Abstract—Today, the developments in information technologies deeply affect many sectors and have brought concepts such as e-commerce and e-service into our lives. Undoubtedly, the air transport sector is one of the sectors most affected by developments in information technologies. It is known that the distribution activities of airline companies have shifted to a large scale internet sales channel instead of travel agencies. In this sense, the concept of quality, also emerges as an important competitive tool in e-services. On the other hand, the fact that e-service has effects on customer satisfaction, word of mouth and business profitability makes e-service quality a subject to be researched. In this context, this study will focus on the quality of e-services offered in the airline industry, one of the sectors where e-services are mostly used. In this study, which is planned to use the Analytic Hierarchy Process (AHP) and Additive Ratio Assessment (ARAS) methods, the importance levels of the factors affecting the quality of e-service will be determined in the first stage with the help of expert opinions. In the second and final stage of the study, airline companies offering scheduled services in Turkey will be ranked according to their e-service quality performances by interviewing passengers at various airports with the help of the questionnaire method.

Keywords—e-service quality; airlines; Analytic Hierarchy Process; ARAS

I. INTRODUCTION

Along with the developments in information technologies and the use of the internet in commercial activities, a radical transformation has taken place and internet has become an important marketing tool supporting many sectors [1]. In this process, businesses have reduced both transaction costs and become accessible from around the world by moving their activities to the internet. These developments in information technologies not only have affected many sectors but also deeply affected the air transport industry. Although travel agencies have played an effective role in distribution activities in the airline transportation industry, having a globally growing demand every year, in the past; today, services have been offered to a large extent through websites. According to a study conducted by SITA, 75% of purchases and 31% of check-in transactions in the airline transportation industry were made through websites in 2016 [2].

Quality of service has become more important in order to meet customers’ demands and expectations with today’s growing service sector, increasing competition and rising welfare. In order to be able to explain the quality of service, it will first be necessary to explain the concept of quality. Quality can be defined as an assessment of how well a product or service meets customer expectations [1]. The quality of service is defined as “the evaluation of consumers' expectation of service and perceptions of service they experienced after comparison” [3]. The quality of e-service is another concept that is starting to be used because of the usage of the Internet at marketing of services, and this concept is “the judgments which consumers receive about the services offered in the internet environment and the general evaluation of the quality” [4]. It is known that e-service quality is very important and e-service quality is influential on customer satisfaction, repurchase intention and word of mouth [5].

Although there are many models and scales for measuring service quality, it is seen that different models are offered for measuring e-service quality and various methods such as statistical approaches and Multi-Criteria Decision Making (MCDM) methods, since e-services are different from services. On the other hand, three different dimensions relating to e-service quality have come to the forefront despite the many quality dimensions suggested. These are information quality, system quality and service quality and have been involved in many different studies [1, 6, 7].
This study's aim is to handle e-services provided by airlines in a multi-dimensional hierarchical structure due to the importance of e-service quality and determine the importance levels of the criteria with the help of integrated methods and rank scheduled airline companies in Turkey according to their performances. For this purpose, AHP and ARAS methods will be used integratedly. The study will be the first study that assesses the quality of e-services in the field of air transport in Turkey by taking a hierarchical structure and ranking scheduled airlines according to their performances for practical purposes.

The study will contain the following sections. In the second section, the research methods which are used will be mentioned; in the third section, the first findings will be explained and in the fourth section suggestions will be made for future studies.

II. RESEARCH METHODOLOGY

In this section, calculation of the importance of elements affecting quality on web-based e-services offered by airline operators and the methods to be used in performance ranking will be mentioned. While mobile applications or social media related to the services provided by airlines could be taken into account, web sites have been examined in this study. The proposed methodology is illustrated in Figure 1.

- Identification of decision-makers, airlines and criteria affecting e-service quality
- Creation of decision hierarchy
- Determination of criterion importance by AHP method
- Ranking airlines according to e-service quality performance via ARAS method
- Sorting alternatives and choosing the best airline

As shown in Figure 1, the importance of criteria will be obtained by the AHP method after the preparation phase. In creating the hierarchical structure to be used in the AHP method, a three-dimensional hierarchical structure, which is often used in the literature, will be utilized [1, 6, 8]. The hierarchical structure also includes 13 sub-dimensions. In the application of ARAS method, the passengers of the scheduled airlines in Turkey will be interviewed. Domestic passenger carrying airlines in Turkey and their market shares can be seen in Figure 2. As stratified sampling is used in the study, the number of passengers is added according to the market share ratio for each airline. In order not to advertise, businesses were represented by codes X1, X2, X3, X4 and X5.

Figure 1. The proposed methodology for evaluation of airline websites

Figure 2: Turkey domestic passenger traffic by airlines in 2016

A. AHP Method

The AHP method, developed by Thomas L. Saaty, is an MCDM method that is often used for the aim of binary comparison of objects in complex decision making problems and to obtain the best solution in this regard. The main purpose of the method is to contribute to solving problems by taking together the criteria, sub-criteria and alternatives in the problem [9]. Objective or subjective items can be evaluated with the AHP method and decision-making problems can be handled in detail thanks to the hierarchical structure [10].

B. ARAS Method

This method was developed by Zavadskas and Turskis to bring a new approach to the solution of MCDM problems [11]. Unlike many methods in the literature, the utility function values of the alternatives in the ARAS method are evaluated according to the alternative in the optimal state. For this reason, the ARAS method is deemed to be the most appropriate alternative to the objective of proportional scoring within the MCDM methods [12].

III. EARLY RESULTS

As seen in Fig. 1, after the first step, it is passed to the second step, in which the criterial weights are determined. Since the AHP method is based on interviews with experts, 11 experts have been interviewed during this stage. The criteria such as being good at e-service dominance and frequent use of air transportation were taken into consideration in the selection of experts. Therefore, the specialists involved in the study as decision makers were selected from website designers, designers.
academics studying in the field of aviation and airline employees.

As a result of the interviews with the specialists, the obtained forms were aggregated by geometric mean and analyzed with the help of the Microsoft Office Excel program. Firstly, the dimensions were compared dually; then, the ultimate importance levels of all the sub-dimensions are obtained by comparing the sub-dimensions, performing the synthesis step of the method. Table of obtained ultimate significance level is seen in in Table 1.

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Dimension weights</th>
<th>Sub-dim. local weights</th>
<th>Sub-dim. Final weights</th>
<th>Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>IQ</td>
<td>0.347</td>
<td>0.232 0.255 0.213 0.188</td>
<td>9 2 5 11</td>
<td></td>
</tr>
<tr>
<td>SyQ</td>
<td>0.273</td>
<td>0.437 0.119 0.070 0.127</td>
<td>3 12 13 10</td>
<td></td>
</tr>
<tr>
<td>SQ</td>
<td>0.38</td>
<td>0.155 0.058 0.169 0.392</td>
<td>8 6 1 4</td>
<td></td>
</tr>
</tbody>
</table>

The definitions of the items in the above table are as follows:

**Information Quality (IQ):** It refers to the suitability of the information that the website offers or produces.

**Relevancy (I1):** It means that the information on the website conforms to customer needs and expectations.

**Understandability (I2):** It expresses the clarity of the information on the site, which can be easily understood.

**Currency (I3):** It means that the information on the site is up-to-date.

**Richness (I4):** It expresses the existence of extensive information about the service on the website.

**System Quality (SyQ):** It refers to the quality of the website's technological equipments.

**Security (S1):** It expresses the confidentiality and protection of customer information.

**Response time (S2):** It expresses that the results that the customer wants to find are quickly loaded and that the requests are answered quickly.

**Personalization (S3):** It expresses the differentiation of the website and services to each customer in terms of needs.

**Navigability (S4):** It means that the website is easy to use and that the desired information is easy to access.

**Accessibility (S5):** It expresses the ability to access the website easily.

**Service Quality (SQ):** It expresses the fulfillment of the service provided successfully.

**Empathy (H1):** It refers to the understanding of the customer and the activity towards their wishes.

**Responsiveness (H2):** It expresses willingness to help online customers and provide fast service.

**Reliability (H3):** It refers to the accuracy of the service offered by the website and the fulfillment of the service promised.

**Trust (H4):** The good reputation of the services and the use of the website is reassuring and relaxing.

As seen in Table 1, as a result of the analysis, it was determined that service quality is the most important dimension affecting e-service quality. In this regard, a conclusion was obtained supporting the findings in the literature [13]. On the other hand, information quality and system quality dimensions follow the service quality respectively. From this point of view, the findings obtained during the first stage of the study showed that the delivery of services to the passengers without any problem, the continuation of unproblematic communication between the business and the customer, and the importance of providing qualified and satisfactory information to the customers are paid attention by the customers. When the sub-dimensions are examined, it is seen that reliability and security elements are highlighted parallel to findings of many studies in the literature.

During the second and last stage of the study, in which ARAS method is applied; passengers will be interviewed by stratified sampling method in a few of the country's busiest airports and the performances of airline companies will be obtained comparatively. It is expected that the findings of the study will be a guide to insight into the current status of airlines and developing strategies for the future.

### IV. Future Study

In this study, it is aimed to rank the airline companies according to the e-service quality performance and obtain the importance ratings of the factors affecting the airline e-services. Although 3 dimensions and 13 sub-dimensions are
considered in the scope of the study, further enrichment of the
hierarchical structure or differentiation of the methods used can
be considered in future studies. However, the main focus point
is e-services on mobile devices. The results of the research
conducted by SITA show that 80% of airline companies are
planning significant investments to maintain passenger service
on mobile devices in the coming years. On the other hand,
although the mobile device usage rate in airline e-services is
12% today, it is expected to increase to 31% by 2019 [14].
Therefore, it is thought that it will be a good place to continue
working on mobile devices for future studies. Therefore, it is
thought that it will be quite appropriate for the field to continue
studying mobile devices in future studies.

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