

# Assessment of the Competitive Positions of National Airlines of Ukraine

Ovsak Oksana Pavlivna, Liskovych Nazarii Yuriiiovych,  
Nazarenko Oleksandra Pavlivna

*National Aviation University, Lubomir Guzar Avenue, 1, Kyiv. 03058, Ukraine*

**Abstract** – This article presents the results of systematization of methodological basis for assessing the competitive status of domestic airlines in the absence of information about their financial condition, actually due to cluster analysis of their various operational, communication and marketing characteristics. Based on the results comprising cluster analysis of profile indicators of airlines available from open sources, clusters - strategic groups of Ukrainian airlines were identified. Construction of a competitive map of the air transportation market of Ukraine, identification of clusters of domestic airlines provide an opportunity to use a differentiated approach to the tools of strategic positioning and crisis management of airlines of Ukraine.

**Keywords** – airline, strategic airline groups, cluster analysis, competitive position.

## 1. Introduction

Today, the most well-known and widely used tool for identifying the competitive position of enterprises in a particular industry is cluster analysis, which allows statistical methods to distribute the studied objects with similar characteristics into the corresponding individual groups (clusters).

---

DOI: 10.18421/TEM101-40

<https://doi.org/10.18421/TEM101-40>

**Corresponding author:** Ovsak Oksana Pavlivna,  
National Aviation University, Lubomir Guzar Avenue, 1,  
Kyiv. 03058, Ukraine.

**Email:** [ovsak@i.ua](mailto:ovsak@i.ua)

*Received:* 15 November 2020.

*Revised:* 03 February 2021.

*Accepted:* 10 February 2021.

*Published:* 27 February 2021.

 © 2021 Ovsak Oksana Pavlivna, Liskovych Nazarii Yuriiiovych & Nazarenko Oleksandra Pavlivna; published by UIKTEN. This work is licensed under the Creative Commons Attribution-NonCommercial-NoDeriv 4.0 License.

The article is published with Open Access at [www.temjournal.com](http://www.temjournal.com)

International publications contain many publications on the definition of strategic groups of enterprises, in particular airlines: Tang M, Thomas H. [1], Kling J. A., Smith K. A. [2], Ketchen D.R, Shook C.L. [3], Desarbo W.S. and Grewal R. [4]. Researchers Murthi B.P.S., Rasheed A. A. and Goll I. revealed the features of using the regression model of the latent class to identify strategic groups of American airlines [5]. Unfortunately, these scientific and methodological works cannot be used to assess competition and identify strategic groups in countries with underdeveloped financial markets, such as Ukraine. This is due to the insufficiently public financial statements of the national airlines of Ukraine, because only three of them – PJSC “Ukraine International Airlines”, PJSC “Bukovina”, JSC “Motor Sich” are joint-stock companies whose reports are publicly available. Other airlines (16) are limited liability companies in their legal form and do not publish their financial statements.

Most often, experts in the transport and aviation industry recommend using the M.Porter approach, according to which it is advisable to form strategic groups of competing firms that use similar competitive approaches and positions in the Market [6]. In accordance with this methodological approach, a study by Kling J. A. and Smith K. A. was conducted regarding the definition of strategic groups of American Airlines [2]. In our research to determine the competitive position of airlines in the absence of information about their financial position we used the methodological approaches of M.Porter, G. Azoev and A.Chelenkov [6], [7] to build a competitive market map and identify strategic groups of national airlines of Ukraine based on their diverse operational, communication as well as marketing characteristics.

## 2. Analysis of the State of Competition in the Ukrainian Air Transportation Market

To analyze the market competition in which Ukrainian airlines operate, the Porter Five Forces model was used, which is based on the concept that there are five competitive forces that determine the competitive environment and intensity combined

with the attractiveness of the market [8]. Porter's Five Forces Analysis is considered appropriate to identify sources of competitive advantage in the business environment, which in turn is crucial for determining the airline's competitive position and possible future strategy based on the competitive position – its strategic position. In addition, M. Porter claims that commercial aviation is one of the toughest markets with the lowest profit margins and the strongest forces, and established competitors compete vigorously with each other in terms of price and customers. He even highlights the importance of analyzing the five competitive forces, as it allows airlines to see an overall competitive picture of what exactly drives the industry's profitability.

The analysis of the development of the Ukrainian air transportation market allowed us to form columns of the matrix of competitive advantages for five key factors of competition in the industry: the market power of consumers of transport services, the market power of suppliers, the threat of new competitors in the aviation market and competition between competing airlines. They were gradually systematized below.

- 1) Market power of consumers of air transport services:
  - Due to the introduction of anti-pandemic measures at the state level, passenger flights were suspended, and there is a possibility of a long-term crisis due to a decrease in consumer demand due to caution, even if the countries' restrictions on air traffic are lifted. Spontaneous weekend short-distance travel may decrease due to the difficulty of traveling during this period.
- 2) Market power of suppliers:
  - Airlines' dependence on airport infrastructure development;
  - Limited availability of domestic airlines to modern aircraft on affordable financial terms;
  - The presence of a monopoly power of aviation fuel suppliers in the domestic market of Ukraine;
  - The presence of risks of increasing lease payments for the use of aircraft, significant amounts of deductions for aircraft maintenance, even with temporary non-use. At the same time, due to the emergence of the pandemic (COVID 19), there are opportunities to receive aircraft on affordable terms due to a decrease in the demand of foreign airlines for aircraft, receiving aircraft on sublease terms from partner airlines;
  - The presence of a monopoly power of aviation fuel suppliers in the domestic market of Ukraine, which contributes to maintaining a high level of prices;
  - Lack of a well-developed system of mutual settlements with partners in the aviation business (airlines, travel operators, hotels, etc.).
- 3) The threat of new competitors in the aviation market:
  - For airlines - the presence of both barriers to entry to the market for new domestic airlines, and barriers to access to new international markets (economic, administrative and legal);
  - The need for experience in managing an aviation business, while at the same time training options are available. Due to the introduction of anti-pandemic measures at the state level, passenger flights were suspended, and there is a possibility of a long-term crisis due to a decrease in demand for reasons of caution, even if restrictions on air traffic are lifted. There is a possibility of the emergence of a low-budget domestic carrier, whose aircraft fleet will consist of domestic-made aircraft.
- 4) The threat of air travel replacement services:
  - In Ukraine, other types of transport are an alternative to domestic air transportation, sometimes external (their cost, convenience, quality, safety, habits, etc. determine the parameters of consumer choice). It should be borne in mind that the cost of traveling by rail in Ukraine is cheaper than by air. The development of airport infrastructure and ease of access to the airport are important parameters. However, due to the emergence of the pandemic (COVID19), the safety of travel, stay in the destination country and the availability of reliable medical care on air travel turned out to be factors, the lack of guarantees of which (and their cost) determine the choice of consumers in favor of video meetings, video conferences and other innovative ways of conducting business communications. There is a tendency to replace long-distance air travel with close, well-known destinations.
- 5) Rivalry between competing airlines:
  - Weighing the action of the above four competitive forces, the rivalry between competing airlines, mainly between airlines, becomes particularly acute. Due to the gradual liberalization of bilateral interstate agreements, there is an increase in competition with foreign airlines (both network and low-budget) in the market in general and routes in particular. There is increasing competition for leadership in the regular seasonal and charter air transportation sector. At the same time, integration processes are developing among leading airlines (“Ukraine International Airlines”, “Wind Rose”), as well as among airlines and business partners, in particular travel companies (“SkyUp Airlines LLC” and “Join UP!” travel companies).

Table 1 shows the dynamics of the number of flights performed by airlines that provide the largest

volumes of air navigation services, including the following: “Ukraine International Airlines”, “Turk Hava Yollari A.O.”, “Belavia”, “LOT Polish Airlines”, “Wizz Air Hungary LLC”, “Wind Rose”, “Pegasus”, “Air Moldova”, “Azur Air Ukraine”, “Austrian Airlines AG”, “Qatar Airways”, “SkyUp Airlines LLC” and “Ryanair”.

Table 1. Dynamics of the most significant volumes of air navigation services for airlines

Airlines	Number of flights			
	2016	2017	2018	2019
“Ukraine International Airlines”	49145	57205	61691	58772
Turk Hava Yollari A.O.	22928	27606	29972	33716
“Belavia”	12796	14537	16003	18629
“LOT Polish Airlines”	9903	12756	15813	18449
“Wizz Air Hungary LLC”	5625	8832	15251	20944
“Wind Rose”	3519	8162	9 301	10185
“Pegasus”	4289	5825	7 664	5569
“Air Moldova”	4219	5527	7 224	5423
“Azur Air Ukraine”	4073	4607	4 859	7229
“Austrian Airlines AG”	3205	3751	3687	3787
“Qatar Airways”	1589	1985	4673	5893
“SkyUp Airlines LLC”	-	-	2411	10631
“Ryanair”	-	-	1728	9295
Total	121 291	150 793	180 277	208 522

Source: (Reports of the state enterprise “Ukraerorukh”, 2017-2020), [9]

Table 2. Dynamics of the market share of airlines with the most significant volumes of providing aviation services in the Ukrainian aviation market

Airlines	Market share 2016	Market share 2017	Growth rate market share 2017/2016	Market share 2018	Growth rate market share 2018/2017	Market share 2019	Growth rate market share 2019/2018
Ukraine International Airlines	0,41	0,38	-7,32%	0,34	-10,53%	0,28	-17,65%
Turk Hava Yollari	0,19	0,18	-5,26%	0,17	-5,56%	0,16	-5,88%
Belavia	0,11	0,10	-9,09%	0,09	-10,00%	0,09	0,00%
LOT Polish Airlines	0,08	0,08	0,00%	0,09	12,50%	0,09	0,00%
Wizz Air Hungary LLC	0,04	0,06	50,00%	0,08	33,33%	0,1	25,00%
Wind Rose	0,03	0,05	66,67%	0,05	0,00%	0,05	0,00%
Pegasus	0,04	0,04	0,00%	0,04	0,00%	0,03	-25,00%
Air Moldova	0,03	0,04	33,33%	0,04	0,00%	0,03	-25,00%
Azur Air Ukraine	0,03	0,03	0,00%	0,03	0,00%	0,03	0,00%
Austrian Airlines AG	0,03	0,02	-33,33%	0,02	0,00%	0,02	0,00%
Qatar Airways	0,01	0,01	0,00%	0,03	200,00%	0,03	0,00%
SkyUp Airlines LLC			-	0,01		0,05	400,00%
Ryanair			-	0,01		0,04	300,00%

Using the constructed Table 2, the analysis of the dynamics of the market share of airlines with the most significant volumes of providing aviation services in the aviation market of Ukraine has been carried out.

Analysis of the dynamics of the market share of airlines with the most significant volumes of providing aviation services in the Ukrainian aviation market showed that in 2019 there was a rapid decline in the market shares of leading network airlines: “Ukraine International Airlines”, “Turk Hava Yollari A.O.”, “Air Moldova”, the market position is maintained such airlines as: “Belavia”, “LOT Polish Airlines”, “Wind Rose”, “Azur Air Ukraine”, “Austrian Airlines AG” and “Qatar Airways”. There was a rapid growth in the market shares of such airlines: “SkyUp Airlines LLC”, “Ryanair” and “Wizz Air Hungary LLC”, moreover, the last two are well – known European low-cost carriers. As the analysis of **Table 2** showed for each year, we can distinguish three leading airlines, each of which had shares above 10%, as well as five leading airlines, each of which had shares above 5%.

The analysis carried out on the basis of statistical information does not make it possible to form an idea of the state of affairs in the air transportation market, so it became advisable to identify strategic groups of national airlines based on data from open sources and content analysis of airline reports and websites. This will make it possible to use a differentiated approach to the tools of strategic positioning of Ukrainian airlines as well as areas and tools of anti-crisis management.

### 3. Methodology and Data

As the analysis of sources has shown, cluster analysis allows using statistical methods to distribute the studied objects with similar features into the corresponding individual groups (clusters) [10], [11]. Cluster analysis uses various types of coefficients: correlations, distance indicators, associativity and probability, as well as similarity coefficients. The use of each of these coefficients has its own advantages and disadvantages, which has to first be taken into account [12], [13]. In the practice of cluster analysis of economic characteristics of enterprises, when determining the degree of similarity of these objects, the most common are correlation coefficients and Euclidean distances [2], [11]. As a result of analyzing the set of input data, homogeneous groups are formed in such a way that objects within these groups are similar to each other in a certain set of features, and objects from different groups (clusters) differ significantly from each other. When performing cluster analysis of the studied objects, one of the most important tasks is to select a set of their features, which are taken as the basis for their assessment. The purpose of this stage of analysis is to determine the set of variable features that most fully reflects the similarity or difference of the specified objects. These attributes have to meet the conditions of the selected classification of objects, as well as the final purpose of the analysis. Therefore, cluster analysis should be carried out on the basis of the values of key indicators that are related to the corresponding state of development of the airline, due to the peculiarities of its business processes.

The analysis of the peculiarities of airlines' activities showed that such key indicators of domestic airlines should include: the type and types of air transportation performed, the share of regular flights, the annual number of flights, the use of global distribution systems for the sale of air

transportation, the number of aircraft fleet, punctuality of the airline, the availability of loyalty programs. Taking into account the specifics of the activities of domestic airlines, it is advisable to include in the list of such indicators the presence of integration interactions of such an airline with partners in the aviation business and the state of mutual settlements with them. To perform a cluster analysis of the characteristics of Ukrainian airlines, their profile indicators were used which are obtained from open sources and systematized in Table 3. Designations relative to Table 3 are presented below.

- Var.1 - type of air transportation (passenger (pass), cargo, mixed);
- Var.2 - type of flights operated (regular and charter - 3, charter - 1);
- Var.3 - share of regular flights (more than 50% regular "2"; more than 50% regular charter - 2, more than 50% charter - 0.5);
- Var.4 - use of global distribution systems for the sale of air transportation (1-available. 0-missing);
- Var.5 - annual number of flights (up to 7,000 flights - "1", 7000-15000 - "2" more than 15,000 flights "3");
- Var.6 - number of aircraft in operation (up to 5 aircraft "1", 5-15 "2", more than 15 aircraft "3");
- Var.7 - average age of the aircraft fleet (up to 10 years "3", 10-20 years "2", more than 20 years "1");
- Var.8 - airline punctuality (up to 80% "1", 80-90% "2", more than 90% "3")
- Var.9 - availability of integration interactions (availability of all possible interactions - "3" mixed with travel agencies, or with airlines "2", transactions only with cargo agents - "1");
- Var.10 - loyalty programs (presence of "1" or absence of "0");
- Var.11 - timely settlements with business partners and clients (presence of "1" or absence of "0")

Most domestic airlines operating in the international air transportation market are limited liability companies in their organizational and legal form, so their financial indicators, as well as cost-effectiveness indicators, are not publicly available. Joint-stock airlines are «Ukraine International Airlines», «Bukovina» and «Motor Sich» airlines.

A measure of determining the proximity of objects to the possibility of combining them in a common cluster is the Euclidean distance calculated from the values of their key indicators. When identifying airline and airport clusters, it is also advisable to use a set of dummy variables that reflect the absence or presence of certain characteristics for an airline with the values "0" and "1", respectively.

Thus, cluster analysis is performed with the calculation of the Euclidean distance matrix "C" for the studied objects, taking into account their profile indicators. The method is based on the analysis of this square and symmetric with respect to the main diagonal of the matrix, which has the following form.

$$C = \begin{pmatrix} 0 & C(1,2) & \dots & C(1,p) \\ C(2,1) & 0 & \dots & C(2,p) \\ \dots & \dots & \dots & \dots \\ C(p,1) & C(p,2) & \dots & 0 \end{pmatrix} \quad (1)$$

and consists of elements, namely, Euclidean distances C (i, j) between the corresponding profile indicators of objects.

Table 3. Profile indicators of Ukrainian Airlines (prepared for software processing)

№	Airline	Var.1	Var.2	Var.3	Var.3	Var.5	Var.6	Var.6	Var.8	Var.9	Var 10	Var. 11
1	PJSC "Ukraine International Airlines"	mixed	3	2	1	3	3	3	3	3	1	1
2	"Wind Rose LLC"	pass	3	1	0	2	2	2	2	2	1	1
3	"SkyUp Airlines"	pass	3	1	0	2	2	2	2	1	1	1
4	«Azur Air Ukraine»	pass	3	1	0	2	2	2	2	1	1	1
5	"YanAir Airlines"	pass	3	0,5	0	1	2	1	2	1	0	0
6	"Bravo Airways"	pass	3	0,5	0	1	2	1	2	1	0	0
7	Separate division airline of PJSC "Motor Sich"	mixed	3	1	0	1	2	1	2	2	0	1
8	PJSC "Bukovina"	mixed	3	1	0	1	1	2	2	2	0	1
9	"JONIKA Airlines"	pass	3	0,5	0	1	1	2	1	1	0	0
10	"Wizz Air Ukraine"	pass	3	1	0	1	1	3	3	1	0	1
11	"AtlasGlobal Ukraine"	pass	3	1	0	1	1	2	2	1	0	1
12	Airline "Khors"	mixed	1	0,5	0	1	2	1	2	1	0	1
13	"Kharkiv Airlines"	mixed	1	0,5	0	1	2	1	2	1	0	1
14	Aviation transport company "Yuzmashair"	cargo	1	0,5	0	1	2	1	2	1	0	1
15	"Anda-Air" Airline	pass	1	0,5	0	1	1	1	1	1	0	1
16	"UM Air" Airline	mixed	1	0,5	0	1	1	1	2	1	0	1
17	CAVOK Airlines	cargo	1	0,5	0	1	1	1	2	1	0	1
18	"Antonov" State enterprise	cargo	1	0,5	0	1	3	2	3	1	0	1
19	Aircompany "ZetAvia"	cargo	1	0,5	0	1	2	1	2	1	0	1
20	"Maximum Air "	cargo	1	0,5	0	1	2	1	2	1	0	1
21	"Meridian" airline	mixed	1	0,5	0	1	1	1	2	1	0	1
22	"Aero-charter"	mixed	1	0,5	0	1	1	1	2	1	0	1
23	"Mars RK"	mixed	1	0,5	0	1	1	1	2	1	0	1

Table 4. Estimated ratio scale

Relative weight of the element characteristic	Element characteristics
1	Equilibrium ratio
2	A very small advantage of one over the other
4	A slight advantage of one over the other
6	A noticeable advantage of one over the other
8	A significant advantage of one over the other
10	Strong advantage of one over the other
12	A very strong advantage of one over the other
3, 5, 7, 9, 11	Intermediate values

Elements  $C(i, j)$  of the matrix are calculated based on the values of profile indicators of objects by the expression:

$$C(i, j) = \sqrt{\sum_{k=1}^{Nk} (A(i,k) - A(j,k))^2}, \quad (2)$$

where  $A(i, k)$ ,  $A(j, k)$ , - corresponding values of profile indicators;

$i, j$  - sequence numbers of profile indicators;

$Nk$  - total number of profile indicators used for analysis.

When conducting the cluster analysis, we used an array of profile indicators (parameters) that characterize Ukrainian airlines, taking into account their informative content, as well as based on the availability of information about them in open sources. Given the significant differences in the absolute values and conceptual essence of these

indicators, according to the cluster analysis methodology, it is necessary to determine the degree of importance of each of them by using a weighting factor. For this task, the paper uses the method of analyzing hierarchies of Thomas Saaty, because it allows to analyze complex systems using mixed quantitative and qualitative indicators (profile indicators) [14], [15], [16], according to which the relative importance of indicators is determined by their pairwise comparison. For this purpose, the evaluation scale of pairwise ratios from the method of T. Saaty is taken as a basis, which was modified to an extended 12-point gradation, as shown in Table 4.

Numerical values of the relative significance of the influence of each of the pairs of profile indicators on the airline's characteristics are determined using the above method and using the values of paired comparisons, an inversely symmetric diagonal

comparison matrix is formed, which is presented in Table 5.

A special feature of such a matrix is the fulfillment of the relationship between its elements: , where  $i$  – matrix row numbering,  $j$  – numbering of its columns.

The elements of this comparison matrix are numerical values of the manifestation of the significance of indicators relative to each other

When filling in the matrix, pairs of indicators that were located above the diagonal of the matrix were compared, for which pairs of the same indicators have a single value of relative significance. The values of elements placed below the diagonal of the Matrix were automatically filled with values that are the inverse of the values for the corresponding pairs of indicators placed above the diagonal of the matrix (Table 5). When determining the eigenvector components for each indicator the geometric mean  $Xgeom$  of all numbers in the corresponding  $k$  row of the comparison matrix was calculated:

$$Xgeom_{ki} = \sqrt[n]{A_{k1} \cdot A_{k2} \cdot \dots \cdot A_{kn}}, \quad (3)$$

where  $A_{ki}$  – the  $i$ - ordinal element in the matrix row profile indicator.

Finally, the components of the eigenvector of the matrix are normalized as the ratio of each geometric mean component of  $Xgeom_k$  to their sum (5)

$$Xsum = \sum_{k=1}^n Xgeom_k \quad (4)$$

$$S_{wei}^k = \frac{Xgeom_k}{Xsum}, \quad (5)$$

that is, weighting factors are obtained for each of the  $k_i$  - profile indicators, which are presented in the fourth column of Table 6 comparisons related to the corresponding

According to the method of hierarchical analysis of T. Saaty [16], the degree of violation of the consistency of elements of the calculated comparison matrix is characterized by the consistency index  $I_c$ , determined from the expression:

$$I_c = \frac{(\sigma_{max} - n)}{(n-1)}, \quad (6)$$

where – largest eigenvalue of the matrix,  $n$  – the number of profile indicators used and, accordingly, is the dimension of the matrix.

A measure of the degree of deviation of the comparison matrix from consistency is the value of the relative consistency of the  $Zrl$ :

Table 5. Determination of weight coefficients of profile indicators of Ukrainian airlines

Code of indicators and vectors	Var.2	Var.3	Var.4	Var.5	Var.6	Var.7	Var.8	Var.9	Var. 10	Var. 11	Own vector	Normalized eigenvector (indicator weighting factor)
Var.2	1	1	4	1	3	4	4	8	9	9	2,884	0,206
Var.3	1	1	4	1	3	4	4	8	9	9	2,884	0,206
Var.4	0,25	0,25	1	0,333	0,333	3	3	7	10	10	1,178	0,084
Var.5	1	1	3	1	3	6	6	9	11	11	3,167	0,226
Var.6	0,333	0,333	3	0,333	1	8	8	8	11	11	2,045	0,146
Var.7	0,250	0,250	0,333	0,167	0,125	1	2	2	10	10	0,637	0,046
Var.8	0,250	0,250	0,333	0,167	0,125	0,5	1	9	10	10	0,646	0,046
Var.9	0,125	0,125	0,143	0,111	0,125	0,500	0,111	1	11	11	0,299	0,021
Var.10	0,111	0,111	0,1	0,091	0,091	0,1	0,1	0,091	1	1	0,128	0,009
Var.11	0,111	0,111	0,1	0,091	0,091	0,1	0,1	0,091	1	1	0,128	0,009

$$Z_{rl} = \frac{I_c}{I_{oc}}, \tag{7}$$

where  $I_{oc}$  – is the consistency index of a square matrix of order  $k$ , formed randomly. The values of this value should not exceed 10%.

#### 4. Results and Discussions

Based on the results of cluster analysis, the profile indicators were distributed according to Division scales, normalized, and their weighting coefficients  $k_i$  were determined, as shown in Table 5 and Table 6. The calculated Euclidean distance matrices for the studied Ukrainian airlines are shown in Table 7. The airline's ordinal number in Table 6 corresponds to its ordinal number in Table 3. A Mathematical sample of the smallest values among the elements in each

row of the Euclidean distance matrix for Ukrainian Airlines shows the proximity of the characteristics of the corresponding object to similar characteristics of other objects.

In Table 7, the minimum values of Euclidean distances between the corresponding pairs of objects, indicating the proximity of their corresponding profile indicators, are highlighted in different background colors and red font, which made it possible to include them in joint strategic groups (clusters). As a result of calculations for Ukrainian airlines (formulas (3) – (7)), the values of the maximum eigenvalue of the comparison matrix were calculated (and the corresponding consistency index  $I_c = 0,1239$ . According to the work of Thomas Saaty [13], for a randomly generated matrix with an ordinal number  $k=10$ , the value of the average random consistency Index is  $I_{oc}=1,49$ .

Table 6. Profile indicators of Ukrainian airlines, their distribution on the division scale and weight coefficients

№	Indicator name	Assigning values to indicators on a division scale	Indicator weight factor (normalized eigenvector)
Var.2	Type of flights performed	regular and charter flights – “3”, charter flights - “1”	0,206
Var.3	Share of scheduled flights	more than 50% regular “2”; more than 50% regular charter - 2, more than 50% charter - 0.5	0,206
Var.4	Using global distribution systems for air transportation sales	“1” - used, “0” - not used	0,084
Var.5	Annual number of flights	Up to 7,000 flights - “1”, 7000-15000 - “2”, more than 15,000 flights “3”	0,226
Var.6	Number of passenger vessels in operation	Up to 5 planes “1”, 5-15- “2”, more than 15 aircraft “3”	0,146
Var.7	Average age of the aircraft fleet	Up to 10 years “3”, 10-20 years “2”, more than 20 years “1”	0,046
Var.2	Airline punctuality	up to 80% “1”, 80-90% “2”, more than 90% “3”	0,046
Var.8	Availability of integration interactions	availability of various agreements (with travel agencies, agents, other airlines - “3”, availability of agreements with travel agencies, or with airlines “2”, availability of agreements only with cargo agents - “1”	0,021
Var.9	Loyalty programs	presence of “1” or absence of “0”	0,009
Var.10	Timely mutual accounts with business partners and clients	presence of “1” or absence of “0”	0,009

Calculated using the obtained values by expression (6), the value of  $Zrl=8,31\%$ . It is less than 10%, therefore, the consistency of the comparison matrix obtained for the profile indicators of Ukrainian Airlines corresponds to the norm.

It should be noted that the calculation and analysis of the Euclidean distance matrix for Ukrainian airlines was performed using specially developed computer program codes in the Fortran 90 environment and the calculations of eigenvalues of comparison matrices were carried out using a complex of calculations of mathematical algorithms Wolfram Mathematics.

So, the cluster analysis revealed five strategic groups (clusters) of Ukrainian airlines. The first cluster is represented by a group of cargo airlines formed only by the values of indicator 1 (see Table. 3).

Table 7. Euclidean distance matrix for Ukrainian Airlines

Airline number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	0	0,34	0,35	0,35	0,55	0,55	0,5	0,55	0,61	0,55	0,56	0,68	0,68	0,68	0,73	0,73	0,65	0,68	0,68	0,73	0,73	0,73	0,73
2	0,34	0	0,09	0,09	0,23	0,23	0,21	0,25	0,28	0,26	0,25	0,46	0,46	0,46	0,49	0,49	0,49	0,46	0,46	0,46	0,49	0,49	0,49
3	0,35	0,09	0	0	0,23	0,23	0,21	0,25	0,27	0,26	0,25	0,46	0,46	0,46	0,49	0,48	0,48	0,48	0,46	0,46	0,48	0,48	0,48
4	0,35	0,09	0	0	0,23	0,23	0,21	0,25	0,27	0,26	0,25	0,46	0,46	0,46	0,49	0,48	0,48	0,48	0,46	0,46	0,48	0,48	0,48
5	0,55	0,23	0,23	0,23	0	0	0,1	0,19	0,17	0,21	0,19	0,4	0,4	0,4	0,43	0,43	0,43	0,4	0,4	0,43	0,43	0,43	0,43
6	0,55	0,23	0,23	0,23	0	0	0,1	0,19	0,17	0,21	0,19	0,4	0,4	0,4	0,43	0,43	0,43	0,4	0,4	0,43	0,43	0,43	0,43
7	0,5	0,21	0,21	0,21	0,1	0,1	0	0,16	0,2	0,19	0,16	0,41	0,41	0,41	0,44	0,44	0,44	0,45	0,41	0,41	0,44	0,44	0,44
8	0,55	0,25	0,25	0,25	0,19	0,19	0,16	0	0,12	0,08	0,09	0,44	0,44	0,44	0,42	0,42	0,42	0,51	0,44	0,44	0,42	0,42	0,42
9	0,61	0,28	0,27	0,27	0,17	0,17	0,2	0,12	0	0,15	0,11	0,43	0,43	0,43	0,4	0,41	0,41	0,51	0,43	0,43	0,41	0,41	0,41
10	0,55	0,26	0,26	0,26	0,19	0,19	0,16	0,15	0	0,07	0,07	0,45	0,45	0,45	0,44	0,43	0,43	0,51	0,45	0,45	0,43	0,43	0,43
11	0,56	0,25	0,25	0,25	0,19	0,19	0,16	0,16	0,11	0,07	0	0,44	0,44	0,44	0,42	0,42	0,42	0,51	0,44	0,44	0,42	0,42	0,42
12	0,68	0,46	0,46	0,46	0,4	0,4	0,41	0,44	0,43	0,45	0,44	0	0	0	0,16	0,15	0,15	0,17	0	0	0,15	0,15	0,15
13	0,68	0,46	0,46	0,46	0,4	0,4	0,41	0,44	0,43	0,45	0,44	0	0	0	0,16	0,15	0,15	0,17	0	0	0,15	0,15	0,15
14	0,68	0,46	0,46	0,46	0,4	0,4	0,41	0,44	0,43	0,45	0,44	0	0	0	0,16	0,15	0,15	0,17	0	0	0,15	0,15	0,15
15	0,73	0,49	0,49	0,49	0,43	0,43	0,44	0,42	0,4	0,44	0,42	0,16	0,16	0	0,05	0,05	0,32	0,16	0,16	0,05	0,05	0,05	0,05
16	0,73	0,49	0,48	0,48	0,43	0,43	0,44	0,42	0,41	0,43	0,42	0,15	0,15	0,15	0,05	0	0	0,31	0,15	0,15	0	0	0
17	0,73	0,49	0,48	0,48	0,43	0,43	0,44	0,42	0,41	0,43	0,42	0,15	0,15	0,15	0,05	0	0	0,31	0,15	0,15	0	0	0
18	0,65	0,49	0,48	0,48	0,43	0,43	0,45	0,51	0,51	0,51	0,17	0,17	0,17	0,32	0,31	0,31	0	0,17	0,17	0,31	0,31	0,31	0,31
19	0,68	0,46	0,46	0,46	0,4	0,4	0,41	0,44	0,43	0,45	0,44	0	0	0	0,16	0,15	0,15	0,17	0	0	0,15	0,15	0,15
20	0,68	0,46	0,46	0,46	0,4	0,4	0,41	0,44	0,43	0,45	0,44	0	0	0	0,16	0,15	0,15	0,17	0	0	0,15	0,15	0,15
21	0,73	0,49	0,48	0,48	0,43	0,43	0,44	0,42	0,41	0,43	0,42	0,15	0,15	0,15	0,05	0	0	0,31	0,15	0,15	0	0	0
22	0,73	0,49	0,48	0,48	0,43	0,43	0,44	0,42	0,41	0,43	0,42	0,15	0,15	0,15	0,05	0	0	0,31	0,15	0,15	0	0	0
23	0,73	0,49	0,48	0,48	0,43	0,43	0,44	0,42	0,41	0,43	0,42	0,15	0,15	0,15	0,05	0	0	0,31	0,15	0,15	0	0	0

Other domestic airlines make up four more clusters. To the second group called "Network hybrid airlines» only one was included - the most powerful national airline "Ukraine International Airlines". The third strategic group, called "Leading hybrid airlines", includes the following: "SkyUp Airlines LLC", "Azur Air Ukraine", "Wind Rose". The third strategic group, called "Secondary hybrid airlines", consists of the following: "Wizz Air Ukraine", "JONIKA Airlines", "PJSC "Bukovina", "YanAir Airlines", "Bravo Airways". "AtlasGlobal Ukraine", "Motor Sich". The fifth cluster, called "Charter airlines", consists of the following small airlines: "Anda Air", "UM Airlines", "Meridian" airline, "Aero-charter", "Mars RK".

Based on the analysis of the development of the Ukrainian air transportation market, as well as content analysis of open data on the activities of domestic and foreign airlines in the Ukrainian air transportation market (Tables 1, 2), a competitive map of the Ukrainian air transportation market by airline has been compiled (Table 8).

Table 8. Competitive map of the Ukrainian air transportation market (Airlines)

Airline market share		Airline groups			
		Market leaders	Airlines with a strong competitive position	Airlines with a weak competitive position	Market outsiders
Market share growth rate, %		1	2	3	4
Rapid growth	1	-	"Ryanair", "SkyUp Airlines LLC"	"Czech Airlines", "Air Astana", "Air France", "Air Malta", "Air Serbia", "AirBaltic", "El Al", "Flydubai", "Georgian Airways", "Iraqi Airways"	"Ernest Airlines", "Ellinair"
Moderate growth	2	-	"LOT Polish Airlines", "Azur Air Ukraine", "Qatar Airways"	"Swiss International Air Lines", "Scandi-navian Airlines", "Buta Airways", "TAROM", "Onur Air", "Alitalia", "Aegean Airlines"	"Anda Air", "Meridian" airline
Moderate decline	3	"Turk Hava Yollari A.O."	"Belavia", "Wind Rose", "Austrian Airlines"	"KLM", "Lufthansa", "AtlasGlobal Ukraine", "Bukovina"	"UM Air" Airline, "AERO-CHARTER", "MARS RK".
Rapid decline	4	"Ukraine International Airlines"	"Pegasus", "Air Moldova"	"YanAir Airlines", "Bravo Airways", "JONIKA Airlines", "Wizz Air Ukraine"	

## 5. Conclusions

Analysis of the competitive map of the Ukrainian air transportation market in the context of airlines, as well as the composition of strategic groups of Ukrainian airlines identified using cluster analysis revealed the following trends:

- there was a rapid decline in the market shares of leading network airlines, both domestic and foreign;
- there was a rapid increase in the number of flights of leading foreign low-cost airlines, both with a strong market position and with a weak competitive position;
- there was an increase in the number of flights of domestic airlines of the Strategic Group "leading hybrid Airlines»;
- there was a decrease in the market shares of domestic airlines of the Strategic Group "secondary hybrid Airlines".

Identification of strategic groups of Ukrainian airlines provides an opportunity to use a differentiated approach to strategic positioning tools, as well as airlines' anti-crisis management.

## References

- [1]. Tang, M. J., & Thomas, H. (1992). The concept of strategic groups: Theoretical construct or analytical convenience. *Managerial and Decision Economics*, 13(4), 323-329.
- [2]. Kling, J. A., & Smith, K. A. (1995). Identifying strategic groups in the US airline industry: an application of the Porter model. *Transportation Journal*, 26-34.
- [3]. Ketchen, D. J., & Shook, C. L. (1996). The application of cluster analysis in strategic management research: an analysis and critique. *Strategic Management Journal*, 17(6), 441-458.
- [4]. DeSarbo, W. S., & Grewal, R. (2008). Hybrid strategic groups. *Strategic Management Journal*, 29(3), 293-317.
- [5]. Murthi, B. P. S., Rasheed, A. A., & Goll, I. (2013). An empirical analysis of strategic groups in the airline industry using latent class regressions. *Managerial and Decision Economics*, 34(2), 59-73
- [6]. Porter, M. E. (2008). The five competitive forces that shape strategy. *Harvard business review*, 86(1), 78.
- [7]. Azojev, G. L., Chelenkov, A.P. (2000). *Competitive advantages of the company*. "NEWS" printing house. Moscow. 176 P. ISBN 5-88149-045-2 [in Russian].
- [8]. Porter, M.E. (2008). *Competitive Strategy: Techniques for Analysing Industries and Competitors*. Free Press. ISBN: 9781416590354.
- [9]. *Reports of the state enterprise "Ukraerorukh"*, (2017). Retrieved from: <https://uksatse.ua/index.php?s=7fafa5d747ed5296870f4e285d3e17df&act=Part&CODE=247&id=450> [accessed 18 October 2020].
- [10]. Kaufman, L., & Rousseeuw, P. J. (2009). *Finding groups in data: an introduction to cluster analysis* (Vol. 344). John Wiley & Sons.
- [11]. Everitt, B. Landau, y Leese M.(2011). Cluster analysis. *London: Arnold [ua]*. VIII.
- [12]. Borisov, A. N., Krumberg, O. A., & Fedorov, I. P. (1990). Prinyatie resheniy na osnove nechetkikh modeley: primery ispolzovaniya [Decision making based on fuzzy models: examples of use]. *Riga: Zinatne*.
- [13]. Balan, V.G. (2020). Stratehichnyy analiz zovnishn'oho otochennya pidpryemstva z vykorystanniam nechitkykh danykh. *Ekonomichnyy prostir*, 156, 109-115. [in Ukrainian]. <https://doi.org/10.32782/2224-6282/156-19>
- [14]. Saati, T. (1993). Prinyatiye resheniy. Metod analiza iyerarkhiy. *Decision Making. Hierarchy analysis method*]. *Moscow: Radio i svyaz*.
- [15]. Saaty, T. L., & Vargas, L. G. (1984). Inconsistency and rank preservation. *Journal of Mathematical Psychology*, 28(2), 205-214.
- [16]. Saati, T. L., & Andreychikova, O. N. (2015). Ob izmerenii neosyazayemogo. Podkhod k otnositel'nyim izmereniyam na osnove glavnogo sobstvennogo vektora matritsy parnykh sravneniy. *Cloud of Science*, 2(1), 5-39. [in Russian].