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The Effect of Covid-19 on the Financial Performance of Ground Handling: The Example of Çelebi Aviation Holding

Oğuzcan Kurşuncu [1], Nisa Seçilmiş [2*]

[1]General Directorate of State Airports Authority, Kars, Türkiye. (Oguzcan.KURSUNCU@dhmi.gov.tr)
[2]Gaziantep University, Faculty of Aeronautics and Aerospace, Aviation Management Department, Gaziantep, Türkiye. (nsecilmis@gantep.edu.tr)

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Corresponding Author: *Nisa Seçilmiş*

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Abstract

The aviation industry consists of many interrelated components and there are many factors that affect the functioning of these components. The Covid-19 epidemic, which has recently been exposed to the whole world, has left deep traces in the aviation industry. The narrowing of air transportation due to the effect of the epidemic brought along financial problems for the ground services component, which is responsible for the operational process. The aim of this study is to examine the financial effects of Covid-19 on ground handling services. For this purpose, the data of Çelebi Ground Handling Inc., which was determined as a sample company, between 2009-2020 were tested using the Entropy-Based TOPSIS Method. The criteria were weighted with the Entropy method and then the alternatives were classified with the help of the series created using the TOPSIS method. Five criteria were determined as "net sales, profit before interest, total assets, equity and number of employees". According to the results of the research, while the highest weighted criterion was total assets, 2018 was determined as the most successful year of the company in financial terms. It was observed that negative financial effects occurred in 2020 with the effect of the pandemic, but there were improvements again in 2021 and even a more successful financial performance compared to 2017.

This study was generated from a master's thesis prepared in Gaziantep University, Institude of Social Sciences, Aviation Management Master Program.

1. Introduction

The foundations of the emergence of civil aviation in the world were laid in the early 1900s. However, the separation of civil aviation from military aviation and becoming a sector took place after the Second World War (Aydın, 2021). Air transport is one of the indispensable services of daily life, especially in developed countries, such as health and communication services, and is essential for economic growth and social development. Air transport has an important role not only in developed countries but also in developing countries due to its significant impact on the tourism and trade sector (Aktepe & Şahbaz, 2010). As globalization necessitates access to people and resources, the demand for transportation and air transportation, which is one of the main transportation modes, is increasing (Walker et. al., 2019; Seçilmiş & Korap, 2017). Today, modern airports are considered as important economic units covering all activities related to tourism, entertainment, production, service and logistics sectors as well as providing transfer between air and ground transportation (Akça, 2020).

The aviation industry, which has a global service network and interacts with many sectors, is rapidly taking its share from the positive and negative developments in the world. From the past to the present, many crises have occurred on a global scale, such as the Great Depression of 1929 (Black Thursday), the September 11 Crisis, the 2001 Economic Crisis and finally the Covid-19 Pandemic Crisis. The repercussions of these crises in the aviation industry were rapid and heavy. Many businesses in the aviation industry have downsized, airline companies have decided to reduce or even stop flights.

According to the data of the International Civil Aviation Organization (ICAO), in 2020 compared to 2019; international passenger traffic decreased by 60%, the seat supply of airline companies decreased by 50% and there was a financial loss of approximately 370 billion dollars. In addition, airports lost $115 billion and air navigation service providers $13 billion during the same time period (ICAO, 2022). In Türkiye, when compared to 2019 and 2020, it was determined that domestic air traffic decreased by 31.78%, external air traffic by 60.82%, and total air traffic by 45.15% due to the effect of the pandemic (DHMI, 2021). During the Covid-19 Pandemic, businesses, airports, airlines and ground handling companies in the aviation industry had to make financial and operational adjustments according to the course of the pandemic.

Aviation is perhaps one of the most damaged sectors, as the epidemic directly threatens human health and aviation is a people-oriented service sector. Flights came to a standstill due to the coronavirus, countries closed their borders for indefinite periods and restrictions were imposed on flights even on domestic routes, and as a result of this contraction, all

components in the sector were faced with the financial crisis. Researching these effects separately for each sector component is important in terms of learning from the past and guiding the future. In this study, the ground services side, which acts as a bridge between the airport, the airline and the customer, is selected and the effect on this component is investigated.

Ground handling services are responsible for the following types of services: representation, passenger services, loading and control, reporting, ramp (ramp, cargo and mail, aircraft hygiene, unit loading goods control), aircraft line operations (airline maintenance, aviation fuel and oil), flight operation, transportation, catering, surveillance and data processing management, aircraft private security services and inspection services (Yazgan & Yiğit, 2013). Operationallly, ground handling services can be expressed as the services supplied to passengers, aircraft and cargo at an airport. It is not possible for an aircraft to leave the airport without ground services, and it is not possible for an incoming aircraft to reach the parking lot safely without ground services. Ground handling also covers all activities carried out in the apron area, in the terminal and in the cargo warehouses. Airport service chain is shown in Figure 1. Although fuel, catering and line maintenance services are included in the Standard Ground Handling Services Agreement, these services are not included in the main activities of ground handling services since they are also provided by other specialized companies (Yılmaz, 2015).

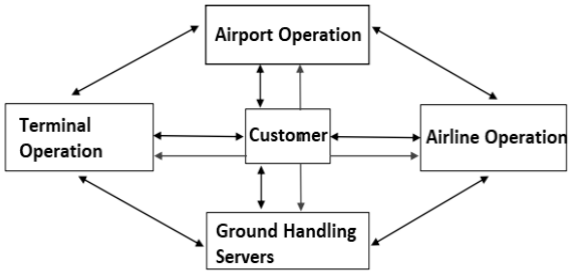

Figure 1. Airport Service Chain (Varışlı, 2015, p. 20)

Ground handling companies may face a number of problems such as flight cancellations or delays due to many different factors such as aircraft mechanical problems, crew diseases, bad weather conditions, legal restrictions, and security procedures while carrying out their operations. These organizations are always obliged to be cautious in every matter and to have the necessary equipment or personnel ready in order to quickly find a solution to any such potential problem (Bazargan & Orhan, 2012). Because possible deficiencies or disruptions play a decisive role in the timely and safe arrival of passengers, luggage and cargo at their destination, that is, they affect the efficiency and success of the transportation process (Schmidberger et al., 2009). Ground handling services, which may not even be noticed until they encounter any problems, are the backbone of flights and constitute one of the most critical links of flight operations.

Namely, a small carelessness or mistake made by ground handling services can harm not only the service company providing this service, but also passengers, airline companies, airports or other components. Ultimately, it can lead to the problem of effective use of both financial and physical resources. In this context, ground handling companies should use their resources correctly and have an effective management approach for both situations in order to maintain their normal activities and be cautious against possible risks.

As mentioned above, the coronavirus outbreak was an unexpected shock, and a process that ground handling companies had to manage with difficulty. In this process, in addition to the health measures brought for passengers and employees, the measures to be taken by companies regarding financial sustainability occupied a very important place in terms of business outcome. Such crises are always likely to occur at the national or global level. For this reason, it is worth investigating how the ground handling services manage this process, how much it is affected financially and what its financial structure is. Analyzing the current situation, determining what kind of measures have been taken and determining what can be done are essential in terms of precaution. In this context, the subject of this research is to find answers to the questions of how the ground services component was affected by the sectoral contraction in the Covid-19 process, whether it was successfully managed, and to make suggestions for possible similar situations.

In order to find an answer to the research question, ground handling companies serving in Türkiye were used. In Türkiye, the activities of airport ground handling services are regulated by the instructions issued by the General Directorate of Civil Aviation, and four organizations currently holding A group operating licenses are serving: Turkish Ground Services Inc., Çelebi Ground Handling Inc., Havaş Ground Handling Inc. and FUGO. Figure 3, shows the % changes in net sales of these organizations before and after the pandemic. Since FUGO has just started to serve, the data of this company is not included. According to the data, Çelebi has been determined as the ground handling company with the lowest rate of change in net sales in 2020, and for this reason, it has been chosen as a sample company in this study.

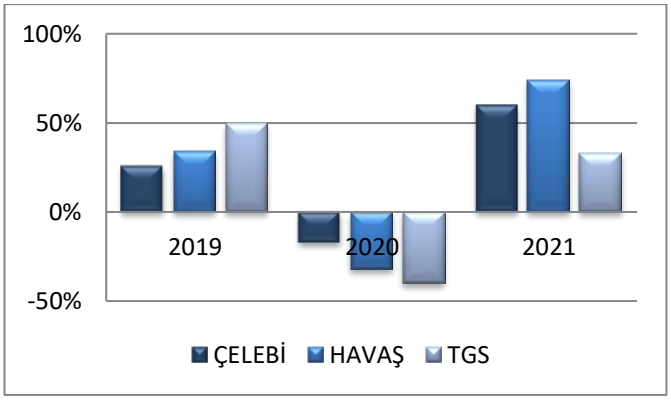

Figure 2. % Change in Net Sales (Fortune Türkiye, 2022; Turkish Airlines, 2022)

In the literature review, it was determined that although many studies were conducted on the effects of Covid-19 on the aviation sector, there was no specific study on the financial impact on ground handling services. It is hoped that the study will contribute to the gap in the literature on this issue. For this purpose, Çelebi Aviation Holding's 2009-2020 data were tested with the Entropy-based TOPSIS method, and the financial structure of this ground handling company was tried to be correlated with the effects of the crisis.

2. Literature Review

It is seen that many academic studies have been carried out in the national and international literature on the effects of the

coronavirus on the aviation sector. In this section, only some of the related studies will be mentioned.

Deveci et al. (2022) examined the effects of the Covid-19 pandemic on air carriers in Turkey. In the study, issues such as financial decisions taken by airlines, flight management, human resources management, hygiene management were presented in terms of differences before and during the pandemic. In the findings of the study, it was mentioned that the sector was seriously affected by the pandemic, it tried to recover with fewer carriers, the salaries of the personnel decreased, the number of passengers decreased, but the cargo flights increased. Köçken et al. (2022) examined the impact of the Covid-19 Pandemic on airports in the study. In the study, data of airports in Türkiye before and during the pandemic were used. Three-Step Data Envelopment Analysis was used to compare these data with the efficiency values. In the light of the information obtained, the performances of the airports were listed. Scheelhaasea et al. (2022), the effects of the Covid-19 Pandemic on a global scale and the measures taken were examined. In the study, the restrictions on the flights of the airline companies, the decisions to stop the flights, the great financial losses experienced by the airport operators and airline companies are included. In addition, in the study, it was emphasized that in order to tolerate these financial losses, governments' providing credit support to these operators more than their repayment capacity may put them in a financially difficult position in the future.

In the study of Dube et al. (2021), potential recovery paths for the global aviation industry from the COVID-19 outbreak were examined. In the study, which used archive and secondary data, it was determined that the epidemic dealt a heavy blow to global aviation, the recovery was slow and airline bankruptcies would increase. In addition, it was mentioned in the study that measures should be taken to protect passengers, reduce costs, increase efficiency, and base on employee health and customer safety. Sucu (2021) examined the impact of Covid-19 and the global crisis it caused on the aviation industry on the basis of Turkish Airlines (THY). In the research, it has been mentioned that perceiving the crisis by senior managers, putting the crisis prevention activities into action, efforts to bring the crisis under control, consist of the steps of communicating with all stakeholders and making efforts to return to the past. In the study, in which THY annual reports, senior management's statements in the written and visual media, and the practices in the crisis management process were examined, it was concluded that THY was successful in the crisis management process. In the study conducted by Annaç Göv & Erbay (2021), they examined the effects of the Covid-19 Outbreak and the views of academics working in the aviation industry on the crisis. The data were provided by 27 Academicians training in the aviation industry in Türkiye, and were analyzed under the Nvivo program. As a result of the study, the importance of cargo transportation was emphasized, and the importance of the aviation industry's readiness after the pandemic process was mentioned. Heiets and Xie (2021) analyzed the losses of the aviation industry by making a brief analysis of the financial effects of the Covid-19 Epidemic on a global scale. In addition, using the PEST analysis, the political, technological, economic and socio-cultural effects of the pandemic on the aviation industry were investigated. In the research, ıt was emphasized that many airlines in the industry will go bankrupt and the rest will merge. In the study conducted by Hopancı et al. (2021), the effects of the Covid-19 epidemic on airports, airline companies and air traffic in the Turkish aviation sector were investigated, and the measures taken to make flights safe were also included. In addition, the predictions made about the recovery process of the aviation sector in the next processes were investigated. In the study, it was determined that airline companies lost 1.7 billion passengers and 6.1 million flights, European aviation suffered a net loss of 56.2 billion Euros and the economic hardship caused 191 thousand direct job losses. Çetin (2021) examined the effects of the Covid-19 Outbreak at the national and international level, and drew attention to the decrease in air traffic, passenger numbers and financial mobility. In the study, it was emphasized that the general recovery in Türkiye will not happen before 2024-2025.

In the study, Akça (2020a) investigated the effects of the Covid-19 Outbreak on Turkish Civil Aviation. The effects of the epidemic were evaluated with its economic aspects, and its financial losses and current situation were analyzed by taking into account the indicators of the aviation sector. In the article prepared by Nizetic (2020), air transport mobility related to Europe (EU) was analyzed for the specific period from January to April 2020. In particular, the impact of COVID-19 on mobility was assessed taking into account the carbon footprint of the two airports in Croatia. The results of the analysis revealed that the pandemic caused more than 89% decrease in the number of flights in the EU, while cargo traffic was not significantly affected. In addition, it was emphasized that there was more than 96% reduction in air transport mobility at selected airports, which is directly related to CO2 emissions falling to a factor of 1.81 for the Zagreb commercial airport and a factor of 3.49 for the seasonal Split airport. Alıcı & Polat (2020) examined the effect of the number of cases and deaths caused by Covid-19 on the stock prices of nine airline companies selected from the countries with the highest number of cases. It was determined that the effects of both variables on stocks were negative, and it was argued that the Covid-19 pandemic was the economic proof of the crisis in airlines.

In the studies, it was determined that the effects of the Covid-19 Pandemic on the aviation sector were evaluated in terms of economic, financial and flight network, and mostly airlines and airports were included. As a result of the studies, the negative effects of the pandemic in every field of the aviation sector were observed. Although there are many studies examining the effects of the Covid-19 Pandemic in the literature, no study has been found that conducts financial analysis of ground handling companies in the aviation sector. This study, which aims to investigate the effects of the pandemic on the financial structure of ground handling services, is therefore expected to make a contribution to the literature.

3. Data and Method of Research

Entropy Based TOPSIS method is frequently preferred in many studies due to its success and high reliability in valuation of financial performance indicators (Altan&Yıldırım, 2019; Perçin&Sönmez, 2018; Sakarya&Aksu, 2020; Akyüz et al., 2019). In addition, it is seen that this method are frequently used in academic studies on the aviation sector (Ömürbek & Balcı, 2017; Ömürbek & Akçakaya, 2018; Bakır & Akan 2018; Kiracı & Asker 2019; Deste & Şimşek, 2019; Ekin & Dinçer, 2020). From this point of view, the Entropy-based TOPSIS method has been preferred in this study, and the data of Çelebi Hava Hizmetleri A.Ş., which is on the Fortune 500 Türkiye list, between the years 2009-2020 has been tested by this method. While deciding on the criteria to be used in this method, studies on the measurement of financial performance

indicators in the literature have been taken into consideration (Perçin&Sönmez, 2018; Işık, 2019; Altan&Yıldırım, 2019; Şahin & Bilgin Sarı, 2019; Ulutaş, 2019; Sakarya&Aksu, 2020). In related studies, it has been observed that criteria such as net sales, change in net sales, profit before interest and taxes, change in profit before ınterest taxes, total assets, equity, exports are mostly included, and among these indicators, the criteria that create undefined data in the analysis are determined and removed from the system. Considering the studies (Ulutaş, 2019; Acer & Kalender, 2020) that emphasize that the number of employees is extremely important when evaluating the performance of companies, this criterion has been included in the analysis as well as financial data. Finally, the financial data and performance indicators to be used in this application have been determined as follows: net sales, profit before interest, total assets, equity and number of employees. The number of employees has been chosen because it provides information about the operational intensity of the company during and before the Covid-19 Pandemic. Other financial data is data that helps to control investments in the light of this data that comes to the fore in a company's financial planning. In this study, all the data belonging to the company in the formation of the decision matrix have been taken from the Fortune 500 Türkiye website.

3.1. Entropy Method

The entropy method is one of the methods used as methods of simultaneous prioritization of reality used to make sense of the lowest certainty or highest uncertainty for a problem. In addition, the method reduces human-induced errors to zero, and as the method gets smaller, the degree of irregularity decreases (Karavardar & Çilek, 2020). The concept of ENTROPY, known as the criterion of disorder and dispersion in thermodynamics, was expressed by Clausius in 1865. The entropy method is used to calculate the sub-criteria weight. The entropy method is a method that can obtain criterion weights by using the values in the decision matrix. Shannon defined the concept of Entropy as the measurement of uncertainty in information. In other words, the concept of Entropy is an effective method used to explain the maximum uncertainty or minimum certainty about an event of interest. The steps of the entropy method are given below (Wu et al., 2011).

Normalization of Decision Matrices:

$$r_{ij} = \frac{x_{ij}}{\sum_1^j x_{ij}} \tag{1}$$

i: alternative value
j: criterion value
rij: Normalized value

Calculating Entropy Values:

$$e_j = -k \sum_{j=1}^{m} r_{ij} \ln(r_{ij}) \tag{2}$$

k: Entropy coefficient
rij: Normalized value
ej: Entropy value

Calculation of Weight Values:

$$W_j = \frac{1 - e_j}{\sum_1^m (1 - e_j)} \tag{3}$$

wj : Weight value
ej: Entropy value

3.2. TOPSIS Method

TOPSIS (Technique for Order Prefence by Similarity Solution), one of the multi-criteria decision making methods, was developed by Hwang and Yoon (1981). This method is based on the fact that the chosen alternative is the closest to the ideal solution and the farthest from the negative ideal solution. For example; The positive ideal solution includes the points with the highest cost and the lowest cost, while the negative ideal solution includes the points where the cost is the highest and the benefit is the lowest. Analysis findings are obtained by ordering the alternatives from the best to the worst according to their distance from these calculated points, in other words, finding the optimum preference. The steps of the TOPSIS method are as follows (Hwang & Yoon, 1981; Chen et al., 2015).

Preparing the Data Row and Creating the Decision Matrices:

The m factor series of the decision problem, which will be the subject of comparison, are determined.

$$\underset{i=1,2,3,\ldots,m}{x_i\big(x_i(j),\ldots,x_i(n)\big)} \quad \underset{j=1,2,3,\ldots,n}{} \tag{4}$$

Decision Matrix:

$$x = \begin{bmatrix} x_1(1)x_1(2) & \cdots & x_1(n) \\ \vdots & \ddots & \vdots \\ x_m(1)x_m(2) & \cdots & x_m(n) \end{bmatrix} \tag{5}$$

Generating Normalized Decision Matrices:

$$n_{ij} = \frac{a_{ij}}{\sqrt{\sum_{i=1}^m a_{ij}^2}} \tag{6}$$

Here, nij is the normalized value of the ith alternative according to the jth criterion.

Generating Weighted Decision Matrices:

In this step, the normalized values are multiplied by the criterion weights.

$$v_{ij} = r_{ij}.w_{ij} \tag{7}$$

Determination of Positive Ideal (A+) and Negative Ideal (A-) Solutions:

In this step, the maximum and minimum values in each column of the weighted matrix are determined. If the criterion is the benefit criterion, the maximum of the criterion values in the positive ideal solution and the minimum one for the cost criterion are taken. Similarly, if the criterion is the benefit criterion, the minimum criterion value is taken in the negative ideal solution, and the maximum one is the cost criterion (Ece, 2019).

$$A^+ = \{(max_i v_{ij} | j \in J), (min_i v_{ij} | j \in J)\} \tag{8}$$

$$A^+ = \{(min_i v_{ij} | j \in J), (max_i v_{ij} | j \in J)\} \quad (9)$$

Measuring Distance Between Alternatives:

The distance of each alternative from the ideal solution is calculated.

$$S_i^+ = \sqrt{\sum_{j=1}^{n} (v_{ij} - v_j^+)^2} \quad (10)$$

$$S_i^- = \sqrt{\sum_{j=1}^{n} (v_{ij} - v_j^-)^2} \quad (11)$$

Calculating Relative Closeness to the Ideal Solution:

Here, it takes a value between $0 \leq C_j^*+ \leq 1$, and C_i*=1 represents the absolute closeness of the relevant decision point to the ideal solution, and Ci*=0 the absolute closeness of the relevant decision point to the negative ideal solution.

$$C_i^* = \frac{S_i^-}{S_i^- + S_i^+} \quad (12)$$

4. Findings

4.1. Entropy solution

The first step of the implementation part is the creation of the decision matrix. While creating the decision matrix, the following financial data and performance indicators were used: Net Sales, Profit Before Interest and Tax, Total Assets, Equity, Number of Employees. The relevant decision matrix is shown in Table 1.

Table 1. Decision Matrix

Year	Net Sales	Profit Before Interest and Tax	Total Asset	Equity	Number of Employees
2009	311.090.568	69.515.602	327.569.517	120.096.539	7.283
2010	347.005.479	71.626.629	359.281.835	128.509.168	3.495
2011	472.753.336	55.945.576	537.163.444	50.482.222	4.207
2012	537.002.487	60.428.482	485.550.616	64.074.156	4.374
2013	507.871.288	72.048.211	515.256.419	46.841.298	10.343
2014	621.449.684	113.031.144	573.244.822	106.453.496	10.508
2015	732.278.323	161.638.141	678.550.555	144.285.259	11.648
2016	709.524.691	92.561.288	689.822.528	101.696.764	12.278
2017	917.789.663	178.250.059	836.042.186	168.855.174	12.657
2018	1.334.270.054	380.496.218	1.522.060.041	353.087.514	13.031
2019	1.877.885.568	378.302.240	2.219.589.632	572.436.992	13.475
2020	1.541.501.101	328.925.275	2.762.169.402	446.297.475	10.009

In table 2., it is seen that there are criteria in different units and the normalization process is performed to standardize the criteria between 0 and 1. These values were found by dividing the values in the decision matrix by their column sum.

Table 2. Normalized Decision Matrix

Year	Net Sales	Profit Before Interest and Tax	Total Assets	Equity	Number of Employees
2009	0.047926184	0.055367035	0.050205749	0.093505341	0.08108078
2010	0.053459186	0.057048403	0.055066216	0.100055287	0.038909423
2011	0.072831728	0.044558928	0.082329679	0.039304691	0.046836035
2012	0.082729864	0.048129424	0.074419112	0.049887165	0.048695226
2013	0.078241951	0.05738418	0.078972045	0.036469923	0.115147399
2014	0.095739682	0.090025824	0.08785978	0.082883075	0.116984325
2015	0.11281379	0.128739799	0.103999723	0.112338311	0.12967581
2016	0.109308397	0.073722214	0.105727349	0.079179556	0.136689526
2017	0.141393411	0.14197068	0.128138066	0.131468074	0.140908888
2018	0.205555807	0.303053514	0.233282282	0.274908576	0.145072586
2019	0.289304464	0.301306078	0.340190874	0.445690748	0.150015586
2020	0.237481536	0.261978847	0.423350699	0.347480436	0.111429017

In Table 3, the values of the expression in the inner part of the formula used to calculate the Entropy value for each criterion found were obtained by multiplying the relevant cell value with the logarithm value of the relevant value. By following the steps below, the formula in the Entropy method was completed, the weight values were found and the weight values of the criteria were reached.

Table 3. Entropy Values for Criteria

Year	Net Sales	Profit Before Interest and Tax	Total Assets	Equity	Number of Employee
2009	-0.145604219	-0.160219515	-0.150196811	-0.221583041	-0.203700001
2010	-0.156573231	-0.163378365	-0.159649013	-0.230330509	-0.126320174
2011	-0.190790256	-0.138620273	-0.205579152	-0.127206151	-0.143369899
2012	-0.206177267	-0.14601801	-0.193344014	-0.149561297	-0.14716546
2013	-0.199356526	-0.164003219	-0.200483278	-0.120761667	-0.248895967
2014	-0.224617015	-0.216751459	-0.21367614	-0.206405744	-0.251015059
2015	-0.246161573	-0.263911692	-0.235389545	-0.245598546	-0.264891074
2016	-0.241963106	-0.192227069	-0.237557901	-0.200802295	-0.272018056
2017	-0.276595081	-0.277145894	-0.263278487	-0.266747571	-0.276130945
2018	-0.325197039	-0.361799188	-0.339543773	-0.354994032	-0.280065684
2019	-0.358817278	-0.361455407	-0.366810274	-0.360176045	-0.284581979
2020	-0.341418988	-0.350918443	-0.363892942	-0.367303123	-0.244516214

The constant k in the formula is found with the formula 1/ ln (m), where m is the number of decision alternatives.

k=1/ln(m) 0.402429604

ej 1.172386729 1.125373677 1.178877819 1.147515953 1.10373181

ej: Entropy value. Entropy values were found for each criterion. Here, the negative value of the constant k is calculated by multiplying the column sum of the values in Table 3. In other words, the sum of -k value * net sales column and the entropy value of the first criterion were found and the other column operations were calculated in this way.

Dj -0.172386729 -0.125373677 -0.178877819 -0.147515953 -0.10373181

dj: Degree of differentiation. In this value, the degree of differentiation was found by subtracting the Entropy value from 1.

Table 2. Calculation of Weight Values

	Net Sales	**Profit Before Interest and Tax**	**Total Assets**	**Equity**	**Number of Employees**
Wj	0.236832049	0.172243564	0.245749776	0.202663543	0.142511068

Calculation of Weight Values is shown in Table 4. It is the last step of the entropy method. It is found by dividing the relevant column differentiation value for each column by the sum of the degrees of differentiation of all criteria. As a result of this process, the importance weights of the criteria were determined. The order is as follows: Total Assets>Net Sales>Equity>Profit Before Interest and Tax>Number Of Employees.

4.2 TOPSIS solution

The first step of the TOPSIS method is to create the decision matrix. Decision matrix and weight values have been given before, so they are not given again in this section.

Table 5. Generating the Normalized Decision Matrix

Year	**Net Sales**	**Profit Before Interest and Tax**	**Total Assets**	**Equity**	**Number of Employees**
2009	0.138633182	0.140169454	0.142197157	0.247497331	0.238063067
2010	0.154638163	0.144426074	0.1559634	0.264834243	0.114242815
2011	0.210675945	0.112807206	0.233181388	0.104034765	0.137516315
2012	0.239307685	0.121846421	0.210776381	0.132045292	0.142975128
2013	0.226325772	0.145276141	0.2236716	0.096531476	0.338086819
2014	0.276940403	0.227913062	0.24884423	0.219381477	0.343480257
2015	0.326329644	0.325922948	0.294557201	0.297345925	0.380744008
2016	0.316189805	0.186638176	0.299450338	0.209578709	0.401337133
2017	0.409000191	0.359418788	0.362923948	0.347980093	0.413725696
2018	0.594598881	0.767222689	0.660722686	0.727649755	0.425950821
2019	0.645434368	0.610294797	0.697515844	0.772771907	0.413015517
2020	0.47078994	0.471194268	0.657911555	0.521855342	0.294840024

Generating the Normalized Decision Matrix is shown in Table 5. It was obtained by dividing each value in the decision matrix by the square root of the sum of the squares of the elements in the relevant column.

Table 6. Weighted Normalized Decision Matrix

Year	Net Sales	Profit Before Interest and Tax	Total Assets	Equity	Number of Employees
2009	0.032832781	0.024143286	0.03494492	0.050158686	0.033926622
2010	0.036623273	0.024876462	0.038327971	0.053672246	0.016280866
2011	0.049894816	0.019430315	0.057304274	0.021084054	0.019597597
2012	0.056675729	0.020987262	0.051798248	0.026760767	0.020375538
2013	0.053601196	0.02502288	0.054967246	0.019563411	0.048181114
2014	0.065588363	0.039256558	0.061153414	0.044460627	0.048949738
2015	0.077285318	0.05613813	0.072387366	0.060261179	0.054260235
2016	0.074883879	0.032147225	0.073589853	0.042473964	0.057194983
2017	0.096864353	0.061907573	0.089188479	0.070522879	0.058960491
2018	0.140820071	0.13214917	0.162372452	0.147468077	0.060702706
2019	0.152859544	0.105119351	0.171414362	0.156612693	0.058859282
2020	0.111498146	0.08116018	0.161681617	0.105761053	0.042017967

Weighted Normalized Decision Matrix is shown in Table 6.

In step 4, ideal and negative ideal solutions were determined. Identified Ideal and Negative Ideal Solutions are given in Table 7. In the table, "A+" denotes positive ideal solution value and "A-" denotes negative ideal solution value.

Table 7. Determination of Ideal and Negative Ideal Solution

	Net Sales	Profit Before Interest and Tax	Total Assets	Equity	Number of Employees
A+	0.152859544	0.13214917	0.171414362	0.156612693	0.016280866
A-	0.032832781	0.019430315	0.03494492	0.019563411	0.060702706

Table 8. Distances to Ideal and Negative Ideal Solutions

Year	Sİ+	Sİ-
2009	0.237359289	0.040929716
2010	0.230926456	0.056499433
2011	0.233896132	0.049829671
2012	0.229770755	0.05032919
2013	0.233855349	0.031941943
2014	0.205056368	0.053952728
2015	0.178945619	0.080145133
2016	0.20087768	0.062933641
2017	0.155123969	0.106988906
2018	0.047787331	0.238671689
2019	0.050433448	0.243225918
2020	0.087485178	0.183014858

Table 9. Distances/ Relative Closeness to Ideal Solution

Year	Cİ*
2009	0.147076295
2010	0.196570439
2011	0.175626153
2012	0.179682971
2013	0.120174071
2014	0.208304377
2015	0.309332279
2016	0.238555497
2017	0.408178752
2018	0.833179172
2019	0.828258676
2020	0.676579792

The distances of the alternatives from the ideal solution and the negative ideal solution were found and shown in Table 8.

Distances/ Relative Closeness to the Ideal Solution were calculated with the formula CI*=SI- / (SI++SI-) and the values found are given in the Table 9. The relative closeness of each alternative to the ideal solution, from largest to smallest, was determined as follows: 2018>2019>2020 >2017>2015>2016>2014>2010>2012>2011>2009>2013.

According to the results of the application; In the analysis report of the data set made with the Entropy Method, the financial indicator that the company attaches the most importance to is total assets; it is followed by net sales, equity and profit before interest and tax, and it is a performance indicator with the lowest weight in the number of employees. On the other hand, according to the success ranking results of the selected criteria made with the help of TOPSIS method; It has been determined that the most successful year in the 12-year period between 2009-2020 was 2018, there was a

decrease in 2020 due to the pandemic, and the most unsuccessful period was 2013.

5. Conclusion

The aviation industry, which has an important place on a global scale, contains many different business lines. All these stakeholders are extremely important in the flawless execution of the operations of the transportation service. Ground handling services are one of the important components that establish the connection between airline companies and airports and play a key role in the management of the flight.

Due to the global networking feature of the aviation industry, the measures taken to prevent the transmission of the Covit-19 virus have also brought about common measures on a global scale. National and international organizations have brought some prohibitions and restrictions both to protect human health and to help the aviation industry survive this pandemic with the least damage. As a result of the measures taken, many countries closed international air traffic and even restricted domestic flights and seat capacities. Although it did not affect the cargo transportation much, the passenger transportation capacity decreased considerably. As a result, large and small-scale airline companies, airport operators and ground handling services companies were also adversely affected, and the aviation industry suffered serious losses.

The Covid-19 pandemic has been one of the factors that most affected the aviation industry among the crises that have occurred to date, and this has caused the aviation industry to shrink financially. Financial indicators are important in terms of planning, decision making and sustainability of companies. In this study, it was aimed to reveal how the financial performance of ground handling services was affected by the Covid-19 Pandemic, and to measure this, the financial data of Çelebi Ground Handling, one of the ground handling companies in Türkiye, between 2008 and 2020 were used. Five selected criteria (net sales, profit before ınterest and tax, total assets, equity and number of employees) were tested with Entropy-based TOPSIS method.

The importance weights of the criteria calculated by the entropy method are as follows: Total Asset>Net Sales>Equity> Profit Before Interest and Taxes>Number of Employees. According to the results obtained with the TOPSIS method, the success order of the years is as follows: 2018> 2019> 2020> 2017> 2015> 2016> 2014> 2010> 2012> 2011> 2009> 2013. Among the years compared, 2018 was the most successful year, while 2013 was the most unsuccessful. Accordingly, it was concluded that the company was affected by the Covid-19 Pandemic, but its financial success rate recovered rapidly, even exceeding its performance in 2017. Considering all these results, it can be said that the company was affected by the pandemic process, but successfully managed this process.

In addition to these determinations, we see that the exemplary company also received agile decisions in crisis management in this process. Namely; Çelebi Ground Handling Inc. management stopped all non-emergency expenditures, postponed investments and directed its employees to paid and unpaid leave as of March 2020. In order to reduce fixed costs, the supports provided by the governments of the countries in which the Group operates were evaluated, necessary applications were made and various supports were utilized. In addition, waivers, discounts or postponements were made in license and lease payments with airport operators and country aviation authorities. The Group Management closely followed the cash flow in order to preserve the strength of its liquidity position (Çelebi, 2021).

The findings of the study are proof that the pandemic has negatively affected the ground handling industry financially. Based on the weighted criteria evaluation results made on the sample organization, it can be thought that supporting a strong asset structure with net sales and strong equity is a way to get out of crisis periods easily. In addition to the proportional distribution in the financial structure, it is also very important to make and implement decisions quickly and correctly in order to get out of the crisis. One way to facilitate this is to include the concept of prudence in company planning. The future plans of ground handling companies should include measures against possible crises as well as growth targets. According to the magnitude of the effects of these crises or the type of crisis (economic, health, terrorism, etc.) it is necessary to have different precautionary packages in different categories in order to minimize the damage that may occur. Thanks to this readiness, the struggle in terms of personnel, operational and financial aspects can be facilitated and faster and more accurate management can be achieved.

The limitations of this study are as follows; the inability to include all the financial data desired to be used in the analysis because it contains undefined data, using only one ground handling company's data, data is limited to the years available in the reports. In addition, the short-term effects of the pandemic cannot be observed because the data are accessed as annual figures.

For future studies, it is recommended to include the balance sheet and income statement ratios used in this study, as well as the ratios of financial statements such as cash flow, change in equity, into the analysis. Another suggestion is to expand the study by using data and/or different methods from different companies serving in the national arena or in other countries. Comparing the financial effects of the previous crises and the effects of the Covid-19 pandemic is thought to be another dimension in terms of the fact that the ground handling component has a wider place in the academic literature.

Ethical approval

Not applicable.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

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