QUALITATIVE ANALYSIS OF THE RELATIONSHIP BETWEEN THE PROFILE OF DEPARTING PASSENGERS AND THEIR PERCEPTION OF THE AIRPORT TERMINAL

Michelle Bandeira [1]
Department of Air Transport, Aeronautics Institute of Technology, Sao Jose dos Campos, SP, Brazil

Anderson Correia [2]
Department of Air Transport, Aeronautics Institute of Technology, Sao Jose dos Campos, SP, Brazil

ABSTRACT

The opinion of passengers on the degree of importance of the components is required in order to prioritize services. A low service level can, besides causing inconvenience for terminal users, increase the waste of resources and increase costs if there is no adequate planning. Hence, outlining passenger profiles at the airport is relevant to strategic planning of airport activity management. It is believed that individual characteristics could influence opinion on the degree of importance or about the quality of airport services. This article shows that the check-in and the departure lounge were considered the most important areas in the airport terminal by passengers. Finally it was noted that the age and reason for travel influenced the passengers' perception about the check-in area and the frequency of flying influenced the perception of the departure lounge.

KEYWORDS: Passengers' opinion; passengers' profile; AHP; airport terminal; independence test.

[1] Michelle Carvalho Galvão da Silva Pinto Bandeira, MSc, is a PhD student at the Aeronautics Institute of Technology. Contact Details: mgalvao@ita.br.

[2] Anderson Ribeiro Correia, PhD, is Professor of Air Transportation and Airports at the Aeronautics Institute of Technology. Contact Details: correia@ita.br.

1. INTRODUCTION

In recent years, structural changes such as commercialization, privatization, and globalization, together with increased competition between airports, have encouraged airports and aviation authorities to place more emphasis on quality (Graham, 2008). In this context, establishing measures to evaluate operational performance of airports is one of the major problems facing airlines and airport operators today (Correia, 2009). Airport managers have to struggle with the decision of prioritizing resources. Although they are motivated to offer a reasonable level of service (LOS) to passengers, there is a growing worldwide tendency for cost reduction. In this scenario, an effort to determine the importance that various passenger groups attribute to airport components would provide a useful indication of where airport managers should invest their limited resources such as funds, employees and their own attention.

The airport terminal may be considered a set of subsystems that interact between themselves to allow a change from land mode to air and vice versa. Various components are installed and different services are produced around these movements – passenger departure and/or arrival – in order to meet client expectations. Some services and areas of the terminal on general are used by passengers, following the flow of departure or arrival. A low level of service can result in, besides inconvenience to terminal users, the waste of resources and increased costs if there is no adequate planning. Hence, service level targets are important because they have serious implications for costs and the airport's economy, as well as the "image" transmitted to the clients and to society (Bandeira, 2008; Ashford *et. al.*, 1997).

Besides the operational and financial concerns, outlining the profile of passengers at the airport contributes to the drawing up of a strategic plan for the management of airport activities. It is believed that individual characteristics related to the frequency of flying, the reason for flying, income, age, and other factors may influence the opinion of the degree of importance or the quality of the services in an airport. The answers to these questions make all the difference in airport planning and in this article are expected to broaden this understanding.

2. LITERATURE REVIEW

Brink and Madison (1975) presented one of the first studies done in the area of airport service levels. They considered that passengers' perceptions of the airport terminal, besides being influenced by the technical and operational conditions, also depend on subjective factors and each person's individual characteristics. Some criteria and characteristics proposed by the research include the purpose of the trip, the frequency of flying, costs of air tickets and airport services. Other authors, such as Omer and Khan (1988) Müller and Gosling (1991) and Ndoh and Ashford (1994) concerned themselves mainly with the method used to collect and analyze passengers' opinions; that is, using a model than can transfer linguistic judgment into quantitative values. Lee and Kim (2003) state that passengers may have different perceptions about services and installations related to departure and arrival processes in an airport terminal. In other words, the route the passenger takes and the services related to their objective – departure, connection, arrival – influence the perception of the service level of the airport. In another study, Seneviratne and Martel (1991) developed a study in which they presented a selection of components of greater importance in the terminal assisted by a passenger opinion poll in some Canadian airports. According to these authors, passenger needs can change according to the installations. A manual of service quality in airports developed by Airports Council International (ACI, 2000) states that the detailing of the types of clients and services enables comprehension of the different processes in which quality of the services must be acquired.

Despite the important effort made by the researchers and entities cited above, there is a major lack of studies which research and identify whether there is a significant relationship between the evaluation of the service level and the social and economic profile of the users interviewed. This study intends to approach this question, the development of which will be detailed in the following sections.

3. RESEARCH METHODOLOGY

Field research was carried out through interviews with 270 passengers in departure lounges at the São Paulo/Guarulhos International Airport between August 2006 and October 2007. For the size of the sample a 6% error margin was allowed and a confidence interval of 95%. Initially the degree of importance of the passenger departure terminal areas at the airport in question was sought, and their respective indicators. The Analytic Hierarchy Process (AHP) method was employed to get the degrees of importance for the attributes according to the passengers' opinion.

The interviews observed passenger characteristics such as income, age, reason for travel, frequency of travel, and type of trip. Each one was divided into classes, as shown in Table 1.

Table 1: Characteristics and classes analyzed

CHARACTERISTICS	CLASSES
HOUSEHOLD INCOME	1. *Income up to US$ 40,000* 2. *Income from US$ 40,000 to US$ 80,000* 3. *Income above US$ 80,000*
AGE	1. *Aged up to 30* 2. *Aged between 30 and 50* 3. *Aged above 50*
REASON FOR TRAVEL	1. *Business travel;* 2. *Leisure* 3. *Family reasons*
FREQUENCY OF TRAVEL	1. *1x a year* 2. *3x to 6x a year* 3. *Over 6x a year*

A statistical treatment was applied to the sample (for each variable used) to identify whether the responses were significant as regards the degree of importance of the indicators linked to these areas. As of this point, it was possible to compare passengers' opinions against their different profiles through the AHP method. In addition, it was checked whether these qualitative variables influenced or not opinion as to the degree of importance. In this case, the independence test from the Chi-squared method was used. There follows a description of the methods used for the current study.

3.1 APPLICATION OF THE AHP METHOD

This work used the hierarchical structure of the method to get the global weights for the airport components. A scale of percentage values was used to get the weights, corresponding to the values from the fundamental Saaty scale so that the passengers could relate the scale to some kind of linguistic or verbal concept during interviews (Bandeira, 2008). Table 2 shows the scales cited.

Table 2: Relation between the Percentage Scale and the Fundamental Scale

Percentage Scale		Fundamental Scale (Saaty)	Degree of relative importance
TPS Components		Weights	Definition
A*	B*		
90%	10%	9	A is extremely more important than B.
80%	20%	7	A is much more important than B.
70%	30%	5	A is more important than B.
60%	40%	3	A is a little more important than B.
50%	50%	1	A and B are of the same importance.
40%	60%	1/3	B is a little more important than A.
30%	70%	1/5	B is more important than A.
20%	80%	1/7	B is much more important than A.
10%	90%	1/9	B is extremely more important than A.

*A and B represent airport terminal components.

Source: Bandeira, Correia and Wirasinghe (2007)

The individual values for each passenger were aggregated in this research in a geometric average. In the case of an arithmetic average, which gives equal weight to all the averages, the results would be biased, as there would be a tendency to disproportionately value a set of weights supplied by the passengers. The Equation (1) shows the geometrical average used to get the final average of the weights given by the passengers.

$$w_f(C_i) = \sqrt[s]{\prod_{k=1}^{s} P_{d_k}} \tag{1}$$

In which:

C_i: *Component i;*

P_{d_k}: *Weight given by the passenger d_k;*

d_k: *Passenger (1...k)*

s: Number of passengers;

As the AHP method is based on peer to peer comparisons, judgments are put in a squared matrix *n x n*, where the lines and columns correspond to the *n* criteria analyzed for the problem in question.

Considering $\mathrm{A} = \lfloor a_{ij} \rfloor$, with *i*, *j* = 1. 2. ..., *n*, called the "decision matrix", each line *i* supplies the reasons between the weight of the criterion or sub-criterion for the index *i* for all the rest. The matrixes are always reciprocal, such that $a_{ij} = \frac{1}{a_{ji}}$, and positive.

Hence, the value a_{ij} represents the relative importance of the criterion for the line *i* given the criterion for the column *j*, where only the principal diagonal assumes values equal to 1. Peer to peer comparisons are made at all levels of the matrix *A*. Therefore, if all the judgments are perfect, in all comparisons it would be possible to see that $a_{ij} \times a_{jk} = a_{ik}$, for any *i, j, k* = 1. ..., *n*, therefore, following this procedure, matrix A, would be consistent.

Take *n* as the number of elements to be compared, $\lambda_{máx}$ the auto-vector of A and *w* the correspondent proper vector or vector of priorities. If the judgments made by the decision maker are perfectly consistent, the result is $\lambda_{máx} = n$ e $a_{ij} = \frac{\varpi_i}{\varpi_j}$. However, almost always some inconsistency is seen in the judgments, which is nevertheless admitted by the AHP method.

The inconsistency can be measured in the following way: the closer the $\lambda_{máx}$ value is to n, the greater the consistency of the judgments. Saaty (1980) showed that A being a value matrix, the vector that satisfies Equation (2) will be found.

$$\mathrm{A}W = \lambda_{máx} x W \tag{2}$$

In which:

A: Decision matrix;
$\lambda_{máx}$: Maximum autovalue of A;
W: Autovector of A associated to $\lambda_{máx}$.

After the normalization of *W*, in (2), the auto-value $\lambda_{máx}$ is gotten from Equation (3).

$$\lambda_{máx} = \frac{1}{n} \sum_{i=1}^{n} \frac{[A\overline{w}]_i}{\overline{w_i}} \tag{3}$$

In which:

A: Decision matrix;
$\lambda_{máx}$: Maximum autovalue of A;
W: Autovector of A associated to $\lambda_{máx}$;
n: Order of the decision matrix;
W_i: Normalized Vector W.

It was observed, furthermore, that small variations in a_{ij} caused small variations in $\lambda_{máx}$, in which the auto-vector's deviation in regard to *n* (the order of the matrix number) is considered a measurement of consistency. It can be said that the auto-vector gives the order of priority and the auto-value is the measurement of consistency of the judgment. For Gomes et al. (2004) it is possible to state that $\lambda_{máx}$ allows an evaluation of the proximity of the scale developed by Saaty (1980) with the scale of reasons or quotients that would be used if matrix *A* were totally consistent. This can be done by means of a consistency index (CI). Therefore, according to Saaty's theorem, "*A* is consistent if, and only if, $\lambda_{máx} \geq n$."

So, if "*A is* consistent if, and only if $\lambda_{máx} = n$", the value ($\lambda_{máx} - n$) is an indicator of the consistency of judgments after the formation of *A* and the obtaining of normalized *W*. The closer to zero such a difference is, the greater the consistency of judgments will be. It must be stressed that this value must serve as a warning to the decider and/or analyst, not only as an excluding situation. Therefore, the magnitude of the perturbation in matrix *A* is calculated using the relation of the Equation (4).

$$CI = \frac{\lambda_{máx} - n}{n-1} \quad (4)$$

Based on the theorems describes, Saaty (1980) proposed the calculation of the reason of consistency (CR) for the decision matrix *A* in Equation (5).

$$CR = \frac{CI}{IR} \quad (5)$$

In which:

CR: *Consistency ratio;*
CI: *Consistency Index;*
IR: *Random Index.*

The greater the CR, the greater the inconsistency of the matrix will be. Generally, an inconsistency considered acceptable for $n > 4$ is a CR $\leq$ 0.10. The random index has been calculated for matrixes squared by an order of *n* by the Oak Ridge National Laboratory, in the United States (Saaty, 1991; 2005). Table 3 shows the values for IR for the matrixes of order *n x n*.

Table 3: IR Values for Matrixes Squared by an Order of *n x n*

n x n	1	2	3	4	5	6	7	8	9	10
IR	0	0	0.58	0.89	1.11	1.25	1.35	1.40	1.45	1.49

Source: Saaty (1991)

Having done all this analysis of the judgment for matrix *A*, and given that this matrix is coherent the results are normalized by the Equation (6). So, the priority vector for sub-criterion *i* (A_{ij}) in relation to criterion (C_i) is presented in Equation (7).

$$v_i(A_1) = \frac{a_{ij}}{\sum_{i=1}^{n} a_{ij}} \tag{6}$$

$$v_i(A_j) = \frac{\sum_{j=1}^{n} vi(A_j)}{n} \tag{7}$$

In which:

i: *1...., n;*
v : *Vector ;*
A: *Criterion for the second level (sub-criterion s);*
n: *Nº of criteria for one and the same level.*

The following formulas, Equations (8) and (9), do the evaluations.

$$\varpi_j(C_i) = \frac{C_{ij}}{\sum_{i=1}^{m} C_{ij}} \tag{8}$$

$$\varpi(C_i) = \sum_{j=1}^{m} \frac{\varpi_i(C_i)}{m} \tag{9}$$

In which:

j: *1...., m;*
ϖ : *Vector;*
C: *First level criterion;*
m: *Nº of criteria for one and the same level.*

Finally, a process of aggregation allows the generation of final values for the weights of the airport components, ordering them through the following additive function of the Equation (10).

$$f(A_j) = \sum_{i=1}^{m} w(C_i) \times v_i(A_j) \tag{10}$$

In which:

j: 1...., *m;*

For the purposes of calculation, the areas of the terminal were designated with criteria for the first level, and their respective indicators in criteria for the second level or sub-criteria. The modeling indicated the importance and intensity of each one of the airport terminal components.

3.2. STATISTICAL TREATMENT OF THE SAMPLE

Considering that for the AHP method binary correlations may indicate whether an element is preferable or equivalent in importance in regard to another, there are two possible situations to be tested.

The first situation was to verify whether the percentage of equivalence found in the binary comparisons was statistically significant. Hence, a designation was made for each binary correlation for the number *n* of interviews in the sample and the parameters *m*, P_1 e $P_{2.}$ which were calculated according to the frequency *f* observed for a certain airport component, if it was equivalent or preferable to the other.

In which:

- P_1: *Population proportion regarding the first element of the binary comparison;*
- P_2: *Population proportion regarding the second element of the binary comparison;*
- *m*: *Population proportion regarding the equivalence of the binary comparison;*

In this case, there is the first test of the hypothesis, in which the nullity hypothesis is H_0: $m \geq P_1 + P_2$ and the alternative hypothesis is H_1: $m < P_1 + P_{2.}$ where P1 and P_2 are popuational proportions from the sample, and *m* is equal to the proportion of the sample when in comparison between two airport components. This test evaluated whether the degree of equivalence (equality) between the components was statistically significant, considering $\alpha = 5\%$. Therefore, the nullity hypothesis was only rejected if $Z^* < -Z_{5\%.}$, where Z* is the confidence interval.

For the rejected hypothesis $H_{0.}$ the second hypothesis test is applied, with H_0': $P_1 = P_2$ e H_1': $P_1 \neq P_{2.}$ to verify whether there had been any significant differences between the proportions isolated for preference in airport components observed in the binary comparisons. Hence, the nullity hypothesis was rejected if $|Z| > Z_{2.5\%,}$ with $\alpha = 5\%$. Therefore, in this second situation the hypothesis H_0': $P_1 = P_2$ is accepted if a component does not present relative preponderance in a comparison; or H_0' is rejected if one component is preferable to another one.

3.3. CHI-SQUARED METHOD FOR ANALYSIS OF QUALITATIVE VARIABLES

Chi-squared (χ^2) is a non-parametric method used to test hypotheses in order to verify a dispersion value for two nominal variables and to evaluate the association between qualitative variables.

The main principle of this method is to compare proportions; that is, the possible divergences between the frequencies observed and expected for a certain event. Hence, it can be said that two groups behave in a similar way if the differences between these frequencies in each category are very small or close to zero (Spiegel, 1972).

One measurement of the discrepancy between the frequencies observed and those expected is provided by the statistic $\chi^{2.}$ expressed by Equation 11. The results obtained are in the Contingency Table.

$$\chi^2_{\text{sample}} = \sum_{i=1}^{k} \frac{(o_i - e_i)^2}{e_i} \qquad (11)$$

In which:

o_i : *Frequency observed;*

e_i : *Frequency expected;*

k: 1...., *k;*

i: 1...., *i;*

For the application of the method, it is necessary that the sample be relatively large with sample N > 40 or at least 5 observations in each plot formed by the variable analyzed. Furthermore, the data analyzed must be independent of each other and the observations must have frequencies or counts where each observation belongs to one and only one category.

It is stressed that if the significant value of χ^2 was gotten from one small sample (N < 40) and/or from a small expected frequency in a plot (typically when less than 5) for formula for the obtaining of χ^2 may produce a greater-than-real value (Spiegel, 1972). In this case the Yates Correction must be applied (or a continuity correction). The statistics for the test are shown in Equation 12.

$$\chi^2_{\text{corrigido}} = \sum_{i=1}^{k} \frac{(|o_i - e_i| - 0.5)^2}{e_i} \quad (12)$$

To evaluate the condition of independence or dependence of the qualitative variables, two hypotheses are tested:

$$H_0: \chi^2_{\text{sample}} \leq \chi_c^2$$
$$H_1: \chi^2_{\text{sample}} > \chi_c^2$$

So that χ_c^2 is the critical Chi-squared measurement with degrees of liberty GL given as in Equation 13:

$$GL = (l-1)*(c-1) \quad (13)$$

In which:

l*: Number of lines formed by the classes for one variable x;*
c*: Number of columns formed by classes for a variable y;*

That is, for the current research, the hypotheses cited indicated:

H_0: The inherent characteristic for the passenger does not influence the opinion given to the degree of importance of the airport component.

H_1: The inherent characteristic for the passenger does influence the opinion given to the degree of importance of the airport component.

So, from the null independence hypothesis, H_0 is accepted when the value of χ^2_{sample} found is less than or equal to the value of χ_c^2 designated. H_0 is rejected when the value of χ^2_{sample} is greater than the value of χ_c^2 designated. In the latter, H_1 is accepted and it is assumed that the variables in question present a dependency relationship.

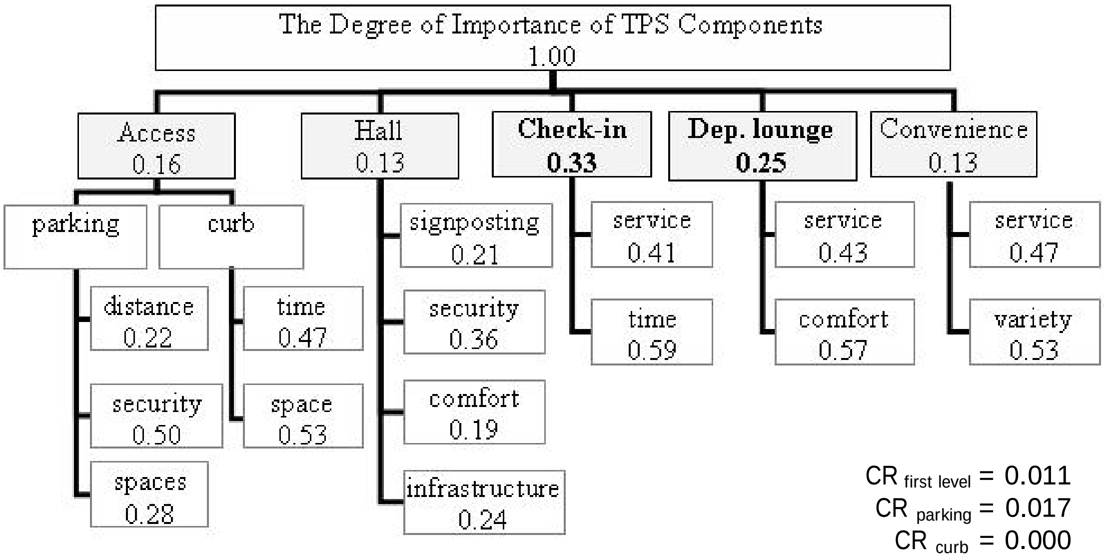
4. GLOBAL TPS RESULTS

The hierarchical structure presented the values of the priority vectors found for the areas of the terminal and its respective indicators. The chart below in Figure 1 shows the global values associated to the TPS areas.

Through analysis of these results it was possible to ascertain that the consistency ration (CR) for the resultant matrixes is within the limit recommended by Saaty (1990; 1991). Hence, the results found through the AHP method are significant.

In decreasing order to evaluate the degree of importance given by the intensity of the vectors found, the weights are as follows: the departure lounge (0.25), access area (parking and curb) (0.16), concessions areas (0.13) and lobby (0.13). Among the indicators listed by area, time spent in the check-in line (0.59) stood out – with a priority vector of greatest intensity – and the comfort of the departure lounge (0.57).

Figure 1: Hierarchical Structure with Global Values associated to the Degree of Importance



$CR_{\text{first level}} = 0.011$
$CR_{\text{parking}} = 0.017$
$CR_{\text{curb}} = 0.000$
$CR_{\text{lobby}} = 0.011$
$CR_{\text{check-in}} = 0.000$
$CR_{\text{departure lounge}} = 0.000$
$CR_{\text{concessions}} = 0.000$

The check-in and departure lounge areas were given the highest values; that is, both areas jointly represent 58% of the degree of global importance for TPS. This is why the next step is to analyze whether the qualitative characteristics (income, age, travel frequency, and reason for travel) have an influence in passengers' decision making as to the degree of importance.

Firstly, the percentages "greater importance" and "equal importance" among the indicators were observed in terms of how significant they were. This analysis was necessary, as the intention was to demonstrate whether there is a dependency association in the results of these observations and the passenger's qualitative characteristics. Finally, the "Chi-Squared Method" was used by means of the independence test, for the composition of the final results.

5. RESULTS OF THE STATISTICAL ANALYSIS OF THE DEGREE OF IMPORTANCE

Figure 2 indicates the percentage importance for the indicators for the check-in area. The time taken in processing the line was given the greatest importance in regard to airline service. However, this percentage was very close equivalence for other services in terms of importance.

Figure 2: Percentage Importance for Indicators for the Check-in Area

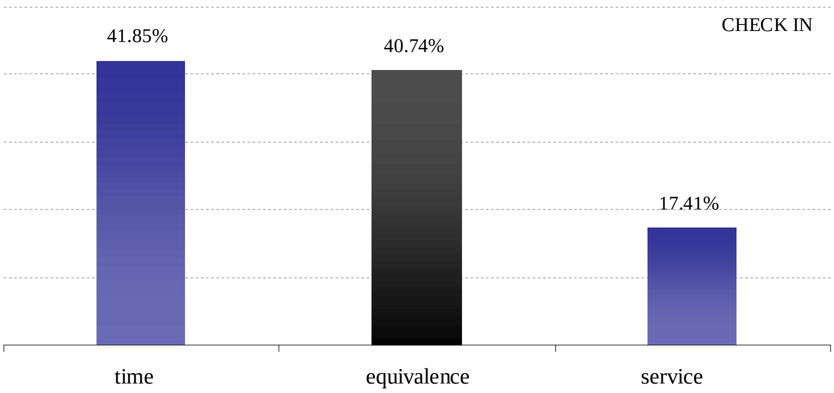


Table 4: First Hypothesis Test – Check-in area

	Number of Passengers							Is Z significant for α = 5%?	
	A	*M*	*B*	*n*	*(A+B)*	*m*	*(P_1 + P_2)*	*Z**	Result
CHECK IN	time	equivalence	service						
	113	110	47	270	160	0.407	0.592	-6.192	Reject H_0

Table 5: Second Hypothesis Test – Check-in area

	Number of Passengers						Is Z significant for α = 5%?	
	A	M	B	n	P_1	P_2	Z*	Result
CHECK IN	time	equivalence	service					
	113	110	47	160	0.706	0.294	11.455	Reject H_0

In which:

A: *Nº of interviewees that consider the first element of the binary comparison preferable to the second;*

M: *Nº of interviewees that consider the two components to be equivalent in importance;*

B: *Nº of interviewees that consider the second element of the binary comparison preferable to the first;*

n: *Set of interviewees formed by the sum of A and B;*

Tables 4 and 5 present the tests for the hypotheses that prove the significant difference in the percentages found for the check-in area. Although the percentage for equivalence of importance (40.74%) is close to the percentage for greater importance in the time spent in the line (41.39%), the results indicate that there is a statistical difference between them, as shown in Table 4. The results also show that there is a statistical difference between the importance of the indicators for time of processing the line and the service provided by the airline, where the former was considered more important than the latter, as shown in Table 5.

Figure 3 indicates the percentage of importance for the indicators for the departure lounge area. Most interviewees attributed greater importance to comfort in relation to the service offered by the airline's staff.

Figure 3: Percentage of Importance for the Indicators for the Departure Lounge Area

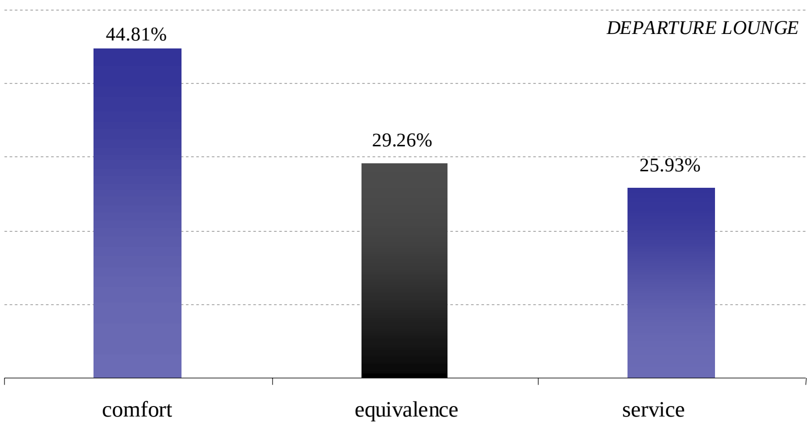


Table 6: First Hypothesis Test – Departure lounge area

	Number of Passengers							Is Z significant for α = 5%?	
	A	*M*	*B*	*n*	*(A+B)*	*m*	$(P_1 + P_2)$	*Z**	Results
DEPARTURE LOUNGE	comfort	equivalence	service						
	121	79	70	270	191	0.293	0.707	-14.982	*Reject* H_0

Tables 6 and 7 present the hypotheses tests that proved the significant difference in the percentages found for the departure lounge area. The results indicate that there is a statistical difference between the importance of the indicators for overall comfort and overall service, where the former was considered more important than the latter.

Table 7: Second Hypothesis Test – Departure lounge area

	Number of Passengers						Is Z significant for α = 5%?	
	A	*M*	*B*	*n*	*(A+B)*	*m*	*Z**	Results
DEPARTURE LOUNGE	comfort	equivalence	service					
	121	79	70	191	0.634	0.366	7.658	*Reject* H_0

In which:

A: *Nº of interviewees that consider the first element of the binary comparison preferable to the second;*

M: *Nº of interviewees that consider the two component to be of equivalent importance ;*

B: *Nº of interviewees that consider the second element of the binary comparison preferable to the first;*

n: *Set of interviewees formed by the sum of A and B.*

6. RESULTS OF THE INDEPENDENCE TEST

This topic covers the following results:

(i) Comparative analysis of the degree of importance given by passengers according to qualitative characteristics: household income, age, reason for traveling, and frequency of travel. For this analysis the AHP method was used, grouping passengers' opinions into classes in a certain characteristic. These results are presented in Figures 4 to 7.

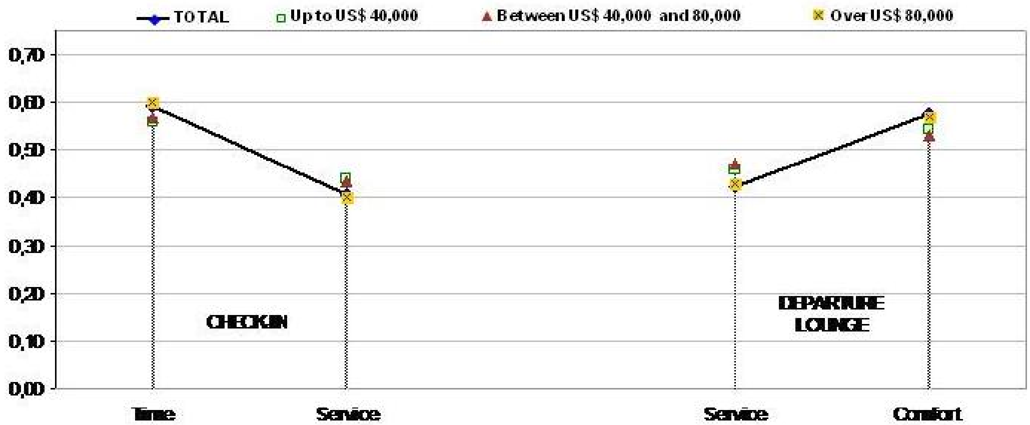
(ii) Next, by way of independence test contingency tables a relation between the qualitative characteristics and opinion given on the degree of importance by the passengers was looked for. The opinion on the degree of importance was divided into three classes: passengers who attributed greater importance to any degree of an indicator x in regard to another, y, passengers who attributed the same importance to the two indicators, and passengers who attributed less importance to the indicator x in regard to another, y. These results are presented in Tables 10 to 14.

6.1 VARIABLES: INCOME AND DEGREE OF IMPORTANCE

Figure 4 presents the differences between the intensity of the priority vectors among the three classes of income – income up to US$ 40,000/year, income between US$ 40,000 and 80,000/year, and income above US$ 80,000/year.

At the check in, the group of people with an income above US$ 80,000/year gave greater importance to the indicator for processing time, while the group of people with an income of up to US$ 40,000/year gave greater importance to service. In the departure lounge the group of people with an income above US$ 80,000/year gave greater importance to the indicator comfort; while the group of people with an income of up to US$ 40,000/year gave greatest importance to service.

Figure 4: Preferences related to Income



Given the preference among passengers according to the classes designated for household income, the Chi-Squared Method was used to ascertain whether this variable influenced passengers' opinion. To such an end, contingency tables were drawn up with the expected and observed values – Tables 8 and 9 – for the check-in and departure lounge areas. All the results in both tables accept the hypothesis H_0 concluding that passenger income does not influence opinion on the degree of importance given to indicators for the check-in and departure lounge.

Table 8: Expected values based on the Independence Hypothesis

Check-in Area

Time in line *vs.* Service at the counter – Check-in area					
	Score Frequency				
Income/year	less important [1]	equal [2]	more important [3]	Total	%
Up to US$ 40,000	42	57	22	121	0.45
Expected value	50.64	49.30	21.06		
χ^2 partial	1.47	1.20	0.04		
Between US$ 40 and 80,000	35	33	14	82	0.30
Expected value	34.32	33.41	14.27		
χ^2 partial	0.01	0.00	0.01		
More than US$ 80,000	36	20	11	67	0.25
Expected value	28.04	27.30	11.66		
χ^2 partial	2.26	1.95	0.04		
Total	113	110	47	270	

χ^2 Total= 6.99

*χ^2 Tabled **α**=5% = 9.48 e GL = 4*

[1]wait time é less important than the service at the counter
[2]wait time and service at the counter are of equal importance
[3]wait time is more important than the service at the counter

Table 9: Expected values based on the Independence Hypothesis

Departure lounge area

Comfort *vs.* Service – Departure lounge area					
	Score Frequency				
Income/year	less important [1]	equal [2]	more important [3]	Total	%
Up to US$ 40,000	37	36	48	121	0.45
Expected value	31.37	35.40	54.23		
χ^2 partial	1.01	0.01	0.71		
Between US$ 40 and 80,000	22	21	39	82	0.30
Expected value	21.26	23.99	36.75		
χ^2 partial	0.03	0.37	0.14		
More than US$ 80,000	11	22	34	67	0.25
Expected value	17.37	19.60	30.03		
χ^2 partial	2.34	0.29	0.53		
Total	70	79	121	270	

χ^2 Total= 5.43

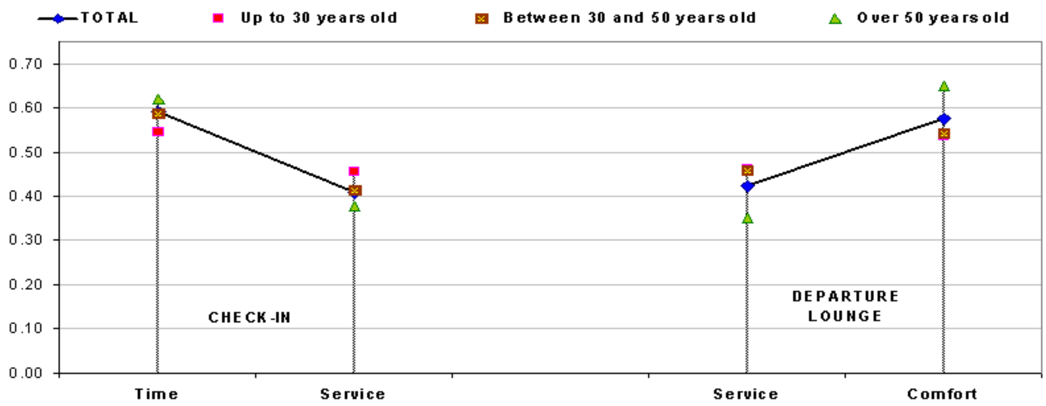
*χ^2 Tabled **α**=5% = 9.48 e GL = 4*

1 comfort is less important than the service at the counter
2 comfort and service at the counter are of equal importance
3 comfort is more important than the service at the counter

6.2 VARIABLES: AGE AND DEGREE OF IMPORTANCE

Figure 5 presents the differences between the intensity of priority vectors among the age ranges (up to 30, between 30 and 50, and above 50 years old). People over 50 years old attributed greater importance to the indicators for wait time, comfort at the check-in and departure lounge, respectively, so showing an inverse relation with the group of people aged up to 30 years old.

Figure 5: Preferences related to Age



Given the preference among passengers according to the classes designated for age, the Chi-Squared Method was used to ascertain whether this variable influenced passengers' opinion. To such an end, contingency tables were drawn up with the expected and observed values – Tables 10 and 11 – for the check-in a departure lounge areas.

Table 10: Expected values based on the Independence Hypothesis Check-in area

Wait time *vs.* service at the counter – Check-in area					
	Score Frequency – check-in				
Age	less important [1]	equal [2]	more important [3]	Total	%
Up to 30	30	51	17	98	0.42
Expected value	37.37	42.77	17.86		
χ^2 partial	1.45	1.58	0.04		
χ^2 partial corrected	1.26	1.40	0.01		
Between 30 and 50	46	50	20	116	0.49
Expected value	44.24	50.63	21.14		
χ^2 partial	0.07	0.01	0.06		
χ^2 partial corrected	0.04	0.00	0.02		
Over 50	14	2	6	22	0.09
Expected value	8.39	9.60	4.01		
χ^2 partial	3.75	6.02	0.99		
χ^2 partial corrected	3.11	5.25	0.55		
Total	90	103	43	236	

χ^2 Total=13.97 e χ^2 Yates correction =11.64

χ^2 Tabled α=5% = 9.48 e GL = 4

[1]wait time é less important than the service at the counter
[2]wait time and service at the counter are of equal importance
[3]wait time is more important than the service at the counter

Table 11: Expected values based on the Independence Hypothesis

Departure lounge area

Comfort *vs.* service – Departure lounge area					
	Score Frequency – Departure Lounge				
Age	less important [1]	equal [2]	more important [3]	Total	%
Up to 30	30	28	40	98	0.42
Expected value	27.82	30.31	39.86		
χ^2 partial	0.17	0.18	0.00		
Between 30 and 50	46	50	20	116	0.49
Expected value	44.24	50.63	21.14		
χ^2 partial	0.07	0.01	0.06		
Over 50	4	6	12	22	0.09
Expected value	6.25	6.81	8.95		
χ^2 partial	0.81	0.10	1.04		
Total	67	73	96	236	

χ^2 Total= 2.77

χ^2 Tabled α=5% = 9.48 e GL = 4

[1] comfort is less important than the service at the counter
[2] comfort and service at the counter are of equal importance
[3] comfort is more important than the service at the counter

The result presented in Table 10 for the check-in area rejects the nullity hypothesis and accepts hypothesis H_1. That is, it concludes that age interferes in passengers' opinion about the degree of importance of the indicators wait time and service at the counter. For the departure lounge area the result in Table 11 accepts the hypothesis H_0, where we can conclude that passenger age does not influence opinion about the degree of importance given to the indicators for the departure lounge.

6.3 VARIABLES: REASON FOR TRAVELING AND DEGREE OF IMPORTANCE

Figure 6 presents the differences between the intensity of priority vectors for the reason for travelling (business, pleasure, and family). Business travelers gave greater importance to the indicator wait time at the check-in, unlike the other two classes, who gave greater importance to service at the counter.

In the departure lounge area, while the passengers travelling for family reasons gave greater importance to the indicator service, others, traveling for business and pleasure, preferred comfort. Given the preference among passengers according to the classes designated for the reason for travelling, the Chi-Squared Method was used to ascertain whether this variable influenced passengers' opinion. To such an end, contingency tables were drawn up with the expected and observed values – Tables 12 and 13 – for the check-in and departure lounge areas.

Figure 6: Preferences related to Reason for Travelling

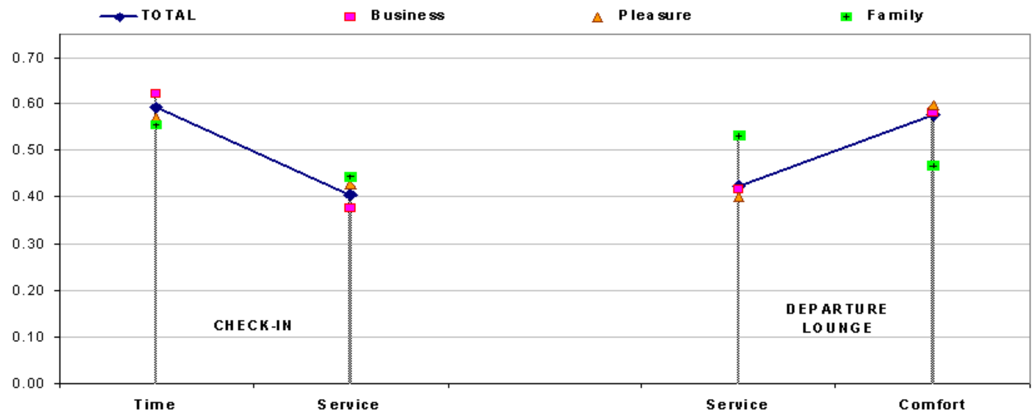


Table 12: Expected values based on the Independence Hypothesis

Check-in area

Wait time *vs.* Service at the counter – Check-in area					
	Score Frequency – *check-in*				
Reason for Travelling	less important [1]	equal [2]	more important [3]	Total	%
Business	53	27	21	101	0.47
Expected value	43.22	39.46	18.32		
χ^2 partial	2.21	3.93	0.39		
χ^2partial corrected	1.99	3.63	0.26		
Pleasure	32	42	14	88	0.41
Expected value	37.66	34.38	15.96		
χ^2 partial	0.85	1.69	0.24		
χ^2 partial corrected	0.71	1.47	0.13		
Family	7	15	4	26	0.12
Expected value	11.13	10.16	4.72		
χ^2 partial	1.53	2.31	0.11		
χ^2 partial corrected	1.18	1.86	0.01		
Total	92	84	39	215	
χ^2 Total=13.26 e χ^2 Yates correction =11.24					
*χ^2 Tabled **α**=5% = 9.48 e GL = 4*					

[1]wait time is less important than the service at the counter
[2]wait time and service at the counter are of equal importance
[3]wait time is more important than the service at the counter

The result presented in Table 12 for the check-in area rejects the nullity hypothesis and accepts hypothesis H_1. That is it concludes that the reason for traveling – Business, Pleasure or Family - interferes in passengers' opinion about the degree of importance of the indicators wait time and service at the counter.

For the departure lounge area the result in Table 13 accepts the hypothesis H_0, where we can conclude that the passenger's reason for traveling does not influence the opinion about the degree of importance given to indicators for the departure lounge.

Table 13: Expected values based on the Independence Hypothesis Departure lounge area

Comfort *vs.* Service – Departure lounge area					
	Score Frequency – DEPARTURE LOUNGE				
Reason for Travelling	less important [1]	equal [2]	more important [3]	Total	%
Business	28	25	48	101	0.47
Expected value	25.84	30.07	45.10		
χ^2 partial	0.18	0.85	0.19		
Pleasure	18	29	41	88	0.41
Expected value	22.51	26.20	39.29		
χ^2 partial	0.90	0.30	0.07		
Family	7	15	4	26	0.12
Expected value	11.13	10.16	4.72		
χ^2 partial	1.53	2.31	0.11		
Total	55	64	96	215	
				χ^2 *Total=5.82*	
				χ^2 *Tabled* α*=5% = 9.48 e GL = 4*	

[1] comfort is less important than the service at the counter
[2] comfort and service at the counter are of equal importance
[3] comfort is more important than the service at the counter

6.4 VARIABLES: FREQUENCY OF TRAVEL AND DEGREE OF IMPORTANCE

Figure 7 presents the differences between the intensity of priority vectors among the frequency of travel (1 time/year, 2 to 6 times/year and more than 6 times/year).

It was noted that in the check-in area the group that travels only 1 time/year gave greater importance to service, unlike the other groups. In the departure lounge area it was noted that people who travelled more than 6 times/year gave greater importance to the indicator comfort, unlike those who travelled only 1 time/year. Such a difference could be explained by the greater demands made by passengers that travel more frequently, as they spend longer inside the terminal.

Given the preference among passengers according to the classes designated for age, the Chi-Squared Method was used to ascertain whether this variable influenced passengers' opinion. To such an end, contingency tables were drawn up with the expected and observed values – Tables 14 and 15 – for the check-in and departure lounge areas.

Figure 7: Preferences related to Frequency of Travel

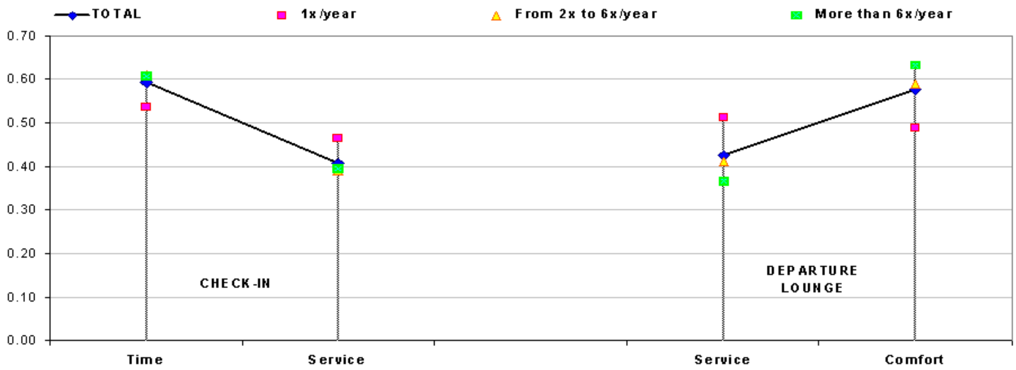


Table 14: Expected values based on the Independence Hypothesis

Check-in area

Wait time *vs.* Service at the counter – Check-in area					
	Score Frequency – check-in				
Frequency of travel	less important [1]	equal [2]	more important [3]	Total	%
1x/year	18	32	13	63	0.23
Expected value	26.23	25.76	11.01		
χ^2 partial	2.58	1.51	0.36		
From 2 to 6x/year.	71	63	25	159	0.59
Expected value	66.20	65.02	27.78		
χ^2 partial	0.35	0.06	0.28		
More than 6x/year	23	15	9	47	0.17
Expected value	19.57	19.22	8.21		
χ^2 partial	0.60	0.93	0.08		
Total	112	110	47	269	

χ^2 Total = 6.74

χ^2 Tabled α=5% = 9.48 e GL = 4

[1] wait time is less important than the service at the counter
[2] wait time tem equal importance than the service at the counter
[3] wait time is more important than the service at the counter

The result indicated in Table 14 for the check-in area accepts hypothesis H_0, where we can conclude that frequency of travel for passengers at São Paulo / Guarulhos International Airport does not influence opinion on the degree of importance for the indicators wait time and service at the counter.

For the departure lounge area, the result found in Table 15 rejects the nullity hypothesis and accepts hypothesis H_1. That is, it concludes that frequency of travel at the airport studied does interfere in passengers' opinion on the degree of importance of the indicators wait time and service at the counter.

Table 15: Expected values based on the Independence Hypothesis
Departure lounge area

Comfort *vs.* Service – Departure lounge area					
	Score Frequency – Departure Lounge				
Frequency of travel	less important [1]	equal [2]	more important [3]	Total	%
1x/year	26	15	22	63	0.23
Expected value	16.39	18.50	28.10		
χ^2 partial	5.63	0.66	1.33		
From 2 to 6x/year.	35	50	74	159	0.59
Expected value	41.38	46.70	70.93		
χ^2 partial	0.98	0.23	0.13		
More than 6x/year	9	14	24	47	0.17
Expected value	12.23	13.80	20.97		
χ^2 partial	0.85	0.00	0.44		
Total	70	79	120	269	
				χ^2 *Total=10.26*	
				χ^2 *Tabled* α*=5% = 9.48 e GL = 4*	

[1] comfort is less important than the service at the counter
[2] comfort is of equal importance to the service at the counter
[3] comfort is more important than the service at the counter

7. CONCLUSIONS

The passengers' opinions on the degree of importance of the components are required in order to be able to prioritize services. Furthermore, it has become necessary to get information on the quality of the services and/or map the profile of the passengers interviewed in order to contribute to the management of the airport as regards decision making.

There have been many studies that have reported the relationship that exists between individual characteristics and the perception of passengers about the degree of importance or about the quality of the services at an airport. However, these studies have not statistically proven whether this hypothesis is significant in their analyses. This proof could make a big difference when resources are limited or if a new airport terminal is being planned. Therefore, knowing that individual characteristics influence passengers' perception contributes more precisely to airport planning.

Unlike other studies, this article has presented, in a pioneering form, a qualitative analysis of the relationship between the passengers' profiles and their perception of the airport terminal. The results obtained have made it possible to ascertain whether there was dependency or independency between the individual characteristics of the passengers and their perception of the terminal. This made it possible to ascertain that "Age" and "Reason for Travelling" influence passengers' perceptions of the check-in area and that "Frequency of travel" influenced perception of the departure lounge area. The final results also indicate that the check-in and departure lounge were the most important areas in the airport terminal in the passengers' opinion.

Finally, it can be said that this kind of analysis can achieve great results in airport planning projects which are designed to direct their resources to a certain passenger audience or to attract potential clients with a certain profile. We suggest that airport operators develop this kind of analysis periodically, since variations on the competitive scenario, economic development, and airport passengers´ profile might have an important influence on the passenger perceptions. However, the methodology provided in this paper is robust and valid under different scenarios.

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