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A New MCDM Approach in Evaluating Airport Service Quality: MEREC-Based MARCOS and CoCoSo Methods

Havalimanı Hizmet Kalitesinin Değerlendirilmesinde Yeni Bir ÇKKV Yaklaşımı: MEREC Tabanlı MARCOS ve CoCoSo Yöntemleri

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ÖZET

Hizmet kalitesi, rekabet üstünlüğünün sağlanabilmesi için önemli bir kurumsal strateji olarak görülmektedir. Havayolu taşımacılığına gösterilen talebin artmasıyla birlikte havaalanları önem arz eden mekânlara dönüşmüştür ve bu da havaalanı hizmet kalitesi konusunu ön plana çıkarmıştır. Şehirlerin dünyaya açılan kapıları olarak nitelendirilen havaalanlarında, yolculara sunulan hizmetin, yolcunun beklentisini karşılama düzeyi ile örtüşmesi durumunda, hizmet kalitesi belirlenmektedir. Bu bağlamda çalışma kapsamında, Skytrax tarafından 2021 yılında beş yıldızlı havaalanı olarak değerlendirilen 17 havaalanı, 11 kriter bazında değerlendirilerek hizmet kalitesinin ölçülmesi amaçlanmıştır. ÇKKV yöntemlerinden MEREC ile kriterlerin önem dereceleri belirlenirken, MARCOS ve CoCoSo yöntemleriyle 17 havalimanının hizmet kalitesine göre sıralaması elde edilmiştir. Havaalanlarının hizmet kalitesini değerlendirmek için kullanılan kriterler; ulaşım hizmetleri, güvenlik taramaları, göçmenlik hizmetleri, yön tabelaları, arrival hizmetleri, departure hizmetleri, tranfer yolcu hizmetleri, terminal konfor düzeyi, terminal tesisleri, alışveriş olanakları ve yiyecek/içecek hizmetleridir. MEREC yöntemiyle yapılan analiz sonucunda, havalimanlarında hizmet kalitesini etkileyen en önemli kriterin göçmenlik hizmetleri kriteri olduğu belirlenmiştir. MARCOS ve CoCoSo yöntemlerinin her ikisinin de ortak sonucuna göre, yolculara en iyi hizmet kalitesini sunan havaalanı Chubu Centrair Havaalanı, hizmet kalitesi açısından en son sırada yer alan havaalanı ise Tokyo Haneda Havaalanı olduğu tespit edilmiştir.

Anahtar Kelimeler:

Havalimanı Hizmet Kalitesi,

ÇKKV,

MEREC,

MARCOS,

CoCoSo,

ABSTRACT

Service quality is seen as an important corporate strategy to ensure competitive advantage. With the increase in demand for air transport, airports have become an important venue, which has brought the issue of airport service quality to the forefront. In airports, which are described as the doors of cities opening to the world, the quality of service is determined if the service provided to passengers coincides with the level of meeting the expectations of the passenger. In this context, within the scope of the study, it is aimed to measure the quality of service by evaluating 17 airports that are evaluated as five-star airports by Skytrax in 2021 based on 11 criteria. While the importance of the criteria was determined with MEREC from the MCDM methods, the ranking of 17 airports according to the quality of service was obtained with MARCOS and CoCoSo methods. Criteria used to assess the quality of service of airports; transportation services, security screenings, immigration services, signs, arrival services, departure services, transfer passenger services, terminal comfort level, terminal facilities, shopping facilities and food/beverage services. As a result of the analysis made by the MEREC method, it was determined that the most important criterion affecting the quality of service at airports was the immigration services criterion. According to the joint results of both MARCOS and CoCoSo methods, it was determined that Chubu Centrair Airport was the airport that offered the best service quality to passengers, and Tokyo Haneda Airport was the last airport in terms of service quality.

Keywords:

Airport Service Quality,

MCDM,

MEREC,

MARCOS,

CoCoSo,

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1. INTRODUCTION

The importance of transportation sectors around the world is increasing day by day. The fact that improvements in the transportation sector have become more comprehensive, customer satisfaction has been prioritized and that millions of people are in a constant state of travel creates changes in the supply-demand balance (Crowford and Melewar, 2003). With the effect of these developments, the service quality element comes to the fore from the moment the passengers enter the terminal building in air transportation. For this reason, the facilities of the terminal building are important for the comfort and satisfaction of the passengers. The non-storable feature of the service concept and its abstractness create different perceptions of the same service. For this reason, service quality is generally referred to as "*perceived service quality*" in the literature. Perceived quality is one of the most important elements as it can influence the consumer's decisions. This perception of value affects the purchase intention (Babakus and Mangold, 1992).

It has a dynamic competitive environment although the aviation sector operates with a small number of companies (Sümerli Sarıgül and Coşkun, 2022). The competitive environment is also increasing with continuous growth and development, in this intensely competitive environment, the quality of the services provided to passengers emerges as an important factor (Yaşar, 2022). Airports are the backbone of the air transport sector (Yaşar et al., 2022). Since airport services are experienced differently for each passenger, it is desired that the perceived service coincides with the level of satisfaction of the passenger. For this, it is necessary to decide what service the passengers attach importance to. Thus, the steps to be taken to improve the services to be provided by the airport will accurately determine the direction of investment activities (Lin et al., 2009).

Therefore, the primary purpose of the study is to analyze the service expectations of the passengers during the time they spend at the airport by using multi-criteria decision-making techniques and to determine the importance of the criteria affecting the passenger expectations. In this way, it is foreseen that the expectations of the passengers and the improvement efforts to be made by the airport operators will be able to meet the satisfaction of the passengers.

17 five-star airports operating were examined with MEREC, MARCOS and CoCoSo methods, which are among the multi-criteria decision-making methods within the scope of this study. The 11 criteria used in the evaluation of airports in the study were determined by secondary data published by Skytrax. The importance of the criteria used in determining the airport quality was used with the MEREC method, and the MARCOS and CoCoSo methods were used to sort the airports according to the quality of service.

In the second part of the study, there is a literature search including studies using MEREC, MARCOS and CoCoSo methods and studies on aviation sector service quality. In the third part, the criteria examined within the scope of the study and the explanations of the method used are presented. In the fourth part, analysis and results are included. In the last section, evaluations were made about the results of the analysis.

2. LITERATURE REVIEW

MEREC, MARCOS and CoCoSo methods, which are among the multi-criteria decision-making methods used within the scope of the study, are generally used in the literature as MEREC-MARCOS and MEREC-CoCoSo as single weighting and single sequencing. There are a limited number of studies due to the fact that there are current and new methods.

In the literature, it is possible to come across studies on various subjects where MEREC and MARCOS methods are used together. Haq et al. (2022) preferred these methods in their research on the problem of aircraft wing material selection. As a result of the analysis, they found that the most suitable sustainable material for the aircraft wing was the material expressed in L3. Ivanović et al. (2022) used their study to determine the best concrete pump alternative in the construction industry. As a result of the research, they concluded that the A1 coded concrete pump model is the most suitable option. In their research, Simic et al. (2022) aimed to list sustainable policies to reduce the effects of urban transportation caused by climate change. As a result of the findings obtained, they stated that the climate change effects caused by urban transportation could be possible thanks to the land use planning policy. In his article Ersoy (2022), he discussed the innovation performances of EU member states. In the findings obtained, it was determined that Switzerland was the country with the highest innovation performance. Ayçin and Arsu (2022) evaluated the countries according to the social development index (SDI) in their research. As a result of the analyzes, they determined that the indicators of importance for the social development of the countries were inclusivity, health and education, while the countries with the highest social development performance were Norway, Finland and Denmark. In his article Noyan (2022), he measured the financial performance of retail enterprises operating in Turkey. When the findings were examined, it was concluded that the most important factor affecting the financial performance in the retail sector was the current ratio.

It is also encountered that the CoCoSo method, which stands out as a current method, is integrated into the MEREC method and used. In his article Bektaş (2022), he aimed to determine the year in which the most successful performance was exhibited by examining the efficiency of the insurance sector between 2002-2021. In the study where a four-stage methodology was used, it was concluded that the most successful performance in the insurance sector was realized in 2020. In their research, Ghosh and Bhattacharya (2022) aimed to perform performance analysis of accommodations operating in India during COVID-19. As a result of the findings obtained, they determined that the hotel with the best performance was Westlite Lemon. Özdağoğlu et al. (2022) investigated the problem of aircraft selection of flight schools. In the findings of the study, while determining that the most important criterion affecting the choice of aircraft was the standard weight, they reached the conclusion that the best alternative was the A3 coded aircraft.

Airline and airport service quality is one of the popular topics investigated using different techniques and various variables in the current literature. The availability of many evaluation criteria and alternatives turns the relevant issue into a complex structure. MCDM methods are also among the frequently preferred methods of solving complex problems. In the national and international literature, numerous studies on the identification of factors affecting service quality and the ranking of airports and airlines providing the best service (Kuo and Liang, 2011; Pandey, 2016; Gupta, 2018; Bakır and Atalık, 2018; Bakır and Akan, 2018; Altınkurt and Merdivenci, 2020; Chakraborty et al., 2020; Kiracı et al., 2021; Keleş et al., 2021; Pamucar et al., 2021; Samad et al., 2021; Kiracı and Durmuşçelebi, 2022; Yaşar and Çınaroğlu, 2022; Baki, 2022).

Kuo and Liang (2011) focused on the service quality of Northeast Asian international airports. The findings of the study, in which VIKOR and GRA methods were used, show that in to increase the quality of service, first of all, attention should be paid to information visibility and convenience. In his article Pandey (2016), he focused on improvements to improve the current service quality of the two most important airports operating in Thailand. As a result of the study using fuzzy MCDM methods; It has come to the conclude that both airports can improve their service quality if they make improvements in terms of waiting time at check-in, ease of finding a way, speed of baggage delivery service, etc.

In its research, Gupta (2018) evaluated the service quality of 5 airlines operating in India with the VIKOR method. As a result of its findings, it has determined that concreteness, reliability, safety and security criteria are the most important factors affecting the quality of service. In their research, Bakır & Atalık (2018) examined the 11 airlines carrying the most passengers based on 2016 with the Entropy and ARAS method based on the criteria of lounge services, in-flight services, cabin crew services. According to the findings, they determined the airline with the best service quality as All Nippon Airlines. In their research, Bakır & Akan (2018) examined the airports serving the most passengers in Europe in 2016 with 8 service quality evaluation criteria. The researchers used the Entropy and TOPSIS methods and determined that the airport with the highest service quality was Munich Airport.

In their article Altınkurt & Merdivenci (2020), they investigated the quality of service provided by 11 airline companies to passengers traveling for business purposes based on 2019. Airport services, lounge services, in-flight comfort, refreshments, entertainment services and cabin crew criteria were taken into consideration and analyzed with AHP and EDAS methods. According to the findings; While the airline that provides the best service is All Nippon Airlines, they have determined that the airline with the lowest service quality is LATAM Airlines. In their study, Chakraborty et al. (2020) aimed to evaluate the performance of 32 major international airports serving in India. Based on 8 evaluation criteria, they analyzed with BWM and MABAC methods. As a result of the analysis, they determined that the annual turnover criterion was the most important evaluation criterion. While Indira Gandhi International Airport is the airport with the best service quality in India, they have reached the conclusion that Surat International Airport is the airport with the worst service quality.

In their studies Kiracı et al. (2021), discussed the service quality of the airports operating in Turkey during the Covid-19 process. They determined 5 main criteria and 33 sub-criteria and evaluated them with the fuzzy AHP method. According to the results of the study, they determined that the importance level of reliability and responsiveness criteria was high. In their research in Keleş et al. (2021), they aimed to determine the service quality of the relevant airports by considering a total of 8 criteria such as distance to the city center and number of parking lots for 3 airports. According to the findings of the studies using SWARA, CODAS and ARAS methods; they have identified Denizli Çardak Airport as the airport that offers the best service in terms of service quality.

In their article Pamucar et al. (2021), they examined the service quality of the five main airports in Spain with MCDM methods. As a result of the analysis they carried out with a number of criteria such as suitability, comfort, staff courtesy, price, security, transportation facilities, they determined that the most important criteria affecting the quality of service were access to the parking lot and Wi-Fi connection. Samad et al. (2021) have focused on determining the factors affecting airline service quality by AHP method in their research. As a result of the analysis obtained, they concluded that the criteria affecting the airport service quality performance were criteria such as baggage delivery time, employee courtesy and on-time performance.

In their study Kiracı & Durmuşçelebi (2022), they examined the service quality measurement of the 10 largest airports operating in Turkey in the period 2013-2019. In their findings with the CRITIC method; they determined that the most important criterion affecting the quality of service was the number of tracks. In their research, Yaşar & Çınaroğlu (2022) evaluated the service quality of 25 airports operating in Europe in 2021 based on 11 criteria. Using CRITIC and Entropy methods, they aimed to determine the most important criterion affecting the quality of service. According to the findings obtained by the CRITIC method, they determined that the most important criterion affecting the quality of airport service was immigration service services, and according to the findings of the Entropy method, the most important criterion was terminal comfort. In his article Baki (2022), he aims to evaluate and rank the performance of five major airports in Turkey. As a result of the analysis carried out using FUCOM and MAIRCA methods, it was determined that the two most important criteria affecting airport performance were land transportation and security screening services. It has reached the conclusion that Istanbul Airport is the airport with the highest service quality performance offered to passengers.

As a result of the literature review, there was no study in which MEREC, MARCOS and CoCoSo methods were used together and the quality of airport service was investigated. It is thought that the fact that there are few studies in which the methods are used in the domestic literature will contribute to the literature in terms of providing a different perspective in terms of evaluating the quality of service.

3. METHODOLOGY OF RESEARCH

In this study, which aims to measure the quality of the perceived services at airports, Skytrax (2021) data was used. Skytrax objectively conveys the experiences of passengers as it is a neutral platform that is not affiliated with any organization that evaluates airlines or airports based on passenger opinions. However, the study has some limitations. The data obtained through Skytrax only covers a specific period. On the other hand, the fact that airports contain many complex and different facilities and that they are evaluated with 11 criteria has led to a narrower evaluation of service quality. Nevertheless, the limited number of relevant data of this study in the field literature constitutes the unique aspect of the study. In addition, it is hoped that the examination of the service quality of airports in an integrated manner with current multi-criteria decision-making methods will guide future research.

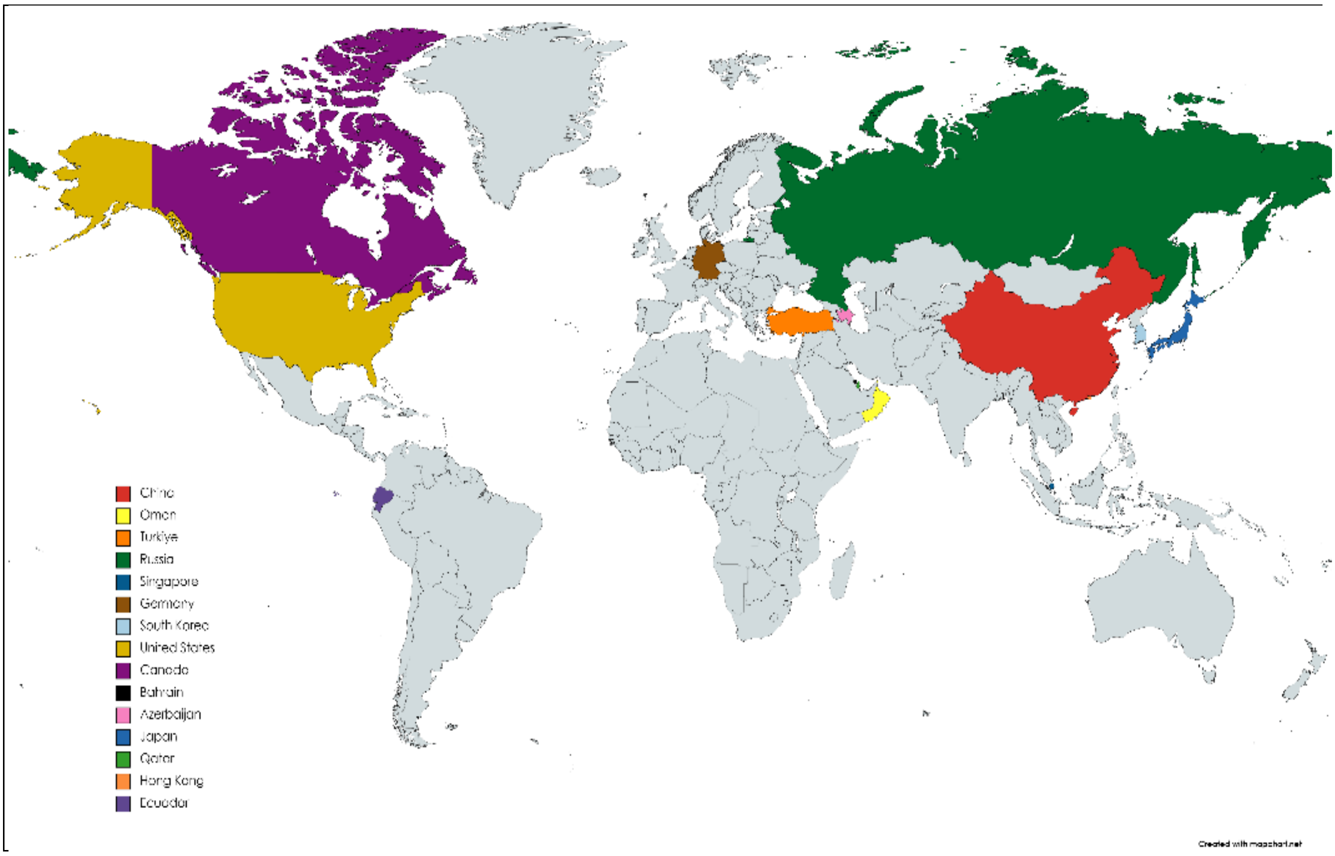
In the study, 17 airports operating and evaluated as "*five-star airports*" by Skytrax were examined. The airports examined are listed in Table 1.

Table 1. Airports Examined within the Scope of the Study

Airport	Code
Bahrain International Airport	BAH
Baku Heydar Aliyev International	GYD
Chubu Centrair Airport	NGO
Hamad International Airport	DOH
Haikou Meilan International Airport	HAK
Hong Kong International Airport	HKG
Houston William P. Hobby Airport	HOU
Istanbul Airport	IST
Munich Airport	MUC
Platov International Airport Rostov	ROV
Quito Mariscal Sucre International	UIO
Salalah International Airport	SLL
Seoul International Airport	ICN
Shanghai Hongqiao International Airport	SHA
Shenzhen Bao'an International Airport	SZX
Singapore Changi Airport	SIN
Tokyo Haneda Airport	HND

The countries to which the airports examined within the scope of the study are connected are given in Figure 1.

Figure 1. Countries Where the Airports Examined within the Scope of the Study Are Located



Source: Mapchart.net (Figure Produced by the Authors)

In the study, 11 criteria were used for the perception of service quality. These criteria are listed in Table 2.

Table 2. Criteria List

Criteria	Criteria
Transportation	C1
Security Screenings	C2
Immigration Services	C3
Signage	C4
Arrival Services	C5
Departure Services	C6
Transit Passenger	C7
Terminal Comfort	C8
Terminal Facilities	C9
Shopping Facilities	C10
Food/Beverage	C11

3.1. MEREC Method

The MEREC method is an objective criterion weighting method introduced by Keshavarz-Ghorabaee et al. (2021). When calculating the severity of a criterion, it focuses on the change in the total criterion weight when the corresponding criterion is excluded from the calculation. In this respect, it differs from other objective criterion weighting methods (Keshavarz-Ghorabae et al., 2021).

The steps of this method are as follows (Özdağoğlu et al. 2022);

The initial decision matrix should be created as in Equation 1.

$$X = \begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1n} \\ x_{21} & x_{22} & \cdots & x_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ x_{m1} & x_{m2} & \cdots & x_{mn} \end{bmatrix} \tag{1}$$

To normalize the determined criteria, Equality 2 is used for benefit-oriented criteria and Equality 4 is used for cost-oriented criteria.

$$n_{ij} = \frac{\min_j x_{ij}}{x_{ij}} \tag{2}$$

$$n_{ij} = \frac{x_{ij}}{\max_j x_{ij}} \tag{3}$$

The overall performance values of the alternatives are calculated with the help of Equation 4.

$$R_i = In\left(1 + \frac{\sum_{j=1}^{n} \left|In\ (n_{ij})\right|}{n}\right) \tag{4}$$

To eliminate the effect of each criterion, the performance value, which takes into considered the effect of the criterion, is calculated with the help of Equation 5.

$$R'_{ij} = In\left(1 + \frac{\sum_{j=1, j\neq k}^{n} \left|In(n_{ij})\right|}{n}\right) \tag{5}$$

The sum of the absolute differences of the values calculated by equations 4 and 5 is calculated by Equation 6.

$$E_j = \sum_{i=1}^{m} \left|R'_{ij} - R_i\right| \tag{6}$$

In the last step of the method, the criterion weights are calculated by Equation 7

$$w_j = \frac{E_j}{\sum_{j=1}^{n} E_j} \tag{7}$$

3.2. MARCOS Method

MARCOS (Measurement Alternatives and Ranking According to Compromise Solution) method was introduced to the literature by Stevic et al. (2019). The method determines the utility functions of the alternatives and reveals the consensus sequence according to the ideal solution. The best decision alternative is closest to the ideal and furthest to the anti-ideal (Stević and Brković, 2020).

The steps of the method are carried out in the following stages (Gençtürk et al., 2021). By determining the evaluation criteria and alternatives, the decision matrix is obtained with the help of Equality 1. Creation of an Expanded Initial Matrix; As seen in Equation 8, the ideal (AI) and non-ideal (AAI) solutions are added to the initial decision matrix to obtain an extended initial matrix.

$$X^G = \begin{array}{c} \\ A_1 \\ A_2 \\ \vdots \\ A_m \\ AI \\ AAI \end{array} \begin{array}{c} \begin{array}{cccc} C_1 & C_2 & \cdots & C_n \end{array} \\ \begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1n} \\ x_{21} & x_{22} & \cdots & x_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ x_{m1} & x_{m1} & \cdots & x_{mn} \\ x_{ai1} & x_{ai2} & \cdots & x_{ain} \\ x_{aa1} & x_{aa2} & \cdots & x_{aan} \end{bmatrix} \end{array} \tag{8}$$

AI and AAI values; Equality 9 and Equality 10 are used to calculate the criteria according to the benefit-cost direction.

$$AI = {}^{max}{}_{i}\ X_{ij} \quad if \ \ j \in F \qquad ve \qquad {}^{min}{}_{i}\ X_{ij} \quad if \ \ j \in M \tag{9}$$

$$AAI = {}^{min}{}_{i}\ X_{ij} \quad if \ \ j \in F \qquad ve \qquad {}^{max}{}_{i}\ X_{ij} \quad if \ \ j \in M \tag{10}$$

Here F; it represents the benefit-side criteria, and M represents the cost-side criteria. normalization of the extended initial matrix; Equality 11 is used for benefit-based criteria and Equality 12 is used for cost-oriented criteria for normalization process.

$$n_{ij} = \frac{x_{ij}}{x_{ai}} \quad j \in F \tag{11}$$

$$n_{ij} = \frac{x_{ai}}{x_{ij}} \quad j \in M \tag{12}$$

Creation of the weighted matrix; Equation 13 is used to construct the weighted matrix (V). The weighted matrix is obtained by multiplying the elements of the normalized matrix by the criterion weights (w_j).

$$v_{ij} = n_{ij} \,.\, w_j \tag{13}$$

Calculation of the degree of utility of alternatives; with the help of equations 14 and 15, the degree of utility is calculated according to ideal and non-ideal solutions, respectively. The value of the S_i in the equations refers to the sum of the weighted matrix elements and is calculated using Equation 16.

$$K_i^+ = \frac{S_i}{S_{ai}} \tag{14}$$

$$K_i^- = \frac{S_i}{S_{aai}} \tag{15}$$

$$S_i = \sum_{i=1}^{n} v_{ij} \tag{16}$$

Calculation of utility functions of alternatives; the utility function refers to the consensus solution of the observed alternative according to the ideal and anti-ideal solution. The utility function of the alternatives is calculated by Equation 17.

$$f(K_i) = \frac{K_i^+ + K_i^-}{1 + \frac{1-f(K_i^+)}{f(K_i^+)} + \frac{1-f(K_i^-)}{f(K_i^-)}} \tag{17}$$

In the equation, $f(K_i^+)$ refers to the utility function according to the ideal solution, and $f(K_i^-)$ refers to the utility function according to the non-ideal solution. It is calculated using Equality 18 and 19, respectively.

$$f(K_i^+) = \frac{K_i^-}{K_i^+ + K_i^-} \tag{18}$$

$$f(K_i^-) = \frac{K_i^+}{K_i^+ + K_i^-} \tag{19}$$

Listing of alternatives; sort by the utility functions calculated by equality 17. The alternative with the highest value is determined as the most preferred alternative.

3.3. CoCoSo Method

It is based on the selection of the alternative. The steps of the method are as follows (Akgül, 2021); the initial decision matrix is created as in Equation 1. After the decision matrix is created, the normalization process is carried out. Equality 20 is used for benefit-qualified criteria and Equality 21 is used for cost-qualified criteria.

$$r_{ij} = \frac{x_{ij} - min\ x_{ij}}{\max\ x_{ij} - \min\ x_{ij}} \tag{20}$$

$$r_{ij} = \frac{\max\ x_{ij} - x_{ij}}{\max\ x_{ij} - \min\ x_{ij}} \tag{21}$$

The total weighted comparability (S_i) and total exponential weighted comparability (P_i) values for the alternatives are determined within the scope of Equations 22 and 23, respectively.

$$S_i = \sum_{j=1}^{n} \left(w_j \times r_{ij}\right) \tag{22}$$

$$P_i = \sum_{j=1}^{n} (r_{ij})^{w_j} \tag{23}$$

Thanks to the S_i ve P_i values obtained, the triple evaluation scores for each decision alternative are calculated with the help of Equality 24, 25 and 26, respectively.

$$k_{ia} = \frac{P_i + S_i}{\sum_{i=1}^{m} (P_i + S_i)} \tag{24}$$

$$k_{ib} = \frac{S_i}{\min\ S_i} + \frac{P_i}{\min\ P_i} \tag{25}$$

$$k_{ic} = \frac{\lambda(S_i) + (1-\lambda)(P_i)}{(\lambda \max\ S_i + (1-\lambda) max\ P_i)} \tag{26}$$

The λ value in equality 26 can be valued between 0 and 1. It is generally accepted as 0.5 by decision makers. In the last stage of the method, the performance scores expressed k_i olarak are determined by Equality 27.

$$k_i = (k_{ia} \times k_{ib} \times k_{ic})^{\frac{1}{3}} + (k_{ia} + k_{ib} + k_{ic}) \frac{1}{3} \tag{27}$$

Here, the decision alternative with the highest performance score is selected as the best alternative.

4. FINDINGS OF RESEARCH

In this part of the study, the findings obtained from MEREC, MARCOS and CoCoSo methods are included. The decision matrix, which is the first stage of all three methods, is shown in Table 3. While creating the decision matrix, the data obtained through Skytrax is brought into matrix format with the help of Equation 1. This decision matrix will be used in common in the methods used in the study.

Table 3. Decision Matrix

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
BAH	0,900	0,933	0,960	0,873	0,883	0,917	0,883	0,955	0,918	0,840	0,944
GYD	0,850	0,817	0,880	0,918	0,933	0,833	0,995	0,900	0,873	0,780	0,800
NGO	0,950	0,900	0,925	0,955	0,917	0,940	0,925	0,955	0,933	0,840	0,844
DOH	0,825	0,833	0,820	0,892	0,917	0,950	0,867	0,909	0,950	0,920	0,933
HAK	0,875	0,862	0,875	0,903	0,950	0,907	0,825	0,843	0,814	0,825	0,833
HKG	0,900	0,800	0,760	0,900	0,850	0,833	0,867	0,900	0,882	0,940	0,944
HOU	0,950	0,833	0,800	0,967	0,900	0,940	0,925	0,882	0,922	0,860	0,867
IST	0,925	0,867	0,860	0,900	0,858	0,950	0,833	0,909	0,882	0,900	0,856
MUC	0,888	0,837	0,813	0,954	0,933	0,928	0,842	0,895	0,908	0,917	0,878
ROV	0,775	0,817	0,900	0,882	0,867	0,920	1,000	0,918	0,922	0,840	0,822
UIO	0,900	0,933	0,920	0,892	0,933	0,820	0,900	0,882	0,870	0,860	0,844
SLL	0,850	0,850	0,850	0,900	0,958	0,883	0,950	0,882	0,889	0,820	0,800
ICN	0,850	0,808	0,830	0,958	0,867	0,967	0,950	0,755	0,929	0,950	0,878
SHA	0,725	0,793	0,390	0,782	0,887	0,868	0,778	0,864	0,752	0,860	0,844
SZX	0,875	0,843	0,800	0,909	0,883	0,871	0,864	0,873	0,773	0,814	0,800
SIN	0,913	0,867	0,850	0,925	0,954	0,963	0,850	0,941	0,965	0,920	0,875
HND	0,933	0,867	0,187	0,947	0,922	0,872	0,313	0,918	0,819	0,827	0,759

4.1. Findings on the MEREC Method

The first step of the MEREC method, the Decision matrix, is shown in Table 3 according to Equation 1. Then, the normalization process of the determined criteria was carried out. Since all of the determined criteria are benefit-oriented, they are normalized with the help of Equality 2 and are included in Table 4. The main purpose of normalization is to remove the differences between units.

Table 4. Normalization Process

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
BAH	0,805	0,849	0,194	0,895	0,962	0,894	0,354	0,790	0,819	0,928	0,803
GYD	0,852	0,971	0,212	0,851	0,910	0,984	0,314	0,838	0,862	1	0,949
NGO	0,763	0,881	0,201	0,819	0,927	0,872	0,338	0,790	0,806	0,928	0,899
DOH	0,878	0,951	0,227	0,876	0,927	0,863	0,361	0,829	0,791	0,847	0,813
HAK	0,828	0,920	0,213	0,866	0,894	0,904	0,379	0,894	0,924	0,945	0,911
HKG	0,805	0,991	0,245	0,868	1	0,984	0,361	0,838	0,853	0,829	0,803
HOU	0,763	0,951	0,233	0,808	0,944	0,872	0,338	0,855	0,815	0,906	0,876
IST	0,783	0,915	0,217	0,868	0,990	0,863	0,375	0,829	0,853	0,866	0,887
MUC	0,816	0,948	0,229	0,819	0,910	0,883	0,372	0,842	0,828	0,850	0,865
ROV	0,935	0,971	0,207	0,886	0,980	0,891	0,313	0,821	0,815	0,928	0,923
UIO	0,805	0,849	0,202	0,876	0,910	1	0,348	0,855	0,864	0,906	0,899
SLL	0,852	0,933	0,219	0,868	0,886	0,928	0,329	0,855	0,846	0,951	0,949
ICN	0,852	0,981	0,224	0,815	0,980	0,848	0,329	1	0,809	0,821	0,865
SHA	1	1	0,478	1	0,958	0,944	0,402	0,873	1	0,906	0,899
SZX	0,828	0,941156	0,233	0,859971	0,962	0,941	0,362	0,864	0,973	0,957	0,949
SIN	0,794	0,915	0,219	0,845	0,890	0,851	0,368	0,801	0,779	0,847	0,867
HND	0,776	0,915	1	0,825	0,921	0,940	1	0,821	0,919	0,943	1

The overall performance values of the alternatives were calculated with the help of Equation 4 and the R_i value was obtained. The general performance values obtained in Table 5 are given.

Table 5. Overall Performance Value

	R_i		R_i
BAH	0,31278	**ROV**	0,28571
GYD	0,27912	**UIO**	0,29395
NGO	0,31827	**SLL**	0,28403
DOH	0,29815	**ICN**	0,29131
HAK	0,27472	**SHA**	0,17353
HKG	0,27920	**SZX**	0,25783
HOU	0,30028	**SIN**	0,31366
IST	0,29288	**HND**	0,08827
MUC	0,29648		

The value of R_i in Table 5 represents the overall performance value of the alternatives. The performance value calculated by eliminating the effect of each criterion R'_{ij} is included in Table 6 with the help of Equation 5.

Table 6. Performance Value with Criterion Effect Eliminated

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
BAH	0,298	0,302	0,198	0,305	0,310	0,305	0,241	0,297	0,299	0,308	0,298
GYD	0,268	0,277	0,166	0,268	0,273	0,278	0,196	0,267	0,269	0,279	0,276
NGO	0,300	0,310	0,206	0,305	0,313	0,309	0,244	0,303	0,304	0,313	0,311
DOH	0,289	0,295	0,193	0,289	0,293	0,288	0,227	0,285	0,282	0,287	0,284
HAK	0,262	0,269	0,162	0,265	0,267	0,268	0,206	0,267	0,269	0,271	0,268
HKG	0,264	0,279	0,178	0,269	0,279	0,278	0,207	0,267	0,268	0,266	0,264
HOU	0,282	0,297	0,197	0,286	0,296	0,291	0,225	0,290	0,286	0,294	0,291
IST	0,276	0,287	0,184	0,283	0,292	0,283	0,224	0,280	0,282	0,283	0,285
MUC	0,283	0,293	0,192	0,283	0,290	0,288	0,227	0,285	0,284	0,286	0,287
ROV	0,281	0,284	0,172	0,277	0,284	0,278	0,203	0,272	0,272	0,281	0,280
UIO	0,279	0,283	0,180	0,285	0,288	0,294	0,220	0,283	0,284	0,287	0,287
SLL	0,273	0,279	0,175	0,274	0,276	0,279	0,205	0,273	0,273	0,281	0,280
ICN	0,280	0,290	0,184	0,277	0,290	0,280	0,213	0,291	0,277	0,278	0,281
SHA	0,174	0,174	0,116	0,174	0,170	0,169	0,102	0,163	0,174	0,166	0,165
SZX	0,245	0,254	0,150	0,247	0,255	0,254	0,184	0,248	0,256	0,255	0,254
SIN	0,298	0,308	0,208	0,302	0,306	0,303	0,245	0,299	0,297	0,303	0,304
HND	0,067	0,081	0,088	0,072	0,081	0,083	0,088	0,072	0,081	0,083	0,088

In Table 6, the performances of the alternatives are calculated based on the subtraction of each criterion value separately. The sum of the absolute difference of the values of R_i and R'_{ij} calculated by equations 4 and 5 is calculated by the formula in Equation 6 and included in Table 7.

Table 7. $\sum_{i=1}^{m}\left|R'_{ij} - R_i\right|$ Calculation of Value

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
BAH	0,014	0,011	0,115	0,007	0,003	0,007	0,071	0,016	0,013	0,005	0,015
GYD	0,011	0,002	0,113	0,011	0,006	0,001	0,083	0,012	0,010	0,000	0,004
NGO	0,018	0,008	0,112	0,013	0,005	0,009	0,074	0,016	0,014	0,005	0,007
DOH	0,009	0,003	0,105	0,009	0,005	0,010	0,071	0,013	0,016	0,011	0,014
HAK	0,013	0,006	0,113	0,010	0,008	0,007	0,069	0,008	0,005	0,004	0,006
HKG	0,015	0,001	0,102	0,010	0,000	0,001	0,073	0,012	0,011	0,013	0,015
HOU	0,018	0,003	0,103	0,014	0,004	0,009	0,076	0,011	0,014	0,007	0,009
IST	0,017	0,006	0,109	0,010	0,001	0,010	0,069	0,013	0,011	0,010	0,008
MUC	0,014	0,004	0,105	0,014	0,006	0,008	0,069	0,012	0,013	0,011	0,010
ROV	0,005	0,002	0,114	0,008	0,001	0,008	0,083	0,014	0,014	0,005	0,005
UIO	0,015	0,011	0,114	0,009	0,006	0,000	0,074	0,011	0,010	0,007	0,007
SLL	0,011	0,005	0,110	0,010	0,008	0,005	0,079	0,011	0,011	0,003	0,004
ICN	0,011	0,001	0,107	0,014	0,001	0,011	0,078	0,000	0,014	0,013	0,010
SHA	0,000	0,000	0,058	0,000	0,003	0,004	0,072	0,010	0,000	0,007	0,008
SZX	0,013	0,004	0,108	0,011	0,003	0,004	0,074	0,010	0,002	0,003	0,004
SIN	0,015	0,006	0,106	0,011	0,008	0,011	0,069	0,015	0,017	0,011	0,009
HND	0,021	0,007	0,000	0,016	0,007	0,005	0,000	0,016	0,007	0,005	0,000

The sum of the absolute deviations is calculated in Table 7. With the help of these obtained values, the weights of the criteria are calculated. The absolute difference (E_j) calculated in Table 6 and the weight values (W_j) for the criteria were determined using Equation 7 and are shown in Table 8.

Table 8. Weight Ratings of Criteria

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
E_j	0,220	0,080	1,692	0,176	0,075	0,112	1,183	0,197	0,183	0,120	0,135
W_j	0,052	0,019	0,405	0,042	0,018	0,026	0,283	0,047	0,043	0,028	0,032

In Table 8, the weights of the criteria used in the study are shared. The criterion weights represent the importance levels of the criteria. In order to determine the importance levels of the criteria, their values are sorted from large to small. C3 (immigration services) was the most important criterion among the criteria with 0.405 when the W_j values obtained were examined,. It is seen that the criterion with the least importance rating is C5 (arrival services). If we list the criteria according to their importance; Immigration services, transfer passenger services, transportation services, terminal comfort level, terminal facilities, signs, food and beverage, shopping facilities, departure services, security screening and arrival services.

4.2. Findings on the MARCOS Method

The creation of the decision matrix, which is the first step of the method, is carried out with the help of Equation 1 and the decision matrix is included in Table 3. The expanded decision matrix, which is created by adding AI and AAI rows under the decision matrix, is created in Equation 8 format. The values of AI and AAI are calculated with the help of Equations 8 and 9. The expanded decision matrix is available in Table 9.

Table 9. Expanded Decision Matrix

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
BAH	0,900	0,933	0,960	0,873	0,883	0,917	0,883	0,955	0,918	0,840	0,944
GYD	0,850	0,817	0,880	0,918	0,933	0,833	0,995	0,900	0,873	0,780	0,800
NGO	0,950	0,900	0,925	0,955	0,917	0,940	0,925	0,955	0,933	0,840	0,844
DOH	0,825	0,833	0,820	0,892	0,917	0,950	0,867	0,909	0,950	0,920	0,933
HAK	0,875	0,862	0,875	0,903	0,950	0,907	0,825	0,843	0,814	0,825	0,833
HKG	0,900	0,800	0,760	0,900	0,850	0,833	0,867	0,900	0,882	0,940	0,944
HOU	0,950	0,833	0,800	0,967	0,900	0,940	0,925	0,882	0,922	0,860	0,867
IST	0,925	0,867	0,860	0,900	0,858	0,950	0,833	0,909	0,882	0,900	0,856
MUC	0,888	0,837	0,813	0,954	0,933	0,928	0,842	0,895	0,908	0,917	0,878
ROV	0,775	0,817	0,900	0,882	0,867	0,920	1,000	0,918	0,922	0,840	0,822
UIO	0,900	0,933	0,920	0,892	0,933	0,820	0,900	0,882	0,870	0,860	0,844
SLL	0,850	0,850	0,850	0,900	0,958	0,883	0,950	0,882	0,889	0,820	0,800
ICN	0,850	0,808	0,830	0,958	0,867	0,967	0,950	0,755	0,929	0,950	0,878
SHA	0,725	0,793	0,390	0,782	0,887	0,868	0,778	0,864	0,752	0,860	0,844
SZX	0,875	0,843	0,800	0,909	0,883	0,871	0,864	0,873	0,773	0,814	0,800
SIN	0,913	0,867	0,850	0,925	0,954	0,963	0,850	0,941	0,965	0,920	0,875
HND	0,933	0,867	0,187	0,947	0,922	0,872	0,313	0,918	0,819	0,827	0,759
AI	**0,950**	**0,933**	**0,960**	**0,967**	**0,958**	**0,967**	**1,000**	**0,955**	**0,965**	**0,950**	**0,944**
AAI	**0,725**	**0,793**	**0,187**	**0,782**	**0,850**	**0,820**	**0,313**	**0,755**	**0,752**	**0,780**	**0,759**

The extended decision matrix given in Table 9 is formed by adding ideal (AI) and anti ideal (AI) solution values to the decision matrix. The normalization process is carried out according to the benefit and cost direction over the expanded decision matrix obtained. Since the determined criteria are beneficial, the normalization process was carried out with Equality 11. The normalized decision matrix is shown in Table 10.

Table 10. Normalized Decision Matrix

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
BAH	0,947	1,000	1,000	0,903	0,922	0,948	0,883	1,000	0,952	0,884	1,000
GYD	0,895	0,875	0,917	0,950	0,974	0,862	0,995	0,943	0,905	0,821	0,847
NGO	1,000	0,964	0,964	0,987	0,957	0,972	0,925	1,000	0,967	0,884	0,894
DOH	0,868	0,893	0,854	0,922	0,957	0,983	0,867	0,952	0,985	0,968	0,988
HAK	0,921	0,923	0,911	0,934	0,991	0,938	0,825	0,883	0,844	0,868	0,882
HKG	0,947	0,857	0,792	0,931	0,887	0,862	0,867	0,943	0,914	0,989	1,000
HOU	1,000	0,893	0,833	1,000	0,939	0,972	0,925	0,924	0,956	0,905	0,918
IST	0,974	0,929	0,896	0,931	0,896	0,983	0,833	0,952	0,914	0,947	0,906
MUC	0,934	0,896	0,846	0,987	0,974	0,960	0,842	0,938	0,941	0,965	0,929
ROV	0,816	0,875	0,938	0,912	0,904	0,952	1,000	0,962	0,956	0,884	0,871
UIO	0,947	1,000	0,958	0,922	0,974	0,848	0,900	0,924	0,902	0,905	0,894
SLL	0,895	0,911	0,885	0,931	1,000	0,914	0,950	0,924	0,921	0,863	0,847
ICN	0,895	0,866	0,865	0,991	0,904	1,000	0,950	0,790	0,963	1,000	0,929
SHA	0,763	0,850	0,406	0,809	0,925	0,898	0,778	0,905	0,780	0,905	0,894
SZX	0,921	0,903	0,833	0,940	0,922	0,901	0,864	0,914	0,801	0,857	0,847
SIN	0,961	0,929	0,885	0,957	0,996	0,996	0,850	0,986	1,000	0,968	0,926
HND	0,982	0,929	0,194	0,980	0,962	0,902	0,313	0,962	0,849	0,870	0,804
AI	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
AAI	0,763	0,850	0,194	0,809	0,887	0,848	0,313	0,790	0,780	0,821	0,804

In Table 10, the values in the expanded decision matrix are standardized to take values in the range of [0,1]. After the normalization process, a weighted decision matrix is created with the weights of the criteria determined by the MEREC method. The weighted decision matrix (v_{ij}) is calculated with Equation 13. The weighted decision matrix is shown in Table 11.

Table 11. Weighted Decision Matrix

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
BAH	0,050	0,019	0,405	0,038	0,017	0,025	0,250	0,047	0,042	0,025	0,032
GYD	0,047	0,017	0,371	0,040	0,018	0,023	0,282	0,045	0,040	0,024	0,027
NGO	0,053	0,019	0,390	0,042	0,017	0,026	0,262	0,047	0,042	0,025	0,029
DOH	0,046	0,017	0,346	0,039	0,017	0,026	0,246	0,045	0,043	0,028	0,032
HAK	0,049	0,018	0,369	0,039	0,018	0,025	0,234	0,042	0,037	0,025	0,029
HKG	0,050	0,017	0,321	0,039	0,016	0,023	0,246	0,045	0,040	0,028	0,032
HOU	0,053	0,017	0,338	0,042	0,017	0,026	0,262	0,044	0,042	0,026	0,030
IST	0,051	0,018	0,363	0,039	0,016	0,026	0,236	0,045	0,040	0,027	0,029
MUC	0,049	0,017	0,343	0,042	0,018	0,026	0,238	0,044	0,041	0,028	0,030
ROV	0,043	0,017	0,380	0,039	0,016	0,026	0,283	0,046	0,042	0,025	0,028
UIO	0,050	0,019	0,388	0,039	0,018	0,023	0,255	0,044	0,040	0,026	0,029
SLL	0,047	0,018	0,359	0,039	0,018	0,025	0,269	0,044	0,040	0,025	0,027
ICN	0,047	0,017	0,350	0,042	0,016	0,027	0,269	0,037	0,042	0,029	0,030
SHA	0,040	0,016	0,165	0,034	0,017	0,024	0,220	0,043	0,034	0,026	0,029
SZX	0,049	0,017	0,338	0,040	0,017	0,024	0,245	0,043	0,035	0,025	0,027
SIN	0,051	0,018	0,359	0,040	0,018	0,027	0,241	0,047	0,044	0,028	0,030
HND	0,052	0,018	0,079	0,041	0,017	0,024	0,089	0,046	0,037	0,025	0,026
AI	0,053	0,019	0,405	0,042	0,018	0,027	0,283	0,047	0,044	0,029	0,032
AAI	0,040	0,016	0,079	0,034	0,016	0,023	0,089	0,037	0,034	0,024	0,026
W_j	**0,053**	**0,019**	**0,405**	**0,042**	**0,018**	**0,027**	**0,283**	**0,047**	**0,044**	**0,029**	**0,032**

Equations 14, 15 and 16 were used to calculate the degree of utility for the alternatives, and Equation 17 was used for calculating the utility function. According to the ideal solution, the utility function was calculated with Equation 18 and the distance to the non-ideal solution was calculated with Equation 19. The degree of utility, the utility functions, the distance to the ideal solution and the distance to the non-ideal solution are shown in Table 12.

Table 12. $S_i, K_i^-, K_i^+, f(K_i^-), f(K_i^+), f(K_i)$ Calculation of Values

	S_i	K_i^-	K_i^+	$f(K_i^-)$	$f(K_i^+)$	$f(K_i)$
BAH	0,952	2,275	0,952	3,275	1,952	5,603
GYD	0,934	2,231	0,934	3,256	1,933	5,543
NGO	0,953	2,278	0,953	3,276	1,953	5,607
DOH	0,885	2,116	0,885	3,205	1,882	5,385
HAK	0,884	2,114	0,884	3,204	1,881	5,381
HKG	0,857	2,048	0,857	3,175	1,852	5,291
HOU	0,896	2,142	0,896	3,217	1,894	5,421
IST	0,892	2,132	0,892	3,212	1,889	5,406
MUC	0,877	2,095	0,877	3,196	1,873	5,356
ROV	0,945	2,258	0,945	3,267	1,944	5,579
UIO	0,930	2,223	0,930	3,252	1,929	5,532
SLL	0,911	2,177	0,911	3,232	1,909	5,469
ICN	0,907	2,168	0,907	3,228	1,905	5,456
SHA	0,649	1,550	0,649	2,956	1,633	4,608
SZX	0,859	2,054	0,859	3,178	1,855	5,299
SIN	0,902	2,155	0,902	3,222	1,899	5,438
HND	0,454	1,085	0,454	2,752	1,429	3,974
AI	1,000	2,390	1,000			
AAI	0,418	1,000	0,418			

The value of $f(K_i)$ calculated with the help of equation 17 determines the order of alternatives according to the utility functions. The alternative with the highest value is determined as the most preferred alternative. With a value of 5.607, NGO (Chubu Centrair Airport) is a more preferable airport compared to other alternatives in terms of service quality. The benefit value is determined as HND (Tokyo Haneda Airport), which is further behind than other alternatives. According to the MARCOS method, the ranking of alternative airports is as follows; NGO, BAH, ROV, GYD, UIO, SLL, ICN, SIN, HOU, IST, DOH, HAK, MUC, SZX, HKG, SHA and HND.

4.3. Findings on the CoCoSo Method

The decision matrix, which is the first step of the CoCoSo method, was created with the help of Equation 1 in Table 3. After the decision matrix is created, Equation 20 is used for the normalization process and is included in Table 13.

Table 13. Normalization Process

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
BAH	0,778	1,000	1,000	0,492	0,308	0,659	0,830	1,000	0,781	0,353	1,000
GYD	0,556	0,167	0,897	0,738	0,769	0,091	0,993	0,727	0,567	0,000	0,220
NGO	1,000	0,762	0,955	0,934	0,616	0,818	0,891	1,000	0,852	0,353	0,460
DOH	0,444	0,286	0,819	0,594	0,616	0,886	0,806	0,773	0,931	0,824	0,940
HAK	0,667	0,488	0,890	0,653	0,923	0,591	0,745	0,443	0,290	0,265	0,400
HKG	0,778	0,048	0,741	0,639	0,000	0,091	0,806	0,727	0,610	0,941	1,000
HOU	1,000	0,286	0,793	1,000	0,462	0,818	0,891	0,636	0,800	0,471	0,580
IST	0,889	0,524	0,871	0,639	0,077	0,886	0,757	0,773	0,610	0,706	0,520
MUC	0,722	0,310	0,809	0,932	0,769	0,738	0,769	0,705	0,731	0,804	0,640
ROV	0,222	0,167	0,922	0,541	0,154	0,682	1,000	0,818	0,800	0,353	0,340
UIO	0,778	1,000	0,948	0,594	0,769	0,000	0,854	0,636	0,554	0,471	0,460
SLL	0,556	0,405	0,858	0,639	1,000	0,431	0,927	0,636	0,643	0,235	0,220
ICN	0,556	0,107	0,832	0,955	0,154	1,000	0,927	0,000	0,833	1,000	0,640
SHA	0,000	0,000	0,263	0,000	0,339	0,329	0,676	0,547	0,000	0,471	0,460
SZX	0,667	0,354	0,793	0,689	0,307	0,350	0,801	0,591	0,096	0,202	0,220
SIN	0,833	0,524	0,858	0,775	0,962	0,971	0,782	0,932	1,000	0,824	0,625
HND	0,926	0,524	0,000	0,895	0,667	0,356	0,000	0,818	0,312	0,275	0,000

Equation 22 is used for the total weighted comparability (S_i) values of the alternatives, and the (S_i) values are shown in Table 14.

Table 14. Total Weighted Comparability (S_i) Values

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	S_i
BAH	0,040	0,019	0,405	0,020	0,005	0,017	0,235	0,047	0,034	0,010	0,032	0,868
GYD	0,029	0,003	0,363	0,031	0,013	0,002	0,281	0,034	0,024	0	0,007	0,790
NGO	0,052	0,014	0,386	0,039	0,011	0,021	0,252	0,047	0,037	0,010	0,014	0,888
DOH	0,023	0,005	0,331	0,025	0,011	0,023	0,228	0,036	0,040	0,023	0,030	0,780
HAK	0,035	0,009	0,360	0,027	0,016	0,015	0,211	0,021	0,012	0,007	0,012	0,730
HKG	0,040	0,009	0,300	0,027	0	0,002	0,228	0,034	0,026	0,027	0,032	0,720
HOU	0,052	0,005	0,321	0,042	0,008	0,021	0,252	0,030	0,035	0,013	0,018	0,802
IST	0,046	0,010	0,352	0,027	0,001	0,023	0,214	0,036	0,026	0,020	0,016	0,776
MUC	0,038	0,005	0,327	0,039	0,013	0,019	0,217	0,033	0,032	0,023	0,020	0,772
ROV	0,011	0,003	0,373	0,022	0,002	0,018	0,283	0,038	0,035	0,010	0,010	0,810
UIO	0,040	0,019	0,384	0,025	0,013	0	0,242	0,030	0,024	0,013	0,014	0,808
SLL	0,029	0,007	0,347	0,027	0,018	0,011	0,262	0,030	0,028	0,006	0,007	0,776
ICN	0,029	0,002	0,337	0,040	0,002	0,026	0,262	0	0,036	0,028	0,020	0,787
SHA	0	0	0,106	0	0,006	0,008	0,191	0,025	0	0,013	0,014	0,367
SZX	0,035	0,006	0,321	0,029	0,005	0,009	0,227	0,027	0,004	0,005	0,007	0,679
SIN	0,043	0,010	0,347	0,032	0,017	0,026	0,221	0,044	0,043	0,023	0,020	0,831
HND	0,048	0,010	0	0,037	0,012	0,009	0	0,038	0,013	0,007	0	0,178

Equation 23 was used to calculate the total exponentially weighted comparability P_i values and P_i values were included in Table 15.

Table 15. Total Exponentially Weighted Comparability (P_i) Values

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	P_i
BAH	0,986	1	1	0,970	0,978	0,988	0,948	1	0,989	0,970	1	10,83
GYD	0,969	0,966	0,956	0,987	0,995	0,937	0,997	0,985	0,975	0	0,952	9,723
NGO	1	0,994	0,981	0,997	0,991	0,994	0,967	1	0,993	0,970	0,975	10,86
DOH	0,958	0,976	0,922	0,978	0,991	0,996	0,940	0,987	0,996	0,994	0,997	10,74
HAK	0,978	0,986	0,953	0,982	0,998	0,985	0,920	0,962	0,947	0,962	0,970	10,64
HKG	0,986	0,943	0,885	0,981	0	0,937	0,940	0,985	0,978	0,998	1	9,637
HOU	1	0,976	0,910	1	0,986	0,994	0,967	0,978	0,990	0,978	0,982	10,76
IST	0,993	0,987	0,945	0,981	0,954	0,996	0,924	0,987	0,978	0,990	0,979	10,71
MUC	0,982	0,977	0,917	0,997	0,995	0,991	0,928	0,983	0,986	0,993	0,985	10,74
ROV	0,923	0,966	0,967	0,974	0,966	0,989	1	0,990	0,990	0,970	0,965	10,70
UIO	0,986	0,999	0,978	0,978	0,995	0	0,956	0,978	0,974	0,978	0,975	9,802
SLL	0,969	0,982	0,939	0,981	1	0,977	0,978	0,978	0,980	0,959	0,952	10,70
ICN	0,969	0,957	0,928	0,998	0,966	1	0,978	0	0,992	1	0,985	9,776
SHA	0	0	0,581	0	0,980	0,970	0,895	0,971	0	0,978	0,975	6,353
SZX	0,978	0,980	0,910	0,984	0,978	0,972	0,939	0,975	0,902	0,954	0,952	10,52
SIN	0,990	0,987	0,939	0,989	0,999	0,999	0,932	0,996	1	0,994	0,984	10,81
HND	0,995	0,987	0	0,995	0,992	0,972	0	0,990	0,950	0,963	0	7,848

After determining the S_i and P_i values, the values of k_{ia}, k_{ib} and k_{ic}, which are the triple evaluation scores for each alternative, are calculated through Equality 24, 25 and 26, respectively. The performance score (k_i) is calculated with the values obtained from the triple evaluation scores. The triple evaluation and performance scores are shown in Table 16.

Table 16. Triple Evaluation and Performance Scores

	k_{ia}	k_{ib}	k_{ic}	k_i
BAH	0,064	6,568	0,996	2,681
GYD	0,057	5,957	0,894	2,405
NGO	0,064	6,686	1,000	2,726
DOH	0,063	6,060	0,980	2,492
HAK	0,062	5,766	0,968	2,381
HKG	0,056	5,551	0,881	2,255
HOU	0,063	6,183	0,984	2,538
IST	0,063	6,036	0,978	2,482
MUC	0,063	6,013	0,979	2,475
ROV	0,063	6,224	0,980	2,550
UIO	0,058	6,067	0,903	2,448
SLL	0,063	6,029	0,976	2,478
ICN	0,058	5,944	0,899	2,403
SHA	0,037	3,056	0,572	1,243
SZX	0,061	5,461	0,954	2,264
SIN	0,063	6,354	0,991	2,602
HND	0,044	2,235	0,683	1,010

Performance values are calculated in Table 16. The alternative with the highest k_i value is determined as the airport with the highest service quality. When the performance values calculated with the help of triple evaluation scores were examined, it was determined that the airport with the best performance in terms of service quality was NGO, and the airport that remained in the background compared to the others was HND.

The ranking obtained according to the CoCoSo method is as follows; NGO, BAH, SIN, ROV, HOU, DOH, IST, SLL, MUC, UIO, GYD, ICN, HAK, SZX, HKG, SHA and HND.

5. CONCLUSION

Air transport has been opened to full competition with liberalization movements. The intense competitive environment has revealed the need to focus on the quality of services provided in the aviation sector. The fact that air transportation is a fast, safe and comfortable option has increased passenger demand day by day and the quality of services provided to passengers in both airlines and airports has become the focal point.

The service offered to passengers traveling by air starts from the transportation of the passengers to the airport and ends when they reach the destination. In this process, transportation to the airport and the services to be provided during the time spent by the passengers in the airport will increase passenger satisfaction. However, the quality of services provided to passengers may not be the same for every passenger. The reason for this is; it is about the suitability of the service provided to the passengers with the expectations of the passengers and the extent to which it will overlap. In this context, in recent years, in attempts to improve the quality of service, importance has been attached to the experience of passengers during air travel.

The concept of service is difficult to measure and evaluate due to the fact that it is abstract and is perceived differently by each passenger. Within the scope of this study, it is aimed to measure the quality of service provided to passengers at airports. Analysis was performed with MCDM methods that enable the evaluation of multiple subjective or objective criteria. Thanks to the MCDM methods, it is possible to determine the importance levels of the factors affecting the quality of service at the airports and to rank the airports included in the analysis according to the quality of service.

11 different criteria that are thought to play a role in the perception of services within 17 airports and terminals that have already managed to receive five stars and have come to the forefront under the heading of service quality have been identified. Multi-criteria decision-making methods were used for the importance of the criteria and the ranking of alternative airports. In the study where single weighting and sequencing were made with two different methods; MEREC method was used for weighting, MARCOS and CoCoSo methods were used for sequencing.

The importance of the criteria affecting the quality of service is determined with the MEREC method as a result of the analysis, the service quality factors that are given importance to passengers; immigration services, transfer passenger services and transportation. It was determined that the least important criterion was arrival services.

The airport with the best service quality was determined by integrating the service quality criterion weights determined as a result of the MEREC method into MARCOS and CoCoSo method. According to the results of both methods, the airport with the best service quality is Chubi Centrair Airport, while the airport that is in the background in terms of service quality is Tokyo Haneda Airport.

When the results of the MARCOS method were examined, it was determined that Chubi Centrair Airport was the airport that offered the most successful service quality. The airports following the ranking are; Bahrain International Airport is located in Platov International Airport Rostov. The airport that was identified as the most unsuccessful in terms of service quality is Tokyo Haneda Airport. According to the findings obtained by the CoCoSo method; Similar to the MARCOS method, the airport with the best service quality is Chubi Centrair Airport. The other most successful airports in the relevant performance ranking are; Bahrain International Airport and Singapore Changi Airport. The last airport in the last place was determined as Tokyo Haneda Airport, again in a manner similar to the findings of the MARCOS method.

In future studies, the importance of the criteria can be re-evaluated by using objective and subjective weighting methods. Ranking studies involving the inclusion of different multi-criteria decision-making techniques in the analysis and the comparison of business performances can be discussed.

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