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Criteria of quality assessment of regional airport services - A very last picture before the COVID-19 pandemic

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1. Introduction

More than 40 000 airports worldwide serve billions of passengers every year (Miskolczi et al., 2021). In recent decades, air transport has become more and more accessible, influencing the development of markets of many regions and countries. Omnipresent globalisation causes the integration of states, societies, economies and cultures, and air transport significantly facilitates it. Before the COVID-19 pandemic, air transport was one of the most dynamically developing types of transportation. The quality of airport services was measured, as it supports the development of air transport and airports in particular. As today the future of the air transport industry is not clear, it is essential to have the last picture of service quality assessment criteria before the airports’ lockdown to sustain their development after reassumption. The study covered the operation of a regional international airport in Europe before the lockdown due to the COVID-19 pandemic. A diagnostic survey was used in the study, and the data were collected through a questionnaire of 40 questions. The study covered 263 passengers who had used the services of the examined airport at least once before the lockdown. The collected data were statistically analysed. The main findings are that the passengers consider components of the quality of airport services in groups and not individually. In some groups of factors, the level of satisfaction varies depending on the frequency of airport use. The results are in accordance with the findings of other authors researching different airports. They should be considered when managing the airport and identifying the causes of low-quality services to improve and eliminate or at least reduce passenger dissatisfaction, especially in the face of resumption of airport operations after the COVID-19 pandemic.

The global development of air transport affects the expansion of terrestrial infrastructure for passengers. Airports are an essential component of the air transport network, and the demand for airport services is growing. Airports are, in fact, multiservice companies and have to be managed as such. Efficiency and service quality are key performance indicators for airport operation, and airport service quality (ASQ) is crucial to airport management (Allen et al., 2020; Barakat et al., 2021; Hong et al., 2020; Lee and Yu, 2018; Merkert and Assaf, 2015; Pandey, 2016).

The COVID-19 pandemic outbreak at the turn of 2019 and 2020 changed that situation and broke the global upward trend for the air transport industry. Governments around the world implemented drastic restrictions to reduce spreading the virus. In many countries, the airports were closed and the flights cancelled. The lockdowns in 2020 have caused financial losses in the tourism sector, including the aviation sector. This air traffic crisis has lasted much longer than others in history, and no other has affected air transport so significantly. The
International Civil Aviation Organisation (ICAO) reported that the global passengers’ amount decreased 69% in 2020 compared to 2019, in some months even 99% (Buhusayen et al., 2020; Drljaca et al., 2020). The ICAO last report shows that the largest decrease ever in the number of passengers carried by airlines was in 2020 – from 4,500 million in 2019 to 1,800 million in 2020. The worst situation was in April 2020, when the number of passengers was the lowest, below 40 million, while the number of passengers in April 2019 was over 360 million. Since then, the number of total passengers has grown but is still far below pre-pandemic levels (International Civil Aviation Organisation, 2022).

The aviation sector is global, and it constantly changes sustainably. However, this sector is very insensitive to global crises. For example, the terrorist attack of 9/11 in 2001 had a significant impact on the operation of airports and the aviation industry – the safety standards of airports and flights were improved, which forced changes in the behaviour of passengers at the airport. A specific factor triggers each crisis; the 9/11 attack was caused by terrorism, and the COVID-19 pandemic was caused by a virus. The sector has to overcome this ongoing crisis because the safety of passengers during air travel is crucial; if one passenger is infected, all persons travelling on the same plane are exposed to viral infection. To avoid that and help the industry return to pre-pandemic development, new guidelines for access to the airport and airport services are being developed and implemented, e.g., body temperature measurement and tests for the presence of the virus.

Such a big crisis like the one that is going on now will change the aviation industry and may also change the hierarchy of factors influencing the satisfaction of airport services. No one knows how the air transport industry will operate when the pandemic is over and what changes will occur in passengers’ expectations. The authors suspected that such an important factor with global impact might affect the air transport industry both positively and negatively, but such a hypothesis may be verified in the future. The global situation will surely force the managers of airports to change their approach to the services provided; many areas of operation of these facilities, especially those directly related to quality, will have to be redefined to sustain their development. The authors indicate that it is essential to have the last picture of service quality assessment criteria before closing the airports.

In the presented paper, the authors address the issue of quality criteria, which are taken into consideration by airport customers when assessing its services. These criteria may concern different dimensions, such as tangibility, reliability, responsiveness, assurance, and empathy (Parasuraman et al., 1985). The authors assumed that the list of possible quality criteria captured by these dimensions, as well as their character is complex, and so is the perception of these criteria by the airport customers. This complexity of quality assessment of airport services encouraged the authors to pose one main research question:

RQ1: How do the airport passengers consider components of airport service quality?

The paper shows a fragment of reality in airport functioning as an inherent element of the air transport sector, focusing on the quality criteria taken into account by airport customers when receiving services. The presented research aims to identify and analyse quality criteria used by passengers in the assessment process of airport services. The study covered the operation of a regional international airport in Europe shortly before the lockdown due to the COVID-19 pandemic. The research was conducted in April 2020, when most of the European airports were locked, but the survey concerned the time before the pandemic. The research was deliberately set in time; the authors wanted to take the last picture of airport service quality assessment criteria before the lockdown. The idea was to create a base level to which the next research could be compared.

The structure of the article is as follows: the next section (section 2) is dedicated to presenting the literature review on ASQ; section 3 contains the description of the research object and methods, including the research procedure, collecting data and statistical methods of data analysis; in section 4, the results of the research are presented and discussed. The conclusion section (section 5) ends the paper and proposes future research directions. The survey questions are listed in Appendix.

2. Literature review

The quality of airport services is a multidimensional construct (Khalid and Migdadi, 2022; Lee and Yu, 2018). Many different aspects influence the perception of a service (Bezzera and Gomes, 2016; Khalid and Migdadi, 2022). In the era of globalisation, the quality of airport services and customer satisfaction with their use are essential for airport managers because airports are companies involved not only in the air transport process but, in fact, they are multiservice companies (Barakat et al., 2021; Pandey, 2016). The quality of airport services influences the general perception of the airport’s location, supports the region’s development (Allen et al., 2020), and promotes it as a tourist destination (Prentice and Kadan, 2019).

Service quality is strictly linked to customer satisfaction since service is not an item but an experience. Airport service quality perception and passengers’ satisfaction are in the airport industry’s interest (Allen et al., 2020; Antwi et al., 2020; Bezzera and Gomes, 2015; Moro et al., 2020; Prentice and Kadan, 2019; Trischler and Lohmann, 2018), and many surveys have been systematically carried out on these topics, e.g., (Barakat et al., 2021; Bellizzi et al., 2020; Bezzera and Gomes, 2016; Law et al., 2022; Lee and Yu, 2018; Merkert and Assaf, 2015). Service quality is a multidimensional construct. It is crucial to understand customers’ criteria in the assessment process to support the effective management and development of airport services (Chonsalasin et al., 2021; Khalid and Migdadi, 2022; Lee and Yu, 2018). The passenger-orientated approach should be used in airport services improvement, and airport management should support that orientation (Barakat et al., 2021). Airport service quality is the way to increase the non-aeronautical revenues of an airport (Hong et al., 2020; Merkert and Assaf, 2015; Prentice and Kadan, 2019). This may be crucial especially for regional airports, where public funding may be a share of revenues, and other social and economic factors of a local nature may affect its operation, such as opening hours or the number of flights (Merkert et al., 2012).

In general, airport service quality is the difference between a passenger’s expectations and the perception of the service received (Pandey, 2016; Prentice and Kadan, 2019; Trischler and Lohmann, 2018). The first studies on ASQ were conducted in the 1970s and 1980s. They concerned the assessment of the level of services in the passenger terminal. Later, in the 1990s, research was focused on exploring the passengers’ needs and their perception of elements of the passenger terminal and airport-related processes. A constantly changing business environment causes the need to understand the customer perception of service quality. The measurement of customer satisfaction of services may be treated as the measurement of service quality. It may support the organisation’s efforts to deal better with customer needs (Bezerra and Gomes, 2016; Pandey, 2016). Recently, the range of issues related to ASQ has been expanded, and a broader approach to ASQ based on passenger perception has become more evident. The research includes, among others, investigating the nature of the effects of different service attributes on passenger satisfaction or exploring the multidimensionality of ASQ (Bezerra and Gomes, 2016).

There are two main categories of activities that passengers spend time on in the airport: activities mandatory for the journey and discretionary activities. Passengers spend most of their time on the first group of activities, i.e., passengers flow from check-in through security screening until boarding. The second group of activities is those on which passengers spend time before or between obligatory processing points, e.g., parking, obtaining information, shopping, and consuming (Bezerra and Gomes, 2016; Prentice and Kadan, 2019). Passengers’ perception of airport service quality has been traditionally associated with the efficiency of the mandatory processes. The shorter waiting times and the more positive attitude of the service staff are, the better
perception of the airport services is. The time spent in queues reduces the time for other activities and affects the passengers’ satisfaction (Bezerra and Gomes, 2016; Prentice and Kadan, 2019). To overcome that, the airport has to optimise the existing infrastructure with the increasing traffic volume while adopting a customer-oriented service performance (Pandey, 2016). In the area of discretionary activities, the research on ASQ considers the physical setting in which airport services are performed, delivered, and consumed, e.g., signage and cleanliness of terminal areas, staff behaviour, and availability of convenience facilities (Bezerra and Gomes, 2016). However, the dimensions of airport service quality assessment differ between studies (Trischler and Lohmann, 2018). There is no established consensus on the dimensions and attributes of airport service (Lee and Yu, 2018), but the are some areas in which most of these factors can be grouped. Table 1 presents some of the frequently studied aspects of airport service quality in recent years.

The airport industry still needs a comprehensive framework. The influence of different factors related to airport service on passenger satisfaction is still not entirely researched (Bezerra and Gomes, 2015). Most of the research conducted on ASQ has been done with the assumption that all criteria of ASQ assessment are equally important. It is difficult to measure the service quality due to their heterogeneity, intangibility and inseparability (Bezerra and Gomes, 2016; Pandey, 2016). The complicated nature of airport services implies that multiple dimensions can influence passengers’ perception of airport service quality. Moreover, different customer groups with different preferences and needs use the airport services (Trischler and Lohmann, 2018). Current practices have usually been based on the service attribute level, with little or no consideration for the validity and reliability of the measurement instruments (Bezerra and Gomes, 2016).

Many different methods, both qualitative and quantitative, have been used to measure airport service quality and passengers’ satisfaction. Most of the studies were performed as statistical analysis of the data from surveys, e.g. (Bezerra and Gomes, 2016, 2015; Chonsalasin et al., 2021; D’Alonzo et al., 2021; Hong et al., 2020; Law et al., 2022; Prentice and Kadan, 2019). However, there has also been fuzzy logic (Pandey, 2016), deep learning (Barakat et al., 2021), or text of reviews analysis (Bakir et al., 2022; Moro et al., 2020) implemented to assess the airport service quality. Table 2 presents selected research on ASQ conducted in the recent few years, with an indication of the aim, methods used and main findings.

### Table 1

| Airport service quality aspect | Source |
|--------------------------------|--------|
| Signage and wayfinding         | (Allen et al., 2020; Antwi et al., 2020; Bezerra and Gomes, 2015, 2016; Chonsalasin et al., 2021; Hong et al., 2020; Prentice and Kadan, 2019; Pandey, 2016; Trischler and Lohmann, 2018) |
| Information                    | (Allen et al., 2020; Antwi et al., 2021; Barakat et al., 2021; Bezerra and Gomes, 2015, 2016; D’Alonzo et al., 2021; Chonsalasin et al., 2021; Hong et al., 2020; Prentice and Kadan, 2019; Pandey, 2016; Trischler and Lohmann, 2018) |
| Security and control           | (Allen et al., 2020; Antwi et al., 2020; Barakat et al., 2021; Bezerra and Gomes, 2015, 2016; D’Alonzo et al., 2021; Chonsalasin et al., 2021; Hong et al., 2020; Prentice and Kadan, 2019; Pandey, 2016; Trischler and Lohmann, 2018) |
| Waiting times                  | (Allen et al., 2020; Antwi et al., 2020; Barakat et al., 2021; Bellizzi et al., 2020; Bezerra and Gomes, 2015, 2016; Chonsalasin et al., 2021; Pandey, 2016; Trischler and Lohmann, 2018) |
| Staff behaviour                | (Antwi et al., 2020; Bezerra and Gomes, 2015, 2016; Chonsalasin et al., 2021; Hong et al., 2020; Law et al., 2022; Prentice and Kadan, 2019; Pandey, 2016) |
| Cleanliness                    | (Allen et al., 2020; Bezerra and Gomes, 2015, 2016; D’Alonzo et al., 2021; Chonsalasin et al., 2021; Prentice and Kadan, 2019; Pandey, 2016) |
| Comfort                        | (Allen et al., 2020; Antwi et al., 2020; Antwi et al., 2021; Bezerra and Gomes, 2015, 2016; D’Alonzo et al., 2021; Chonsalasin et al., 2021; Hong et al., 2020; Prentice and Kadan, 2019; Pandey, 2016; Trischler and Lohmann, 2018) |
| Availability and efficiency of | (Allen et al., 2020; Antwi et al., 2021; Bezerra and Gomes, 2015, 2016; D’Alonzo et al., 2021; Chonsalasin et al., 2021; Hong et al., 2020; Prentice and Kadan, 2019) |
| the airport services           | (Chonsalasin et al., 2021; Hong et al., 2020; Prentice and Kadan, 2019) |
| Parking and transport          | (Antwi et al., 2020; Bellizzi et al., 2020; Chonsalasin et al., 2021; Hong et al., 2020; Pandey, 2016) |
| Prices                         | (Bellizzi et al., 2020; Bezerra and Gomes, 2015, 2016; D’Alonzo et al., 2021; Chonsalasin et al., 2021; Law et al., 2022; Pandey, 2016) |

### 3. Materials and methods

#### 3.1. Research object characteristics

The research object was a regional international airport located in Europe. The studied airport has over a hundred years of history. It was rebuilt many times during this time, achieving higher and higher throughput. It is located 10 km from the city centre, which is an agglomeration with a population of over 1.25 million inhabitants. The airport is the base of operations for both domestic and foreign carriers, including Hungarian Wizz Air since 2010 and Irish Ryanair since 2011. The number of passengers using the airport’s services in 2018 amounted to nearly 3.3 million, and the revenues were over 50 million euros.

#### 3.2. Research strategy and procedure

The paper aims to present key factors used by passengers to assess the quality of regional airport services. A single case study method was chosen as the research approach. The authors have assumed that it is a suitable research approach in this very case (cf., Benbasat et al., 1987; Yin, 2002). Taking the aim of the paper into consideration, the presented study can be described as qualitative research of a descriptive nature.

The case study research was conducted using the following procedure (Yin, 2002):

1. Preparing the research.
2. Data collection using a questionnaire.
3. Statistical analysis of the collected data,
4. Drafting conclusions.

#### 3.3. Preparing the research

To answer the research question, a questionnaire was prepared. It consisted of 40 survey questions, 14 of which aimed to identify the respondent’s characteristics (i.e., sex, age, education level, region of residence, the last time the airport services were used, frequency of airport use, the reason of the journey, destination, etc.), while 24 questions concerned the assessment of airport service quality made on the 5-point Likert scale (1-very dissatisfied, 5-very satisfied). The survey also included two open-ended questions about unpleasant situations related to airport use. The complete list of survey questions is attached in Appendix.

The survey questions aimed to recognise how passengers evaluate the various stages of traffic handling in the airport, from the parking lot to boarding. Therefore, the following aspects were assessed:

- Signage, equipment, overall perception of the terminal,
- Communication accessibility of the airport, internal transfer at the airport,
- Prices,
- The behaviour of the crew at service points,
- Time of procedures,
- The way the procedures are carried out.
| Source       | Aim                                                                 | Methods                                           | Findings                                                                                       |
|-------------|----------------------------------------------------------------------|--------------------------------------------------|------------------------------------------------------------------------------------------------|
| Bezerra and Gomes, (2015) | Identifying service quality dimensions related to airports and examining the effects of those dimensions on passenger's overall satisfaction with an airport together with variables related to passenger characteristics. | Exploratory factor analysis (EFA) | Findings underline implications regarding the use of meaningful service dimensions instead of a large set of variables as predictors of passenger satisfaction. The study stresses the need for considering how passenger characteristics may be related to different perceived levels of service quality. A six-factor structure provides a meaningful multi-item measurement model for perceived ASQ. The proposed measurement model could be considered an alternative for a multidimensional approach in the context of airport performance measurement regarding service quality. |
| Bezerra and Gomes, (2016) | Fitting a measurement model for perceived ASQ built on typical service measures within the airport industry and testing for the model’s equivalence across groups of passengers. | Exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) | The service quality of both the airports is satisfactory; however, some areas require improvement which was identified and suggested. The study demonstrates and signifies that the Fuzzy MCDM method is a promising and pragmatic decision-making tool for the airport service quality measurements. |
| Pandey, (2016) | Investigating the service quality of two gateway airports and identifying the scope of improvements. | Fuzzy Multi Criteria Decision Making (MCDM), Method, Improvement Performance Analysis using a fuzzy expert system | Online reviews provide a good proxy for airport service quality ratings and an effective means to cross-validate the conventional industry-standard survey results. The ASQ program effectively covers all the service quality attributes of airport users. The relative importance of service attributes varies depending on the size of the airports, and some ASQ service attributes may not be relevant anymore for most passengers. |
| Lee and Yu, (2018) | Demonstrating that user-generated online contents can be used as an alternative data source for assessing airport service quality, which effectively complements and cross-validates the conventional service quality surveys. | Sentiment analysis and topic modelling | Overall airport service quality is significantly related to airport reuse and destination revisit. Passenger satisfaction and reuse of airports exert significant mediation effects between airport service quality and intended outcome variables. |
| Prentice and Kadan, (2019) | Examining the relationship between airport service quality, passenger satisfaction, and behavioural intentions, including airport reuse and destination revisit. | Confirmatory factor analysis (CFA) | Overall airport service quality is significantly related to airport reuse and destination revisit. Passenger satisfaction and reuse of airports exert significant mediation effects between airport service quality and intended outcome variables. |
| Allen et al. (2020) | Exploring factors employed to assess airport service quality. | Principal Component Analysis (PCA) and Structural Equation Modelling (SEM) | Overall airport service quality is significantly related to latent factors such as accessibility to the services, control operations and environment in the terminal. The theoretical model suggests robust direct associations among processing/non-processing domains and passenger satisfaction, as well as the processing domain and passenger affective image, except non-processing domain and passenger affective image relation. Moreover, significant mediating and moderating effects of passenger affective image and travel purpose on the significant positive direct associations are found. |
| Antwi et al. (2020) | Testing a theoretical model that explores the direct and indirect relationships among airport service quality, passenger affective image and satisfaction, as well as the moderating mechanism of passenger type (travel purpose) in these associations. | AIPEX model and confirmatory factor analysis (CFA) | Overall airport service quality is significantly related to airport reuse and destination revisit. Passenger satisfaction and reuse of airports exert significant mediation effects between airport service quality and intended outcome variables. |
| Bolllizi et al. (2020) | Finding out what users of air transport look for in the services provided by the airlines, and what they would like to receive when they travel by air. | Stated Preference (SP) survey and Multinomial Logit (MNL) model | Overall airport service quality is significantly related to airport reuse and destination revisit. Passenger satisfaction and reuse of airports exert significant mediation effects between airport service quality and intended outcome variables. |
| Hong et al. (2020) | Using a structural equation model to get a conceptual framework to find the relationship between service quality and user satisfaction at airports. | Exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) | Overall airport service quality is significantly related to airport reuse and destination revisit. Passenger satisfaction and reuse of airports exert significant mediation effects between airport service quality and intended outcome variables. |
| Moro et al. (2020) | Addressing service quality by analysing TripAdvisor online reviews over units from both a high-end and a low-end chain in five European cities. | Text mining and topic modelling | Overall airport service quality is significantly related to airport reuse and destination revisit. Passenger satisfaction and reuse of airports exert significant mediation effects between airport service quality and intended outcome variables. |
| Barakat et al. (2021) | Introducing a general framework for measuring ASQ using passengers’ tweets about airports in any language to support ASQ evaluation. | Deep learning models (CNN and LSTM) | The proposed approach is recommended for use as a complement to more traditional methods of measuring airport service quality. Seven dimensions of service quality: security, check-in, wayfinding, airport environment, access, arrival services, and airport facilities. It is important to provide passengers with more attractive services so that they will become repeat customers. |
| Chonsalasin et al., (2021) | Creating a model for measuring airport quality by using confirmatory factor analysis to identify passengers' expectations. | Confirmatory factor analysis (CFA) | Overall airport service quality is significantly related to airport reuse and destination revisit. Passenger satisfaction and reuse of airports exert significant mediation effects between airport service quality and intended outcome variables. |

(continued on next page)
The survey was conducted in April 2020, and respondents were asked about their experience of using the examined airport in 2016–2019. The questionnaire was posted on the airport’s social network. The respondents were not invited to the survey, and they took part in the study on their initiative. The questionnaire was available for a month. In the next step, the responses were statistically analysed.

3.4. Collecting data using a questionnaire

At the time the questionnaire was available, 284 responders filled it. Most of the interviewed people (263) had used the services of the examined regional airport at least once before the COVID pandemic. Only these responses were taken into account in the analysis of the results. The answers of 21 respondents that had never used the examined airport were rejected. The survey results were placed in the form of a table worksheet and underwent statistical analysis with the use of SPSS and Statistica software.

The characteristics of respondents are presented in Table 3. The majority of respondents were female (60.8%). About 44% of questioned passengers were in the age between 18 and 25 (44.1%), and the remaining age groups were at least twice smaller. In most cases, the highest level of education was secondary (51% secondary and 0.4% secondary professional), while over 45% of respondents indicated higher than secondary (45.2%). Almost half of the respondents were habitants of large cities (with more than 500 thousand habitants) (47.1%). Most of the examined passengers use an airport twice a year (70.7%); the main purpose of their journey is tourism (66.9%), and they fly mostly to Europe (43.7% Western Europe and 31.9% Southern Europe).

3.5. Statistical analysis of collected data

The answers to the survey questions created observable statistical variables. The realisation of the purpose of the study was to reduce the size of the resulting evaluation matrix. The reduction of dimensions consisted of identifying those survey questions in which the respondents answered approximately the same. Such a procedure allows describing groups of survey questions as a whole instead of asking the question separately and detects unexpected relationships between individual survey questions. The method that provides the reduction of variables is exploratory factor analysis (EFA) (Bartholomew et al., 2008; Harman, 1976). The resulting factors were additionally assessed for model coherence (Cronbach’s alpha). It was performed to determine whether the measurement scales in individual observable variables, grouped into factors, were correctly and reliably selected. The results of the analysis include a positively verified model (Cronbach and Shavelson, 2004). The assessment of the impact of the frequency of flying on the perceived quality of airport services in groups of components of the service satisfaction assessment. These groups are: 1) passenger service; 2) security, information and disabled; and 3) prices. Table 5 shows the values of the model parameters for the chosen 11 aspects; these values can be interpreted as correlation coefficients. They indicate the consistency of the single question in the questionnaire to the component differentiated in the statistical analysis. The threshold value was 0.7.

The first group of assessment factors, called passenger service, includes six issues: the check-in and boarding times and staff behaviour, the form of boarding, and the staff’s behaviour in crisis situations (Table 5). All of these aspects relate to mandatory activities that a passenger must take to continue the journey. This area of factors is crucial in the perception of airport service quality because ASQ is traditionally associated with the perception of the mandatory process (Bezerra and Gomes, 2016). In airport traffic management, it is crucial to reduce passengers’ time spent in queues because this factor reduces passengers’ discretionary time and affects their perception of airport service quality (Prentice and Kadan, 2019). The assessment of these factors in the presented research is relatively high and ranges from 2.77 to 3.83 on a 5-point scale (Table 4).

The second group of factors in the airport service quality assessment is security, information and disabled (Table 5). The group is heterogeneous. The behaviour of security control staff is a part of the mandatory process, while the behaviour of airport information handling and the behaviour of the staff towards the disabled are discretionary activities. Those activities are noticeable by passengers, especially those with disabled people, so the staff should behave polite and patient in such situations. Questioned passengers rated the highest this group of factors (among chosen 11 components) – from 3.94 to 4.03 out of 5 points (Table 4).

The third and last group of essential factors influencing the service quality of an examined regional airport are prices which includes parking prices and prices in shops and restaurants at the airport (Table 5). Prices are a typical aspect of airport service quality assessment and are indicated in some other research (see Table 1). It may be so because, in general, prices at the airport are much higher than those in regular stores and restaurants and passengers notice it. The passengers of the examined airport rated this dimension of airport services the lowest of all, 2.29–2.38 out of 5 (Table 4).

The identified dimensions of airport services perception differ between studies. Other authors who also used EFA in the analysis of responses detected similar groups of airport service attributes to those identified in this paper, e.g., prices (Bezerra and Gomes, 2015, 2016) or security (Bezerra and Gomes, 2015, 2016; Chonsalasin et al., 2021;
It may indicate that these aspects are important to passengers in general and passengers are stable in assessing these areas in different research. The respondents’ features are usually presented within the research results (Bezerra and Gomes, 2015, 2016; Chonsalasin et al., 2021; D’Alonzo et al., 2021; Prentice and Kadan, 2019), but mostly only as sample characteristics. In general, the results are not interpreted in the context of these features. Only Bezerra and Gomes (2015) stated that the time of waiting for a flight or frequency of airport use might influence the overall satisfaction of airport services. Analysing obtained results described in the paper, the authors noticed that the assessment of the quality of airport services in the identified groups of factors differs depending on the frequency of flying and thus on the frequency of using airport services. The surveyed passengers were divided into three groups according to the frequency of using the airport: those who rarely fly (up to two times a year), who fly with medium frequency (3 and 4 times a year) and who fly more often (more than five times a year). A similar division of respondents was made by other authors (Bezerra and Gomes, 2015, 2016; Chonsalasin et al., 2021).

The assessment of the created groups of factors in the context of the frequency of airport use is shown in Fig. 1. As it can be seen, the frequency of airport use influences the assessment of airport service quality. The prices are evaluated as the lowest of all factors; none of the groups of passengers is satisfied with the price level at the airport. People who rarely use airport services (up to 2 times a year) define the level of satisfaction with prices at the airport as higher than those who use services more often. The low assessment of prices is quite stable between created groups of passengers, but it can be noticed that the more often the person uses the airport, the lower the rate is. It is understandable because the high prices at the airport are more inconvenient when they have to be paid often.

The reverse dependency can be seen in the assessment of the security, information, disabled group of factors (Fig. 1). The more often a person uses the airport, the higher rate is given. Such a relationship may be caused by the fact that the more often the airport is used, the more

| Table 3 |
|-----------------|--------|--------|
| Characteristic | Category | Frequency | Percentage |
| Age             | 18-25  | 116     | 44.1       |
|                 | 26-40  | 53      | 20.1       |
|                 | 41-65  | 26      | 9.9        |
|                 | more than 66 | 13   | 4.9        |
|                 | no data| 55      | 20.9       |
| Gender          | Male   | 160     | 60.8       |
|                 | Female | 103     | 39.2       |
| Education       | Primary| 9       | 3.4        |
|                 | Secondary | 134   | 51.0       |
|                 | Secondary professional | 1   | 0.4        |
| Place of living | Village| 41      | 15.6       |
|                 | City, up to 50 thousand inhabitants | 57  | 21.7       |
|                 | City, 50-100 thousand inhabitants | 23  | 8.7        |
|                 | City, 100-250 thousand inhabitants | 7   | 2.7        |
|                 | City, 250-500 thousand inhabitants | 11  | 4.2        |
|                 | City, more than 500 thousand inhabitants | 124 | 47.1       |
| The last time the services of the examined airport were used | Before 2016 | 15  | 5.7        |
| Frequency of airport use last year | 0-2 times | 152 | 58.2       |
| Frequency of airport use in general | up to 2 times a year | 186 | 70.7       |
| The main purpose of travelling | Studying | 8    | 3.0        |
| Destination of most of the flights (most frequently indicated) | Western Europe | 115 | 43.7       |
| The most important factor when choosing an air carrier (most frequently indicated) | Price | 167 | 63.5       |
| Is examined airport chosen on purpose when choosing the departure or arrival airport? | Yes | 126 | 47.9       |
|                                    | No | 58 | 22.1       |
|                                    | I don’t know | 79  | 30.0       |

Table 4
Basic statistical parameters of answers on the Likert scale <1,5>.

| Question                                | Mean | Standard deviation | Standard error |
|-----------------------------------------|------|--------------------|----------------|
| Are you satisfied with the _____ at the examined airport? | 2.51 | 1.118 | 0.069 |
| catering offer                          | 4.06 | 0.947              | 0.058 |
| terminal signage                        | 3.43 | 0.985              | 0.061 |
| congestion                              | 3.43 | 0.997              | 0.061 |
| Ar number of seats                       | 2.29 | 0.997              | 0.061 |
| prices                                  | 2.38 | 0.961              | 0.059 |
| travel to the airport                    | 3.92 | 1.009              | 0.062 |
| What is your general perception of the examined airport? | 3.83 | 0.868 | 0.054 |
| Are you satisfied with the _____ at the examined airport? | 3.63 | 1.383 | 0.085 |
| behaviour of the check-in service        | 3.83 | 1.285 | 0.079 |
| boarding service behaviour               | 4.02 | 0.941 | 0.058 |
| behaviour of airport information handling | 4.03   | 0.936   | 0.058 |
| behaviour of the staff in the case of, e.g., a flight delay, a problem with a ticket or luggage, etc. | 2.77   | 1.353   | 0.083 |
| What is your general perception of service at the examined airport? | 3.79 | 0.971 | 0.060 |
| Are you satisfied with the _____ at the examined airport? | 2.98 | 1.209 | 0.075 |
| offered flight grid                      | 3.43 | 1.160 | 0.072 |
| check-in time                            | 3.58 | 1.172 | 0.072 |
| boarding time                            | 3.51 | 0.948 | 0.076 |
| form of boarding (queueing, priority entrance) | 3.51   | 0.948   | 0.076 |
| baggage claim time                       | 3.74 | 0.921 | 0.057 |
| safety control time                      | 3.74 | 0.966 | 0.060 |
| passport control time                    | 3.66 | 0.951 | 0.059 |
| information on carriers’ rules (luggage, tickets, transport, etc.) | 3.45   | 1.081   | 0.064 |
probable it is that a passenger needs help and receives it from the staff, so his rate of this area of services grows with the frequency of the airport use. However, the differences between the groups are small, and the analysis of variance did not detect any statistically significant difference here.

In contrast, clear differences can be seen in the assessment of the quality of airport passengers service (boarding, check-in, crisis situations). It is rated moderately high, and the level of satisfaction is significantly lower by people who use the airport 3–4 times a year. People who fly rarely or very often rate this group of factors significantly higher than those who fly with medium frequency (Fig. 1). It is difficult to assess where this differentiation comes from. Maybe it is so because rarely flying passengers have not experienced any unpleasantness in this area or do not know what to expect, and people who fly often get used to the different levels of passenger service. Those passengers who fly 3–4 times a year have probably already experienced some uncomfortable situations or lost much time in queues and at the same time are not used to it yet, so their rate is relatively low. Bezerra and Gomes (2015) noticed a similar dependence that passengers who travel with medium frequency assess the airport services lower than those who rarely fly. However, their conclusion concerned the overall satisfaction of airport services and not only a specific group of factors.

Table 6 presents the overall assessment of the quality of airport services in the created packages without grouping passengers according to the frequency of airport use, the Leven test score, which determines the choice of the intergroup comparison method, and the p-value for the ANOVA test. P-values below 0.05 mean there is variation in the group, and p-values above 0.05 indicate no difference. As noticed earlier, the passengers at the examined airport rate the highest the safety service, information and support for the disabled. This component of the level of satisfaction does not significantly depend on the frequency of using the airport (see Fig. 1), and the average rating equals 4.0 on a 5 point satisfaction scale (Table 6). The other two components are rated lower, respectively, passenger service 3.5 and prices 2.3.

Based on the conducted research, two hypotheses may be put:

**H1.** Passengers consider components of the quality of airport services in groups (packages) and not individually. The components inside a package are treated equally, and they are independent between packages.

**H2.** The airport service quality assessment depends on the frequency of airport use.

The hypotheses may be verified in larger-scale research, which would cover more objects and many more respondents.

### Table 5

| Are you satisfied with the ______ at the examined airport? | Key components of the satisfaction assessment |
|----------------------------------------------------------|-----------------------------------------------|
|                                                          | Passenger service | Security, information and disabled |
| boarding service behaviour                                | 0.894             |                                  |
| boarding time                                             | 0.877             |                                  |
| behaviour of the check-in service                         | 0.865             |                                  |
| form of boarding (queueing, priority entrance)            | 0.832             |                                  |
| check-in time                                             | 0.832             |                                  |
| behaviour of the staff in the case of, e.g., a flight delay, a problem with a ticket or luggage, etc. | 0.711             |                                  |
| behaviour of the staff towards the disabled               | 0.834             |                                  |
| behaviour of security control staff                       | 0.786             |                                  |
| behaviour of airport information                           | 0.742             |                                  |
| handling                                                  |                  |                                  |
| parking prices                                            | 0.873             |                                  |
| prices at the airport                                     | 0.766             |                                  |

The research described in this paper has some limitations. The first one is connected with the hypotheses put above. The questions in the survey concerned only one indicated airport characterised in section 3.1. The examined airport is regional but international. Future research could involve other airports of a similar size to check if the indicated dimensions of airport service quality are specific to the examined airport or are typical for airports this size. In addition, another research could cover a big national airport to compare the identified dimensions typical for regional airports to those of a big airport. Such research could verify the put hypotheses. The opposite limitation is indicated by Chonsalasin et al. (2021); they researched a group of airports and suggested that the specific airport should be examined in future studies. Considering this, maybe the future research should cover a group of airports with the possibility of identifying the answers given in the context of a specific airport. Another limitation of our research was the time of using the airport, which was asked about in the survey. That was the time of rapid development of regional airports in our country, which may have influenced the results. More research is needed to check if the identified dimensions of airport service quality are stable in time or not. The next limitation was the questionnaire language, which was the country’s national language where the airport was located. Only people who use it fluently could have filled it out. Maybe sharing the survey in English would bring different results because passengers from other countries might answer it. The same limitation was pointed out by other authors (Chonsalasin et al., 2021). The last limitation is that the questionnaire was posted on the airport’s social network and might not have reached users who do not use such means of communication. Of course, using the internet nowadays seems obvious, but still, a large group of passengers, especially older, do not use it at all or to that extent to notice and fill out a questionnaire. A similar limitation was indicated by Prentice and Kadan (2019), but the problem indicated by them was that online surveys caused passengers to have to reminisce memories of their travel, and their evaluations of airport services quality may be inaccurate since emotional responses fade over time. On the other hand, Antwi et al. (2020) reported that an online survey is necessary because it is nearly impossible to have access onsite to the entire passengers’ service process, such as boarding or immigration check-point. Taking these issues into consideration, the subsequent research should be held both onsite and online.

Despite the limitations mentioned above, airports are a homogenous group with a specific main function independent of their size or other factors that are limitations in this study. The results described in this paper are similar to the results of other studies covering different airports globally. However, the main difference is that in this study, not all the aspects asked in the survey were considered as important - based on the statistical analysis of the responses, it was found that only 11 out of 24 factors are important in assessing the quality of airport services (Table 4). These factors have been grouped into three packages according to the calculated coefficient (Table 5). In other studies, all the presented aspects are usually grouped, and there are more groups, at least seven (Bezerra and Gomes, 2015, 2016; Chonsalasin et al., 2021; Prentice and Kadan, 2019). Only Hong et al. (2020) identified three groups and allocated there not all but some statistically indicated attributes. It may be connected with the stage of the research conducted. In the early stage of the research, as described in this paper, the isolation of important factors from all factors asked in a questionnaire is made, while in the proper phase of the research, only the most important factors identified earlier are studied.

“This leads to the managerial implication of the conducted research. From the perspective of airport management, the most important thing is to be adequately prepared to serve passengers. Identification of groups of aspects that are important to passengers may help the managers focus on these components of airport functioning that influence their perception of delivered services the most. The conducted research can help prioritise airport services and support adaptive management. In operational management, decision-making processes can be supported...
in order to better match the quality of services in the distinguished groups to the passengers’ needs. However, considering strategic management, it can help in the situation of global crises, such as the COVID-19 pandemic. The ongoing crisis can change the scope of the airport’s functioning very quickly. The restrictions imposed in many global sectors worldwide, including air transport (Buhusayen et al., 2020; Drljača et al., 2020), have significantly influenced our lives in many aspects. They have also changed our perception of services. Other things seem to be more important than before, e.g., health security, especially in the case of these services that were provided in direct contact. Most of the services offered at the airport are provided in such a way. The question is if and how the airport services change to maintain and increase the passengers’ satisfaction with their use after the pandemic. The passengers indicate that they are ready to get information and do the check-in without human assistance but with self-service technology or robots.

Such solutions may improve technology acceptance and enhance the general perception of the airport’s attractiveness, especially if the solutions are easy to use (Antwi et al., 2021; Miskolczi et al., 2021). The passengers would choose how they want to be served – with or without direct contact with the staff, and as a result, they would have a better perception of their own effectiveness in using new technologies. It could also positively influence their assessment of satisfaction with airport services, e.g., eliminating or at least decreasing the low assessment of the behaviour of the staff in the area of passengers service during obligatory activities during air travel. The conducted research may be the basis for further research on changes in the assessment of the quality of airport services in the context of the COVID-19 pandemic.

**Table 6**

| Variable | Average for the whole group | Leven test | p-value ANOVA | Intergroup differences in quality assessment (Tukey test) |
|----------|-----------------------------|------------|---------------|---------------------------------------------------------|
| Prices   | 2.3                         | Assumption of homogeneity fulfilled | 0.008 | Passengers rarely rate their satisfaction with prices at the airport higher |
| Passenger service | 3.5  | Welch patch is required | 0.005* | Medium frequency travellers rate passenger services lower |
| Security, information, disabled | 4.0 | Assumption of homogeneity fulfilled | 0.13 | There was no differentiation of assessments between frequency groups |

* Welch’s ANOVA.
5. Conclusions

Air transport is one of the most dynamically developing types of transportation, which supports omnipresent globalisation. As airports are an important component of the air transport network and the quality of airport services may influence regional development and promote tourist destinations, the quality of airport services is constantly measured. The conducted research aimed to identify and analyse the quality criteria used by passengers to assess airport services. The study covered the operation of a regional international airport in Europe shortly before lockdown in March 2020. Based on the literature review, the authors put a research question on how passengers consider components of airport services’ quality, whether in groups (packages) or individually. The question was answered with the use of the EFA method, which allowed to group the quality criteria influencing the passengers’ assessment. As a result, 11 issues were indicated as relevant, and they were allocated in three groups: passenger service; security, information and disabled; and prices. The analysis of the results allowed authors to notice that the airport service quality assessment depends on the frequency of the airport use. The analysis showed that there are differences and tendencies in the airport services assessment depending on how often a passenger flies. Based on these findings, the authors put two hypotheses that could be verified in larger-scale research with more passengers.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jairtraman.2022.102231.
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