Correlation between the quality of service and economic performance of airports illustrated by Pulkovo airport and Denver international airport

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Abstract. The article analyzes the relationship between the level of airport service and their commercial performance. The airports chosen for comparison are Pulkovo Airport, one of the largest airports in Russia (the second largest by area) and the fourth largest by passenger traffic in Russia, as well as Denver International Airport, the largest airport in the United States. The study provides a brief description of Pulkovo Airport and Denver International Airport, gives quality of service assessments in these airports, based on which the main service problems in the above-mentioned airports are identified, as well as the possible factors that led to these problems. It is revealed and proved that regardless of the location and size of the airports, the main goal of their owners is to make the biggest profit, the quality of passenger service decreases every year, while the amount of profit derived from the operation of these airports, on the contrary, grows.

1 Introduction

Air travel is one of the most popular and convenient ways of getting from one place to another. As Lisa-Marie Brause, Andrei Popa, Tobias Koch, Andreas Deutschmann and Martin Hellmann write in their article, "Within the last years air traffic gained more and more importance due to its advantages such as safety, punctuality, speed and reliability [1]. It is well known that an airport is a commercial enterprise, the main purpose of which is to make a profit. According to Deniz Sulu, Huseyin Arasli, Mehmet Bahri Saydam, "The airline industry's fierce competitiveness requires efficient customer relationship management both online and offline in order to retain passenger satisfaction and so generate future revenue" [2]. Moreover, according to Lin Y. H., Chen C. F., "passenger shopping motivations have positive effects on commercial activities at the airport" [3]. Airports are developing, improving their infrastructure in order to attract as many customers as possible, but the quality of service is getting worse every year, there is a strong inverse correlation between the quality of service and economic indicators.

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1.1 Literature review

The study reviewed the work of foreign and Russian authors who addressed the issues of airport service quality, passenger loyalty and airport performance in general. The authors also described possible ways of improving the quality of passenger service at airports, future prospects for airport development and ways of improving the level of airport performance. The subject of airport development, passenger service and their desire to use the airport again, is more relevant than ever and authors from different countries touch upon the subject in their studies [1-4], [8], [10], [12], [15], [17], [19], [21].


One of the most detailed and well written works is Boonchunone S., Nami M., Tusubul S., Pongthavornvich J., Suwunnamek O. [19]. In it the authors not only disclose in great detail, with many examples and a large volume of statistics, the impact of the quality of service at the airport on passenger loyalty, but also touch upon the topic of image, which further confirms the hypotheses put forward. At the same time, however, we believe that the literature does not fully disclose the influence of various external factors on passenger loyalty, which also plays a major role in the research.

1.2 Problem statement

As a result of the analysis of the cited and other scientific papers in the area under study, it has been established that the main problems in passenger service at the airport that require a priority solution are the following:
- long queues at check-in, passport control and further inspection of belongings;
- incompetent, rude personnel;
- limited choice of food and drink;
- insufficient space in the passenger waiting area;
- incomprehensible signs;
- paid car parks; insufficient parking spaces;
- expansion of the shopping area at airports.

However, these critical issues require continued attention, primarily in the area of further research and service improvements at Pulkovo Airport and Denver International Airport.

1.3 Aim, objectives and hypothesis

The aim of the study is to determine the impact of service quality at Pulkovo Airport and Denver International Airport on passenger loyalty, to compare domestic and foreign experience and to identify promising ways of developing these airports.

The set objective of the study requires a number of objectives:
1. to briefly describe Pulkovo Airport and Denver International Airport;
2. to summarize the evaluation criteria for Pulkovo Airport and Denver International Airport;
3. to conduct a comparative analysis of the quality of service at Pulkovo Airport and Denver International Airport, identify their main problems and possible causes of these problems;
4. to identify possible ways to improve the quality of passenger service at Pulkovo Airport and Denver International Airport.

The hypothesis of the study is that the quality of passenger service at an airport is inversely proportional to the amount of profit generated by the airport, regardless of the country in which the airport is located, as well as its size.

2 Methods

Relevant material from a variety of sources was chosen as the basis for writing this paper. Various research mainly experimental methods were also used, in particular, the comparison method, as well as empirical-theoretical methods involving analysis and comparison.

3 Results

3.1 Pulkovo Airport

As Felix Johan Pot, Sierdjan Koster write in their article, "Regions typically take great pride in having an airport within their borders" [4]. One such airport is Pulkovo International Airport, an airport of federal importance located in the Moscow district of St. Petersburg. It operates since 1932 and is the only airport in the city and is one of the busiest and largest airports in the Russian Federation. The airport employs approximately 4,000 people. Pulkovo has been the main operator of Pulkovo since 2010 - OOO Vozdushnye Vorota Severnoy Stolitsy.

Pulkovo is developing quite dynamically. The airport's infrastructure is quite well developed, as it can be seen in Figure 1.

![Pulkovo airport indicators](image_url)

**Fig. 1.** Pulkovo airport indicators [5].
It can be concluded from analysing the figure that the airport is indeed equipped with all the facilities necessary to maintain its efficient operations. The statistics on traffic size, traffic volumes, number of take-offs and landings and airport profits (Table 1) also suggest an intensive development of the airport.

**Table 1. Traffic volume of Pulkovo airport since 2008 [6].**

<table>
<thead>
<tr>
<th>Year</th>
<th>Passenger traffic (millions of passengers)</th>
<th>Takeoffs and landings (thousands)</th>
<th>Cargo handled (thousands of tons)</th>
<th>Profit (billions of rubles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>7.072</td>
<td>94.04</td>
<td>22.6</td>
<td>3.4</td>
</tr>
<tr>
<td>2009</td>
<td>6.758</td>
<td>87.89</td>
<td>19.5</td>
<td>6</td>
</tr>
<tr>
<td>2010</td>
<td>8.444</td>
<td>103.5</td>
<td>23.2</td>
<td>7.4</td>
</tr>
<tr>
<td>2011</td>
<td>9.431</td>
<td>116.6</td>
<td>22.8</td>
<td>8.9</td>
</tr>
<tr>
<td>2012</td>
<td>11.16</td>
<td>13.75</td>
<td>23.8</td>
<td>11.2</td>
</tr>
<tr>
<td>2013</td>
<td>12.48</td>
<td>14.74</td>
<td>23.8</td>
<td>14.2</td>
</tr>
<tr>
<td>2014</td>
<td>14.28</td>
<td>13.75</td>
<td>23.8</td>
<td>14.2</td>
</tr>
<tr>
<td>2015</td>
<td>13.28</td>
<td>13.75</td>
<td>23.8</td>
<td>14.2</td>
</tr>
<tr>
<td>2016</td>
<td>15.02</td>
<td>13.75</td>
<td>23.8</td>
<td>14.2</td>
</tr>
<tr>
<td>2017</td>
<td>16.12</td>
<td>13.75</td>
<td>23.8</td>
<td>14.2</td>
</tr>
<tr>
<td>2018</td>
<td>16.54</td>
<td>13.75</td>
<td>23.8</td>
<td>14.2</td>
</tr>
<tr>
<td>2019</td>
<td>16.98</td>
<td>13.75</td>
<td>23.8</td>
<td>14.2</td>
</tr>
<tr>
<td>2020</td>
<td>17.94</td>
<td>13.75</td>
<td>23.8</td>
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<tr>
<td>2021</td>
<td>18.03</td>
<td>13.75</td>
<td>23.8</td>
<td>14.2</td>
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</tbody>
</table>

Table 1 shows that passenger traffic at the airport is increasing every year (the only exception is during the pandemic, when it declined). The number of take-offs and landings is also steadily increasing, albeit not in a stable manner. The airport's cargo turnover is also increasing year by year, fuelled by the positive developments in e-commerce and transport companies. Airport profits are also on the rise.

### 3.2 International Denver Airport

Denver International Airport, the largest airport in the United States and the second largest in the world, is located almost 40 kilometres from downtown Denver. The airport was opened in 1955, but in such a short period of existence it has shown excellent results. Due to its large area, the airport is growing rapidly and plays a big role for the people not only of Denver, but of the whole world. More details can be seen in Figure 2.

Based on the information in Figure 2, it can be said that Denver Airport is developing at a rapid pace, and the large area and well-developed infrastructure only accelerate the process. As Arasli H., Saydam M. B., Kilic H. in their article, "To achieve the upper hand, businesses need to produce a high-quality product and service to satisfy their customers in a competitive sphere". [8].
In terms of passenger traffic, Denver airport is one of the top 10 largest airports in the United States. We refer to Table 2.

**Table 2.** Traffic volume of Denver international airport since 2008 [9].

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger traffic (millions of passengers)</td>
<td>51.25</td>
<td>50.17</td>
<td>51.99</td>
<td>52.85</td>
<td>53.16</td>
<td>52.56</td>
<td>55.47</td>
<td>54.01</td>
<td>52.56</td>
<td>53.47</td>
<td>54.01</td>
<td>58.27</td>
<td>61.38</td>
<td>64.5</td>
</tr>
<tr>
<td>Profit (millions of dollars)</td>
<td>742</td>
<td>768</td>
<td>808</td>
<td>592</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

Referring to Table 2, it is clear that the airport handles over 51 million passengers every year, which is a very significant figure. Almost every year this figure grows, if we don't count the years of major crises and pandemics. According to statistics, the airport employs more than 35,000 people who oversee and organise the workflow, which allows it to handle more than 600,000 take-offs and landings each year. Passenger revenues were not found for all years, but it can be seen that before 2019 and the COVID-19 pandemic, airport revenues increased annually, after quarantine, sanctions and bans the numbers decreased, but are now coming back to normal.

### 3.3 Evaluation criteria for Pulkovo Airport and Denver International Airport

According to Thowayeb H. Hassan, Amany E. Salem, "...customer satisfaction is related to the experience that has been formulated on the basis of a service encounter" [10].

In order to compare the quality of service of the airports in question, it was necessary to summarise the criteria against which these airports were assessed. Nine criteria were taken for analysis (Figure 3).
3.4 Assessment of the airport services quality

According to Smirnov A., Smolokurov E., Timofeeva E., Krovsh S., "The purpose of most travel is to provide passengers with the opportunity to relax and visit different countries" [11]. According to Chonsalasin D., Jomnonkwao S., Ratanavaraha V., "To support effective development of airport service, it is important to understand what services and what quality of service delivery, standardization, and infrastructure customers expect" [12].

Table 3 presents the ratings of Pulkovo Airport and Denver International Airport according to the criteria presented in Table 3. The table is made on the basis of visitor feedback and is expressed numerically from 1 to 5. The data are based on a study by the British consultancy Skytrax.

<table>
<thead>
<tr>
<th>Evaluation criteria</th>
<th>Pulkovo Airport</th>
<th>Denver International airport</th>
</tr>
</thead>
<tbody>
<tr>
<td>Queuing Times</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Terminal Cleanliness</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Terminal Seating</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Terminal Signs</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Food Beverages</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Airport Shopping</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Wi-fi Connectivity</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Airport Staff</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Recommended</td>
<td>84% not recommended, 16% recommended</td>
<td>83% not recommended, 17% recommended</td>
</tr>
</tbody>
</table>

The table shows that passengers rated the service at both airports an average of 3/5. Let us examine the indicators in more detail.

As stated by Özkul E., Bilgili B., Koç E., "The service atmosphere within the physical evidence scope is an element that requires huge investment" [15]. The infrastructure at Denver International Airport is very well developed, with a large terminal including halls...
A, B, C providing many facilities for the traveller, but feedback from many passengers is to the contrary. Staff behaviour, long queues and a lack of opportunities to buy the necessary drinks and food greatly reduce ratings and therefore passenger loyalty.

Due to the large number of people in the halls, there are long queues where people stand for an hour or sometimes longer. The staff at the check-in counters are not well organised and the check-in process is very slow. Signposts are as unclear as possible, making it difficult to navigate the terminal and the halls, making it difficult for guests to navigate the premises and find everything they need. Furthermore, some people comment on the rude attitude of the police and airport staff, who are not always able to answer a question or suggest a solution.

The airport gets a 3 for cleanliness as the airport itself is quite clean but the bins in the lavatories are almost always overflowing and soap is also often absent.

Shopping for food and drinks is also difficult for passengers. According to feedback from 2021, many shops at the airport were closed and there were no vending machines, so you could get a drink from a drinking fountain or buy something from McDonald's, which also made visitors unhappy. Due to this situation many airport users referred to the airport as a "absolutely horrible airport" and did not really want to go back there [16].

As for Pulkovo Airport, it is not as satisfying as it should be either. People who have been to this airport at least once cannot fail to note its well-developed infrastructure and are likely to agree that it has enormous potential, which, unfortunately, is not fully unlocked.

Passengers note that there are more and more retail outlets at the airport, which makes the airport look more like a market. Even the boarding gates from the security checkpoint go straight through the duty free zone.

Queues are a big problem at Pulkovo. The airport is almost always full of passengers, and there are not enough seats for them, so many have to wait for their flight sitting on their own bags, or even standing up. There are long queues at the check-in desks and staff can leave their desks indefinitely, which not only keeps the queues from getting smaller, but makes them multiply in size.

The cleanliness of the airport is not particularly objectionable to passengers, with the exception of the not always clean washrooms and the small number of litter bins.

The total area of the airport is 1,350 hectares. Signposts do not always make it easy to find the right area and the choice of food and beverages is not as extensive as one would hope (there are only 23 food stands). The situation is also worsened by the high prices.

Another important point of concern for passengers can be added - parking. Pulkovo has 5 parking areas, of which 1 is free and 4 paid. The total capacity is more than 2,700 spaces. The first 15 minutes of parking are free, but there are usually not enough spaces; there are too many people who want to park and almost nobody wants to use paid parking, because it is not economical for people and it is easier to park somewhere far away and save money. In this regard, along the Pulkovskoe highway, along the roadside, you can usually see a whole column of cars. It is important to note that these cars are not always parked according to traffic rules, can block the way for other cars and create other emergency situations.

It can be concluded that Pulkovo is economically profitable as an airport, but the quality of services there is getting worse every year, despite the fact that economic indicators are growing steadily.

Another important point is that the quality of service at the airport may depend on the competitors. According to Ahmed Abdelghany, Vitaly S. Guzhva, "some airports might have adjacent airports, and in some cases, these airports compete on demand" [17]. In our case, Pulkovo is the only airport in St. Petersburg; accordingly, it has no competitors in this region. This means that passengers have no possibility to choose another airport, even if they are not satisfied with the service at Pulkovo. They will either have to use what is
available, or travel to another city by car or train to depart from another airport, and that is absolutely unprofitable. It is this fact that allows Pulkovo Airport to remain so popular and in demand despite not the best quality of service. This factor allows Pulkovo to pay little attention to improving its passenger service. Unlike St Petersburg airport, Denver airport has many competitors. Therefore, it makes sense for the management of this airport to invest in improving service quality in order to attract as many passengers as possible and generate as much profit as possible.

3.5 Airport development prospects

3.5.1 Pulkovo Airport

The website of the St Petersburg administration indicates that Pulkovo is to be transformed by 2025: the management plans to add an additional service terminal, renovate the station square and create a pedestrian zone, as well as build several new aircraft hangars and office and business centres for business-class passengers. Reportedly, the additional terminal will be able to increase the airport's annual passenger capacity by 15 million passengers, bringing the figure to 40 million passengers per year (instead of the current 25 million).

Among other things, it is planned to develop the public transport infrastructure at the airport. Right now a railway overpass over the Pulkovskoye Shosse is being reconstructed which will eventually reduce the traffic jams on the way to the airport. There are also plans to launch a commuter train that will run from the northern part of the city straight to the airport, which will connect Pulkovo Airport and the northern part of the city. "It will be an underground tunnel under the airport - a unique solution in terms of transport accessibility." [18].

3.5.2 International Denver Airport

As Surasidh Boonchunone, Mariam Nami, Saowaluck Tus-u-bul, Jaruzgorn Pongthavornvich, Opal Suwunnamek say, "In today's competitive environment, business organizations need to find innovative information and communication strategies to differentiate them from their competitors" [19]. In the near future, the Denver airport intends to build a seventh runway, as well as to expand the lobby with more than twenty gates, improve and enhance passenger screening and security systems, and increase airport capacity. The more global plans include increasing the number of runways from 6 to 10, creating an additional terminal, concourses D, E, and another 100 gates that would increase passenger traffic and accommodate up to 100 million passengers a year [20].

According to Mobolaji K., Földes D., Csiszár C., "The increase in air transportation demand implies challenges on airport ground access. Using private transportation mode to reach the airport is a typical practice which results in the vast demand for parking facilities" [21], so in the long term the number of car rental spaces is planned to be doubled even further.

4 Discussion

The findings of the analysis of the relationship between the quality of service and the commercial performance of airports confirmed the validity of the hypothesis proposed at the beginning of the paper. It was assumed that the quality of passenger service at an airport is inversely proportional to the amount of profit generated by the airport's operations. These results can also be interpreted as being relevant at the current stage of airport development.
Passenger feedback and the data obtained confirm this and prove that profits and passenger traffic at major airports in Russia and the United States are increasing every year (in Pulkovo the profit in 10 years increased by 13.8 billion rubles and in the US by only 3 years - 66 million USD) but the level of service quality is decreasing.

5 Conclusions

We can conclude from our analysis of the relationship between service quality and airport profitability that there are many problems at airports which have a significant impact on the quality of passenger service. These problems do not depend on the country in which the airport is located or its size (Pulkovo airport in Russia and Denver International Airport in the US differ significantly in size, but have similar problems). The main ones are the following:
- low service rates, long waiting times in queues;
- rude staff;
- filthy halls, floors, examination areas;
- incomprehensible signage, a poorly designed transfer system inside the airport;
- insufficient number of food and beverage outlets
- insufficient passenger waiting area.

Overall, passengers gave the Pulkovo Airport and the Denver Airport a score of 3 out of a possible 5. This indicates that the management and staff of the airports have a lot to strive for. It is confirmed that the main aim of the airports is to gain as much profit as possible instead of improving services for passenger convenience.

To improve the quality of passenger service at airports it is important to organize the whole system properly, so that it operates quickly, efficiently and smoothly, then people will wish to return to the airport again and again to leave their money there and thus bring profit. A satisfied customer can leave a good review or recommend the airport to their friends, which will greatly improve the reputation of the place.

To solve the above problems the following options can be proposed:
- to increase the number of airport staff, optimise their work by adding additional check-in desks;
- to provide training for airport staff to create a better quality of work, create a friendly environment within the team and when dealing with passengers;
- to increase the number of staff at cleaning positions, clean the premises every 30 minutes to 1 hour;
- to change signposts to be more understandable, make them larger in size and hang them in more places so passengers don't have any questions;
- to install more food courts and food and beverage outlets
- to increase the number of halls in operation, add more seats, or set up a public address system that would alert passengers to where seats are vacant and few people are available at a given time.

The quality of service has a direct impact on passenger attitudes and loyalty, so it is essential that the airport and its staff do their job properly.

References