evaluate service quality in a Taiwanese airline. To examine expectations and perceptions values more realistic, they described some linguistic terms. In terms of service quality importance, reliability and assurance dimensions are the most critical ones. Responsiveness, empathy and tangibles are in the next priorities, respectively. Shahin and dabestani [14] studied three of four stars hotels in the concept of expectations and perceptions of customers based on the different dimensions of service quality. The authors used correlation analysis to identify service quality gaps and they used ANP to identify the most important dimensions of service quality. They showed that the gaps are negative. In their study the price has the highest negative service quality gap and the communication has the highest correlation with the other dimensions of service quality. Nejati et al. [15] studied service quality in the airline industry in Iran. Fuzzy TOPSIS was used for this purpose. Their results showed that the "safety of flight", "good appearance of flight crew", and "to services customers 24 hours with highest possible quality" are known as the most important factors in the airline's customers. The "checking flight scheduling by phone" was ranked as the least important factor. Augustine et al. [16] provided a fuzzy AHP method for services criteria ranking. In this paper a comprehensive framework based on AHP fuzzy logic have been provided. Chang analysis method is used in order to rank criteria in the service sector. The results of this research showed that this method deals with criteria prioritization with perspective of all business stakeholders. Tavakoli and Shirouyehzad [7] employed a Parasuraman service quality model to evaluate the service quality gap in the seven branches of a private bank. The authors also used two methods of multi criteria decision making (MCDM) to rank them. The merged result revealed that the reliability gap is the most important dimension among five other ones along with sensitivity analyses on service quality dimensions application.

3. The Hugarian Assignment Algorithm and Linear Allocation

Linear assignment is one of the most well-known techniques in MADM. In this technique, given options will be ranked based on each indicator scores and then final ranking of options will be determined through a process of linear compensation (based on the possible exchanges between characteristics). In this method, based on the solution space properties of simplex, and

keeping all the arrangements implicitly, the optimal solution is extracted in a convex space of simplex. In this technique, the priorities of each option in each specific evaluation criteria is characterized and a model of the allocation planning will be formed to address the allocation model in order to prioritize options. In the allocation model, the planning and allocation model and from-to matrix have been made to assign people to tasks [17]. The mathematical formulation of the technique is explained in continue.

$$x_{ij} \begin{cases} 1 & \textit{if person i assigned to task j} \\ 0 & \textit{otherwise} \end{cases} \qquad (1)$$

$$\min Z = \sum_{i=1}^{n} \sum_{j=1}^{n} c_{ij} x_{ij} \qquad (2)$$

$$S.t$$

$$\sum_{i=1}^{n} x_{ij} = 1 \qquad j = 1,2,3,\dots,n \qquad (3)$$

$$\sum_{j=1}^{n} x_{ij} = 1 \qquad i = 1,2,3,\dots,n \qquad (4)$$

$$x_{ij} = (0,1) \; \forall \; i,j \qquad (5)$$

Table 1.   from-to matrix

Task / Person	1	2	…
1			
2			
.		Time duration to finish task per each person	
.			
.			
n			

4. Methodology

According to the importance of the service quality in hotels, in this research the prioritization of hotels in the city of Isfahan are studied and the multi attribute decision making is used to solve this problem. For this purpose first by using the questionnaire, in each hotel the service quality indicators gaps is calculated respectively. Then overall quality of provided services in the hotel and weight of each indicators are calculated. Then a linear assignment method prioritize the options. The steps of the methods will be discussed in continue.
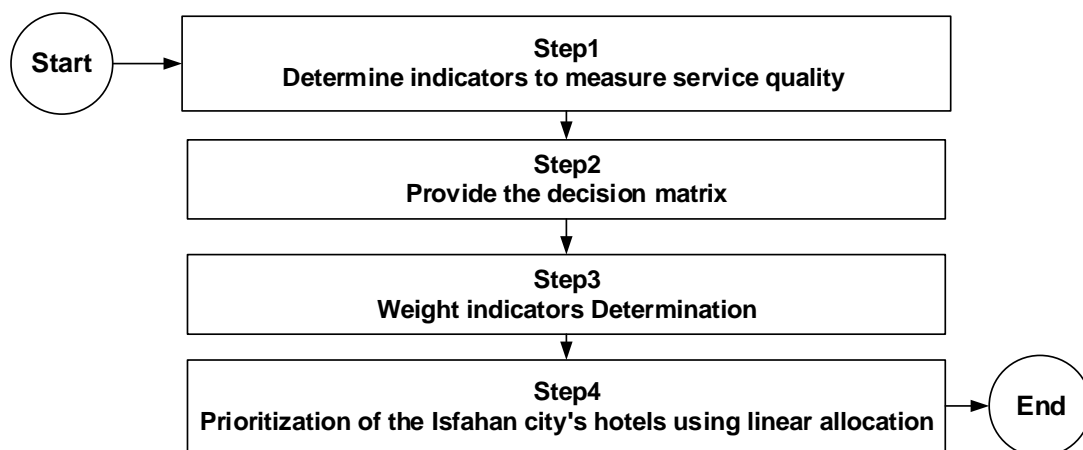
Figure 1.   The hotels prioritizing algorithm

Step 1- Service quality indicators determination and measurement

In this research seven grand hotels in city of Isfahan are prioritized and the quality of their services are assessed. According to recent literature, to determine indicators of service quality, the service quality model which is proposed by Parasuraman et al. [6] is selected. The model is used by authors in order to examine of service quality in similar cases. In this model, tangibility, reliability, responsibility, assurance and empathy are considered as five main indicators of the service quality which in both expectations and perceptions dimension are evaluated. Parasuraman et al. [6] questionnaire is used to assess service quality indicators. There are two main parts in this questionnaire which each parts included 22 properties in frame of main five indices. Two dimension customers' perceptions and expectations of properties are evaluated.

Academic and hotel industry experts assessed the validity of content and Cronbach's alpha coefficient was used to assess the reliability of questionnaire. For this questionnaire the Cronbach's alpha coefficient is 0.89 which is greater than 0.7 and it is acceptable. In continue the customers' perceptions and expectations are used in order to service quality gaps evaluation for each indicators.

Step 2- Decision matrix

In this research, service quality indicators combination and customers' perceptions of the quality of services are used to prioritize the hotels. For this purpose, based on the data that are extracted from the questionnaire, first the quality of each of the seven hotels are calculated and then by calculating the differences between expectations and perceptions of customers for each indicators service quality indicators gaps are calculated. The detail is shown in table 2.

Table 2.   Decision making matrix

Hotels	Gap-R	Gap-A	Gap-T	Gap-E	Gap-Res	P
Alighapu	0.412	0.747	0.31	0.574	0.5	82.52
Piroozi	0.392	0.737	0.38	0.54	0.48	77.92
Abbasi	0.422	0.487	0.31	0.466	0.557	84.76

Table 2.   Decision making matrix

Hotels	Gap-R	Gap-A	Gap-T	Gap-E	Gap-Res	P
Kosar	0.614	0.647	0.37	0.682	0.36	75.4
Azadi	0.432	0.563	0.43	0.45	0.284	84.32
Sepahan	0.308	0.637	0.757	0.474	0.62	77.48
Setareh	0.432	0.523	0.49	0.326	0.67	72.68

Step 3- Indicators weight determination

Paired comparison matrix used to determine the weight of the indicators. For this purpose square matrix is used to determine five service quality indicators gaps. In this case a 5 x 5 square matrix determined and by using the experts' feedback and geometric mean of their ideas, service quality indicators gaps weight are determined as table 3:

Table 3.   paired comparison matrix for service quality indicators

	R	A	T	E	Res	Geometric mean	Gap weight indicators SQ
R	1	5	7	4	2	3.086	0.497
A	0.2	1	2	0.333	0.2	0.484	0.078
T	0.143	0.5	1	3	5	1.014	0.163
E	0.25	3	0.333	1	2	0.871	0.140
Res	0.5	5	0.2	0.5	1	0.758	0.122

Furthermore, based the importance of customers' perceptions from service quality and gaps between different perceptions and expectations, in this section we set a paired comparison 2 x 2 matrix for "the perception", and the gaps of "perception and expectation". The weights are calculated and shown in the table 4.

Table 4.   Paired comparison matrix between gap and perception

	P	G	Geometric mean	Gap weight indicators SQ
P	1	0.334	0.577	0.250
G	3	1	1.732	0.750

According to Tables 3 and 4 final weight of prioritization indicators are determined. The perceptions indicators weight is equal to 0.25 and the weight of the SQ indicators determined by product of gap weight calculated in table 4 and each gap calculated in table 3. The results is shown in table 5.

Table 5.　　　Gap weights

	Gap-R	Gap-A	Gap-T	Gap-E	Gap-Res	P
Weight	0.3726	0.0585	0.1224	0.1051	0.0915	0.2500

Step 4- Prioritization of the Isfahan city's hotels using linear assignment

In this section the prioritizing of the hotels in city of Isfahan is finalized by using linear allocation. The Hungarian algorithm is used and the results of prioritization are shown in Table 6.

Table 6.　　　　prioritizing of the hotels using linear allocation

Hotel	Alighapu	Piroozi	Abbasi	kosar	Azadi	Sepahan	Setareh
Rank	3	4	1	7	2	6	5

5.　Discusion and conclusion

According to high competition between different organizations and service institutions, the need to have a competitive advantage is taken in to account by organizations. Service organizations try to provide products for customers with the production and consumption as well as intangible are the same.

In recent years, competition between different organizations, especially service organizations increased and the organization management more follow the need to create a competitive advantage for their organizations. In general, services are intangible and time of production and consumption are at the same time thereby the organizations seek to increase the level of their customers' perception for the received services, and decrease the gap between the customers' perceptions and expectations of received service. This process can be can increase customer satisfaction and thus help the organizations achieve their objectives.

According to importance of service quality in service organizations, and also considering that the city of Isfahan has many tourism places and it is attractive for many tourists from all around the world, in this study, we focused on prioritizing of hotels located in city of Isfahan with service quality approach. We evaluated the performance of service quality of hotels, and then the gap between customers' perceptions and their expectations of the service received is considered. Finally, the available options (hotels) are ranked using linear assignment.

The results showed, from experts' reasons in hotel industry can conclude that taking into account service quality gaps are more important than considering customers' perceptions of service quality. In addition, the reliability has the greatest weight in different dimensions of the service quality in the hotel industry. Following the results of ranking of seven hotels located in Isfahan, Abbasi hotel has earned the highest rank.

The results of this research can help hotels managers to pay more attention to the quality of their services and reduce the gap between customers' perceptions and the expectations to be able improve their ranking among other hotels. This research used the data collected from seven

hotels which can be developed to more hotels located in the Isfahan as the next phase. Also by using the Fuzzy method we can reduce uncertainty in the data.

6. References

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