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Airport Level of Service: A Model according to Departing Passenger's Perceptions at a Small-sized Airport

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Abstract

Purpose: This study proposes a conceptual model of level of service evaluation to a small-sized airport with a focus on departing passengers.

Design/methodology: The variables selected to compose the model were chosen according to their adequacy to departing passengers and the airport's characteristics. A survey was conducted, and, posteriorly, exploratory factor analysis was used in order to verify the adequacy of the conceptual model proposed and also to improve it according to the results obtained.

Findings: The results show that the level of service of the airport is composed of three dimensions: airport characteristics, passenger processing, and prices. The relative importance of the dimensions according to their contribution to the composition of the airport's overall level of service was also determined.

Originality/value: The paper combines theoretical and practical findings in a model for level of service evaluation to a small-sized airport from an air transportation management perspective.

Keywords: Conceptual model, departing passengers, level of service, small-sized airport.

1. Introduction

A conceptual model for evaluating the level of service of departing passengers of a small-sized Brazilian airport is presented at this study. Most of the variables selected to compose the model were extracted from the existing literature and selected according to their adequacy to departing passengers and the airport's characteristics. In order to determine the dimensions of the conceptual model, exploratory factor analysis was conducted using the method of principal component analysis with VARIMAX rotation. Subsequently, a multiple linear regression was performed to assess the relative importance of each dimension to the overall level of service of the airport.

The application of the model to the airport's departing passengers resulted in an evaluation of the overall level of service of the airport and also in an evaluation of the level of service of each variable selected to compose the model.

2. Theoretical Framework

One of the most frequent definitions of service quality in the literature is the one by Parasuraman, Zeithaml and Berry (1985), in which perceived service quality is the difference between the service a consumer expects and the service a consumer receives. Additionally, Tsaur, Chang and Yen (2002) stated that service quality is a composite formed of various attributes, consisting not only of tangible attributes, but also of intangible and subjective ones such as comfort and safety, as well as was also verified by Aydin (2017), Li, Yu, Pei, Zhao and Tian (2017), Onã, Oña, Eboli and Mazzulla (2016), Su, Swanson and Chen (2016).

Furthermore, the influence of some service quality dimensions varies according to industry types, for example, tangibles are the most important factors in facility/equipment-based industries, whereas in people-based industries, responsiveness is the most relevant factor (Lee, Lee & Yoo, 2000). Thereby, the development of service quality models that address the peculiarities inherent to airport services is necessary.

There are different models of airport level of service evaluation in the literature. Many of these models have greater focus on quantitative aspects, creating measures that allow airports' performance evaluation and benchmarking. These models use variables such as walking distance and number of passengers per square meter in the departure lounge. The research conducted by Borille and Correia (2013) is an example of this approach since the analysis of airports' arrival components was based on

operational components such as terminal layout, quantity and type of carousels, waiting time, space available and demand characteristics.

On the other hand, there are models of level of service evaluation with greater focus on qualitative aspects in which passengers' perceptions are what determine airports' service quality. These models are characterized by the use of more subjective variables such as quality of passenger orientation, courtesy of airport staff and comfort of airport facilities. Butler and Keller (1992) stated that only customers can really define service quality.

Regarding quantitative and qualitative models, Graham (2005) explains that, for example, a quantitative approach can measure if equipment are reliable or not, however, solely based on this analysis, it is not possible to determine whether consumers feel safe, satisfied and assured with the use of such equipment. Therefore, this study seeks to address the models in which passenger' perceptions of level of service are the main focus.

It was found in the literature a variety of studies that propose level of service evaluation based on an additive method (Barros, Somasundaraswaran & Wirasinghe, 2007; Correia, Wirasingue & Barros, 2008; Han, Ham, Yang & Baek, 2012; Lubbe, Douglas & Zambellis, 2011). The additive method assumes that the overall level of a service is composed of the sum of the level of service performance of all variables, taking into consideration their relative importance (weight). It is also assumed that variables are independent (Liou & Tzeng, 2007).

Based on the additive approach, Correia, Wirasingue and Barros (2008) proposed a method for airports' overall level of service evaluation in which the relative weight of each variable according to passengers' perceptions is determined by performing a multiple regression analysis. In this case, the overall level of service evaluation of the airport is the dependent variable and the individual evaluations of the attributes selected to compose the model are the independent variables. The authors consider that the method developed can be used to generate measures in order to compare different airports; however, in a research about airline service quality, Chang and Yeh (2002) warned that level of service variables are context-dependent and should be selected in order to reflect the environment investigated.

From a literature review and a qualitative research in which in-depth interviews, focus groups and content analysis were used, Fodness and Murray (2007) developed a conceptual model for airport perceived service quality containing 65 themes divided into three main dimensions: interaction dimension (mainly addresses the problem-solving behavior of the airport service staff), function dimension (addresses the efficiency and effectiveness with which passengers move through the airport in terms of orientation, layout, accessibility etc.) and diversion dimension (addresses the capacity of the

attractions of the airport to redirect passengers' attention or stimulate them aesthetically in order to make their processing less tiring, for example, art exhibition, shops, restaurants etc.).

Additionally, Lubbe et al. (2011) evaluated the relative importance of the service quality dimensions at an airport in South Africa using the final model of perceived service quality proposed by Fodness and Murray (2007). As an outcome, the research conducted by Lubbe et al. (2011) found that the most important dimensions for passengers are the interaction dimension, the function dimension and the diversion dimension, respectively.

2.1. Proposed conceptual model

Most of the variables selected to compose the conceptual model of this study were based on previous research and also on the model used by the Airports Council International [ACI] in the Airport Service Quality Survey, however, variables that were not found in the literature and considered relevant were also selected.

Another caveat regarding the selection of the variables is that, due to the diversity of studies addressed in this research, some authors were chosen to support the selection of variables despite the variables they used were applied with broader or narrower scope. Therefore, it is considered that the variables are similar and have the same essence.

Variables more controlled by the airport administration were primarily selected. Some of that, such as flight delays and access to the airport were avoided, however, some selected variables are not fully controlled by the airport administration, for example, courtesy and helpfulness of check-in staff and value for money of shopping facilities. Thus, the proposed conceptual model with its dimensions and selected variables is shown in Table 1, as well as the detailing of the scope of the variables used by other authors when necessary.

Number	Dimension	Variables	Authors
1	Access	Parking facilities	ACI (2011); Humphreys, Francis and Fry (2002)
2		Enplaning curbside	Correia et al. (2008)
3		Availability of trolleys	ACI (2011); Graham (2005); Humphreys et al. (2002); Fodness & Murray (2007) (convenient location); Lubbe et al. (2011) (convenient location); Yeh & Kuo (2003)
4	Check-in	Check-in waiting time	ACI (2011); Chen & Chang (2005) (convenient check-in procedures); Correia et al. (2008) (check-in overall evaluation); Graham (2005); Humphreys et al. (2002) (check-in satisfaction in general); Fodness & Murray (2007); Lubbe et al. (2011)
5		Courtesy and helpfulness of check-in staff	ACI (2011); Correia et al. (2008) (check-in overall evaluation); Graham (2005) (staff courtesy in general); Humphreys et al. (2002) (check-in satisfaction in general); Fodness & Murray (2007) (airport staff in general); Yeh & Kuo (2003) (airport staff in general)
6	Security screening	Security screening waiting time	ACI (2011); Graham (2005); Humphreys et al. (2002); Yeh & Kuo (2003)
7		Courtesy and helpfulness of security staff	ACI (2011); Barros et al. (2007); Graham (2005) (staff courtesy in general); Fodness & Murray (2007) (airport staff in general); Yeh & Kuo (2003) (airport staff in general)
8		Security screening thoroughness	ACI (2011); Correia et al. (2008); Fodness & Murray (2007)
9	Airport facilities	Availability of seats	Barros et al. (2007) (in transfer area); Graham (2005)
10		Availability of toilet facilities	ACI (2011); Barros et al. (2007); Yeh and Kuo (2003)
11		Internet access/Wi-Fi	ACI (2011); Barros et al. (2007) (Internet and telephone facilities); Han et al. (2012) (Internet and PC availability at an airline lounge); Lubbe et al. (2011)
12		Availability of electrical outlets	Literature support was not found
13	Orientation	Walking distance inside the terminal	ACI (2011); Correia et al. (2008); Graham (2005); Fodness & Murray (2007)
14		Flight information screens	ACI (2011); Barros et al. (2007); Chen & Chang (2005) (provision of flight information); Graham (2005); Fodness & Murray (2007); Lubbe et al. (2011); Yeh & Kuo (2003)
15		Signs to airport facilities	Correia et al. (2008) (orientation in general); Barros et al. (2007) (guidance, signs and directions); Chen & Chang (2005); Graham (2005); Humphreys et al. (2002); Fodness & Murray (2007); Lubbe et al. (2011); Yeh & Kuo (2003)
16	Comfort	Comfort of airport seats	Fodness & Murray (2007)
17		Cleanliness of airport facilities (toilets included)	ACI (2011); Barros et al. (2007) (cleanliness of restrooms); Fodness & Murray (2007); Graham (2005); Han et al. (2012) (sanitation and cleanliness of an airline lounge); Humphreys et al. (2002); Yeh & Kuo (2003)
18		Lighting	Yeh & Kuo (2003)
19		Terminal crowding	Graham (2005); Fodness and Murray (2007); Yeh & Kuo (2003)
20	Services	Availability of restaurants/eating facilities	ACI (2011); Correia et al. (2008) (concessions in general); Barros et al. (2007); Graham (2005) (satisfaction with the range of commercial facilities); Fodness & Murray (2007); Lubbe et al. (2011); Yeh & Kuo (2003)
21		Availability of shopping facilities	ACI (2011); Correia et al. (2008) (concessions in general); Graham (2005) (satisfaction with the range of commercial facilities); Fodness & Murray (2007); Lubbe et al. (2011); Yeh & Kuo (2003)
22		Value for money of restaurants/eating facilities	ACI (2011); Barros et al. (2007); Graham (2005) (value for money of commercial facilities); Humphreys et al. (2002) (shops in general)
23		Value for money of shopping facilities	ACI (2011); Graham (2005) (value for money of commercial facilities); Humphreys et al. (2002)

Table 1. Proposed conceptual model

The twenty-three selected variables shown in Table 1 were initially divided into seven dimensions. These seven dimensions were defined according to departing passengers' processing: firstly, passengers begin their processing outside the passenger terminal (access dimension), then they head for the check-in counter inside the passenger terminal (check-in dimension) and posteriorly go to security screening to be inspected (security screening dimension) and therefore be allowed in the departure lounge where they will wait for their flights, concluding their ground processing when they board their airplanes. The remaining dimensions (airport facilities dimension, services dimension, comfort dimension and orientation dimension) seek to address additional aspects that occur during these three main processing stages.

3. Methodology

3.1. Population and sample

This study addressed the departing passengers of a small-sized Brazilian airport that were waiting in the departure lounge, since it is considered that for more accurate assessments passengers should answer the questionnaires after they have been almost completely processed by the airport. Hair, Black, Babin and Anderson (2009) suggested that the sample size for performing factor analysis should be greater than 100 observations and at least five times greater than the number of variables analyzed. Therefore, this study is aimed at collecting a minimum of 120 valid observations, since there are 24 variables being analyzed.

3.2. Data collection

Data were collected through a questionnaire based on the one used by ACI (2011) in the ASQ survey. The questionnaire was divided into two parts; the first one had questions addressing the characteristics of the sample and the second one had questions that sought to evaluate the level of service of each variable of the proposed conceptual model, also evaluating the overall level of service of the airport. The anchors of the questions of the second part of the questionnaire were selected according to the linguistic terms used by Yeh and Kuo (2003): very poor, poor, fair, good and very good. In addition to these terms, in case passengers have not used or have not noticed certain variable while they were being processed by the airport, the response alternative "did not notice/use" was also added. The convenience sampling technique was used due to the short time available for data collection. Passengers were asked to answer the questionnaires during peak and non-peak periods of the day in order to

increase the representativeness of the sample, as was done by Chen and Chang (2005). Of the 160 passengers that were asked to answer the questionnaire, 152 agreed to participate in the research. Two passengers of the 152 that agreed to participate in the research could not finish answering their questionnaires because their flights started boarding, which resulted in the collection of 150 questionnaires.

3.3. Data treatment and analysis

The data treatment began with the removal of questionnaires considered invalid, in this case, the ones with standard deviation of zero for questions of the second part of the questionnaire; three questionnaires were excluded and thus the number of valid observations was reduced to 147. The next step was the removal of the variables that had more than 15% of missing data, as suggested by Hair et al. (2009). Thus, three variables were removed: parking facilities, availability of trolleys, and Internet access/Wi-Fi. The remaining missing data was replaced by the mean, with such replacement validated by performing the Little's MCAR test which resulted in a significance level of 0.99. According to Hair et al. (2009), the pattern of the missing values should be similar to a random pattern (Sig.>0.05). In order to determine the dimensions that compose the level of service of the analyzed airport, exploratory factor analysis was conducted using the method of principal component analysis with VARIMAX rotation. After determining the level of service dimensions through factor analysis, a multiple linear regression was performed to assess the relative importance of each dimension to the composition of the overall level of service of the analyzed airport. All statistical analyses presented in this study were performed using SPSS 18, including data tabulation.

4. Results and discussion

4.1. Sample characteristics

Table 2 summarizes the main characteristics of the sample.

According to Table 2, the majority of the respondents were male (63%) and 73% had an undergraduate degree or higher. Regarding trip purpose, 42% of the respondents were on a business trip and 58% were on a leisure travel or had other reasons for traveling. The majority of respondents use air travel more than 11 times a year (36%), whereas passengers from the second largest group of respondents use air travel twice a year or less (27%).

Category		Frequency	%
Gender	Male	93	63%
	Female	54	37%
Age	20 years old or younger	12	8%
	21-30	52	35%
	31-40	34	23%
	41-50	26	18%
	51-60	19	13%
	61 years old or older	4	3%
Education	High school or below	40	27%
	Bachelor's degree	55	37%
	Specialization	37	25%
	Master's degree	8	5%
	Doctoral degree	6	4%
	Postdoctoral	1	1%
Trip purpose	Business	62	42%
	Leisure or others	85	58%
Annual frequency of air travel	Twice or less	39	27%
	3 - 6	35	24%
	7 - 10	20	14%
	11 times or more	53	36%

Table 2. Sample characteristics

4.2. Attributes' level of service evaluation

Variable	Mean	Standard deviation
Security screening waiting time	4,04	0,80
Courtesy and helpfulness of security staff	3,97	0,82
Courtesy and helpfulness of check-in staff	3,94	0,90
Lighting	3,90	0,73
Security screening thoroughness	3,87	0,97
Availability of seats	3,85	1,02
Check-in waiting time	3,83	1,02
Walking distance inside the terminal	3,82	0,82
Flight information screens	3,82	0,85
Availability of trolleys	3,72	0,93
Cleanliness of airport facilities (toilets included)	3,68	1,00
Signs to airport facilities	3,62	0,97
Terminal crowding	3,61	0,97
Comfort of airport seats	3,59	0,90
Availability of toilet facilities	3,44	1,16
Parking facilities	3,25	1,05
Availability of electrical outlets	3,22	1,22
Enplaning curbside	3,19	1,11
Availability of shopping facilities	3,08	1,04
Availability of restaurants/eating facilities	3.07	1,18
Internet access/Wi-Fi	2,52	1,33
Value for money of shopping facilities	2,19	1,08
Value for money of restaurants/eating facilities	1,98	1,02
Airport's overall level of service	3,37	0,97

Table 3. Level of service ratings

Table 3 shows the mean evaluation made by passengers according to each level of service variable analyzed, including the ones that were removed for presenting more than 15% of missing data, though in further analysis these variables will be omitted. The scale used in the second part of the questionnaire ranged from 1 (very poor) to 5 (very good).

As can be seen in Table 3, it is believed that some variables benefited from the airport's small size, while others did not, for example, the walking distance inside the terminal was relatively highly rated by passengers due to the simplicity of the airport's layout. Overall, the airport was considered to be regular by passengers, receiving an average rating of 3.37 on a scale in which the highest rating is 5.

4.3. Level of service dimensions

In order to determine the dimensions that compose the level of service of the analyzed airport, exploratory factor analysis was conducted using the method of principal component analysis with VARIMAX rotation. The value of the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) was 0.862 and the significance value of the Bartlett's Test of Sphericity was 0.000, which validates the use of exploratory factor analysis (Malhotra & Birks, 2005). A factor loading cutoff of 0.45 was applied in the exploratory factor analysis, as suggested by Hair et al. (2009) for a sample of approximately 150 observations. The extraction of components was based on eigenvalues, being retained only components with eigenvalue equal to 1 or greater. Cronbach's alpha coefficient of reliability for each component exceeded the minimum value of 0.6 suggested by Hair et al. (2009), thus indicating internal consistency.

In order to obtain a cohesive structure, variables were removed and added manually, resulting in the removal of three variables with loadings greater than 0.45 on more than one component: check-in waiting time, availability of restaurants/eating facilities, and availability of shopping facilities. The components obtained through factor analysis are presented in Table 4.

The exploratory factor analysis shown in Table 4 retained three components with distinguishing characteristics. The first component was named airport characteristics, since its variables are related to the physical characteristics, equipment and ambiance of the airport, for example, availability of toilet facilities (physical characteristic of the airport), comfort of airport seats (equipment characteristic) and lighting (ambience of the airport).

The second component was named passenger processing because its variables are related to the processing and movement of passengers at the airport, for example, security screening thoroughness

(processing), courtesy and helpfulness of check-in staff (related to the way passengers are processed by check-in staff) and signs to airport facilities (related to the movement of passengers). The third and last component is very distinct, since it has only two variables concerning prices charged by airport concessions: value for money of restaurants/eating facilities, and value for money of shopping facilities.

Variables	Components		
	Airport characteristics	**Passenger processing**	**Prices**
Availability of toilet facilities	0,767		
Lighting	0,736		
Terminal crowding	0,734		
Cleanliness of airport facilities (toilets included)	0,719		
Availability of seats	0,696		
Enplaning curbside	0,685		
Availability of electrical outlets	0,611		
Comfort of airport seats	0,591		
Courtesy and helpfulness of security staff		0,781	
Security screening thoroughness		0,715	
Security screening waiting time		0,684	
Signs to airport facilities		0,619	
Courtesy and helpfulness of check-in staff		0,575	
Flight information screens		0,540	
Walking distance inside the terminal		0,540	
Value for money of restaurants/eating facilities			0,909
Value for money of shopping facilities			0,899
Eigenvalues	**6,924**	**1,567**	**1,440**
% of variance	**40,729**	**9,215**	**8,471**
Cronbach's alpha	**0.882**	**0.824**	**0.889**
KMO = 0,862; Bartlett's Test of Sphericity = 1202,333 (df = 136, sig = 0,000).			

Table 4. Results of the exploratory factor analysis

In order to assess the relative importance of each extracted component to the overall level of service of the airport, a multiple linear regression was performed. The components obtained through the exploratory factor analysis were selected as the independent variables and the overall evaluation of the airport's level of service was selected as the dependent variable. The result of the regression is shown in Table 5.

	Beta	**Standardized beta**	**T**	**Sig.**
(Constant)	3,367		72,029	0,000
Airport characteristics	0,660	0,684	14,974	0,000
Passenger processing	0,354	0,367	7,552	0,000
Prices	0,238	0,246	5,071	0,000
R = 0,814, R^2 = 0,663, adjusted R^2 = 0,656.				

Table 5. Principal component regression

The R^2 of the multiple linear regression performed with the extracted components was 0.656, which shows that 65% of the variance of the overall level of service of the airport is explained by the extracted components. The results presented in Table 5 shows the order of the components according to the value of coefficients, thus indicating the relative importance of each component to the overall level of service of the airport. Therefore, the most important component is airport characteristics (0.684), followed by passenger processing (0.367) and prices (0.246).

4.4. Revised conceptual model

The conceptual model revised according to the exploratory factor analysis and the removal of variables with high levels of missing data is presented in Figure 1. This model contains 17 of the 23 variables initially selected.

It can be seen that the division and the interaction of the dimensions of the revised model (Figure 1) are similar to the division and interaction of the dimensions initially proposed (Table 1). The proposed model had three dimensions focused on the processing of passengers (access, check-in and security screening), while the other four dimensions (airport facilities, orientation, comfort and services) addressed additional aspects that would occur over the course of the three main processing stages. The revised model also has a line of reasoning that focuses on processes; however, the processes are addressed in a single dimension with a broader scope, since it has variables such as walking distance inside the terminal and security screening thoroughness.

The comparison of the revised conceptual model (Figure 1) with the conceptual model initially proposed (Table 1) demonstrates that the airport characteristics dimension of the new model includes several variables of the airport facilities and comfort dimensions of the proposed model, for example, the availability of seats (airport characteristics dimension of the proposed model) and cleanliness of airport facilities (comfort dimension of the proposed model). Furthermore, the variable enplaning curbside, which is the only variable left of the access dimension after the removal of variables with high levels of missing data, was also included in the airport characteristics component.

The passenger processing dimension of the revised conceptual model includes several variables of the check-in, security screening and orientation dimensions, for example, courtesy and helpfulness of check-in staff (check-in dimension of the proposed model), security screening thoroughness (security screening dimension of the proposed model) and signs to airport facilities (orientation dimension of the proposed model).

Lastly, the prices dimension of the revised conceptual model kept addressing the same variables of the services dimension of the conceptual model initially proposed, however, the services dimension lost the variables availability of restaurants/eating facilities and availability of shopping facilities after the factor analysis, remaining only the variables related to the prices charged by airport concessions. Thus, the new dimension was simply named prices.

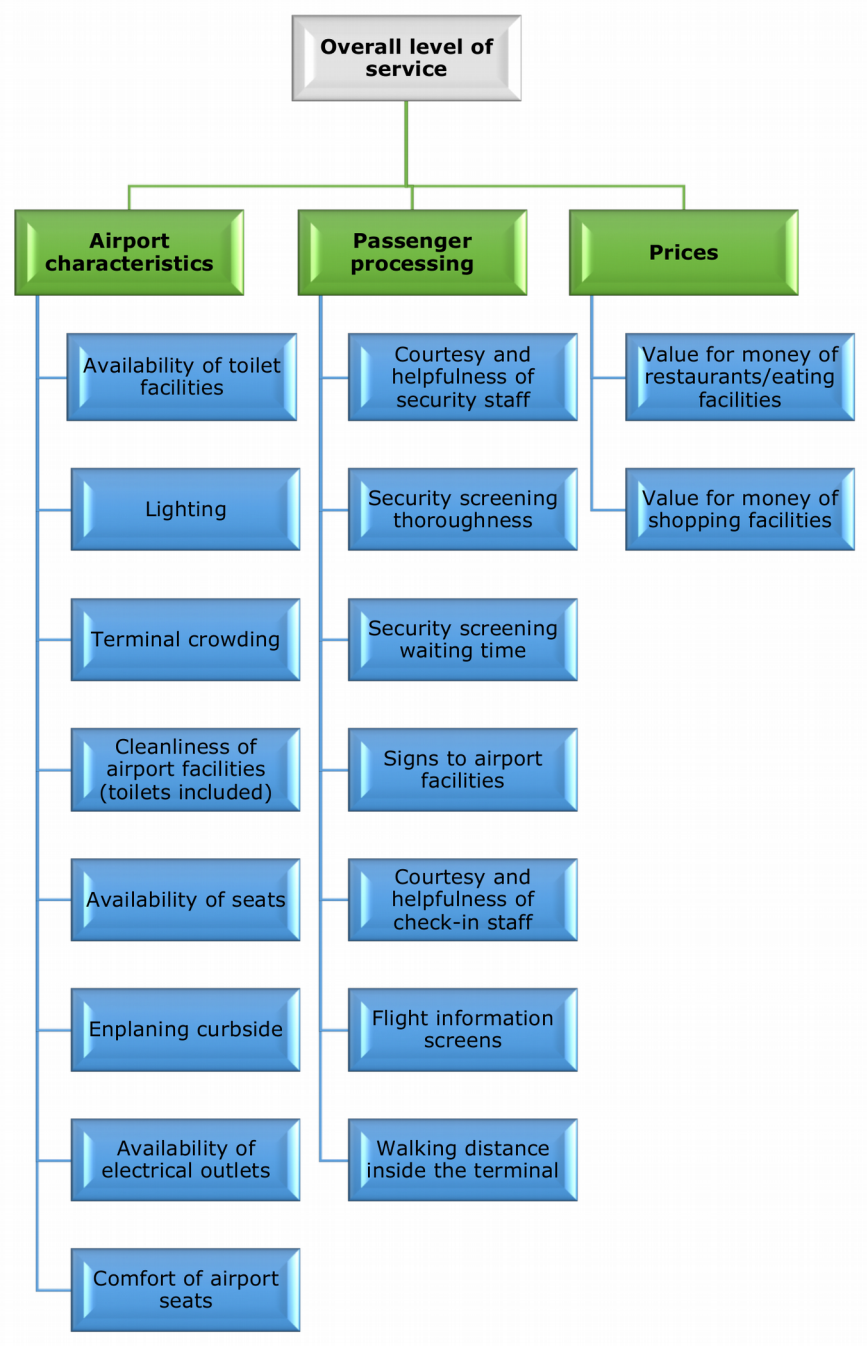

Figure 1. Revised conceptual model

5. Conclusions

From a practical point of view, assuming that service quality is a composite formed of various attributes (Tsaur et al., 2002) and given that passengers are not fully satisfied with the level of service delivered, since the mean overall level of service rating received by the airport was 3.37 on a scale in which the maximum rating was 5, the interested parties can benefit from the development of the conceptual model for departing passengers, identifying attributes with poor performance and posteriorly applying corrective actions in order to increase the overall level of service of the airport. Furthermore, the model can be used for future level of service evaluations. The order of the dimensions according to their contribution to the composition of the airport's overall level of service was also determined, suggesting areas of greater relevance to be analyzed and improved. From a theoretical point of view, this research contributes to the existing literature of airports' level of service with focus on departing passengers, since a conceptual model was proposed, tested and revised. Another contribution of this study was the application of variables frequently used in the literature to a small-sized airport, since a similar study was not found in the literature of airports' level of service.

6. Limitations and future research

During this research, the importance and necessity of studies in the area of airports classification was perceived, since it would maximize the comparability of airports' level of service, once an airport could be compared to another of its same category, favoring the practice of benchmarking. Another suggestion for future research is related to the definition of the scope of the variables that compose the level of service of airports, because it was found to exist great difference of delimitation between the studies analyzed in the theoretical framework of this paper. It would also be very enriching for the literature if more variables that compose the airports' level of service were discovered in future research, which would certainly increase the capacity of explaining the overall level of service of airports. Regarding the limitations of this paper, it is worth to point out the relatively small number of valid observations used in the data processing, although it was above the minimum recommended by the literature.

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