George Christian Linhares Bezerra

MULTIDIMENSIONAL ANALYSIS OF AIRPORT PERFORMANCE

Tese de Doutoramento em Gestão de Empresas, na especialização em Gestão de Operações, orientada pelo Professor Doutor Carlos Alberto Esteves Ferreira Gomes e apresentada à Faculdade de Economia da Universidade de Coimbra.

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FEUC FACULDADE DE ECONOMIA
UNIVERSIDADE DE COIMBRA

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Orientador: Prof. Doutor Carlos Alberto Esteves Ferreira Gomes

Coimbra, 2016

DEDICATION

To my family.

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ABSTRACT

In the current business environment, managers are confronted with conflicting objectives and the need for monitoring different aspects of their organization´s performance. Within the theme of performance, this thesis focuses on the airport industry as an important but still under-researched area regarding performance measurement. Airports are no longer considered solely as huge facilities and public utilities, but complex service organizations comprising different processes, customers, and stakeholders. In this context, a broader perspective for measuring and analyzing airport performance is necessary, including the multidimensionality of the performance construct, the development of reliable measurement practices, and a customer-oriented approach. The main research objective of this thesis is to analyze airport performance from a multidimensional perspective, accounting for the multifaceted nature of performance and the interests of airport stakeholders. Given the state-of-the-art of the literature on performance and the gaps in the airport-related research, the following specific objectives are pursued: i. to identify the performance dimensions emphasized in the airport-related literature, ii. to examine performance measurement practices at Brazilian airports, iii. to develop a measurement model for airport service quality, accounting for the multidimensionality of the service quality construct, and iv. to examine the relationships between passenger perception of service quality and passenger attitudes towards the airport. In view of the comprehensive approach to the research problem and research objectives, a Systematic Literature Review (SLR) study and three empirical studies were undertaken. Based on the SLR, an overview of the airport-related literature was obtained, and a framework of the performance dimensions was proposed. A survey applied to airport executives in Brazil provided a general profile of performance measurement practices, including the frequency of use, the perceived relevance, and ease of data/information acquisition of measures related to different performance dimensions. In this first empirical study, cluster analysis, regression analysis, and gap analysis were used. Based on a multidimensional approach to airport service quality (ASQ), in a second study, a measurement model of perceived ASQ was built upon typical service attributes within the airport industry. This ASQ model was applied to survey data from two Brazilian airports. Data analysis was based on confirmatory factor analysis. Validity and reliability of this ASQ model were assured for different groups of passengers and both airports. In the third empirical study, the American Customer Satisfaction Index (ACSI) model was used as a reference model to achieve the research objective of examining the relationships between passenger perception of ASQ and their attitudes. Departing passengers in a main Brazilian airport were surveyed. The ASQ model proposed in this thesis was successfully used within the ACSI model structure, and passenger perception of switching costs was included to examine particular effects on passenger loyalty. SEM techniques were used to test theoretical hypothesis derived from the literature. Overall, the findings of this thesis provide significant contributions for researchers and practitioners interested in a more comprehensive approach to performance measurement within the airport context, particularly in the cases where the multidimensionality of performance, its practical implications for airport management, and the passenger perceptions and attitudes are considered.

Keywords: Performance; Performance Measurement; Airport Management; Airport Performance; Service Quality; Passenger Satisfaction.

RESUMO

No actual ambiente de negócios, gestores tem sido confrontados com objectivos conflitantes e com a necessidade de monitorizar diferentes aspectos do desempenho de suas organizações. No contexto da investigação em desempenho, a presente tese tem foco no sector aeroportuário. Actualmente, aeroportos tem sido tratados como complexas organizações de serviços que compreendem uma diversidade de processos, clientes e *stakeholders*. Neste sentido, uma perspectiva mais alargada para o problema da medição e análise do desempenho aeroportuário faz-se necessária, incluindo a multidimensionalidade do constructo, o desenvolvimento de práticas de medição confiáveis e uma abordagem orientada para o cliente. O principal objectivo desta tese é analisar o desempenho aeroportuário por meio de uma perspectiva multidimensional, considerando a natureza multifacetada do desempenho e o interesse de *stakeholders* do aeroporto. Tendo em vista o estado da arte da literatura sobre desempenho e o actual estágio da investigação no contexto aeroportuário, os seguintes objectivos específicos foram perseguidos: i. Identificar as dimensões de desempenho enfatizadas na literatura sobre aeroportos; ii. examinar as práticas de medição de desempenho em aeroportos brasileiros; iii. desenvolver um modelo para medição da qualidade de serviço em aeroportos, considerando a multidimensionalidade do constructo qualidade; e iv. examinar as relações entre a percepção do passageiro acerca da qualidade de serviço e suas atitudes em relação ao aeroporto. Tendo em vista a abordagem abrangente ao problema de investigação e objectivos apresentados, a presente tese é composta de um conjunto de estudos interrelacionados, compreendendo um estudo de revisão sistemática de literatura e três estudos empíricos. Por meio da revisão sistemática de literatura, um panorama da literatura relacionada à medição de desempenho em aeroportos foi obtido e um quadro de referência das dimensões de desempenho foi proposto. No primeiro estudo empírico, por meio de inquérito aplicado a executivos de aeroportos no Brasil, obteve-se um perfil das práticas de medição de desempenho, compreendendo a frequência de uso, a relevância percebida e a facilidade para adquirir dados/informações referentes à um conjunto de medidas associadas a diferentes dimensões de desempenho. A análise de dados utilizou análise de agrupamentos, análise de regressão e *gap analysis*. Em um segundo estudo, a partir de uma abordagem multidimensional à qualidade de serviço, um modelo de medição da qualidade foi construído com base em atributos de serviço usualmente utilizados no sector aeroportuário. O modelo foi aplicado em dois aeroportos brasileiros por meio de inquérito junto aos passageiros. A análise de dados compreendeu análise factorial confirmatória. A validade e confiabilidade do modelo proposto foram avaliadas para diferentes grupos de passageiros e para ambos os aeroportos. No terceiro estudo empírico, o modelo associado ao *American Customer Satisfaction Index* (ACSI) foi utilizado como referência para o exame das relações entre a qualidade de serviço e as atitudes do passageiro. Para tanto, foram utilizados dados de inquérito aplicado a passageiros em um principal aeroporto no Brasil. O modelo de medição da qualidade de serviço proposto nesta tese foi utilizado com sucesso na estrutura do modelo ACSI e a percepção do passageiro acerca de existência de custos para mudar de aeroportos (*switching costs*) foi incluída no modelo para examinar seu possível efeito sobre a lealdade. Técnicas de análise de equações estruturais foram utilizadas para testar hipóteses derivadas da literatura. Em geral, os achados decorrentes desta tese representam uma significativa contribuição para investigadores e profissionais interessados em uma abordagem mais abrangente ao problema da medição de desempenho no contexto aeroportuário, particularmente nos casos onde a multidimensionalidade do constructo desempenho, suas implicações práticas para a gestão aeroportuária e a análise da percepção e atitudes dos passageiros são relevantes.

Palavras-chaves: Desempenho; Medição de Desempenho; Gestão Aeroportuária; Desempenho de Aeroportos; Qualidade de Serviço; Satisfação do Passageiro.

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LIST OF ABBREVIATIONS

ACI – Airport Council International

ACSI – American Customer Satisfaction Index

AMOS – Analysis of Moments Structures

ANAC – *Agência Nacional de Aviação Civil*

ASQ – Airport Service Quality

AVE – Average Variance Extracted

BSB – Business to business

B2C – Business to customer

CAA – Civil Aviation Authority

CFA – Confirmatory Factor Analysis

CFI – Comparative Fit Index

CMIN – Minimum Discrepancy

CR – Composite Reliability

CSR – Corporate Social Responsibility

EBITDA – Earnings before interest, depreciation, and amortization

ECSI – European Customer Satisfaction Index

EDP – Expectancy-Disconfirmation Paradigm

EFA – Exploratory Factor Analysis

FAB – *Força Aérea Brasileira*

FO – Foreign Object

GFI – Goodness of Fit Index

IATA – International Air Transport Association

IFI – Incremental Fit Index

INFRAERO – *Empresa Brasileira de Infraestrutura Aeroportuária*

IRR – Internal Rate of Return

KMO – Kaiser-Mayer-Olkin

M.I. – Modification Index

MAR – Multi-airport Region

MECVI – Modified Expected Cross-Validation Index

MLE – Maximum Likelihood Estimation

NCSB – Norwegian Customer Satisfaction Barometer

OLS – Ordinary Least Squares

PM – Performance Measurement

PMS – Performance Measurement System

PRM – Passenger with reduced mobility

RMSEA – Root Mean Square Error of Approximation

ROA – Return on Assets

ROE – Return on Equity

ROI – Return on Investment

RPK – Revenue-passenger-kilometer

SAC – *Secretaria de Aviação Civil*

SBGR – Guarulhos International Airport

SBSP – Congonhas/São Paulo Airport

SCSB – Swedish Customer Satisfaction Barometer

SEM – Structural Equation Modeling

SLR – Systematic Literature Review

SMC – Squared multiple correlations

SMS – Safety Management Systems

SPSS – Software Package for Social Sciences

TLI – Tucker-Lewis Index

TRB – Transportation Research Board

WLU – Work Load Unit

SUMMARY

PART I – BACKGROUND

PART II – EMPIRICAL STUDIES

PART I - BACKGROUND

CHAPTER 1 – INTRODUCTION

1.1. CONTEXT

Performance has been subject to growing interdisciplinary interest, which has reflected in the development of actual performance measurement practices and consistent academic research. An effective performance measurement process has become a key element of strategic management for private and public organizations in a constantly changing business environment.

In order to proactively respond to the challenges in this business environment, managers have required up-to-date and accurate information on different aspects of performance (Nudurupati *et al.*, 2011). Due to the limitations associated with the exclusive use of financial measures, performance measurement practices have gradually changed the focus from the traditional financial aspects towards a broader perspective of the business. Therefore, a more comprehensive approach to performance measurement has been recognized as a critical factor for organizational success (Franco-Santos *et al*., 2012; Bourne *et al.*, 2013).

Within the theme of performance, this thesis focuses on the airport industry as an important but still under-researched area concerning performance measurement (Adler *et al*., 2013; Liebert and Niemeier, 2010). Actually, it seems that difficulties associated with performance measurement are more present in service settings, which is mostly attributed to the intangible aspects of the service provision and to the diverse interests of the stakeholders involved (Yasin and Gomes, 2010).

Regarding the airport as a subject of study, there can be different perspectives. In the strictest sense, an airport is a key element within a region´s transport infrastructure, as the point where people and goods exchange between air transport and land transport modes

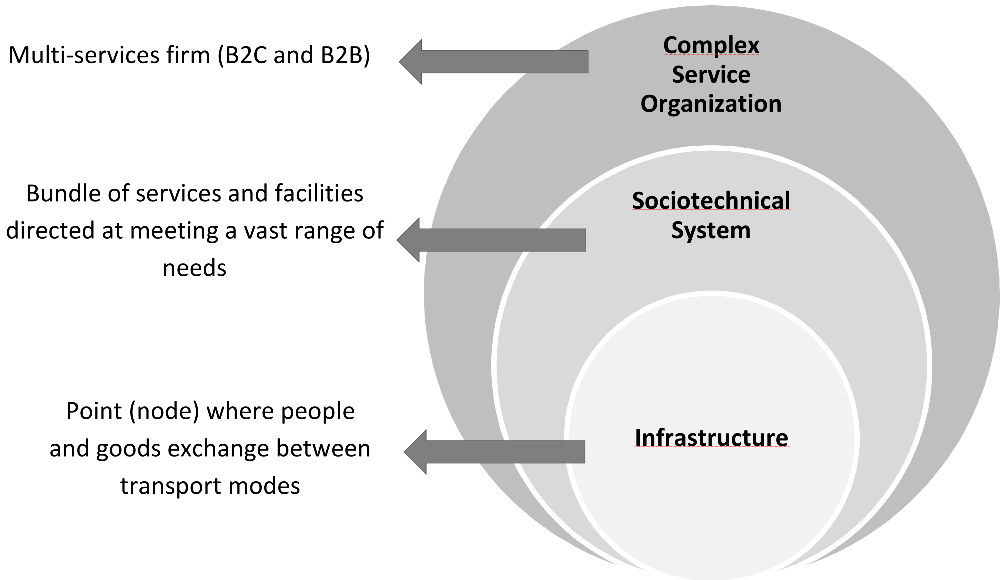
(Ashford *et al.*, 2013). Accordingly, airports are nodes in the air transport system, representing interchange points for air travelers and crucial elements within the airline networks (Postorino and Praticò, 2012; Horonjeff *et al.*, 2010).

Based on a broader perspective, an airport constitutes a complex socio-technical system comprising several services and facilities directed at meeting a vast range of needs related to the transportation of passengers and goods (Janic, 2003a; Halpern and Graham, 2013). In this sense, the airport is the place where the several actors within the air transport industry interact (such as the airport operator, airlines, handling services firms, and governmental agencies) (Gillen, 2011; Graham, 2014). Moreover, the interest in airport performance is shared by several stakeholders, whose objectives are hardly ever convergent (Sarkis and Talluri, 2004; Wu and Mengersen, 2013).

According to a business perspective, airports are complex service organizations. Actually, a main characteristic of the airport business is that it comprises a variety of processes, customers, and stakeholders. Therefore, airports are expected to provide efficient and high-quality services to different customers, including business-to-customer and business-to-business operations (Gillen, 2011; Kalakou and Macário, 2013). Also related to this perspective, it is noteworthy that airports are subject to strict regulation, which can be justified not only due to safety and security issues but also because of the occurrence of market failures, comprising monopoly structures, public goods, and environmental externalities (Adler and Gellman, 2012; Scotti *et al*., 2014). In this context, there is the need for monitoring different aspects of the airport activities.

An illustrative framework of these three perspectives to approach the airport as a subject of study is depicted in Figure 1. In this thesis, the broader perspective of the airport as a complex service organization is embraced.

Figure 1. Approaches to the airport as a subject of study.



Regarding airports as complex service organizations, in addition to the typical reasons for measuring performance, including controlling and supporting decision-making process (Hamann *et al.*, 2013; Neely, 2005), some particular issues can be highlighted, such as the increasing air traffic demand, the deregulation process in the air transport sector, and the movement for changing forms of airport ownership and governance[1]. Consequently, what currently exists is a business environment in which airports are no longer considered exclusively as huge facilities and public utilities, but complex service organizations delivering a vast set of services related to air transport, plus a number of additional ancillary services (Gillen, 2011).

Some characteristics of this evolving business environment might be particularly relevant for this present discussion on airport performance measurement:

a. Currently, major airports worldwide are operated in a commercial manner, as self-sufficient organizations not dependent on government support (Graham, 2014). In this sense, non-aeronautical revenues are ever more important for airport sustainability (Graham, 2009; Gillen, 2011; Fasone *et al*., 2016);

[1] These issues are further discussed in Chapter 2.

b. As many airports nowadays are private or semi-private enterprises, operators and shareholders need information on the economic aspects of the airport performance (Graham, 2011; Adler *et al*., 2013);
c. Perceiving airports as complex systems points to the importance of considering the needs of different stakeholders and to the multifaceted nature of airport performance (Graham, 2014; Zakrzewski, 2008);
d. Airports are expected to lose market power in some competitive environments, such as the case of airports sharing catchment areas or competing for acting as hubs (Oum *et al*., 2008; Pathomsiri and Haghani, 2004; Adler and Liebert, 2014);
e. Even when there is no significant competition or business pressures, regulation may typically comprise performance monitoring regarding different aspects of the airport services, such as efficiency, safety, service quality, and others (Adler *et al.*, 2015; Bel and Fageda, 2010);
f. Improving service quality and adopting a customer-oriented focus has become essential, as traffic volume rises and customer´s needs become more demanding (Fodness and Murray, 2007; Gillen, 2011);

In this context, airports have been compelled to improve their performance, including higher levels of efficiency and service quality, whether to be competitive or just to achieve economic and operational objectives within the regulatory context (Adler and Liebert, 2014; Graham, 2014). As any other service organization, it has become increasingly important the identification of key performance areas, their measurement, analysis, and extraction of relevant information regarding several aspects of the airport business. Therefore, a broader perspective for measuring and analyzing airport performance is necessary.

1.2. RESEARCH PROBLEM AND OBJECTIVES

The prior discussion stressed the need for further investigation on airport performance measurement. Despite the relevance of this subject for today´s airports, based on the extensive literature review presented in section 3.3., there seem to be significant gaps in the airport-related literature. In this thesis, some particular gaps are considered:

- There is a lack of systematized knowledge on the current measurement practices and how airports have considered the different performance dimensions and stakeholders needs in their practices;
- Given the increasing interest in service quality within the airport context, further research on service quality dimensions and their measurement is required;
- In the current perspective for the airport business, where airports are self-sufficient service organizations, there is increasing need for integrating service quality measurement within the context of airport management, including passenger attitudes towards the airport.

Accordingly, the following key issues are covered: i. the need for a more comprehensive approach to performance measurement; ii. the need for further investigation into the current measurement practices; and iii. the integration of service quality measurement and passenger attitudes within the context of airport performance measurement and management.

In this context, this thesis concerns a broad perspective for measuring and analyzing airport performance, including the multidimensionality of the performance construct, the development of reliable measurement practices, and a customer-oriented approach. In this sense, the following research questions are stated:

1) In view of the institutional and technological changes in the airport industry over recent decades, what are the relevant performance dimensions related

to the airport business nowadays?

2) Given the importance of performance measurement for airports, what is the current profile of airport operators concerning performance-related practices?
3) Considering the increasing relevance of service quality for airports, how to integrate service quality measurement and passenger attitudes within the context of airport management?

To respond to these questions requires a comprehensive research effort covering different issues related to airport performance. Hence, the theoretical background supporting this thesis includes the subjects of performance measurement, service quality, and customer satisfaction.

The particular context of the study is the airport management, according to the perspective of airports as organizations delivering a vast set of services to different customers and operating in a complex business environment. As for the approach to the research questions, some references from the Stakeholder Theory are considered, especially the idea that performance measurement practices should account for the interests of the stakeholders (Neely *et al*., 2001).

The main research objective of this thesis is to provide an analysis of airport performance from a multidimensional perspective, accounting for the multifaceted nature of performance and the interests of airport stakeholders. Considering the state-of-the-art of the literature on performance measurement, as well as the gaps identified in the research related to the airport business, the following specific objectives are stated:

1) To identify the performance dimensions emphasized in the airport-related literature;
2) To examine performance measurement practices at Brazilian airports, in order to identify the current profile of airport executives concerning performance measurement;
3) To develop a measurement model of airport service quality, accounting for

the multifaceted nature of the service quality construct;

4) To examine the relationships between passenger perception of airport service quality and passenger attitudes towards the airport.

For the empirical studies related to the specific objectives 2, 3, and 4, the Brazilian case is considered. The particular relevance of the Brazilian context is twofold. First, it is one of the biggest air transport markets in the world, with approximately 100 million passengers in 2015 (ANAC, 2016)[2]. Second, the airport sector in Brazil has been through substantial changes in the last decade, including an in-progress airport privatization program (Vasigh *et al*., 2014).

While previous studies have attempted to shed light on different aspects of airport performance empirically, this study is innovative for three main reasons. The first reason is that only a few studies have provided a more comprehensive approach to airport performance, and none of these has placed focus on the reality of a developing country (the extensive literature review presented in Section 3.3. is supportive of this point).

Second, studies dedicated to examining actual performance measurement practices are scarce in the transport literature. Concerning the airport industry, besides a few research efforts at the beginning of the first decade of the 2000s, this specific issue seems to have been overlooked (Francis *et al*., 2002, 2003; Humphreys *et al*., 2002; Fry *et al*., 2005). Since airports are dynamic open systems, assessing measurement practices may contribute to understanding the executives´ perspectives on airport business performance (Gomes and Yasin, 2013). With the research objective 2, this thesis aims to reduce this significant gap in the literature.

Third, considering the increasing interest in airport service quality (ASQ), this thesis is innovative for discussing passenger perceptions of ASQ according to the multidimensionality of the service quality construct and the relationships between the antecedents and consequences of passenger satisfaction. Measuring service quality has

[2] The air transport market in Brazil was also the second in the world in number of registered aerodromes (SAC, 2016).

become ever more important for airport managers. However, due to the complexity of the airport service environment, an effective process of measuring and analyzing relevant information regarding passenger perceptions and attitudes is not easily achieved.

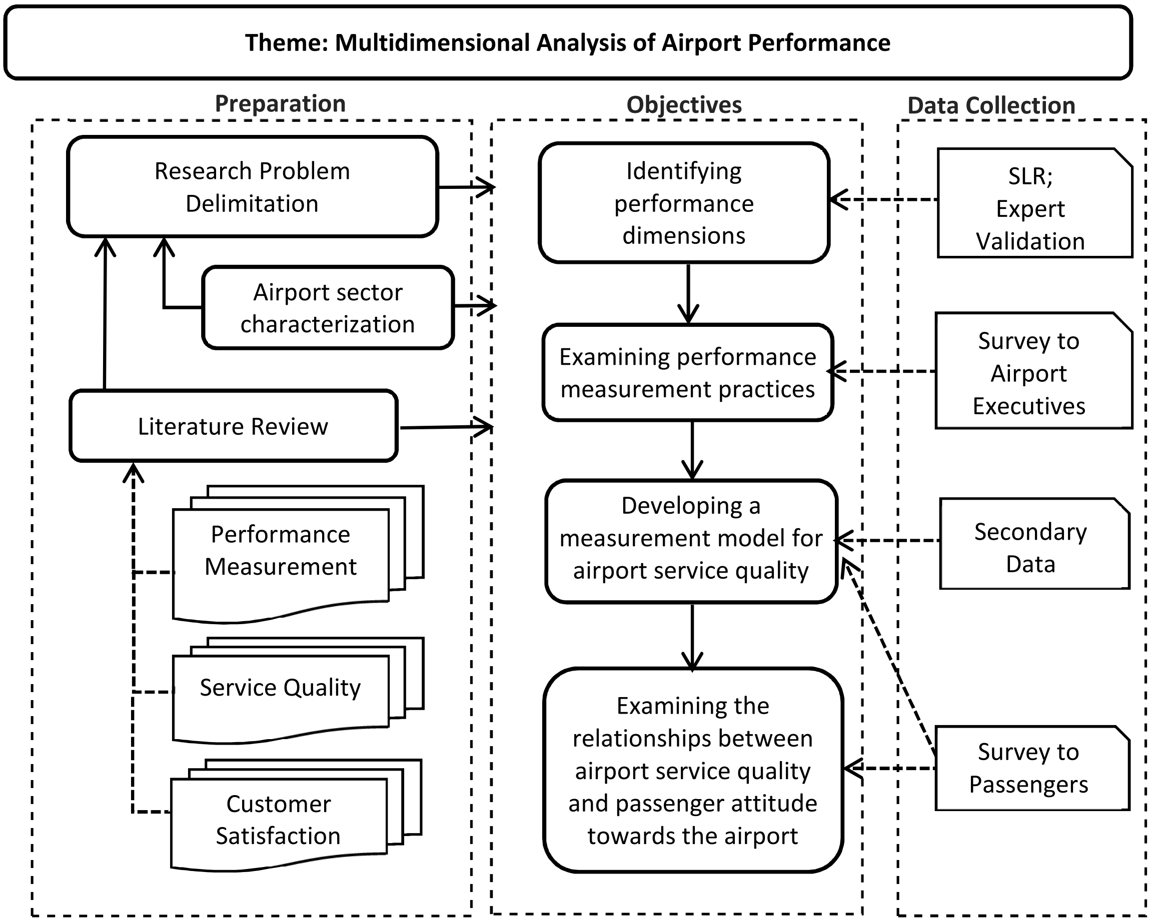
Concerning service quality measurement, while generic approaches might not cover particular aspects of the passenger-airport interaction, current practices within the airport industry have usually been more concerned with context-specific purposes (George *et al*., 2013; Pantouvakis, 2010; Fodness and Murray, 2007). Moreover, considerations on the reliability and validity of the measurement instruments and the use of these measurement practices in the context of airport management have received only limited attention (George *et al*., 2013; Fodness and Murray, 2007; Bezerra and Gomes, 2015). The research objective 3 is expected to provide relevant insights on these particular issues.

As for the analysis of the relationships between service quality and passenger attitudes, despite being a regular topic in the services literature, it seems that there is a lack of research concerning the airport context, as discussed in the literature review chapter. Therefore, this thesis appears among the few research efforts with such a comprehensive approach to the passenger perceptions and attitudes. In this sense, the findings associated with the research objective 4 may contribute to understanding passenger perceptions and attitudes towards the airport.

1.3. RESEARCH DESIGN

In view of the research questions and research objectives stated, this present thesis comprises a set of independent but interrelated studies. Figure 2 outlines the research design, featuring the stages of preparation and the research objectives with their respective data collection methods.

Figure 2. Research design.



Notes: (- - - ->) indicates content; (——>) indicates sequence; *SLR – Systematic Literature Review.

First, grounded on the state-of-the-art of the literature and characterization of the airport sector, a framework for the performance dimensions related to the airport business is provided. Afterward, a set of performance measures derived from the literature and representative of these dimensions is submitted to a sample of airport executives in order to examine their current profile concerning performance measurement practices. These two objectives constitute an exploratory phase that supports the subsequent objectives.

After this exploratory phase, a model for measuring airport service quality consistent with a multidimensional approach is built upon typical service quality measures within the airport industry and tested for its validity, reliability, and invariance across groups of passengers and airports. This third objective focused on a significant gap in the literature and practice, concerning service quality measurement in the airport context.

Finally, the relationships between passenger perception of airport service quality and their attitudes towards the airport are examined according to the theoretical background provided by the customer satisfaction literature. This objective is achieved by testing for the suitability of a model of the antecedents and consequences of passenger satisfaction with the airport. This fourth objective is also related to the integration of service quality measurement and passenger attitudes into the context of the airport management.

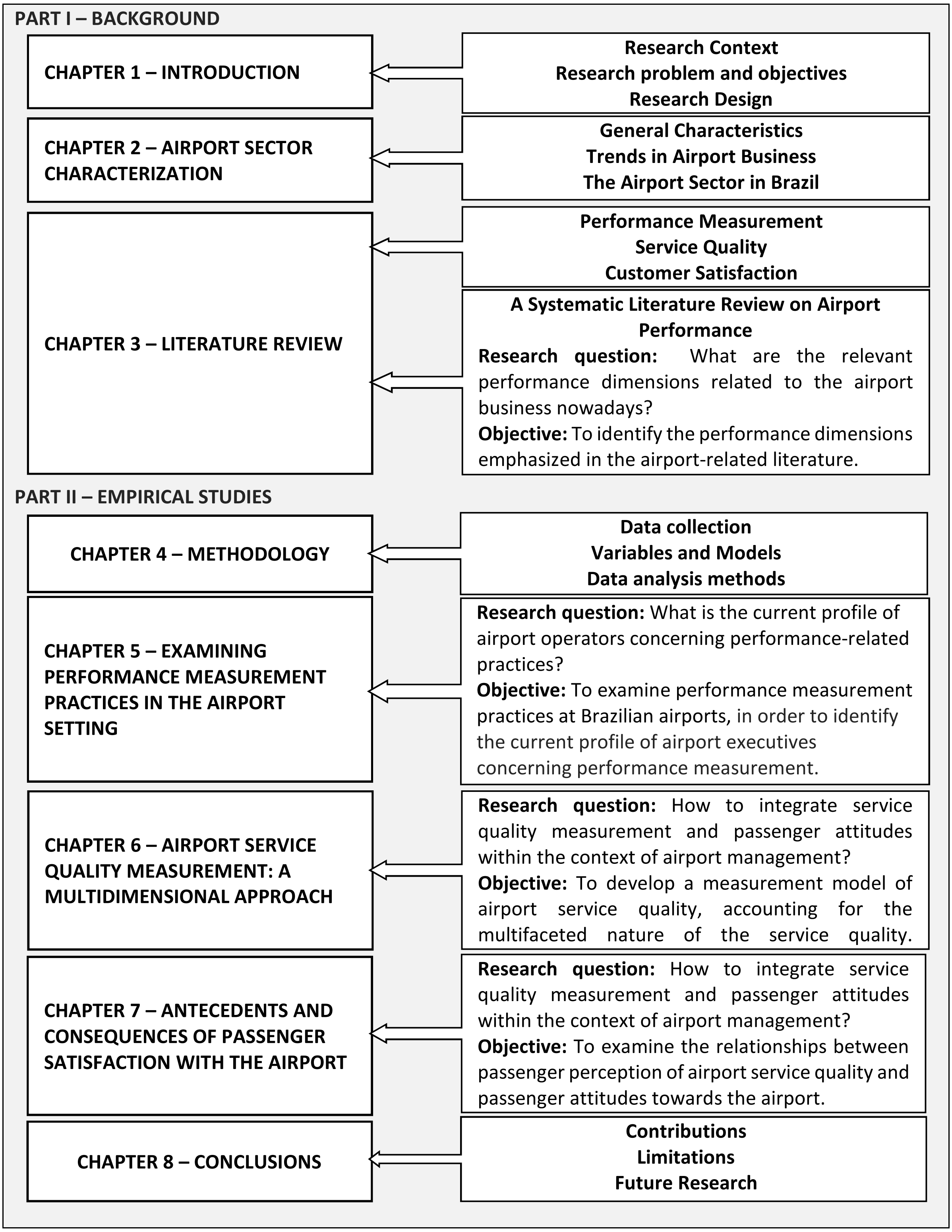
1.4. STRUCTURE OF THE THESIS

This thesis is divided into two main parts. The first part presents the background and theoretical framework, comprising this introductory chapter, the sector characterization (Chapter 2), and the literature review covering the subjects of Performance Measurement, Service Quality, and Customer Satisfaction (Chapter 3). As regards the literature review chapter, the section of performance measurement includes the Systematic Literature Review study on airport performance measurement, which provides results for achieving the research objective 1.

The second part of the thesis is related to the empirical studies. It includes the methodology chapter (Chapter 4) and three other chapters comprising the empirical studies. Finally, the main findings of this comprehensive research effort are discussed along with their theoretical and practical implications, the limitations, some notes on a research agenda, and some final considerations (Chapter 8).

Figure 3 summarizes the thesis structure and highlights the key content elements concerning each chapter.

Figure 3. Thesis structure.



CHAPTER 2 – AIRPORT SECTOR CHARACTERIZATION

2.1. INTRODUCTION

This chapter presents considerations on the airport sector in order to describe the study's context. The main characteristics of the airport business are first outlined according to a broad perspective, and then some more particular trends related to airport performance measurement are emphasized. Afterward, a brief discussion on the current paradigm for the airport business is provided, based on the extensive literature reviewed. Finally, an overview of the Brazilian airport sector, which is the specific context for the empirical studies, is delivered.

2.2. GENERAL CHARACTERISTICS OF THE AIRPORT BUSINESS

Along with the air navigation facilities, airports constitute the infrastructure of the air transport system. As such, they are critical components for the system´s overall performance. Furthermore, their ability to deliver increased capacity and improved services at reasonable costs is determinant to the system´s effective response to the traffic growth (Holt *et al*., 2006).

As a key element of the transport infrastructure, in the strictest sense, an airport represents the physical site where people and goods exchange between the air mode and land transport modes (Ashford *et al.*, 2013). Essentially, it is designed to provide a suitable interface for the aircraft and passengers or cargo to be transported (Horonjeff *et al.*, 2010).

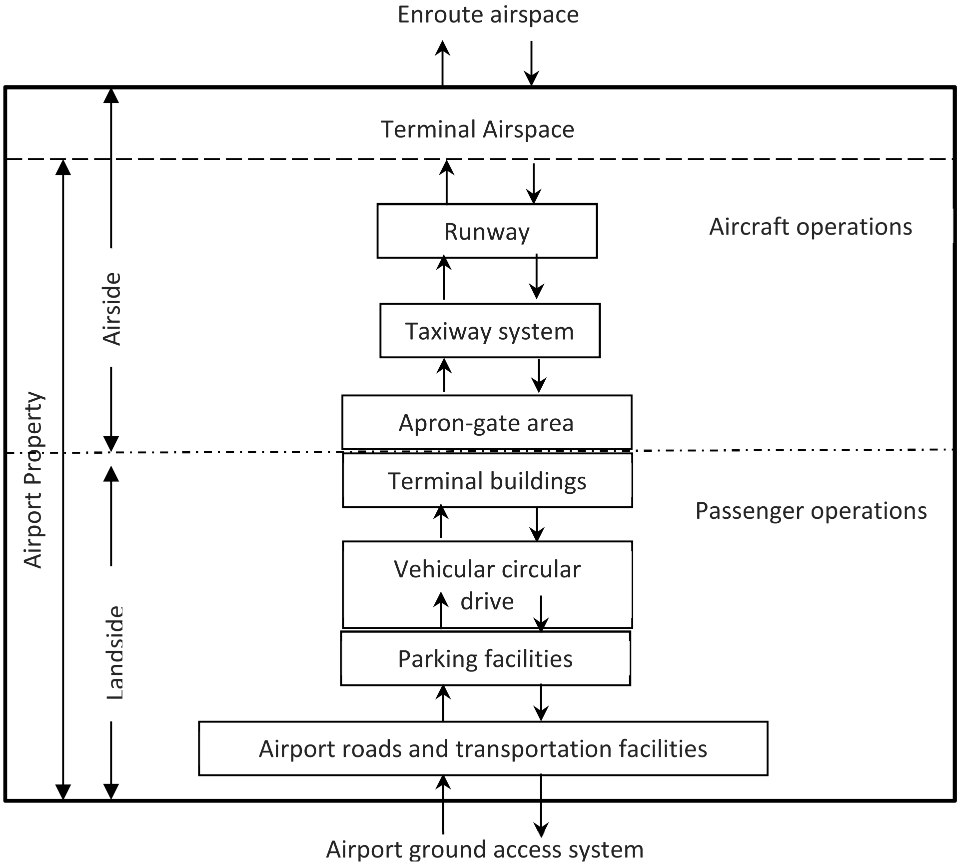
Based on a managerial perspective, an airport appears as a network consisting of multiproduction processes (Liebert and Niemeier, 2013). In this sense, the main airport functions have remained essentially the same over time, comprising (Doganis and Graham, 1987; Mumayiz and Ashford, 1986; Ashford *et al.*, 2013; Mackenzie-Williams, 2005; Graham, 2014):

- The provision of facilities for aircraft operation, such as runways, taxiways, aprons, hangars;
- The provision and operation of terminals for passenger pre-flight and post-flight activities and formalities (typically includes check-in, passport control, embarking/disembarking, baggage processing);
- The provision of space within the terminals for shopping, catering, and other retail business services, such as bars and restaurants, car hire, foreign exchange facilities, and others.

In addition to these core functions, other major activities related to the airport business are also noteworthy. Based on the positive impact on revenues, the provision of ground handling (directly or indirectly) and car parking services can be highlighted. Concerning the costs for the airport management, an important activity is the operation of air traffic control services (Mackenzie-Williams, 2005).

Apropos of airport design and operational aspects, these several activities are usually separated into two main components, the airside and the landside. Figure 4 outlines the key elements related to each airport side, comprising the aircraft operations and passenger processing activities.

Figure 4. Main airport components.



Source: Based on Ashford *et al*. (2013).

The airside concerns with the aircraft operations, comprising runways, taxiways, and aprons as its core design elements. Traffic control activities, ground handling services (including passengers embarking/disembarking, cargo and luggage loading/unloading), aircraft-related technical services, and safety activities are undertaken within the airside (Fernandes and Pacheco, 2007; Zografos *et al*., 2013; Horonjeff *et al.*, 2010). It is to be noted that both the design elements and services related to this component are under restricted regulation and supervision due to safety reasons (Enoma and Allen, 2007; Yadav and Nikraz, 2014).

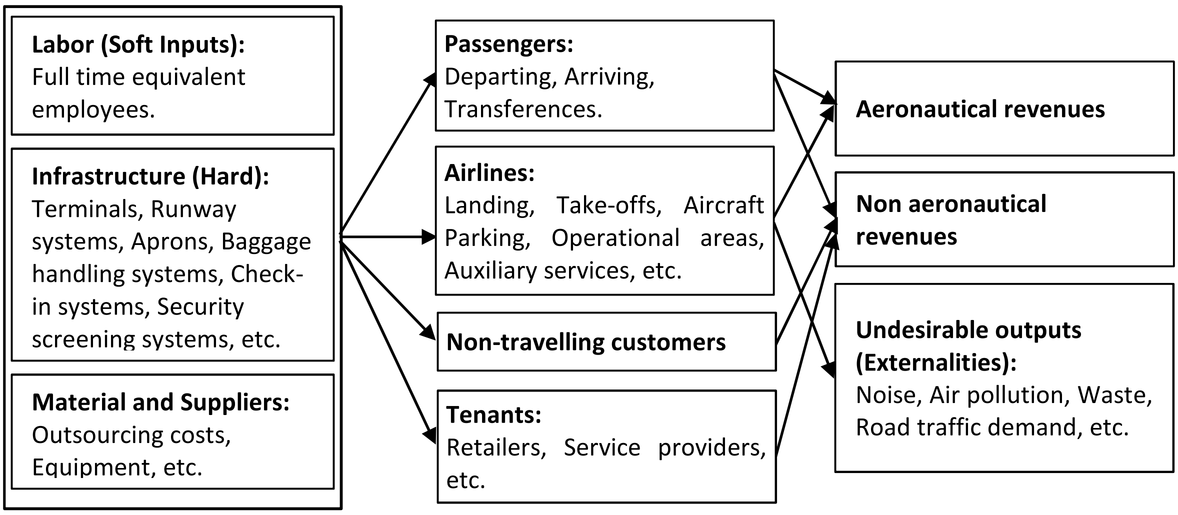
As regard the landside, it consists of the airport access roads, parking areas, passenger and cargo terminals. The airport landside connects with the outside, and thus it holds the passenger-related services before embarking and after disembarking (Correia *et al*., 2008a; Horonjeff *et al.*, 2010). According to the passenger and general public perspective, the landside epitomizes the airport service that is effectively experienced (Bezerra and Gomes, 2015).

Currently, given the complexity of the airport business, a systemic perspective has surpassed such a technical approach to the airport services. Hence, airports are no longer seen solely as large processing facilities and public utilities, but firms delivering airside services to airlines, terminal retail, access services to passengers, and several other additional ancillary services (Gillen, 2011).

In this context, regarding the set of services and facilities provided, there is no typical airport (Graham, 2014). Beyond the basic operational functions, some airport operators will undertake more than a few additional activities, including security, air traffic control, handling, car parking, duty-free shops, cleaning and heavy maintenance. Conversely, other airports will contract these services out. Obviously, these decisions will delineate the specific airport business model and ultimately will have an impact on different aspects of its performance (Kalakou and Macário, 2013).

A general perspective on the macro processes undertaken by an airport, including the main inputs, customers, and the related outputs is shown in Figure 5.

Figure 5. Airport macro processes.



Source: Adapted from Adler *et al*. (2013).

This generic model to the airport macro processes is based on Adler *et al*. (2013), besides the addition of different customers and their related outcomes (including the undesirable ones) and the two well-recognized categories of airport revenues. The aeronautical revenues originate from the airport services covered by airport fees (usually subjected to regulation to some extent). The non-aeronautical category comprises a more varied group of revenues, typically associated with the ancillary services provided by the airport. Current major airports worldwide may be considered as a type of two-sided platforms, i.e. these airports could even be able to cross-subsidize the airside and the landside activities through their pricing structure (Ivaldi *et al*., 2012).

This generic model, however, does not fully account for the complexity of the airport interaction with its stakeholders. Currently, major airports are complex and dynamic organizations consisting of many interacting parts, including passengers, airlines, handling agents, ground transportation and other aviation-related service providers (Halpern and Graham, 2013; Graham, 2014). Moreover, airports are subject to concern for the regional and national economy (Adler *et al.*, 2015). Hence, there are always different stakeholders who need information on diverse aspects of airport performance (Zakrzewski, 2008; Skouloudis *et al*., 2012; Schaar and Sherry, 2010). Accounting for the diversity of the stakeholders´ interests leads airports towards the adoption of a wider approach to the problem of measuring performance. Consequently, performance measurement practices within the airport sector are supposed to embrace a multidimensional perspective.

Despite the particular business model adopted by a specific airport, with more or less outsourcing, for instance, airports are particularly infrastructure-intensive, which implies massive investments and indivisibilities (Martín *et al*., 2013). This characteristic has normally been associated with two main ideas. First, airports have low flexibility in adjusting their capacity to demand variations, which may be particularly evident during expansive times, as airport capacity typically increases stepwise and beyond existing demand (Graham, 2014; Martín *et al*., 2013). Second, airports have usually been seen as natural monopolies, due to the presence of sunk costs, as well as the assumptions of economies of scale and market power (Ivaldi *et al*., 2012; Haskel *et al*., 2013). Given these particularities, airport exploration has traditionally been consigned to the public sector (Vogel, 2011).

Another characteristic of the airport business is that airport managers have little or none control over the aggregated demand for air travel. As an intermediate point within the air transport system, airport demand usually will reflect the economic relevance and touristic potential of its catchment area (Doganis, 1992; Czerny, 2013). In this respect, airports are usually challenged to develop non-aeronautical activities in addition to the core airport processes related to the aviation activities (Morrison, 2009a). According to the perspective of airports as complex service organizations, authors have claimed that an airport could be seen as a multi-services firm comprising both aviation and non-aviation activities (Gillen, 2011; Morrison, 2009a; Czerny, 2013; Jones and Dunse, 2015; Jimenez *et al*., 2013).

As a key part of the international air transport system, the airport industry has experienced significant changes since the late 1970s. Based on the literature reviewed, some trends may be particularly related to the evolution of the performance measurement practices within the airport context, such as the increasing air traffic demand, the deregulation process in the air transport market, and the changes in the forms of airport ownership and governance. Accordingly, a new paradigm for the airport business has emerged.

2.3. TRENDS RELATED TO PERFORMANCE MEASUREMENT.

2.2.1. Increasing air traffic demand

Over recent decades, the air transport industry has strongly increased worldwide. From 1990 to 2014, the number of passengers improved about 214% (World Bank, 2015). The demand for air travel is expected to growth at an average annual rate of 4,1%, reaching 7,3 billion/year by 2034, which is more than twice the 3,3 billion passengers in 2014 (IATA, 2015a). Asia-Pacific, North America, and Europe regions still comprise about 4/5 of the global traffic, but more recently emerging economies presented greater increase rates (IATA, 2015b).

Since airport business is infrastructure-intensive, it requires a high amount of investments, and it is subject to step changes in size and capacity (Graham, 2014). Consequently, a non-effective response to the increase in traffic demand can lead airports to significant events of congestion or even to capacity crunches. On the other hand, improving capacity in anticipation may be inefficient (Holt *et al*., 2006).

In this context, airport managers have been expected to accomplish investment programs efficiently, optimize the available resources, and systematically review operating processes (Adler and Liebert, 2014; Diana, 2010). Therefore, performance measurement becomes a key activity for supporting decision-making processes regarding the investment cycle to avoid cost inefficiency. By effectively measuring the different operating processes vis-à-vis the planned capacity, for instance, airport executives and policy makers may be provided with relevant information for supporting their planning-related decisions (Morrison, 2009b).

2.2.2. Deregulation Process

Historically, air transport has been a fully regulated industry, in which barriers to entry, restrictions on ticket fares, capacities, and frequencies were typical (Doganis, 2006). In this context, airports were regarded as natural monopolies with economies of scale and market power. Consequently, in several countries, the majority of commercial airports have been subject to public ownership and/or economic regulation in order to boost efficiency and avoid market power exploitation (Halpern and Graham, 2013; Liebert and Niemeier, 2013).

Beginning in the US and followed by several countries at different times, since the late 1970s, there has been a movement for less regulation concerning economic and commercial aspects of the air transport market (Jarach, 2001; Doganis, 2006). First, the emphasis was on fostering competition within the air services market by reducing the barriers to entry of new firms and prices liberalization. More recently, this process has focused on the organization and delivery of infrastructure services (Gillen, 2011; Janic, 2008).

One of the main outcomes of the increased competition among airlines has been the pressure for airports to expand airside and terminal capacity while ensuring efficient operation and meeting customer service requirements (Assaf and Gillen, 2012). Since airlines have become more sensitive to the prices practiced by airports, it was harder to transfer higher operating costs at inefficient airports to the passenger. In this context, airports have been facing persistent demands for higher quality, higher efficiency, and taxes and fees reduction (Fry *et al*., 2005; Green, 2014).

According to Assaf and Gillen (2012), the shift to commercialization and privatization of airports has followed the airline deregulation process with some lag. It seems that consequences of the deregulation of the air transport industry, namely higher competition between airlines and increasing demand, fostered the need for improvement in the airport infrastructure capacity, as well as the adoption of a more business-like philosophy in airport operations (Janic, 2008).

2.2.3. Changes in the Airport Ownership and Governance Forms

Airports have traditionally been regarded as public utilities financially supported by governments. Nonetheless, there has been a movement towards making airports financially self-sufficient through the introduction of commercial goals and, in some cases, shifting for private ownership (Humphreys *et al*., 2002). Changing airports governance and ownership forms appeared to be a reasonable response to the increasing demand and the airline new business models (Oum *et al*., 2008; Graham, 2011).

Several arguments support this movement towards airport corporatization and privatization, covering perceptions of inefficiencies in the way governments have run airports and the assumption that private organizations are much more effective in raising funds and undertaking airport capacity expansion (Oum *et al*., 2008; Assaf and Gillen, 2012; Fasone *et al*., 2014). The effects of ownership and governance forms on the organizational performance has been an important research topic, however, there is no conclusive evidence on whether those assumptions are valid or not to the airport sector (Scotti *et al*., 2012; Fasone *et al*., 2014; Yu, 2010).

Nevertheless, different types of privatization have been implemented worldwide. After United Kingdom´s pioneering in the 1980s, several other countries in all continents have followed this trend with a diversity of models implemented (Gillen and Mantin, 2014; Oum, *et al*., 2008; Zakrzewski, 2009; Graham, 2011). According to Assaf and Gillen (2012), there was little airport privatization activity until the mid-1990s, but then privatization increased mainly in Europe, South America, Oceania, and Asia.

In contrast to this global trend, it is noteworthy that the United States of America and Canada (two of the major air transport markets) have not embraced airport privatization and have applied very particular solutions retaining public ownership (Oum *et al*., 2008). Overall, there is an extensive set of combinations of property types, governance, and price regulation, but airports in many countries are still publicly owned (Assaf and Gillen, 2012).

Regardless the model adopted, privatization implies regular performance monitoring and measurement within the State´s regulatory function (Adler *et al*., 2015; Gillen and Mantin, 2014). Accordingly, airport privatization has not only demanded a more commercial perspective to the airport sector but also has required the definition of objectives and performance targets to be achieved within the regulatory context. Furthermore, since many airports nowadays are operated as private or semi-private enterprises, operators and shareholders need relevant information on the performance of their airport (Suzuki, 2014).

2.2.4. The Current Paradigm for Airport Business

Associated with the aforementioned trends, there is a widespread acknowledgment of a current business environment in which airports are seen as modern firms supposed to deliver efficiency and high-quality services to different customers, including airlines, passengers, retailers, and other users in general (Jarach, 2001; Graham, 2009; Gillen, 2011; Merkert and Assaf, 2015; Vogel and Graham, 2013).

Actually, the main airports worldwide are for the most part run in a commercial-like way, and non-aeronautical revenues are becoming ever more important (Gillen, 2011; Graham, 2014). Likewise, improving service quality and adopting a customer-oriented focus become essential to achieve a better performance as traffic volume rises and customers are more demanding (Gillen, 2011; Fodness and Murray, 2007).

The perception of airports as complex service organizations leads to considering the interests of different stakeholders, including environmental and social issues related to the aeronautical activities (Skouloudis *et al*., 2012; Zakrzewski, 2008; Upham and Mills, 2005). Airports are inserted into a complex business environment in which several stakeholders are legitimately interested in the outcomes of the airport activities, including externalities, such as the positive economic impact on society and the undesirable outcomes related to the aeronautical activities.

This more comprehensive approach has implied significant challenges for airport performance measurement. The point is that the most appropriate measures for the performance aspects of interest of the stakeholders (customers, local governments, regulators, and community) are usually non-financial (Humphreys *et al*., 2002; Neely, 2005; Adler and Liebert, 2014). There has been a debate on the role of stakeholders regarding airport performance management and measurement (Zakrzewski, 2009; Schaar and Sherry, 2010; Upham and Mills, 2005; Skouloudis *et al*., 2012; Wu and Mengersen, 2013). In this context, the focus of performance measurement needs to be progressively moved from measuring just operational and financial performance to a more holistic and multidimensional approach, in which other aspects of the airport performance are equally relevant (Fernandes and Pacheco, 2007; Gillen, 2011; Skouloudis *et al*., 2012).

2.4. AIRPORT SECTOR IN BRAZIL

The airport sector in Brazil is the case for the empirical studies reported in this thesis. Regarding this specific context, some data and information related to the Brazilian airport industry are presented.

Air travel demand increased in the last decade, and the forecast is positive, despite the country´s economic slowdown verified in 2015 and 2016. In comparison to 2006, air transport in Brazil presented approximately 232% of increase regarding revenue-passenger-kilometer[3]. Another important remark is that its average annual growth was more than 3,5 times the GDP in the last decade (ANAC, 2015). By the end of 2015, Brazilian domestic air transport market was the third biggest in the world. Concerning the number of airports, it ranked second worldwide (SAC, 2016a).

As mentioned before, the airport business is a highly regulated economic activity, which is due to not only the inherent safety and security risks associated with the aeronautical activities but also for economic reasons. For the most part, airports are inserted into a context in which market failures are presented, such as monopoly structures, public goods and environmental externalities (Upham and Mills, 2005). In the particular case of Brazil, the regulatory framework constraints airport business from the infrastructure planning to several specific operational aspects (Bezerra, 2012).

According to the Brazilian Constitution and Federal Laws on civil aviation (Brazilian Federal Laws nº 7.565, nº 6.009, and nº 11.182), airports are public utilities that can be exploited directly by the public power or by the private sector under a grant (Brasil, 1986, 1973, 2005). According to this regulatory framework, the granting for the private sector may comprise the forms of concession, leasing, or permission (Mello and Prazeres, 2013). Therefore,

[3] Revenue-passenger-kilometer (RPK) is a measure of the volume of passengers carried by an airline. It is the sum of the products obtained by multiplying the number of revenue passengers carried on each flight stage by the respective stage distance.

private organizations are not authorized to purchase public airports outright, and exploitation has to be delegated according to procedures determined by Brazilian laws.

Despite the legal provision for public and private exploitation of airport infrastructure, historically the main airports in Brazil have been run by government-owned organizations. Until the early 2010s, the main airports were under the control of a state-owned company (*Empresa Brasileira de Infraestrutura Aeroportuária* – INFRAERO). Created by law in 1972, INFRAERO is a public enterprise provided with administrative and financial autonomy, subordinated to Federal Government for political issues and long-term planning (Brasil, 1972). At the early 2010s, INFRAERO was in charge of 67 airports, and it was responsible for over 97% of the air traffic regarding passengers and commercial aircraft (Bezerra, 2012).

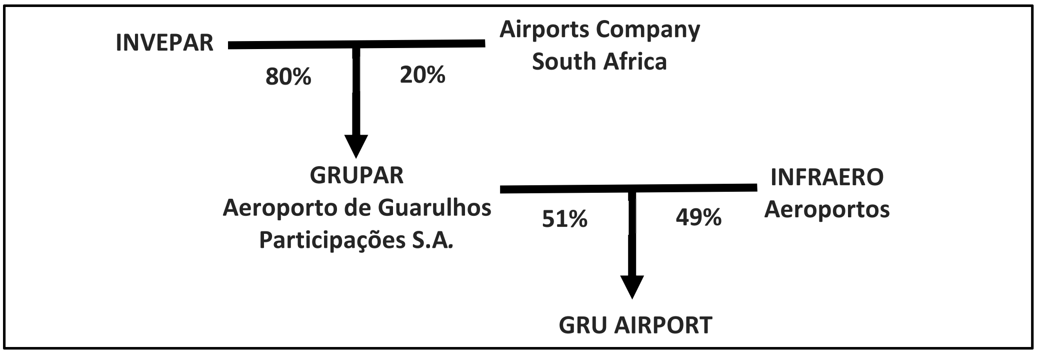
Regarding airport exploitation, other important players were Brazilian Air Force (*Força Aérea Brasileira* – FAB) and States and Municipalities governments. The FAB is usually in charge of military airports, some airports located at the frontier, and other strategic airports. As for the airports under State and Municipality control, the effective operation was frequently delegated to private companies under contract (Bezerra, 2012).

At the late 1990s, Brazilian government firstly announced the intention to privatize airports under INFRAERO control. As in many other countries, the drive for privatization was associated with Government's lack of resources to counterbalance the industry´s growth and the need for infrastructure developing (Mello and Prazeres, 2013). Notwithstanding, it was only in 2010 that the first federal airport concession took place. The object was the construction and operation of a new international airport in the Rio Grande do Norte, a State in the Northeast of Brazil.

Afterward, a federal program of airport concession has comprised the main airports in subsequent phases. As regards this program, it is remarkable that airports ownership remained with the Brazilian government and the concession contract provided INFRAERO with 49% of participation in the new consortiums. The following graphic is illustrative of the shareholder composition of GRU Airport, which is presented as an example of this model of governance (Figure 6). The consortium was formed with 51% of shares belonging to

Aeroporto de Guarulhos Participações S.A. (Grupar) (formed by INVEPAR and Airports Company South Africa - ACSA) and 49% to INFRAERO. To be noted that regarding the 51% that belongs to the private initiative, INVEPAR holds 80% and ACSA 20%.

Figure 6. Shareholder composition of GRU Airport.



Source: GRU Airport website, accessed in 15/03/2016.

At the time of writing this thesis, no study on the impacts of these concessions on airport performance was found. In order to provide information on the current Brazilian airport industry concerning the type of governance, Table 1 presents the top 10 airports in Brazil, including their traffic volume and type of governance as in December 2015.

Table 1. Brazilian airports by traffic volume and type of governance.

Pos.	ICAO Code	State	Main City	PAX 2015	Airport Operator	Type of Governance
1	SBGR	SP	SÃO PAULO	38.983.948	GRU AIRPORT	Concession
2	SBBR	DF	BRASÍLIA	19.503.501	INFRAMÉRICA	Concession
3	SBSP	SP	SÃO PAULO	19.222.657	INFRAERO	Public exploitation
4	SBGL	RJ	RIO DE JANEIRO	16.919.816	RIOGALEÃO	Concession
5	SBCF	MG	CONFINS	11.304.284	BH AIRPORT	Concession
6	SBKP	SP	CAMPINAS	10.324.658	Aeroportos BRASIL	Concession
7	SBRJ	RJ	RIO DE JANEIRO	9.464.771	INFRAERO	Public exploitation
8	SBSV	BA	SALVADOR	8.745.710	INFRAERO	Public exploitation
9	SBPA	RS	PORTO ALEGRE	8.349.170	INFRAERO	Public exploitation
10	SBCT	PR	CURITIBA	7.277.036	INFRAERO	Public exploitation
11	SBRF	PE	RECIFE	6.692.108	INFRAERO	Public exploitation
12	SBFZ	CE	FORTALEZA	6.335.125	INFRAERO	Public exploitation
13	SBBE	PA	BELÉM	3.711.673	INFRAERO	Public exploitation
14	SBFL	SC	FLORIANÓPOLIS	3.649.851	INFRAERO	Public exploitation
15	SBVT	ES	VITÓRIA	3.578.914	INFRAERO	Public exploitation
16	SBGO	GO	GOIÂNIA	3.420.396	INFRAERO	Public exploitation
17	SBCY	MT	CUIABÁ	3.306.480	INFRAERO	Public exploitation
18	SBEG	AM	MANAUS	3.238.648	INFRAERO	Public exploitation
19	SBSG	RN	NATAL	2.584.456	INFRAMÉRICA	Concession
20	SBFI	PR	FOZ DO IGUAÇU	2.057.159	INFRAERO	Public exploitation

Notes: PAX – Number of passengers processed in 2015.
Source: ANAC (2016).

It is noteworthy that airports in the States of São Paulo, Rio de Janeiro, and Minas Gerais, which are the wealthiest and most populated States in the country, are among the top seven in the Brazilian airport system. The airport in Brasília appeared in the second position mainly because of its role as a domestic hub in the air transport network. This table 1 also suggests concentration, as these 20 airports comprised about 86% of the total of passengers processed in Brazilian territory, based on data provided by ANAC (ANAC, 2016).

The air transport network in Brazil is depicted in figure 7, which shows the Regions with more connectivity within the network. The overlap of lines on the Southeast Region suggests a higher concentration of air routes. Based on data provided by ANAC, Guarulhos Airport, in São Paulo, Galeão Airport, in Rio de Janeiro, and Juscelino Kubitchesk International Airport, in Brasilia, presented the highest level of connectivity (ANAC, 2016). To be noted that these airports can be considered international and domestic hubs, which may suggest the existence of potential competition in the market.

Figure 7. Brazilian air transport network.

Source: SAC (2013).

It is also noteworthy that Congonhas Airport, in São Paulo, and Santos Dumont Airport, in Rio de Janeiro, presented high traffic volume and connectivity, despite being under regulatory constraints concerning opening hours and aircraft performance. These airports are expected to compete with Guarulhos and Galeão for a large catchment area covering the cities of São Paulo and Rio de Janeiro, respectively.

Provided with this outlook of the Brazilian airport industry, the relevance of this particular market was demonstrated. As previously explained in the introductory chapter, in addition to the size of the Brazilian market, it is also to be recognized the particularities of the country´s socio-economic characteristics and the in-progress privatization process. These characteristics should be considered in the empirical studies.

2.5. CHAPTER CONCLUSIONS

This chapter provided a description of the airport sector, comprising the general characteristics of the airport business, the particular trends over recent decades that may be related to performance measurement, and the outline of the airport sector in Brazil, which is the particular context for the empirical studies reported in this thesis.

Overall, it was evident that the airport business has some specific characteristics that make it quite specific concerning performance measurement practices. Because of this, a proper sector characterization seemed to be a crucial requisite for an adequate approach to the research questions and research objectives.

CHAPTER 3 – LITERATURE REVIEW

3.1 INTRODUCTION

To respond to the research questions stated, a comprehensive research effort covering different issues related to the multidimensionality of airport performance is needed. Consequently, to provide a consistent and effective approach to the thesis objectives, a multidisciplinary theoretical background is required, comprising the subjects of performance measurement, service quality, and customer satisfaction.

The multifaceted nature of performance is the central theme in this thesis, which leads to the recognition of its multiple dimensions in the context of the airport business. The subjects of service quality and customer satisfaction are then emphasized to provide background for the empirical studies focusing on service quality measurement and its use within the airport management context. Although these three subjects are considered interrelated, in the present chapter they are reviewed in distinct sections for the sake of better organization.

Regarding chapter structure, the next section provides background on performance measurement in organizations, with a focus on the current trends in the research literature. Subsequently, the results of a systematic literature review (SLR) on performance measurement in airport settings are reported and discussed. These results comprise the evolution of the airport-related literature and the proposition of a framework of the performance dimensions related to the airport business with impact on external stakeholders. Afterward, service quality is stressed, including a review covering service quality models and the specialized literature on airport services. Finally, customer satisfaction is emphasized, with a focus on the models for the antecedents and consequences of customer satisfaction and the particular context of the passenger experience with the airport services.

3.2. PERFORMANCE MEASUREMENT

The long time interest in performance measurement has been reflected in the development of actual performance measurement practices and consistent research literature (Lampe and Hilgers, 2015; Bourne *et al.*, 2013; Franco-Santos *et al*., 2012; Neely, 2005; Choong, 2013; Mathur *et al.*, 2011). According to Taticchi *et al*. (2010) and Choong (2013), the literature on performance is vast and varied, comprising a broad range of sources, from reports on ad hoc projects to books and extensive research literature with theoretical and empirical studies. Notwithstanding, the several approaches for performance and research focus are usually dependent on the author´s background and research purposes (Neely, 2005; Boyd *et al*., 2005).

Essentially, the relevance of measuring performance has usually been associated with the management function of controlling. In this context, a reliable performance measurement process is critical for achieving organizational effectiveness, as it provides an opportunity for identifying and analyzing deviations from the expected performance levels, targets and objectives (Behn, 2003; Watts and McNair-Connolly, 2012; Slack *et al*., 2010). Furthermore, performance measurement may also help organizations in monitoring the implementation of their diverse projects and programs, supporting organizational strategy (Combs *et al*., 2005; Carlson and Hatfield, 2004). Nowadays, in order to proactively respond to the challenges to succeed in a constantly changing business environment, managers require up-to-date and accurate information on different aspects of their business performance (Nudurupati *et al.*, 2011).

The interest in performance measurement has increased substantially since the 1970s, along with a focus change from a financial emphasis to a non-financial perspective, due to the recognition of significant limitations associated with the exclusive use of financial measures. Therefore, a more comprehensive approach to performance measurement has been imperative, given the current business environment (Neely, 2005; Bourne *et al*., 2013).

Concerning the knowledge field of business management, in addition to the necessity of control there is also a great interest in the performance construct while a dependent variable within models of the relationships between related constructs and performance, as well as for benchmarking purposes (March and Sutton, 1997; Richard *et al.*, 2009). Based on the recurrence of the subject in recent research and professional literature, this interest seems to remain absolute (Neely, 2005; Taticchi *et al*., 2010; Nudurupati *et al.*, 2011; Bourne *et al*., 2013; Choong, 2013).

Regarding theoretical studies, there are concerns about implications of the multidimensionality of performance to research and practical purposes, including the reliability and validity of performance measures (Boyd *et al*., 2005; Hamann *et al.*, 2013). Regardless of the interest in the performance construct, authors have argued that its underlying structure and even definition are hardly ever explicitly explained (March and Sutton, 1997; Kirby, 2005). Relating to the problem of measuring performance, this may lead to imprecise conclusions and ambiguous managerial implications (Combs *et al*., 2005; Richard *et al.*, 2008). Therefore, any discussion on performance should be preceded by sufficient clarification in order to provide an appropriate construct definition and clear approach to the subject.

The myriad of definitions of performance within the literature and the number of frameworks for performance management and measurement seem to be dependent on the approach to the construct and the study´s objectives as well. With this in mind, in this thesis the theoretical background provided by the strategic management field is used. Therefore, organizational performance is considered an extended concept of organizational effectiveness. In this sense, this extended concept concerns not only to the degree to which organizations are attaining their stated goals, but also to the economic and social outcomes resulting from the interaction between the organization and its environment (Cameron, 1986; Venkatraman and Ramanujam, 1986; Combs *et al*., 2005; Hamann *et al.*, 2013).

Such a broad concept embraces the current concerns on the economic, environmental and social outcomes of the organization´s activities (Brammer *et al*., 2012). However, a comprehensive and effective performance measurement approach needs to be complemented by a more intra-firm perspective. In this context, the concept of operational performance is also considered, which accounts for the particular operational dimensions of the business activities (Venkatraman and Ramanujam, 1986; Hamann *et al.*, 2013).

The operational performance comprises the activities that support the product/service production and delivery to customers (Ray *et al*., 2004). Therefore, their outcomes are directly perceived only at the firm level, and their effects on the organizational dimension are not necessarily independent of each other. In this context, the operational performance mediates the effects of these activities and organizational capabilities in the organizational performance domain (Ray *et al*., 2004; Combs *et al*., 2005).

Based on the discussion above, this thesis approaches the performance construct according to these two distinct but interrelated domains of performance; the organizational and the operational performance. Overall, the need for understanding and accurately define the performance construct is of utmost relevance for examining and explaining the relationships between performance and other constructs, as well as to prescribe ways that managers can adjust their efforts towards improving organizational performance (Carlson and Hatfield, 2004).

After discussing the performance construct, considerations on the research literature on performance measurement are provided. Main topics related to measuring performance seem to be “what measure” and “how to do it.” Performance measurement may be recognized as the process of quantifying the efficiency and effectiveness of organizational actions. This process is intended to provide the basis for assessing how well the organization is doing concerning its objectives, then supporting the decision-making process to improve organizational performance (Richard *et al.*, 2009).

According to an extensive literature review carried out by Neely (2005) and updated by Taticchi *et al*. (2010), comprising the period from 1970 a 2008, a sum of 6.618 scientific papers with the term “performance measurement” in the title, abstract or document keywords have been published in 546 journals.

Focusing on the specific literature related to performance measurement in the service sector, Yasin and Gomes (2010) examined the scope and nature of the approaches and models used to measure performance in service operational settings. After reviewing a database with more than 140 peer-reviewed studies published between 1981 and early 2008, the results emphasized different aspects of the service performance, namely operational, customer, strategic, supplier, and environmental.

Other authors have also concerned about the diversity of aspects associated with the research and practice of performance measurement. Table 2 summarizes categories of analysis related to the performance measurement practices according to the literature reviewed.

Table 2. Aspects related to performance measurement.

Category	Type/Classification
Perspectives	Effectiveness; Efficiency; Comprehensive.
Approaches	Survival; Accountability; Present value; Subjective; Multidimensionality.
Classes of measures	Accounting-Financial; Customer/Market; Process; Innovation; Learning; Social; Environmental; Behavioral; Aggregated; etc.
Methods	Objective; Subjective.
Data source	Primary (from the organization); Secondary (databases or third parties).
Scope of analysis	Country; Industry; Organization; Business Units; Departments; Divisions.
Orientation	Transversal; Longitudinal.

Sources: Based on (Ginsberg, 1984; Dess and Robinson, 1984; Haber and Reichel, 2005; Carneiro *et al.*, 2005; Yildiz and Karakas, 2012)

Currently, there is an emphasis on the multidimensionality of the construct performance, derived from the recognition of the complexity and ever changing characteristic of the business environment (Kennerley and Neely, 2003; Richard *et al.*, 2008). Accordingly, the literature clearly points to the increasing importance of the different facets of performance measurement, tracking, monitoring, improvement, benchmarking, and management (Gomes and Yasin, 2011).

Organizations are ever more compelled to improve their practices for measuring and analyzing performance to be reasonably effective and competitive. More recently, research literature has emphasized the design and implementation of Performance Measurement Systems (PMS), as well as the integration of performance measurement within the organization´s environment, strategic management practices, and culture (Nudurupati *et al.*, 2011; Franco-Santos *et al*., 2012; Bourne *et al*., 2013).

In this context, the effective design, implementation, and use of PMS have emerged as critical factors for effective performance measurement. According to a proper and straightforward definition by Neely *et al*. (1995), PMS can be understood as a set of measures used to quantify both the efficiency and effectiveness of the organizational action. Based on a wider perspective, Lebas (1995) characterized PMS as the philosophy supported by performance measurement, which includes the shared vision, teamwork, training, incentives and other elements surrounding the performance measurement activity.

Regarding the development and implementation of a PMS, several methods have been described in the research literature. It is argued that the appearance of the first PMS by the 1980s are the result of the changes in the way organizational performance has been measured. In this sense, the literature began to stress the utility of non-financial measures, as well as the need to balance and integrate the different performance dimensions (Nudurupati *et al.*, 2011; Franco-Santos *et al*., 2012; Neely, 2005).

Lohman *et al*. (2004) suggested that a remarkable characteristic of many of the methods for developing PMS is the focus on developing performance metrics and implementing a system based on the firm´s strategy and processes. Gomes and Yasin (2011) provided a list of some relevant characteristics of PMS as highlighted by the performance measurement literature (Table 3).

Table 3. PMS characteristics.

Characteristic	Author *apud* Gomes and Yasin (2011)
Reflects relevant non-financial information, based on key success factors of the organization	Clarke (1995)
Articulates strategy and monitoring organization results	Grady (1991)
Based on organizational objectives, critical success factors, and customer needs	Manoochehri (1999)
Monitoring both financial and non-financial aspects	Manoochehri (1999); McNair and Mosconi (1987); Drucker, 1990)
Capacity to change dynamically with the strategy	Bhimani (1993)
Meet the needs of specific situations in relevant operations but also should be long-term oriented	Santori and Anderson (1987)
Must make a link to the reward systems	Tsan *et al*. (1999)
Stimulates the continuous improvement processes	Kaplan and Norton (1992, 1993); Flapper *et al*. (1996); Neely *et al*. (1997); Medori and Steeple (2000)
Must be simple, easy to understand, implement, and use	Santori and Anderson (1987); Kaplan and Norton (1996); Ghalayini *et al*. (1997)
Must be clearly defined and present a very explicit purpose	Flapper *et al*. (1996); Neely *et al*. (1997)
Should allow a fast and rigorous response to changes in the organizational environment	Bititci *et al*. (1997); Medori and Steeple (2000)

Source: Based on Gomes and Yasin (2011).

Concerning the problem of effectively measure performance in organizations, it leads to the discussion on the performance measures to be used given the different dimensions of performance. Although providing further discussion on this specific topic is not an objective of this thesis, it is to be stressed the existence of arguments for using a set of measures that will properly reflects the complexity of each organization´s dynamics (Kirby, 2005; Kaplan and Norton, 1996; Richard *et al.*, 2009; Franco-Santos *et al*., 2012; Richard *et al.*, 2008; Neely, 2005).

Despite the diversity of performance measures and PMS configurations, the essential idea is that the particular organization´s environment and the necessity of performance comparison against its competitors must be taken into account so that to guide the decision-making process as regards the performance measurement practices. In this context, given the different facets of performance measurement, benchmarking best practices are usually seen as a crucial ingredient in the effort to achieve a superior performance (Gomes and Yasin, 2011; Hong *et al.*, 2012).

As organizations are compelled to integrate benchmarking efforts within their performance measurement practices, benchmarking is thus another common issue identified in the performance-related literature. Based on an extensive literature review of benchmarking practices, Hong *et al*. (2012) concluded that benchmarking remains an important strategic tool for organizations in turbulent times. Their findings suggested that different approaches to benchmarking could be used, based on the specific purposes: strategy-based benchmarking; operational effectiveness-based benchmarking; technical efficiency-based benchmarking; and micro-macro integrative benchmarking. In this sense, the authors proposed that for achieving the best results, benchmarking practices should go beyond the operational level and moves into a wide range of value chain, strategic, operational, and project levels.

Another issue related to performance measure particularly relevant for this thesis is the importance of considering the stakeholders´ needs in the measurement process. Research in the field of performance measurement supports the notion that organizations cannot be seen as private institutions solely responsible to their shareholders, but instead should be regarded as social institutions. In this context, a firm is accountable to all of its stakeholders who are affected by the business activities (Harrison *et al*., 2010; Ackermann and Eden, 2011). Concerning actual performance measurement practices, authors have advocated that measures should be derived from the stakeholders´ needs (Neely *et al*., 2001).

3.2.1. PERFORMANCE MEASUREMENT AND STAKEHOLDERS

The traditional performance measures based on financial results are certainly important for managers. However, they give only a little insight into why these particular results were achieved, and virtually nothing about other aspects of the business. Accordingly, they fail in provide guidance for where or how improvements can be made (Kaplan and Norton, 1996; Neely, 2005). Furthermore, information derived from financial measures are usually insufficient for several of the stakeholders related to an organization.

The need for extending performance measurement practices beyond these traditional financial indicators has been widely advocated in the literature, as mentioned in the previous section. At this point, in this particular subsection, the relevance of stakeholders for performance measurement and management is linked to the conceptual framework of this study.

The stakeholder concept has been broadly defined by the recognition of the existence of multiple parties having a legitimate interest or stake in the business (Freeman, 1984; Donaldson and Preston, 1995; Agle *et al.*, 2008; Ackermann and Eden, 2011). According to Freeman (1984), an organization must be accountable to all of its stakeholders who are affected by the business outcomes. Over the last decades, this "stakeholder approach" has been presented in the literature and practice related to organizational performance (Harrison and Wicks, 2013; Atkinson *et al*., 1997).

Developments in stakeholder theory have supported organizations to move on from organization-based approaches, in which stakeholders are managed exclusively for the organization's own benefit, towards a wider approach based on long-term relationships with mutual benefits (Harrison *et al*., 2010).

Authors have debated on theories for explaining the organization-stakeholder interaction and provided some rationales of stakeholder identification. In this study, Freeman´s definition of stakeholder as "any group or individual who can affect or is affected by the achievement of the organization´s objectives" is used (Freeman, 1984:46). Considering stakeholders in the process of measuring performance is grounded on the notion that they have a legitimate interest in and an ability to influence the actions of an organization. Hence, there are legal, moral and utilitarian reasons for including the stakeholders´ needs within the performance measurement process (Freeman, 1984; Agle *et al.*, 2008; Jones *et al*., 2007).

Legal arguments for why stakeholders should be taken into account are based on the conception that any organization exists in contemplation of the law, has a personality as legal person and limited liability for its actions (Freeman, 1984). Therefore, executives will always have responsibilities to the organization shareholders, in the sense that business must be conducted according to their interests. However, several provisions in contemporary law also define obligations to customers, employees, local communities, and other publics (Phillips, 2003).

Jones *et al*. (2007) stress that decision making with respect to stakeholder relationships can be fraught with tension. Accordingly, trade-offs between organization and stakeholder interests will inherently involve allocation of benefits and burdens among human beings and, hence, will involve moral questions. Consistent with this perspective, an organization must see stakeholders as having intrinsic value and thus should accept taking stakeholders into account as its moral obligation. In fact, the moral arguments for adopting a stakeholder approach are diverse, comprising transaction costs, property rights and the principle of stakeholder fairness as summarized by Gooyert (2012).

Based on utilitarian reasons, taking stakeholders´ interests and objectives into account could be in the self-interest of the organization. Based on the well-known “prisoners’ dilemma game”, Freeman (1984) claimed that adopting a posture of negotiation with the several stakeholder groups is the only way to keep from having a solution imposed from outside. Although an organization could take short-term advantage by making a decision that harms a stakeholder, in the future this organization is likely to deal again with the same stakeholder and a process of conflict may start. Furthermore, negotiation with stakeholders leads to avoiding enforcement costs (Harrison *et al*., 2010).

Whether taking stakeholders´ interests and objectives into account is admittedly important for organizations, there is the problem of properly identifying the stakeholders and their objectives related to the organization (i.e. stakeholder analysis). There is a consensus that all stakeholders have a role to play in the management of organizations, and thus they need to be adequately involved based on the degree they can influence organization outcomes or are affected by them (Mitchell *et al*., 1997; Agle *et al.*, 2008).

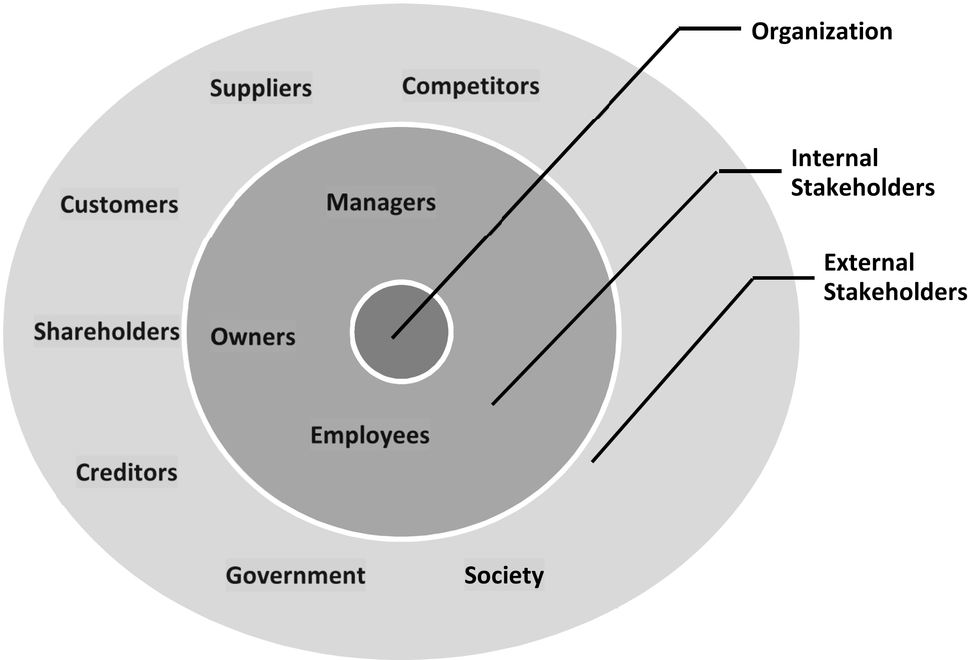
Friedman *et al*. (2004) proposed that four aspects should be considered for identifying stakeholders. First, there is a direct or indirect connection between the stakeholder and the organization. Second, the stakeholder´s interests are measurable. Third, the stakeholder is perceived as a legitimate and integral part of the business environment. Fourth, the stakeholder may undertake different functions in interacting with the organization.

There are a number of alternatives for stakeholders´ identification. Based on literature review, Miragaia *et al*. (2014) identified two main approaches for stakeholder classification: i. the categories of internal and external stakeholders (Freeman, 1984) and ii. the stakeholder salience (Mitchell *et al*., 1997).

Freeman (1984) provides a model of the organization-stakeholders relationships, according to which there are always several stakeholders influencing and being influenced by the organization. These stakeholders are expected to have different demands and influences on the organization, so they cannot be treated as one single entity. In this context, the internal stakeholders are responsible for the implementation of the organizational objectives and the external stakeholders are those affected by the organization outcomes.

In simple terms, internal stakeholders are groups within the organization and considered as parts of the organization (e.g. owners, managers, and employees). The external stakeholders do not form part of the organization but have legitimate interest or involvement in the organization actions and results (e.g. customers, suppliers, government, and local community). This stakeholder categorization has been largely used in the literature and management practice and will serve as a frame of reference to this Thesis. Figure 8 illustrates examples of typical internal and external stakeholders for the case of a general business organization.

Figure 8. The typical internal and external stakeholders of a business organization.



Source: Based on Freeman (1984).

Mitchell *et al*. (1997) advocate that properly engaging the different stakeholders and their roles and interests is important to understand how they affect the organization and its activities. According to the authors, the concept of “stakeholder salience” may be useful for supporting the process of stakeholder identification. Stakeholder salience is determined by three attributes: power, legitimacy, and urgency. In this context, salience is related to the degree to which management should give priority to competing stakeholder claims (Mitchell *et al*., 1997).

Power is the ability of the stakeholder to influence organization´s decisions. This attribute is also related to the organization´s dependence on a stakeholder. Legitimacy implies that the stakeholder has a legal, moral, or presumed claim. It is defined as a generalized perception or assumption that the actions of an entity are desirable or appropriate within a socially constructed system of norms, values, and beliefs. Urgency is related to the degree of which the stakeholder claims call for immediate attention (timely response) from management (Neville *et al*., 2011).

In practical terms, the classification of stakeholders is based on their degree of saliency according to managers perceiving them as possessing these three key attributes. More specifically, stakeholders will become increasingly salient within the perception of managers as they accumulate any combination of these three attributes (Mitchell *et al*., 1997; Neville *et al*., 2011). This method for stakeholder identification has been used in several empirical approaches (e.g. Neville *et al*., 2011; Le *et al.*, 2014; Zakrzewski, 2008; Weber and Marley, 2012).

Accordingly, stakeholders can be classified in different ways, based on these three attributes. This classification system is obviously dynamic, and a stakeholder salience can rise or decline. Hence, managers have to track all stakeholders and their evolvement continuously over time.

Lately, in addition to these three attributes, Driscoll and Starik (2004) proposed another dimension to capture the spatial relationship between stakeholders and the organization or a specific planned intervention, called proximity. This fourth attribute has been considered in Haigh and Griffiths (2009) and Le *et al*. (2014).

The proper identification of stakeholders is pivotal to address the problem of associating stakeholders´ interests with the process of measuring performance. Certainly, the effectiveness of any PMS is dependent on the extent to which the organization has successfully identified its key stakeholders´ needs and interests regarding the business (Franco-Santos *et al*., 2012; Neely *et al*., 2001). Additionally, the multidimensional nature of performance may be best approached in view of the particular interactions between the organization and its several stakeholders. Another main issue associated with integrating stakeholders into organizational strategy and performance measurement is related to obtaining useful information for guiding the strategy process as well as product/service development (Harrison *et al*., 2010).

In this Thesis, the identification of the airport stakeholders and how their interest or objectives may be affected by airport performance are considered. As major airports are complex and dynamic organizations consisting of many interacting parts, several different stakeholders need information on the diverse aspects of airport performance. According to Wu and Mengersen (2013), airports represent the epitome of complex systems with multiple stakeholders, multiple jurisdictions and complex interactions between many actors.

Accounting for the diversity of stakeholders´ interests shall lead airport managers towards the adoption of a wider approach to the performance construct. Consequently, performance measurement practices within the airport sector are supposed to embrace a multidimensional perspective. Aware of the importance of integrating stakeholders in the process of measuring performance, Humphreys and Francis (2002) claimed that measurement practices at airports were likely to be driven by the forces of a more commercial focus, increased responsiveness to targets set by regulators and increased sensitivity to environmental standards.

Schaar and Sherry (2010) described the interrelationships between airport stakeholders from an operational perspective and emphasized the implications of the airport-stakeholder interaction for a comprehensive performance benchmarking. Their study identifies the airport stakeholders, their objectives for the airport, and the relationships between them. The authors concluded that airport benchmarking must be based on the goals of one or more stakeholders. However, depending on the stakeholders, conflicting goals may exist, and hence managers are challenged with the need for balancing these opposing objectives in determining the airport performance goals.

Jimenez *et al*. (2013) approached the airport as a multi-service firm that interacts with a network of stakeholders to deliver service packages to different groups of customers. The authors elaborated on airport stakeholder identification and emphasized different customer groups. An integrated conceptual framework to support the appraisal and design of competitive strategies for airports was delivered.

As regards performance measurement practices related to stakeholders, Humphreys *et al*. (2002) found that, besides the traditional operational and financial measures, airports in Europe and the USA were concerned on environmental measures so that to comply with regulatory provisions. These authors also argued that participation from the stakeholders to which the performance targets were mean to benefit may be highly useful for the airports.

In their research on the sustainability of airports, Upham and Mills (2005) aimed to propose and assess a set of environmental and sustainability measures for airport benchmarking. The authors made recommendations on the use of these measures in the airport-stakeholders communication process.

Focusing on the context of developing countries, a study of Akwei *et al*. (2012) assessed the performance of an African airport from the perspectives of three groups of stakeholders: the airlines, the passengers, and the local community. Based on the results, the particular airport focused on financial and service quality measures. They also stressed that the airport did not pay much attention to environmental performance, which seems to reflect in the low ratings provided by the local community.

Skouloudis *et al*. (2012) assessed by content analysis the comprehensiveness and quality of corporate social responsibility (CSR) reports published by airports in different regions. Their findings indicate that CSR reporting was not a common practice among international airports, and there was significant variability in the disclosure practices. Similarly, Koç and Durmaz (2015) provided a comparison of the world's best ten airports according to Skytrax and ACI´s ASQ awards in 2012. Their results indicate that an airport that performs very well according to the passenger expectations not necessarily will perform satisfactorily based on the sustainability measures that can be related to other stakeholders´ interests or objectives.

More recently a study sponsored by the Transportation Research Board (TRB) provided a literature review on stakeholders-related practices in the airport industry (Elliot *et al*., 2015). The authors described practices and tools, communication techniques, feedback loops, and case examples that highlight how smaller airports proactively manage stakeholder relationships. This document of best-practice guidelines also suggested the interest of the airport industry in the USA in the matter.

Focusing on the impact and benefits of the airport privatization on groups of stakeholders, Zakrzewski (2008) reported the perceptions of key stakeholder groups on the privatization of Sydney Airport, in Australia. Preliminary attributes and indicators of an airport performance model including stakeholders' perspectives are presented. Subsequently, this same author proposed a theoretical model referred to as the Stakeholder Airport Performance Assessment Model (SAPAM), proposed to examine airport performance from the stakeholders' perspectives (Zakrzewski, 2009).

Based on this literature review, it seems that there is an increasing awareness about the need for considering stakeholders´ interests in the performance measurement process within the airport industry. Recognized the relevance of stakeholders´ interests, the particular concern in this Thesis is the identification of key airport stakeholders and how airport performance may be related to their interests or objectives.

This Thesis does not aim to elaborate on stakeholder identification, thus based on the literature reviewed; it grounds on Schaar and Sherry (2010) and Zakrzewski (2009) for airport stakeholder identification. In the context of this study, the external stakeholders are emphasized, as opportunely discussed in the next section.

3.3. A SYSTEMATIC LITERATURE REVIEW ON AIRPORT PERFORMANCE MEASUREMENT

In addition to the common reasons for considering an effective performance measurement a key issue for today´s organizations (Hamann *et al.*, 2013; Lampe and Hilgers, 2015), some factors can be considered particularly significant for the airport context. As previously discussed in Chapter 2, it is remarkable the increasing air traffic demand, the deregulation process, and the intensifying movement for changing airport ownership and governance forms. Consequently, there is a current paradigm for the airport business in which a broader perspective of airport performance seems to be imperative, as well as the development of reliable measurement practices.

In this context, understanding how this specific industry has been dealing with different aspects of performance is a timely and relevant subject. Accordingly, in this subsection, the results of an extensive literature review on performance measurement in airport settings are reported.

This systematic literature review study (SLR) is related to the objective 1. Thus, it aims to provide a comprehensive overview of the studies related to the subject according to replicable procedures. Explicitly, the following questions were addressed in the process of literature review.

a) How the literature related to airport performance measurement has evolved since the 1970s?
b) Which performance dimensions related to the airport business have been emphasized?

Concerned to reduce systematic errors or bias, this study was undertaken according to the systematic literature review method. A systematic literature review (SLR) aims to identify, appraise and summarize relevant studies to answer one or more research questions (Petticrew and Roberts, 2006).

In using this method, the researcher looks for applying the same rigor to secondary research (i.e. research about research) as there should be in primary research. For this purpose, research procedures need to be documented so that to provide an audit trail of the literature review process regarding the databases searched, the search conditions applied, and the categories of analysis used (Ginieis *et al*., 2012).

The next subsection describes the literature review procedures, including research criteria, classification categories, and data treatment procedures. Afterward, the results are presented and discussed in the following section. Finally, a summary of the findings, implications, and considerations on a research agenda on airport performance measurement are delivered.

3.3.1. SLR Procedures

Research Criteria

For the purpose of systematically review the literature on airport performance, several online academic sources were used, namely: Elsevier Online Database (Science Direct), Emerald Insight, SAGE Publications, SpringerLink, Taylor and Francis, Wiley Online Library, Blackwell, Scopus, and Proquest. Furthermore, additional searches were processed in the TRID database (Transportation Research Board, 2015), since it was expected to find relevant gray literature (Juricek, 2009). This gray literature comprises studies published outside academic journals but released by relevant sources. In this sense, these additional searches included books, book chapters, technical or research reports, and some conference proceedings[4].

Date range comprised the period from 1970 to May/2015. The research effort was undertaken from January/2015 to May/2015. As regards search criteria, only the results with keywords appearing in the document´s title, abstract or document´s keywords were considered potentially relevant.

The searching process comprised two phases. In the first phase, the subject of airport performance was approached with a wider perspective. Accordingly, the following keyword combinations were used: airport + performance, airport + measurement, and airport + management.

The second phase of the searching process aimed to identify the different aspects related to airport performance. Therefore, compound keywords with the terms "airport" and "performance", along with terms referring to the several aspects previously identified in the first phase have been used, such as: efficiency, productivity, benchmarking, financial, finance, economic, service quality, level of service, satisfaction, customers, safety, security, operational, operation, competition, competitiveness, environmental, noise, pollution, and

[4]Proceedings provided by the referred publishers or TRID database were considered in the literature sample.

social. Table 4 summarizes the keywords used in these two phases of searching.

Table 4. Phases of the SLR search process.

Phase	Keywords
1	airport + performance; airport + measurement; airport + management.
2	airport + performance + (efficiency, productivity, benchmarking, financial, finance, economic, service quality, level of service, satisfaction, operational, operation, safety, security, environmental, noise, pollution, social)

The exclusive use of keywords in the English language is justified for the prevalence of this language in the academic literature (Genç and Bada, 2010). Moreover, it is current practice to present abstracts in English even when the original text is written in another language. In following these search criteria, we have sought to guarantee the greater representativeness for the literature sample.

Classification categories

Consistent with the specific research questions addressed in this SLR, the documents were assessed and classified according to the following categories. Based on these categories, a comprehensive and systematized knowledge on the evolution of the literature on airport performance is expected:

- Period of time of the publication;
- Source of publication (whether academic journal or gray literature);
- Type of document (whether article, book, book chapter or report);
- Nature of the study (whether empirical, conceptual, case study, literature review, simulation, report, case study or practical guidance);
- Performance dimensions emphasized.

As regards the performance dimensions, we have based on the background of provided by the strategic management field previously discussed in Section 3.2. Accordingly, we recognize that interesting relationships among different aspects of airport performance would be potentially lost if performance was treated as a one-dimensional construct (Boyd *et al.*, 2005). Moreover, two domains of performance were considered, the organizational domain and the operational domain.

Furthermore, we aimed to provide a framework of the performance dimensions with interest by external stakeholders. This approach is consistent with the premise that performance measures should be derived from the need of stakeholders, instead of prescriptive strategies (Neely *et al.*, 2001). Concerning this particular contribution, the identification of airport external stakeholders was based on Schaar and Sherry (2010) and Zakrzewski (2008; 2009). Hence it comprises customers (airlines, other air operators, passengers, passenger´s companions, other airport users); infrastructure asset providers; suppliers and partners; investors/shareholders; government; regulators; community; and environmental groups.

Concerning the development of this framework, we firstly identified the aspects related to airport performance measurement during the literature review. Then, we submitted the set of potential performance dimensions to content validation by nine experts, among scholars and professionals in three different countries[5]. These experts were contacted personally or by email and asked to state their opinions on the proposed categorization *vis-à-vis* a definition of scope and a set of examples of related performance measures. The objective was to obtain the experts´ opinion on whether the proposed dimensions appropriately comprised the respective performance measures and whether these dimensions were sufficiently discriminant among each other.

Data Treatment

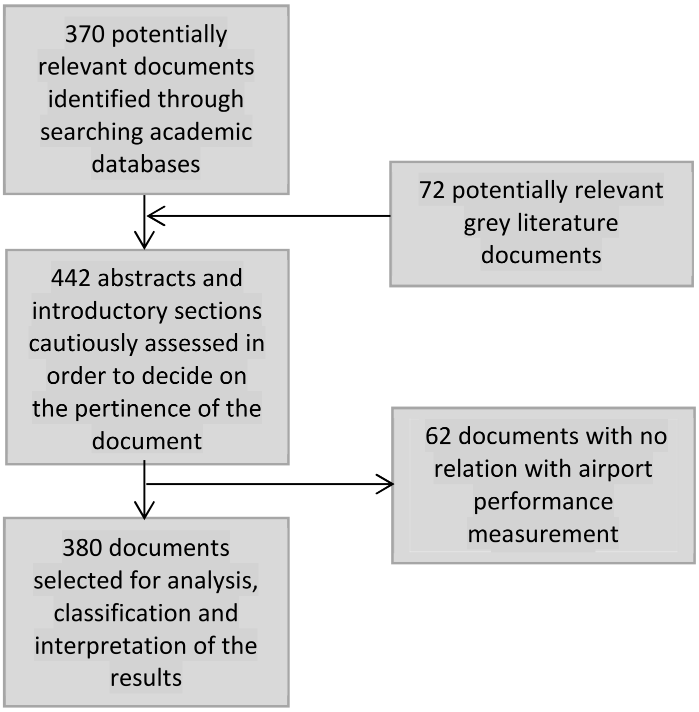
Following the research criteria, 370 potentially relevant studies were identified through the searching databases. Additionally, 72 potentially relevant gray literature documents were found. However, after careful examination of the abstracts and introductory sections, we realized that some documents had used the terms in contexts not relevant to this study.

[5] Researchers and practitioners from Brazil, Canada, and Portugal were considered for this consultation process.

Therefore, the documents not actually pertinent were excluded, and the 380 remaining documents were considered for analysis, classification and interpretation of the results.

The following flowchart summarizes the data treatment process and illustrates the inclusion and exclusion of studies from the review (Figure 9).

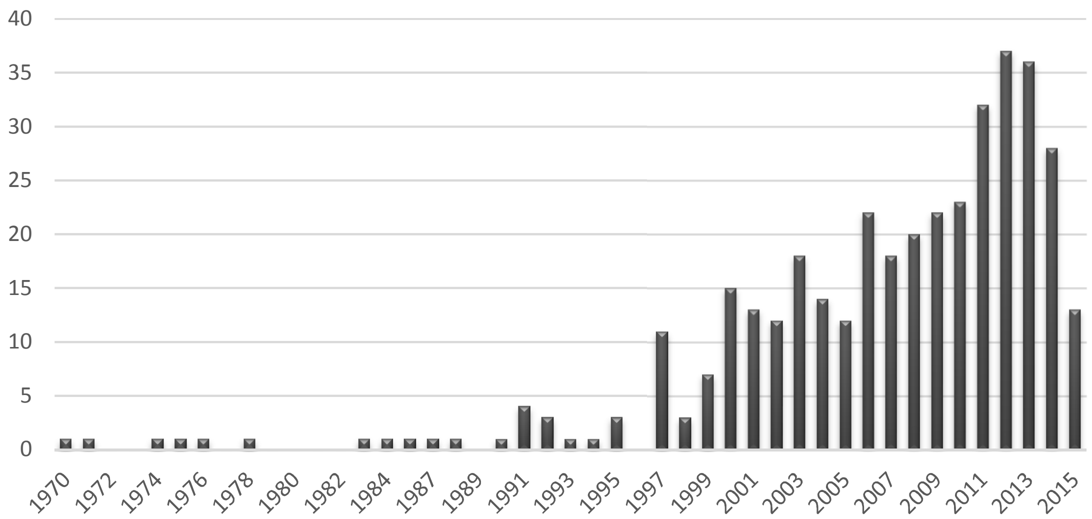
Figure 9. SLR data treatment flowchart.



3.3.2. The SLR Results

Based on the literature reviewed, it was found that knowledge on airport performance measurement is well documented, comprising empirical studies, theoretical essays and literature reviews, along with some professional-related studies and reports. However, it was only by the middle of the 1990s that performance measurement issues become more evident when it is possible to see a crescent and uninterrupted flow of publications within the literature reviewed (Figure 10).

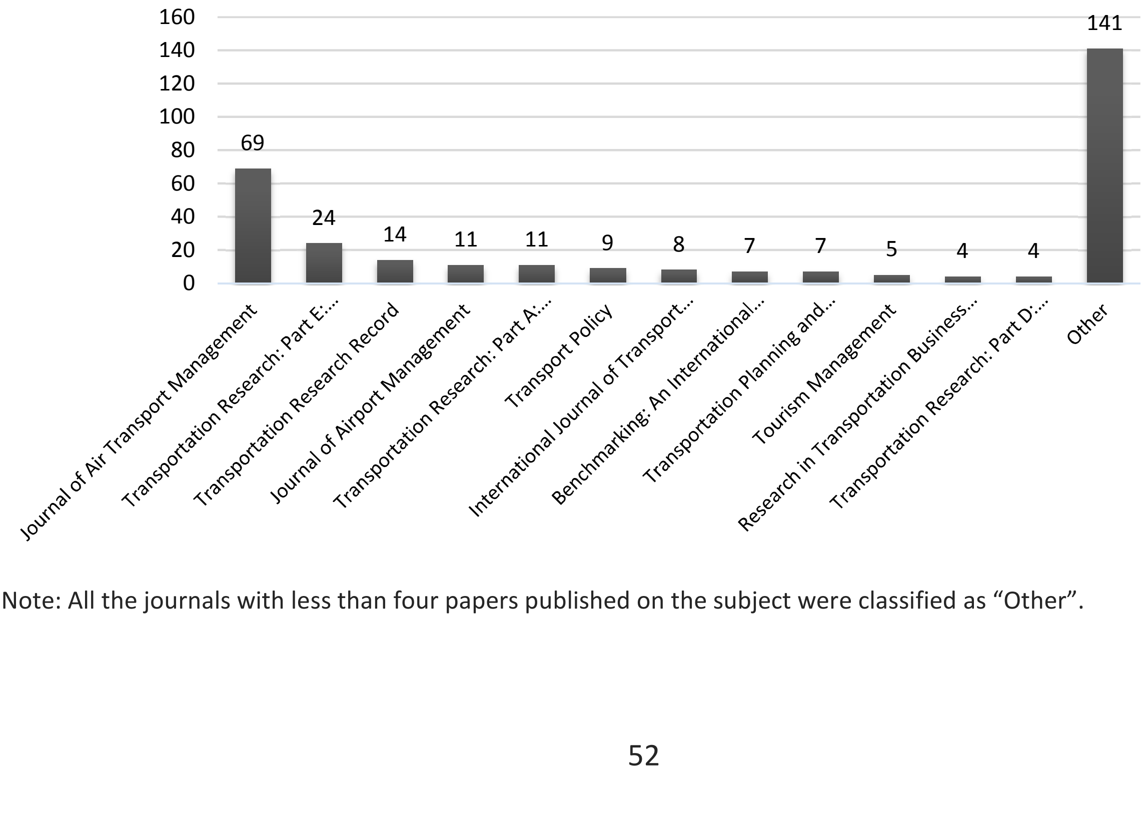
Figure 10. Documents published in the airport sector by year (1970 to May/2015).



Note: As regards books and periodic reports, only the first edition was considered.

As regards the research literature, five journals concentrate about 41% of the publications, namely the Journal of Air Transport Management, Transportation Research: Part E, Transportation Research Record, Journal of Airport Management, and Transportation Research: Part A (Figure 11). The column "Other" refers to the studies published in other journals that presented less than four publications within the period.

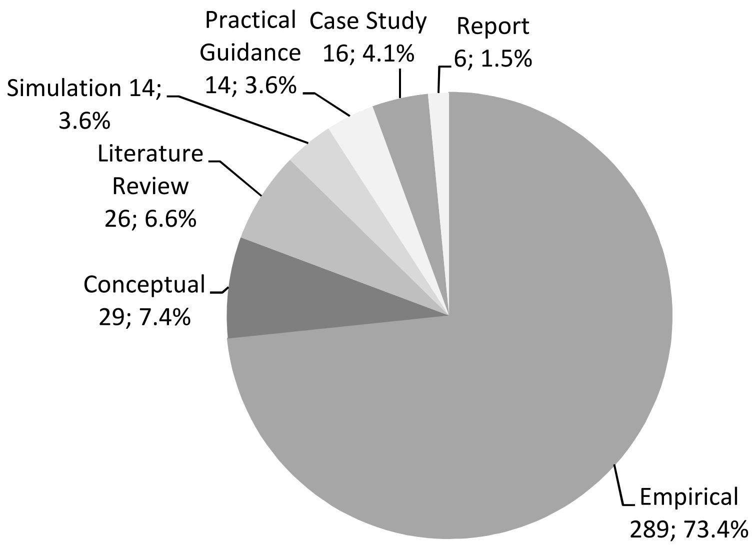
Figure 11. Distribution of scholar studies by the journal of publication.



Note: All the journals with less than four papers published on the subject were classified as "Other".

Figure 12 outlines the studies according to their nature. Seven categories were considered: empirical, conceptual, case study, literature reviews, simulation, practical guidance, and reports. Accordingly, empirical studies represent about 73% of the sample literature, followed by conceptual studies and literature reviews, both with 7%.

Figure 12. Distribution of studies according to nature.



Note: Some studies were classified in more than one category.

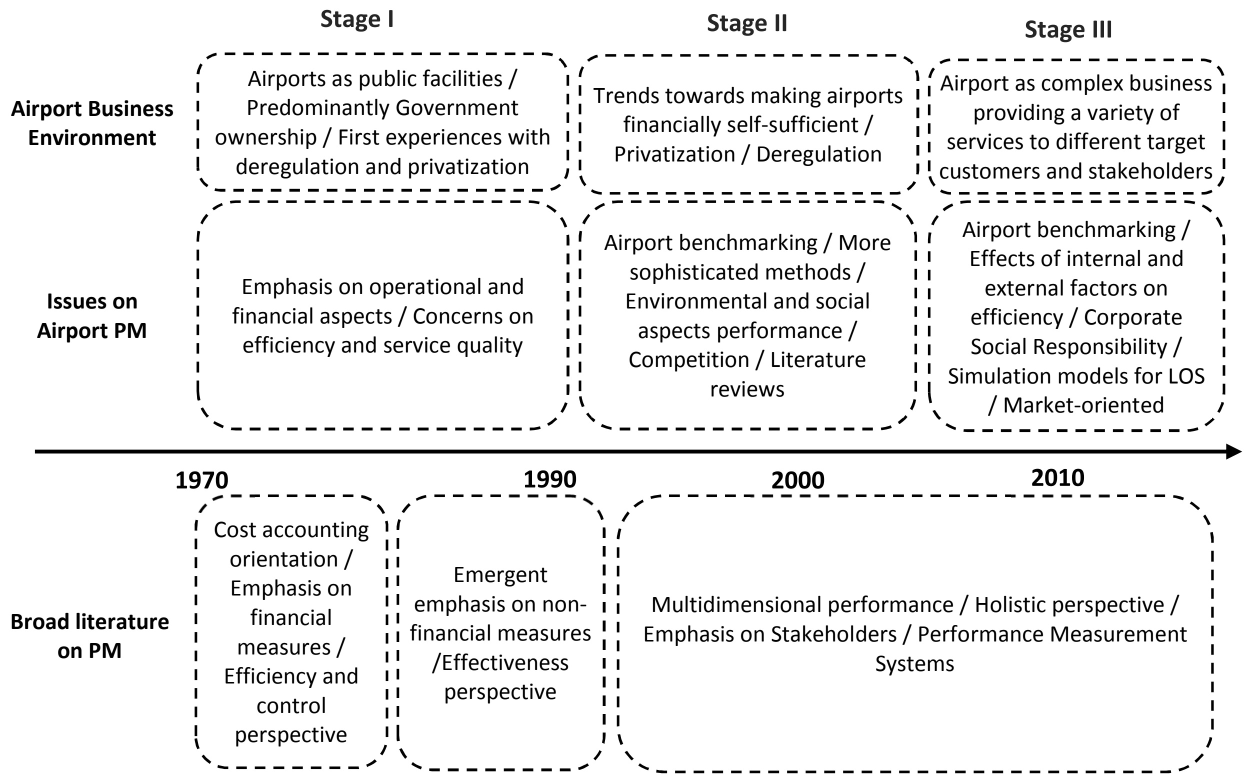
After this brief overview of the airport-related literature, the specific research questions guiding the SLR process are covered. First, the evolution of the airport performance measurement is assessed, and then the performance dimensions are examined subsequently.

The Evolution of Airport Performance Measurement

How the literature on airport performance measurement has evolved since the 1970´s is the first research question considered in the SLR. Based on the literature reviewed, the evolution of airport performance measurement may be explained in three stages. The first stage comprises the 1970s and 1980s. The second stage comprises the 1990s and the early 2000s. The third stage comprises the period from the beginning of the 2000s until the present days.

Figure 13 illustrates this evolution along with information regarding the airport business environment and the broad literature on performance measurement (PM).

Figure 13. Evolution of the literature on airport performance measurement.



Stage I

In this first stage, studies related to performance measurement were scarce in the airport-related literature. This lack of interest might be associated with the weak business pressures within the airport industry, as airports were mostly under government ownership (Francis *et al*., 2002; Graham, 2005; Gillen, 2011).

Regarding this period, only a few studies were identified, essentially focused on the operational, efficiency and financial aspects of airport performance (Keeler, 1970; Whitbread, 1971; Doganis and Thompson, 1974; Doganis *et al*., 1978; Doganis and Nuutinen, 1983; Doganis and Graham, 1987). The assessment of the level of service (LOS) in passenger´s terminals has also received attention (Bennets *et al*., 1975; Mumayiz and Ashford, 1986; Omer and Khan, 1988; Tosic and Babic, 1984).

As a whole, during this first stage, the airport industry had been aligned with the issues and practices reported by the broad literature on performance measurement. Notwithstanding, airports seem to have been slow in adopting a non-financial approach to performance measurement, which was emphasized in several other contexts at the late 1980s (Assaf, 2011b; Yasin and Gomes, 2010). Focusing on the European context, Doganis and Graham (1987) concluded that few airports had implemented comprehensive and systematic performance practices, mostly stressing the use of financial and operational indicators.

Stage II

Following the trend towards making airports financially self-sufficient, the airport industry has been progressively motivated to adopt a different approach regarding performance measurement (Graham, 2005; Jarach, 2001). During this period, airports have increasingly been recognized as mature firms that should be able to stand-alone and operate without government support (Gillen and Lall, 1997).

There was a significant increase in the literature related to airport performance during the 1990s, what appears to have led to its recognition as trending topic within the airport-related literature (Gillen and Waters, 1997). Airport benchmarking appeared as the main topic, with efforts for improving the methods for efficiency/productivity assessment (for further discussion, see Lai *et al*. (2012), Vogel and Graham, 2013, and Graham, 2005). Benchmarking has also become the object of regular studies carried out by organizations within the airport industry (ATRS, 2002; Graham, 2005).

Despite this increasing interest in airport benchmarking, the limited value of simple comparisons among performance indicators was emphasized. Authors have advocated the need for exploring the effects of airport characteristics, managerial factors, and exogenous variables on airport efficiency/productivity to provide more useful insights from the benchmarking results (Bazargan and Vasigh, 2003; Humphreys and Francis, 2002; Yoshida and Fujimoto, 2004; Sarkis, 2000; Adler *et al*., 2013; Lai *et al*., 2012).

Additionally, during this second stage, the following issues have emerged:

- Environmental and social issues associated with the airport activities (e.g. Ignaccolo, 2000; Inamete, 1993; Morrell and Lu, 2000; Pitt and Smith, 2003);
- Advances in level of service (LOS) assessment by simulation-based models (Brunetta *et al*., 1999; Ignaccolo, 2003) and passenger perception of service quality, including terminal elements and airport processes (i.e. check-in, security screening, etc.) (Muller and Gosling, 1991; Seneviratne and Martel, 1991, 1994; Mumayiz, 1991; Lemer, 1992; Hackett and Foxall, 1997);
- Aspects of competition within the airport industry (e.g. Park, 1997, 2003; Pathomsiri and Haghani, 2004);
- Considerations on the airport performance multidimensionality and relevance of the airport stakeholders (Janic, 2003b; Humphreys *et al*., 2002; Francis *et al*., 2002).

Regarding the broad literature on performance measurement, there was a peak of research activity by the late 1990s, with an emphasis on the multidimensional perspective for performance measurement and the development of performance measurement systems (Neely *et al.*, 2000; Neely, 2005; Taticchi *et al*., 2010; Yasin and Gomes, 2010). It is noteworthy that the airport-related literature has once more followed these trends with a significant lag (Francis *et al*., 2002; Graham, 2005).

By the early 2000´s, some literature reviews and empirical studies on the actual practices of performance measurement in airports were published (e.g. Francis *et al*., 2002; Humphreys and Francis, 2002; Humpreys *et al*., 2002). In addition, a review of the evaluation of airport level of service was provided by Correia and Wirasinghe (2004). There were also reviews of previous benchmarking studies focusing on airport efficiency (Fry *et al*., 2005; Mackenzie-Williams, 2005; Graham, 2005).

In this context, for the purpose of describing the evolution of the literature on airport performance measurement, these more systematic efforts of literature review and critical analysis may represent a significant milestone, since they may reveal a maturing of the research on airport performance measurement.

Stage III

The literature kept increasing regarding quantity and range of performance aspects considered. About the middle of the decade of 2000, besides significant developments in benchmarking and LOS studies, a broader approach to the performance construct appeared to be more evident in the airport related literature.

Essentially covering the last decade, this third stage seems to reveal an increasing interest in approaches and methods currently used in other service settings. The following issues are representative of the most recent literature on airport performance measurement (Table 5):

Table 5. Issues in the most recent literature on airport performance measurement.

Issue	Authors
Sophistication of the methods for airport efficiency/productivity benchmarking	(Martín and Román, 2006; Barros and Dieke, 2008; Jessop, 2009; Martín *et al*., 2009; Barros, 2009; Suzuki *et al.*, 2010; Yu, 2010; Assaf, 2011a; Abrate and Erbetta, 2010; Lai *et al.*, 2015; Assaf *et al*., 2014)
The effects of different internal and external variables on airport efficiency (including airport size and characteristics, managerial factors, ownership/governance forms, regulatory aspects, economic downturn, undesirable outputs, etc.)	(Oum *et al*., 2006; Pathomsiri *et al.*, 2008; Yu *et al.*, 2008; Chi-Lok and Zhang, 2009; Fan *et al*., 2014; Voltes-Dorta and Pagliari, 2012; Martín *et al*., 2013; Merkert and Mangia, 2014; Adler and Liebert, 2014)
Accounting for service quality within studies on airport efficiency measurement	(De Nicola *et al*., 2013; Merkert and Assaf, 2015)
Passenger perception of quality and their level of satisfaction with different airport service attributes	(De Barros *et al*., 2007; Chen, 2007; Correia *et al*., 2008a; Chien-Chang, 2012; Mikulic and Prebežac, 2008; Bogicevic *et al.*, 2013)
Discussions on service quality measurement, including exploratory studies on ASQ multidimensionality	(George *et al*., 2013; Fodness and Murray, 2007; Bezerra and Gomes, 2015)
Improvement of simulation models for assessing airport terminal LOS	(Zografos and Madas, 2006; Andreatta *et al*., 2007; Manataki and Zografos, 2009; Zografos *et al*., 2013)
Safety performance measurement	(Enoma and Allen, 2007; Enoma *et al*., 2009; Pacheco *et al*., 2014; Leva *et al*., 2015; Roelen and Blom, 2013; Chang *et al*., 2015)
Security measures and their impact on	(Sindhav *et al.*, 2006; Gkritza *et al*., 2006; Enoma and Allen,

passenger perception of quality	2007; Enoma *et al*., 2009)
The impact of non-aeronautical revenues on financial performance and sustainability, according to a market-oriented approach to the airport business	(Vogel, 2011; Vogel and Graham, 2010; Halpern, 2010; Graham, 2009; Halpern and Pagliari, 2008; Merkert and Assaf, 2015)

Despite the introduction of relevant issues, airport benchmarking remains the main topic of interest. Benchmarking practices are paramount for improving performance. However, while airport managers are required to identify organizational practices that might be related to a superior performance (Adler *et al*., 2013), it seems that the literature mostly adopts an efficiency-based perspective for benchmarking within the airport industry (Hong *et al.*, 2012).

Airport service quality appears as the second most frequent topic, with some approaches and methods usually applied within other industries appearing to have gained momentum (see Bogicevic *et al*., 2013; Fodness and Murray, 2007; Mikulic and Prebežac, 2008; Park and Jung, 2011; Prebezac *et al*., 2010). It seems there is an increasing interest in a broader understanding of airport service quality multidimensionality, particularly from a passenger perspective (Bezerra and Gomes, 2015; Fodness and Murray, 2007; George *et al*., 2013). Moreover, international agencies have been systematically undertaken surveys (ACI, 2015; IATA, 2012), besides ad hoc initiatives by other organizations and airports (Zidarova and Zografos, 2011).

Also, there were attempts to examine airport performance in a strategic approach (Fernandes and Pacheco, 2010; Halpern and Pagliari, 2008; Halpern, 2010; Fernandes and Pacheco, 2007). To be noted that these efforts occurred with a significant lag in comparison with the broader literature on performance measurement. As regards the measurement practices, Graham (2014) observed the adoption of performance measurement frameworks by some airports, namely the Balanced Scorecard.

Some critical essays discussed the practical implications and the methods used for airport efficiency/productivity assessment and benchmarking (Liebert and Niemeier, 2013; Morrison, 2009b; Adler *et al*., 2009; Merkert *et al.*, 2012; Lai *et al*., 2012).

Regarding the professional-related literature, there are efforts to provide more comprehensive frameworks for measuring airport performance (Infrastructure Management Group, 2010; Hazel *et al.*, 2011; ACI, 2012; Kramer *et al*., 2013). It is noteworthy that these industry best practices comprise a broad range of performance aspects that have not been commonly present within research studies.

As regards the different aspects of airport performance, the background provided by the strategic management field, as described in Section 3.2 supports the approach to second research question aimed in this SLR.

Airport Performance Dimensions

The most of the studies reviewed seem to have avoided the complexity inherent in the airport business. Nonetheless, the multifaceted nature of airport performance has been covered by research studies and professional literature (e.g. Airports Council International, 2012; Fernandes and Pacheco, 2007; Francis *et al*., 2002; Gillen and Lall, 1997; Graham, 2005; Hazel *et al*., 2011; Hooper and Hensher, 1997; ICAO, 2006; Infrastructure Management Group, 2010; Janic, 2008; Lai *et al*., 2012; Yeh *et al*., 2011; Zakrzewski, 2008; Zografos *et al*., 2013).

Gillen and Lall (1997) referred to productivity, cost-efficiency, service effectiveness, and financial measures for assessing and benchmarking airport performance. Hooper and Hencher (1997) provided a summary of common measures according to four categories: global performance (includes profitability, cost-efficiency, and cost-effectiveness), productivity, processes, and customer service. Lemaitre (1998) accounted for the financial, marketing (includes passenger satisfaction), and operational perspectives of the airport business. Humphreys *et al*. (2002) worked with three categories: business, service, and environmental. Similarly, Graham (2005) considered the financial, operational (which included service quality), and environmental aspects of airport performance.

Regarding a wider approach to performance, Fernandes and Pacheco (2007) applied a

Balanced Score Card model for airports, focusing on results, service quality, operational and learning perspectives. Zarzewski (2009) built a performance measurement system based on the interest of different stakeholders, emphasizing the operational, financial, and community perspective of the airport performance. A study of Yeh *et al*. (2011) highlighted the following functional areas: productivity, capacity, and delays, efficiency, airline services, competitiveness, financial performance, service quality.

The professional-related literature seems to comprise more diversity as regard the number of performance aspects. The ICAO recommended that airport performance evaluation should comprise the following key performance areas: safety, quality of service, productivity, cost effectiveness (ICAO, 2006). The Airport Council International´s guidance has adapted and expanded the number of ICAO´s performance areas, including core (including outputs of the airport operations), safety and security, quality of service, productivity/efficiency, financial/commercial, and environmental (ACI, 2012). A study focusing on US context proposed nine common areas of performance measurement: safety, security, financial, operational, customer services, environmental sustainability, people, customer relations, and information technology (Infrastructure Management Group *et al*., 2010). Another study provided a sample of measures related to five key performance areas: finance, safety, people, operations, and community (Hazel *et al.*, 2011).

Based on this sample of the literature reviewed, it is evident the diversity of approaches to the construct performance within the airport-related literature. In order to provide a better overview of this situation, Table 6 summarizes the recurrent categories of performance that have been emphasized.

Table 6. Examples of categories of airport performance cited in the literature.

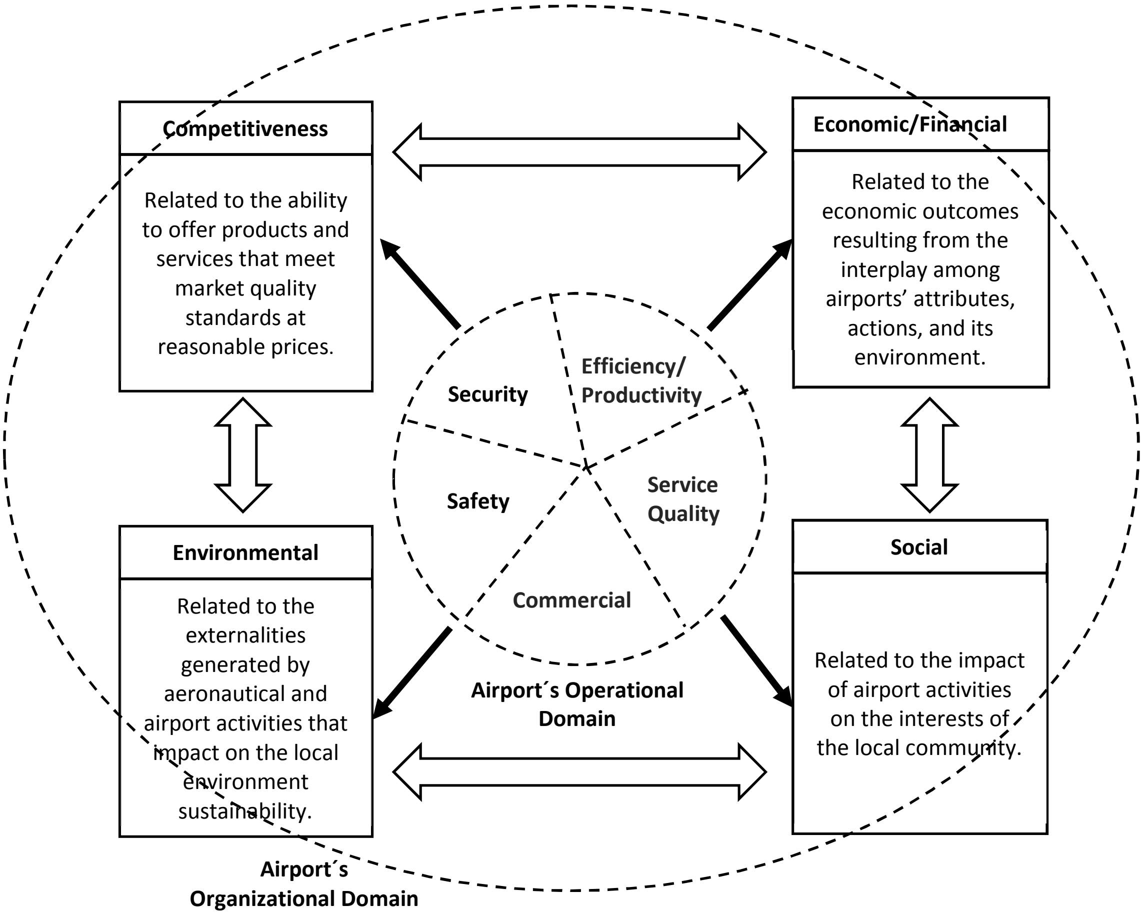
Categories	References
Business	Humphreys *et al*. (2002)
Capacity	Zografos *et al*. (2013)
Client Satisfaction	Zarzweski (2008)
Community	ACRP (2011); Zarzweski (2008)
Core	ACI (2012)
Cost-effectiveness	Hooper and Hencher (1997); OACI (2006);
Cost-efficiency	Gillen and Lall (1997); Hooper and Hencher (1997);
Customer relations	Infrastructure Management Group *et al*. (2010);
Customer service (may include passenger, cargo, and airlines as customer categories)	Hooper and Hencher (1997); Infrastructure Management Group *et al*. (2010);
Delays	Zografos *et al*. (2013)
Results (comprise financial and growth in revenue categories)	Fernandes e Pacheco (2007)
Economic	Janic (2004); Graham (2005); Zarzewski (2008);
Environmental	Humphreys (2002); Graham (2005); ACI (2012); Lai *et al*. (2012); Janic (2004); Infrastructure Management Group *et al*. (2010); Zarzewski (2008);
Financial	Gillen and Lall (1997); Lemaitre (1998); Zarzewski (2008); Infrastructure Management Group *et al*. (2010); Hazel *et al*. (2011); Lai *et al*. (2012; ACI (2012)
Commercial	ACI (2012)
Information technology	Infrastructure Management Group *et al*. (2010);
Learning	Fernandes e Pacheco (2007)
Level of Service	Zografos *et al*. (2013)
Marketing (with focus on passenger satisfaction)	Lemaitre (1998);
Noise	Zografos *et al*. (2013)
Operation/Process Efficiency	Zarzewski (2008).
Operational	Lemaitre (1998); Graham (2005); Zarzewski (2008); Janic (2004); Infrastructure Management Group *et al*. (2010); Fernandes e Pacheco (2007); Lai *et al*. (2012).
Operations (Includes Maintenance and Commercial)	Hazel *et al*. (2011);
People	Infrastructure Management Group *et al*. (2010); Hazel *et al*. (2011);
Processes performance (Runway system, Passenger processing, Baggage handling)	Hooper and Hencher (1997)
Productivity	Gillen and Lall (1997); Hooper and Hencher (1997); OACI (2006);
Productivity/Efficiency	ACI (2012)
Profitability	Hooper and Hencher (1997)
Safety	OACI (2006); Infrastructure Management Group *et al*. (2010); Hazel *et al*. (2011); Zografos *et al*. (2013); ACI (2012); Zarzewski (2008);
Security	Infrastructure Management Group *et al*. (2010); Zografos *et al*. (2013); ACI (2012); Zarzewski (2008);
Service	Gillen and Lall (1997); Humphreys *et al*. (2002)
Service Quality	OACI (2006); Zarzewski (2008); Lai *et al*. (2012); ACI (2012); Fernandes and Pacheco (2007)
Social	Janic (2004); Skouloudis *et al* (2012)

Altogether, these contributions comprise relevant aspects of the multifaceted nature of the airport performance and vary depending on the approach and study´s objectives. Some approaches are more concise, with one category referring to more than one aspect of performance, as the case of Graham (2005), in which the area "Economic" comprise measures of efficiency, productivity, revenue generation and profitability. In contrast, some studies have been very specific, including a diverse set of key performance areas, as the case of the industry best practices (Hazel *et al.*, 2011; ACI, 2012; Infrastructure Management Group, 2010).

Furthermore, some categories are essentially quite similar, as "client satisfaction" from Zarzweski (2009) and "customer relations" from the Infrastructure Management Group *et al*. (2010). In this sense, there are also the several different aspects that could be considered under a more general term as "economic-financial", such as cost-effectiveness, cost-efficiency, results, economic, financial, among others.

Based on the full literature reviewed and content validation by specialists, it is assumed that the following dimensions may embody the diversity of airport performance aspects perceived by external stakeholders: Efficiency/productivity, Service Quality, Safety, Security, Commercial, Economic/Financial, Environmental, Social, and Competitiveness. These nine dimensions may reasonably be grouped within the domains of organizational and operational performance. Figure 14 depicts these dimensions within their respective domains of airport performance.

Figure 14. The framework for the airport performance dimensions.



This framework stresses a comprehensive perspective for the airport performance measurement, beyond the traditional idea of key performance areas or functional activities. Consistent with advances in the performance literature, the operational domain is an antecedent of the organizational domain (Ray *et al*., 2004; Combs *et al*., 2005; Hamann *et al*., 2013).

The domain of organizational performance refers to an extended concept of the airport effectiveness. The four dimensions related to this domain (i.e. Economic-financial, Environmental, Social, and Competitiveness) are assumed to be interrelated. Therefore, an integrated assessment of airport performance regarding these dimensions should provide meaningful information on airport´s sustainability according to the perspective of different stakeholders.

Relating to the domain of operational performance, it mediates the relationship between the airport´s internal activities and the organizational performance. This operational domain characterizes the outcomes of the airport´s internal activities and capabilities that may be effectively perceived by the external stakeholders. For instance, an excellent performance as regard human resources or information technology are not directly perceived by the passengers, but only their effects on the service quality dimension.

In sum, instead of looking for performance areas, this framework highlights different aspects of the airport business with significant impact on the external stakeholders. Table 7 summarizes the nine performance dimensions along with their respective scopes and examples of measures related to each dimension.

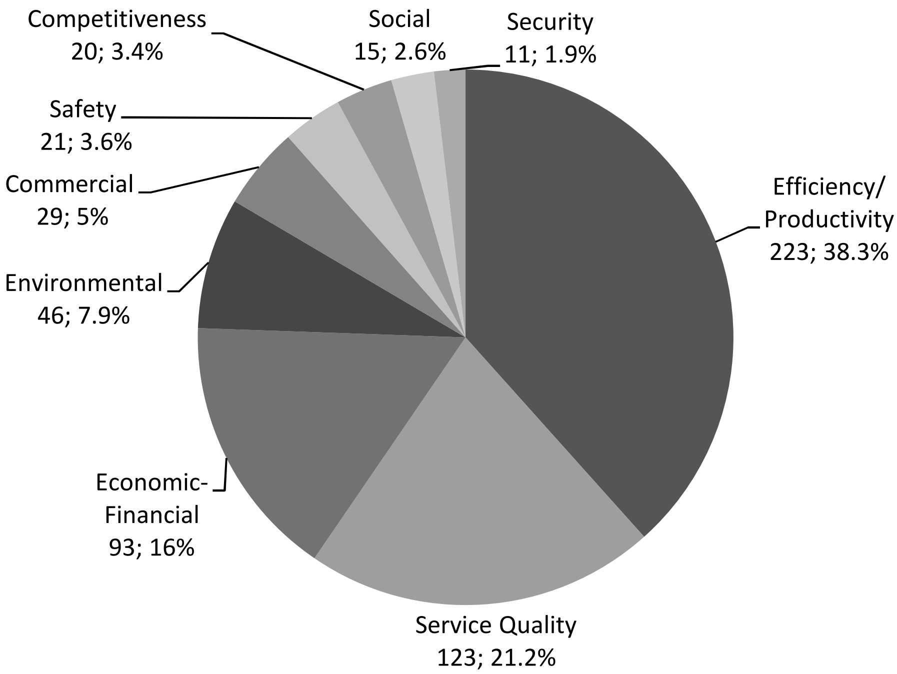
Table 7. Airport performance dimensions.

Dimension	Scope	Example of measures
Efficiency/ Productivity	Related to how well the airport is using the available resources in processing aircraft, passengers, cargo and mail (may comprise an economic and a technological perspective).	Several physical and financial inputs and outputs used as ratios or within parametric or non-parametric models: Air traffic movements; Passengers; Cargo; Work Load Unit; Aeronautical revenue; Operating revenue; Number of employees; Labor cost; Operating cost; etc.
Service Quality	Related to a broad concept of quality, which may include both customer perception and objective performance indicators (comprises aspects of quality of service and level of service (LOS)).	Subjective measures related to customers´ perception of infrastructure and service attributes. Quantitative measures regarding the availability of area per passenger; availability of equipment; waiting times; processing times; delays; etc.
Safety	The state in which risks associated with aviation activities, related to, or in direct support of the operation of aircraft, are reduced and controlled to an acceptable level (ICAO, 2013).	Outcomes: Accidents; Incidents; Other safety-related occurrences. Drivers: Runway conditions; Number of safety training courses conducted; Number of attendees at safety training courses; Number of warning citations issued; etc.
Security	The state in which people and properties within the airport´s boundaries are protected from potential injury/loss caused by deliberate illicit actions performed by people.	Number of reported security breaches; Number of security inspections conducted; Destructive or criminal behavior within the airport; Time it takes to resume normal service after security incidences; Security screening process; etc.
Commercial	Related to the broad notion of airport business, in which the airport is seen as a firm providing a variety of services and products with a focus on different customers and stakeholders (comprises ancillary services such as terminal retail, food and beverage, parking, hospitality, Etc.).	Non-aeronautical revenue; Commercial area leased; Number of parking spaces per passenger; Parking turnover rate, Duty and Tax-free income per passenger; Concession revenue per m^2; Average ticket; Sales by type of retail; Branding; Market value; etc.

Economic/ financial	Related to the economic outcomes resulting from the interplay among an organization's attributes, actions, and its environment, including the concepts of financial and economic performance.	Revenues, Expenditures; Cash flow; Profit/Loss; Return on Sales; Return on Assets; Internal Rate of Return; Economic Value Added; Return on Investment; Debt Service; Investment growth rate; EBITDA; etc.
Environmental	Related to the externalities generated by aeronautical and airport activities that impact on the local environmental sustainability (comprises noise, air quality, water quality, energy conservation and ecology).	Energy consumption; Water consumption; Gaseous pollutants (ambient concentrations of pollutants); Waste; Aircraft noise emissions; Number of complaints regarding noise; Number of houses or people subjected to noise within a certain noise contour; etc.
Social	Related to the impacts of airport activities on the interests of the local community (comprises relationship with the local community, job creation, investments attraction, effects on housing prices; Etc.).	Number of jobs created; % women, minorities, and people with disabilities of the total workforce; Social programs; Sporting/social/cultural sponsorship; Number of activities focused on the local community; Media contact indicators; Impact on real estate pricing; etc.
Competitiveness	Related to the ability to offer a range of products and services that meet its market quality standards at reasonable prices.	Market share for Airports; Airline competition at the airport; Number of destinations (non-stop); Airline operating expenses per passenger at the airport; etc.

Regarding their occurrence on the literature reviewed, the studies related to the airport efficiency/productivity are predominant, with approximately 38% of the studies comprising this dimension. Mostly, there are benchmarking studies covering different methodologies and countries (see Assaf *et al*., 2014; Graham, 2014; Lai *et al*., 2012; Liebert and Niemeier, 2010 for further review on this topic). Service quality (21.2%) and economic/financial (16%) have also been covered with more frequency. The other performance dimensions have received less attention (Figure 15).

Figure 15. Documents by performance dimension covered.



Notes: Some studies were classified in more than one category

To be noted that many studies have covered simultaneously two or three performance dimensions, usually efficiency-productivity and service quality or efficiency-productivity and economic-financial. It is also worth mentioning that only a small number of studies have adopted a multidimensional approach for airport performance, although this is quite usual within the current broad literature on performance as previously discussed in section 3.2., including several other service industries (Yasin and Gomes, 2010; Nudurupati *et al.*, 2011; Hamann *et al.*, 2013).

3.3.3. Final Considerations on the SLR

For the purpose of this SLR study, two research questions were addressed. As regards the first research question, the results suggested that airport performance has been a subject of increasing interest since the beginning of the 1990s. The evolution of the literature could be comprised of three distinct stages, which appears to have followed the changes occurring at the industry level, as well as the developments of the broader literature on performance measurement, even though the latter with a significant lag. The first stage is characterized by the emphasis on operational and financial aspects. In the second stage, efficiency/productivity benchmarking became the main topic of interest. Nonetheless, a broader perspective for airport performance measurement was also introduced. Finally, the third stage seems to stress a more market-oriented approach to airport performance. Based on the results, a gap between performance measurement practices in airport settings and other relevant business settings was found.

As regards the second research question, the results revealed several aspects of airport performance that have been covered by the literature. Moreover, a framework of the performance dimensions related to the airport business was provided. This framework comprises different aspects of airport performance with impact on external stakeholders. It considers two domains of airport performance, with operational performance being an antecedent to organizational performance.

Concerning the multidimensionality of airport performance, although there is a vast literature on airport performance, including some recent reviews focusing mainly on airport efficiency (Morrison, 2009b; Merkert *et al.*, 2012; Lai *et al*., 2012; Liebert and Niemeier, 2013), and best practice guidelines (Infrastructure Management Group, 2010; ACI, 2012; Hazel *et al.*, 2011), there seems to be a lack of systematized knowledge on the current performance measurement practices. Moreover, other significant gaps in the literature are stressed:

- In recognition of the relevance of benchmarking for improving airport performance, empirical research should emphasize the identification of organizational practices that might be related to superior performance;
- As regards the increasing relevance of service quality within the current airport context, further research on the multiple airport service quality dimensions is required. Also, there is the need for considering the relationships between perceived service quality, passenger satisfaction, and other passenger attitudes towards the airport;

- Empirical studies are required to confirm the relevance of the performance dimensions identified in this study, particularly regarding the reliability of the metrics related to these dimensions.

Despite the rigor applied in this SLR, the results are conditioned to the research criteria. In this respect, some studies related to airport performance measurement could not have been retrieved because they did not present the keywords in the document title, abstract, or keywords. Moreover, it should be noted that the framework for the airport performance was based on the perspective of the external stakeholders. Notwithstanding, this research effort may be considered a relevant contribution to the research and practice on airport performance measurement. Based on the gaps identified, in this Thesis, the need for understanding the current performance measurement practices, the multidimensional nature of airport service quality, and the relationships between service quality and passenger attitudes towards the airport are emphasized.

3.4. SERVICE QUALITY

Improving service quality has been recognized a critical issue for helping organizations to increase customer satisfaction, customer loyalty and, consequently, to improve their overall business performance in competitive environments (Duggal and Verma, 2013; Lovelock and Wirtz, 2007; Johnson *et al.*, 2001).

Regarding the airport industry, there has been a consistent interest in service quality by researchers and practitioners, as previously discussed in section 3.3. Additionally, the results of the empirical examination of performance measurement practices at Brazilian airports suggest the relevance of measuring service quality for nowadays airports, as well as the difficulties to obtain accurate information related to some quality measures (see Chapter V).

Looking for theoretical support for the accomplishment of the research objective 3 (i.e. the development of a measurement model for airport service quality), in this section, a review of the service quality literature is provided. The section is organized in four subsections. First, there is a brief review on the subject of quality in the service context, with a focus on the research developments. Afterward, considerations on quality measurement are emphasized, including the description of a sample of service quality models. The evolution of the service literature concerning airports, the current issues and the practices related to the measurement of service quality within the airport industry are stressed in the third subsection. Finally, some concluding remarks are provided.

3.4.1. Quality in the Service Context

Since the 1960s, quality has been defined in several different ways within the business management literature, according to the various perspectives used and the specific purposes (Reeves and Bednar, 1994). Particularly, the 1980s was a decade with intensive efforts aiming to the development of quality models and managerial tools for service quality measurement (Lovelock and Gummesson, 2004; Garvin, 1988).

Based on extensive review of the literature, Garvin (1988) classified the diverse approaches to quality according to five categories:

a) Transcendence approach;
b) Attribute-based approach;
c) Manufacturing-based approach or design quality;
d) User-based approach or maximum satisfaction; and,
e) Value-based approach.

This categorization has been claimed to cover the most relevant aspects of quality in a didactic way (Duggal and Verma, 2013; Lovelock and Wirtz, 2007). According to the first approach, quality is a synonym for the innate excellence existing in an object or service that could be universally recognized through experience. This transcendence or philosophical approach is considered of limited value in the business context.

The second approach is based on the attributes of a given product or service. In this sense, quality is seen as a precise and measurable variable. Therefore, differences in quality will reflect variances in the amount of an ingredient or attribute that is presented in the product or service.

The manufacturing-based (or design quality) is the third approach. It concerns primarily with the engineering and manufacturing aspects of the production process. When adapted to the service context, it is better understood when related to the service provision criteria or standards.

The fourth approach is customer-based and contemplates quality as a subjective construct dependent on the customer perceptions and their particular characteristics concerning profile and specific needs. This approach has been predominant within the service quality literature (Duggal and Verma, 2013).

Finally, according to the fifth approach, quality must be defined in terms of the perceived value of the product or service regarding the prices. This approach is essentially associated with the tradeoff between the perception of performance and the price paid for the product/service.

The conventional definitions based on the idea of conformance-to-specifications have been considered unsuitable for services (Reeves and Bednar, 1994). Different to manufacturing settings, where products present physical characteristics to be evaluated and compared, in the service context, quality is usually best explained and measured with more subjective criteria, mostly related to the customer´s experience and background (Johnston and Kong, 2011; Parasuraman *et al*., 1985).

Actually, some specific characteristics of the services production require different approaches for quality measurement and analysis. Although early research efforts in service quality have derived from the manufacturing sector, debates about the particularities of the quality in service settings have soon appeared (Parasuraman *et al*., 1985; Brady and Cronin, 2001; Lovelock and Gummesson, 2004).

A seminal study recognizing the existence of essential differences between product manufacturing and service operations dates from the earlier 1960´s (Regan, 1963). According to this author, some characteristics related to intangibility, perishability, heterogeneity, and ubiquity, for instance, were considered to make more difficult the management of services and the assurance of service quality. In the following decades, there was an intense debate on the definition of services and the delineation of services from goods.

Based on the literature on services covering the period from the 1970s to the early 1980s, Zeithaml *et al*. (1985) identified the most frequently cited characteristics to distinguish between physical products and services. Another extensive review of Edgett and Parkinson (1993) covered an even broader period (1960-1990) and returned similar results. Accordingly, services were considered to be inherently intangible, perishable, heterogeneous, and to involve simultaneity, i.e. inseparability of production and consumption. Other authors have also debated on the service characteristics and their effects on services management (Lovelock and Gummesson, 2004; Vargo and Lusch, 2004; Moeller, 2010).

Table 8 summarizes the four typical service characteristics based on the literature reviewed for this Thesis. These characteristics have been widely recognized and largely used in the services literature, usually referred as the IHIP framework based on the corresponding initial letters (Moeller, 2010). Nevertheless, there was interest in reviewing the theoretical and practical implications of this categorization given the developments within the service industry as a whole and the particular emergence of the Internet and other technologies of information (Lovelock and Gummesson, 2004; Moeller, 2010; Vargo and Lusch, 2004).

Table 8. Typical service characteristics.

Service Characteristic	Comments
Intangibility	Services are best described in terms of experiences. Consequently, customers may perceive service performance differently than the expectation of the service provider. Intangibility has been considered the fundamental characteristics that differentiate products and services, from which all other differences will emerge (Parasuraman *et al*., 1985).
Perishability	Perishability is related to the fact that unused service capacity cannot be saved or stored for future use. In other words, services cannot be inventoried. Likewise, services cannot be returned or resold. This specific characteristic implies that is much harder to synchronize supply and demand in the case of services.
Heterogeneity	The service delivered usually present high variation. This variation is mainly associated with the dependence on human behavior, but it is also related to the different expectations and customer needs. Therefore, the quality of a service is highly dependent on the circumstances where it is performed. It is expected that service quality will vary from provider to provider, from customer to customer, and even from event to event of consumption (Zeithaml *et al*., 1985).
Inseparability	Inseparability or simultaneity refers to the fact that services are usually produced and consumed at the same time, which requires the presence of the customer to be delivered. Consequently, it is usually hard to define a level of service a priori, and the actual service quality only occurs during service delivery, typically in a context of interaction between the service provider and the customer.

Source: Based on Zeithaml *et al*. (1985); Parasuraman *et al*. (1985); Edgett and Parkinson (1993); Lovelock and Gummesson (2004); Moeller (2010); Vargo and Lusch (2004).

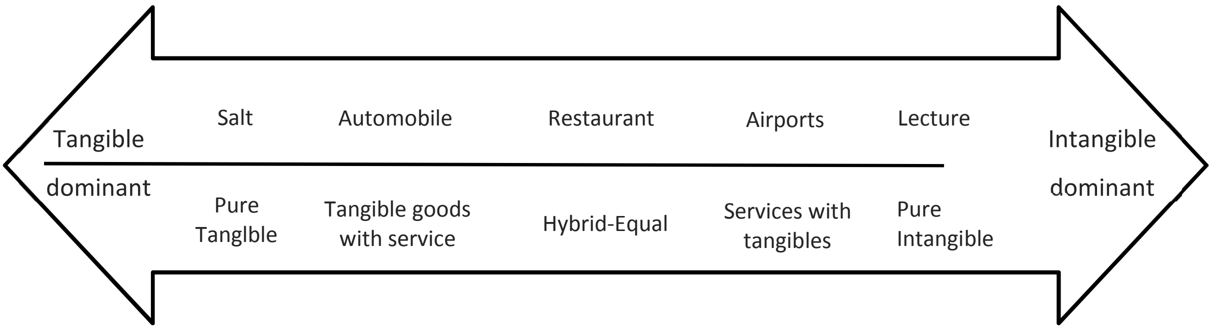
Authors have argued that these characteristics may not accurately differentiate services from physical products, mainly because they are associated with a manufacturing-based model of quality. Moreover, they are considered more associated with the producer´s point of view, rather than the customer´s perspective (Vargo and Lusch, 2004; Lovelock and Gummeson, 2004). Several exceptions to the premise that all services present these characteristics have been discussed, including the proposition of alternative frameworks (Lovelock and Gummeson, 2004).

In this context, authors have stressed the need for a more flexible and customer-based approach to service quality. For instance, the concept of intangibility has been widely considered as the fundamental difference between products and services. However, it is claimed that all offerings could be better arranged along a continuum ranging from “pure products” to “pure services”. Accordingly, the most offerings will contain a mix of tangibles and intangibles elements (Kotler and Keller, 2012).

This continuum does not exclude the notion of intangibility as an essential characteristic of services but represents a significant contribution to understanding service quality in service settings. While some products may present intangible attributes, as the case of a new car that requires periodic after-sales services, some physical attributes are usually experienced in many varieties of services, including the airport services, where the passenger necessarily will interact with several facilities and equipment.

Figure 16 depicts this continuum and provides examples of how different goods and services can be located according to their characteristics as regards the presence of tangible and intangibles attributes.

Figure 16. The intangibility continuum.



Source: Based on Lovelock and Gummeson (2004).

Regarding heterogeneity, customers' demands and experiences concerning physical products will also vary in great extent (Lovelock and Gummeson, 2004). In fact, even manufacturing sectors have been concerned with customization as most customers appreciate customized solutions to meet their specific needs. In this context, a high level of standardization is not necessarily desirable, and service organizations have been motivated to provide different services to different types of customers as a competitive strategy (Kotler and Keller, 2012). Within the airport industry, an example is the offer of additional personalized services for passengers and loyalty programs (Chen *et al*., 2015; Nesset and Helgesen, 2014).

The characteristic of inseparability (or simultaneity of production and consumption) is also considered at different levels, based on the type of service. This Inseparability of production and consumption has a strong connection with the concepts of interaction and service encounter (Lovelock and Wirtz, 2007). In this sense, the perspective of the customer as a co-producer is useful for understanding the perception of value and its implications to the customer experience (Ravald and Grönroos, 1996). In this context, concerning airports, the security screening process illustrates an example where customer presence is compulsory, and the perception of value is intricate. Otherwise, the cleaning and maintenance services are examples where the consumption of the benefits will only take place after the service has been completed.

Lastly, the characteristic of perishability was argued to be not exclusively to services, though it might be harder to be managed within a service context (Kotler and Keller, 2012). Perishability is also present in manufacturing processing capacity, thus optimizing capacity utilization seems to be a universal challenge both for manufacturers as service providers (Lovelock and Gummesson, 2004). Moreover, from the customer perspective, all offerings are somewhat perishable as both products and services are similarly subject to changing customer needs and personal expectations (Vargo and Lusch, 2004).

This above discussion on the service characteristics emphasizes that service quality cannot be understood or properly measured but considering the nature of the customer perceptions of the service performance and their expectations and background. Accordingly, service quality has been usually defined according to the expectancy-disconfirmation paradigm, where service quality is identified as a cognitive evaluation based on the idea of comparing the perceived level of quality received and the expected quality (Oliver, 1996; Parasuraman *et al*., 1985; Wilson *et al.*, 2012; Grönroos, 1984). Notwithstanding, alternative perspectives have also been proposed. Based on the extensive review of the evolution of service quality construct, Duggal and Verma (2013) summarized definitions proposed by researchers during the initial stage of development of the service quality concept (Table 9).

Table 9. Service quality definitions.

Authors	Definition
Berry *et al.* (1980)	The customer's impression of the service provided.
Lehtinen and Lehtinen (1982)	Service quality is the result of the comparison that customers make between their expectations about a service and their perception of the way the service has been performed.
Lewis and Booms (1983)	Service quality involves comparing customer expectations with the performance obtained from the service actually provided.
Grönroos (1984)	Service quality is a perceived judgment, resulting from an evaluation process where customers compare their expectations with the service they perceive to have received.
Parasuraman al. (1985)	The difference between expectations and performance of the service.
Buzzell and Gale (1987)	Quality is whatever the customers say it is, and the quality of a particular product or service is whatever the customer perceives it to be.
Parasuraman *et al.* (1988)	Perceived service quality is the customer´s global judgment about the overall excellence or superiority of the service.
Teas (1993)	Service quality is a comparison of performance with ideal standards.
Cronin and Taylor (1994)	Service quality is a form of attitude representing a long-run overall evaluation.
Rust and Oliver (1994)	Service quality is a comparison to excellence in service encounters by the customer.
Bitner and Hubbert (1994)	The consumer's overall impression of the relative inferiority/superiority of the organization and its services.
Clow *et al.* (1997)	Service quality is viewed as the result of the comparison that customers make between their expectations about a service and their perception of the way the service is received.
Roest and Pieters (1997)	Service quality is a relativistic and cognitive discrepancy between experience-based norms and performances concerning service benefits.

Source: Based on Duggal and Verma (2013).

According to Table 9, it is noteworthy that most of the service quality definitions are customer-based and grounded on the expectancy-disconfirmation paradigm, comprising comparison between perceptions and expectations (Duggal and Verma, 2013). Moreover, these definitions usually associate service quality with meeting the customer´s needs and requirements.

In the development of the service quality literature, researchers have focused on identifying and clarifying various issues related to the subject, including the quality components or dimensions and the measurement of service quality (Duggal and Verma, 2013; Ladhari, 2009; Ghotbabadi *et al*., 2015). In this context, customers' perceptions of quality have been definitively integrated into service management practices.

As a result of a cognitive process, the perceived service quality is not only subjective but also context dependent and will likely vary according to several factors (Wilson *et al*., 2012). Therefore, in the service context, quality is usually best explained and measured with more subjective criteria, mostly related to the customer experience and background (Parasuraman *et al*., 1985; Kang and James, 2004; Wilson *et al.*, 2012). In summary, the particular characteristics of service production and consumption require specific approaches for quality measurement and analysis.

3.4.2. Service Quality Models and Measurement

With the recognition of how important is quality for improving organizational performance and the central role of customer perception for service quality evaluation, a number of models have been developed. As for example of this diversity, a critical review of Seth *et al*., (2005) identified 19 different service quality models reported in the literature. These model attempt to provide understanding on how the customer perceives service quality. Basically, there are two main approaches for service quality in these models, the expectancy-disconfirmation paradigm, and the performance-based approach.

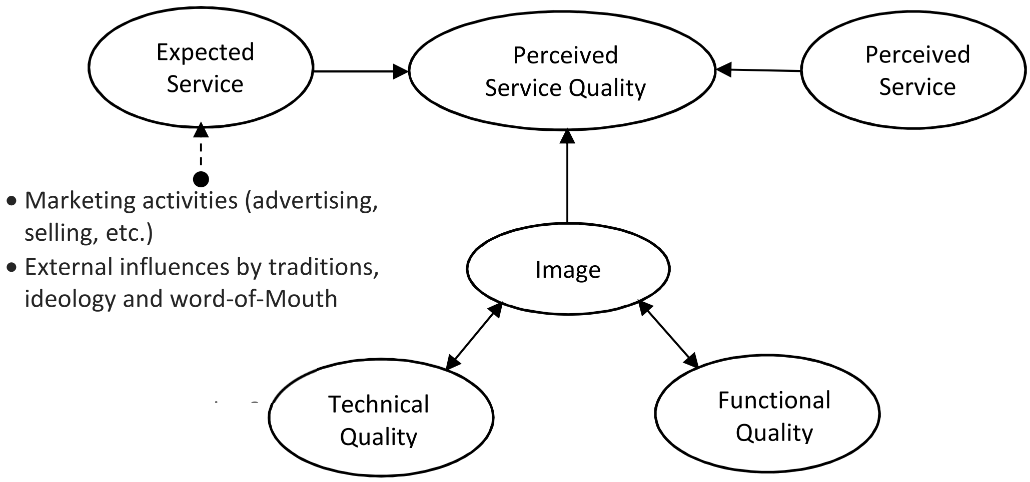
In this context, three models have been particularly recurrent in the literature and will be discussed in this subsection. They are the Total Perceived Quality (also called the Nordic Model), the SERVQUAL and the SERVPERF.

The Total Perceived Quality – The Grönroos Model

Consistent with the expectancy-disconfirmation paradigm, this model assumes that in evaluating service quality customers will compare the service performance experienced with the expected service attributes. Moreover, it assumes that services are intangible, and there is simultaneity of production and consumption. The Total Perceived Quality is based on the results of empirical research with a sample of business executives, which focused on describing how the quality of services is perceived by the customer (Grönroos, 1984).

In this model, customer's experience with the service is divided into three dimensions of quality: technical quality, functional quality, and corporate image. Based on these dimensions and their relationships, the customer perception about the service delivered is compared against their expectations of quality. The result is a measure of perceived service quality (Figure 17).

Figure 17. The total perceived quality model.



Source: Based on Grönroos (1984).

The technical dimension is related to "what" the customer actually receives as result of their interactions with the organization (i.e. the technical outcome of the service process). Therefore, customers are expected to perceive good technical quality when the actual outcome of the service encounter is technically acceptable. In other words, technical quality occurs when the customer receives what they expected to be the outcome of the service process. In this sense, the technical quality can often be measured in an objective manner.

Regarding the functional dimension, it is related to "how" the customer receives this technical outcome. It is argued that a customer is not only interested in the outcomes of the service, but also in the attributes of the service process (Grönroos, 1984). This functional quality is associated with the elements of the interaction between the customer and the service provider. Therefore, it is usually perceived in a more subjective manner.

The third quality dimension is the corporate image, which is related to how the customer perceives the firm or service provider. Since the service itself is the main element perceived by the customer, this corporate image is expected to be fundamentally built on the technical and functional quality of the service. The effects of the technical and functional dimensions on the level of perceived quality are considered to be moderated by the corporate image.

Based on this model, the service quality will be perceived as acceptable when the experienced quality meets the customer´s expectations. However, it is to be noted that this perceived quality would not be determined solely by the level of the technical and functional quality, but rather by the gap existing between the expected and the experienced quality. Customer expectations of service quality are supposed to be inherently context-specific and influenced by both the service provider marketing activities and other exogenous effects, such as word-of-mouth, the corporate image and customer needs (Grönroos, 1984).

Although these dimensions are interrelated, once the service is provided at a minimum technically satisfactory level of quality, the functional dimension will generally be perceived more important for the customer. Thus, the importance of the way the service is delivered and, consequently, the relevance of the interaction between staff and costumers are highlighted (Kang and James, 2004).

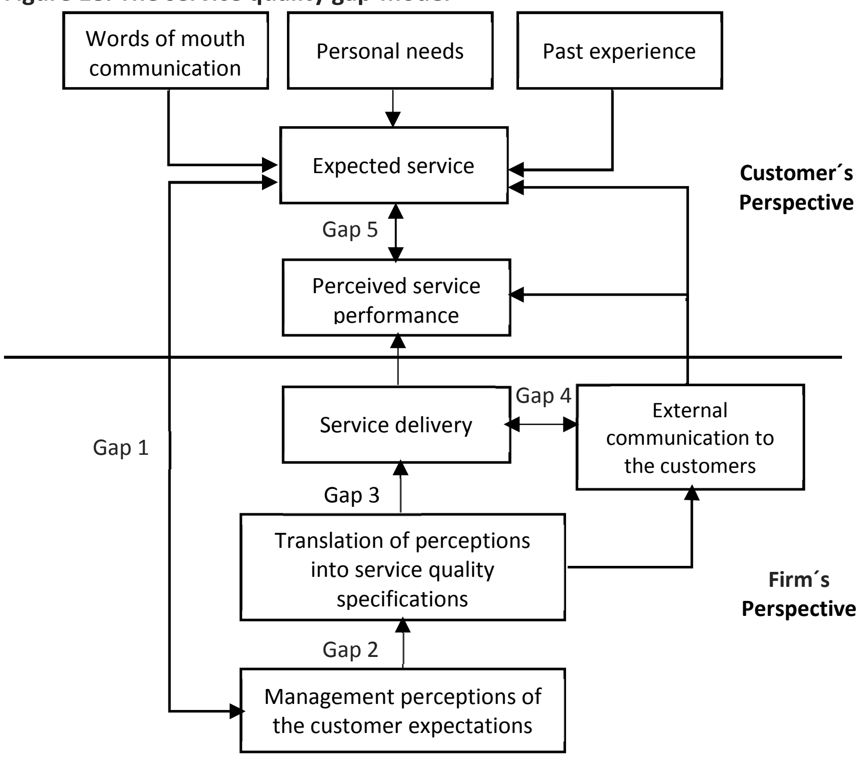
More recent research has revisited Grönroos´ service quality model looking for a more integrated approach to the service quality construct in different service settings (Seth *et al*., 2005; Kang and James, 2004; Roy and Balaji, 2015).

SERVQUAL

The SERVQUAL model developed by Parasuraman *et al*. (1985, 1988) has been the most preferred service quality model (Duggal and Verma, 2013; Ladhari, 2009; Wilkins *et al*., 2007). Also based on the expectancy-disconfirmation paradigm, this model was derived from an exploratory qualitative study comprising in-depth interviews with executives and focus groups interviews with customers of different service sectors (retail banking, credit card, securities brokerage, and product repair and maintenance) (Parasuraman *et al*., 1985). This exploratory research aimed at understanding the key attributes of service quality according to the perspective of the executives and customers. Furthermore, the authors discussed how these perceptions could be combined in a general model to explain service quality from the costumer´s viewpoint.

The authors identified four gaps that could affect service quality as perceived by the customer, based on the service provider's perspective. The gaps cover the service provision according to the management perceptions of customer expectations until the actual service delivery. The conceptual model, also referred to as the gap-model, is reproduced in figure 18.

Figure 18. The service quality gap-model



Source: Parasuraman *et al*. (1985).

The first gap is related to the idea that the service provider does not exactly know the customer expectations about the service. The second gap is associated with the discrepancy between the service provider´s perception of customer expectations and the actual quality specifications established. The discrepancy between the planned service quality and the actually delivered service is the third gap (this is the service performance gap). The fourth gap is associated with inconsistencies between the actual service delivered and the communications to costumers about the service. Finally, there is the gap between the customer expectations and the perceived service performance.

The fifth gap is considered the most important and dependent on the nature of the other four gaps, associated with the design, marketing, and delivery of the service. Accordingly, it can be represented as a function of the other gaps: Gap5 = *f*(Gap1, Gap2, Gap3, Gap4) (Parasuraman *et al*., 1985).

Similar to the Grönroos´ model (Grönroos, 1984), the SERVQUAL assumes that a good service quality is only obtained by meeting or exceeding customer's expectations (Parasuraman *et al*., 1985). Concerning the criteria a customer will use to evaluate the perceived service quality, they were considered to be similar regardless the service sector considered and classified into ten categories of quality determinants: reliability, responsiveness, competence, access, courtesy, communication, credibility, security, access, understanding, and tangibles. These categories were not meant to be definitive, and the authors considered the likely presence of overlaps across the categories. Subsequently, the authors further developed their propositions (Parasuraman *et al*., 1988; Parasuraman *et al*., 1991; Parasuraman *et al*., 1994).

In the study of 1988, the service quality determinants were organized in a five-dimension framework of perceived service quality, comprising tangibles, reliability, responsiveness, assurance, and empathy (Parasuraman *et al*., 1988). The tangibles dimension covers the appearance of physical elements related to the service provision, such as equipment, facilities, and personnel. Reliability denotes the ability to performance the service in an accurate, dependable and consistent manner. Responsiveness is related to the willingness to provide a prompt service and help to customers. Empathy stands for the willingness to provide individual attention and care to customers. Assurance comprises employee´s knowledge, courtesy, and their ability to convey trust and confidence. These five dimensions were considered to provide a comprehensive approach that could be applied in various service settings (Parasuraman *et al*., 1988).

In this same study (Parasuraman *et al*., 1988), a measurement instrument based on these five service quality dimensions was developed (the SERVQUAL scale). Subsequent developments resulted in a questionnaire featuring 22 items (Zeithaml *et al*., 1990; Parasuraman *et al*., 1991; Parasuraman *et al*., 1994). Each item in the questionnaire is measured as regards the level of expectation, and the customer perception of the performance of the service provided. Therefore, the quality rating for a given service attribute "j" (Q_j) is obtained by subtracting the value for the expectation as regards this attribute (E_j) from the perception (P_j) value attributed (i.e., $Q_j = P_j - E_j$). An overall quality rating is then calculated by the sum of all the Q_j values.

The SERVQUAL dimensions and the measurement instrument have been widely used (Parasuraman *et al*., 1994; Ladhari, 2009; Brady and Cronin, 2001), including studies within the transport sector (Pakdil and Aydın, 2007; Wattanacharoensil and Yoopetch, 2012; Pabedinskaitė and Akstinaitė, 2014). Nevertheless, the results of those empirical studies have not always been supportive of the proposed model.

Given theoretical and empirical issues, authors have identified concerns regarding the conceptual foundation and empirical operationalization of the service quality construct as proposed in the SERVQUAL model (Cronin and Taylor, 1992; Carman, 1990; Teas, 1993; Cronin and Taylor, 1994). Some of these important concerns comprise: a. the five dimensions are not always consistent and may vary depending on the service industry investigated; b. critics on the value of collecting information regarding customer´s expectation after the actual consumption of the service; c. the reliability and validity of the SERVQUAL scale (Cronin and Taylor, 1992; Ladhari, 2009; Teas, 1993).

SERVPERF

The previous service quality models assume an expectation-perception approach, based on the expectancy-disconfirmation paradigm. However, there has been a remarkable debate about the pertinence of this approach for measuring service quality. Authors have claimed that there was insufficient theoretical or empirical evidence to support the relevance of the gap between expectation-performance as the basis for measuring service quality (Carrilat *et al*., 2007; Brady *et al*., 2002).

Cronin and Taylor (1992) were among the first to raise arguments against the expectation-perception gap theory of service quality. They concluded that:

- The perceived service quality is best conceptualized as an attitude;
- The adequacy-importance model is the most effective attitude-based operationalization of service quality;
- Current performance measures adequately capture customer´s perceptions of the service quality.

These authors empirically examined their conclusions by testing a performance-based model as an alternative to the SERVQUAL model (Cronin and Taylor, 1992). The original SERQUAL model and three alternative models were assessed and compared as regards the dimensionality, reliability, and validity of the service quality measures. Moreover, these models were also used to examine the relationships between service quality, customer satisfaction, and purchase intentions[6]. In all the models, the measurement items for performance suggested by Parasuraman *et al*. (1988) were used. Data from four distinct types of service firms were considered (banking, pest control, dry cleaning, and fast-food).

The results provided empirical evidence across the four service firms supporting the superiority of the unweighted performance-based model (the SERVPERF model) over the

[6] Besides the original SERVQUAL, the authors considered a weighted SERVQUAL, an unweighted performance-based model to the measurement of service quality (the SERVPERF model), and a weighted SERVPERF. The importance weights were used to verify whether the addition of importance improves the ability of the models to measure service quality, as proposed by Zeithaml *et al*. (1990).

SERVQUAL and the weighted performance-based model. In the four types of service firms, the SERVPERF presented more variation explained in the global measure of service quality than any of the other three scales[7]. The SERVPERF model for service quality can be expressed as the following equation:

$$SQ_I = \sum_{j=1}^{k} P_{ij}$$

Where: SQ_i = The perceived service quality of customer "*i*"; k = number of measurement items; P = Perception of the customer "*i*" of the service performance of attribute/measurement item "*j*".

In view of the drawbacks related to the gap theory, the SERVPERF model was then presented as a valid performance-based model for service quality measurement (Cronin and Taylor, 1992). In this quality model, the perceived service quality consists of an individual attitude towards a product or service, and thus customer´s perception of service quality is only a function of the service performance.

A clear distinction between these two approaches (the gap and the performance based approaches) have significant consequences for organizations, since there is the need to define the main objective regarding service quality measurement, whether to have customers who are satisfied with the service performance or provide services with the highest level of perceived quality (Ladhari, 2009). Brady *et al*. (2002) revisited the SERVPERF, and their conclusions supported the use of the performance-based model for service quality measurement.

Since the seminal studies released at the late 1980s and early 1990s, these general service quality models have been subject to intense debate, with researchers presenting further arguments to support their respective perspectives (Grönroos, 1988; Parasuraman *et al*., 1994; Cronin and Taylor, 1994).

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[7] The authors used exploratory factor analysis with oblique rotation and confirmatory factor analysis for model comparison.

Additionally, several studies have contributed to the debate on service quality models (Carrilat *et al*., 2007; Ladhari, 2009; Dabholkar *et al*., 2000; Adil *et al*., 2013; Coulthard, 2004), which included modifications applied to these generic models to specific service contexts. According to Carrillat *et al*. (2007), the SERVQUAL model usually requires being adapted to the study context more so than SERVPERF. Notwithstanding, due to their equivalent validity, the choice between the competing models should be dictated by the particular purposes. The SERVQUAL is more appropriate for the diagnostic purpose, while SERVPERF can be a best option for a shorter measurement instrument.

Provided with this review, it seems evident that service quality is best explained as a multidimensional construct, once customer evaluation of quality may comprise different service attributes and quality dimensions. However, there is no agreement on the number, content, and nature of these quality dimensions, which is considered depend on the specific characteristics of the service provided (Dabholkar *et al*., 2000; Duggal and Verma, 2013; Carrilat *et al*., 2007).

In this context, generic service quality models have been systematically modified and adapted to the specific context and objectives of the study (Ladhari, 2009; Duggal and Verma, 2013; Falk *et al*., 2010), including the air transport environment (Chen and Chang, 2005; Pabedinskaitė and Akstinaitė, 2014; Tsai *et al*., 2011; Pakdil and Aydın, 2007; Hussain *et al*., 2015).

3.4.3. Service Quality within the Airport Sector

Whereas service quality is only one among several factors that can contribute to overall airport attractiveness, it is nonetheless becoming ever more important as traffic volume rises and airport managers struggle for optimizing infrastructure while improving service quality and adopting a customer-oriented approach (Fodness and Murray, 2007; Halpern and Graham, 2013; Merkert and Assaf, 2015). Also, since non-aeronautical revenues are becoming crucial for airport sustainability, there are increasing concerns with the business and marketing of retail areas in passenger terminals (Halpern and Graham, 2013).

Service quality has become a regular topic within the airport-related literature. Notwithstanding, until the 1980s there were only a few studies on the subject, typically concerned with the assessment of the level of service in passenger terminals (Bennets *et al.*, 1975; Tosic and Babic, 1984; Mumayiz and Ashford, 1986; Omer and Khan, 1988). In the 1990s, other studies focused on understanding passenger needs and their perception regarding elements of passenger terminals and airport-related processes (i.e. check-in, security screening, etc.) (Muller and Gosling, 1991; Mumayiz, 1991; Seneviratne and Martel, 1991, 1994; Lemer, 1992; Yen, 1995; Hackett and Foxall, 1997; Park, 1999).

Concerning the services industry as a whole, in a changing business environment, understanding customer perceptions of quality has become paramount. As the perceived lquality is an antecedent of customer satisfaction, measuring service quality by a customer-based approach may not only indicate customer satisfaction, but also may lead organization´s efforts to better deal with the customer's needs (Johnston and Kong, 2011; Falk *et al*., 2010; Duggal and Verma, 2013).

In this context, following the trend towards making airports financially self-sufficient, the airport industry has been progressively motivated to adopt a different approach regarding service quality (Graham, 2005). More recently, the literature on airport service quality (ASQ) increased regarding the number of studies and the range of issues covered. About the beginning of the decade of 2000, a broader approach to ASQ based on passenger perception became more evident, including:

a) Further investigation of passenger perceptions of quality and their satisfaction level with different service attributes. Some studies based on econometric approaches (Correia *et al*., 2008a; Correia and Wirasinghe, 2007; De Barros *et al*., 2007; Eboli and Mazzulla, 2009; Gkritza *et al*., 2006), and others based on Multi-Criteria Decision Analysis (MCDA) tools (Chien-Chang, 2012; Kuo and Liang, 2011; Lupo, 2015; Tsai *et al*., 2011; Yeh and Kuo, 2003);

b) Importance-Performance Analysis for stressing significant gaps as regards the service provision based on passenger perception (Tsai *et al*., 2011; Mikulic and Prebežac, 2008; Prebezac *et al*., 2010; Lubbe, Douglas and Zambellis, 2011);

c) Focus on specific airport activities, such as security screening procedures (Gkritza *et al*., 2006; Sindhav *et al*. *et al.*, 2006), check-in procedures (Abdullah, 2012; Martín-Cejas, 2006), and the service quality regarding retails services (Torres *et al*. *et al.*, 2005; Perng *et al*., 2010);

d) Investigation on passenger expectations with the airport service (Rhoades *et al*., 2000; Caves and Pickard, 2001; Bogicevic *et al.*, 2013; Fodness and Murray, 2007; Chang and Chen, 2011, 2012);

e) The nature of the effects of different service attributes on passenger satisfaction with the airport (Prebezac *et al*., 2010; Mikulic and Prebežac, 2008; Bogicevic *et al.*, 2013; Lupo, 2015; Eboli and Mazzulla, 2009);

f) Discussions on service quality measurement, including exploratory studies on ASQ multidimensionality (Fodness and Murray, 2007; Bezerra and Gomes, 2015; George *et al*., 2013);

g) Accounting for service quality within studies of airport efficiency measurement (De Nicola *et al*., 2013; Merkert and Assaf, 2015).

Moreover, there is a growing interest in the structural equation modeling (SEM) approach to account for the complex relationships among the several aspects of service quality and passenger attitudes towards the airport (Fodness and Murray, 2007; Jen *et al*., 2013; Jeon and Kim, 2012; Lubbe *et al*., 2011; Nesset and Helgesen, 2014; Park and Jung, 2011). It appears that a more comprehensive approach to understanding the multidimensionality of ASQ and the multifaceted nature of the passenger-airport interaction has been pursued.

As previously discussed, while measured by the customer´s point of view, service quality is identified as a cognitive evaluation. In this evaluation process, the service performance plays an important role, in consort with other factors associated with the service environment, individual needs, past experiences, word-of-mouth, and the service provider’s communication efforts. In this sense, due to the complexity of airport settings, generic models for measuring perceived service quality may not be able to cover some specific features related to the airport services and the passenger-airport interaction (Pantouvakis, 2010; George *et al*., 2013; Wu and Cheng, 2013).

As regards passenger-related services, based on a functional approach, the passenger terminal system comprises three major areas: access interface, processing system, and flight interface (Horonjeff *et al*., 2010). The access interface and the flight interface represent the boundaries of the passenger terminal. The first one comprises the spaces where the passenger transfers from the access mode of transport to the passenger processing area. In the other border, the flight interface consists of the spaces where the passenger transfers from the processing system to the aircraft. In the forthcoming discussion and empirical research, the processing area is emphasized. This processing area comprises every space where the passenger is processed in any activity related to the starting, ending, or continuation of the trip (including ticketing, baggage check-in, security inspection, for instance) (Popovic *et al*., 2009; Kirk, 2013).

Based on the passenger´s point of view, two main categories of activities in airport terminal may be considered: processing activities and discretionary activities (Popovic *et al*., 2010, 2009). In the case of departing passengers, the processing activities comprise the passenger flow from check-in, security screening, passport control, and boarding. Arriving passengers have different processing activities, consisting of disembarking from the aircraft, passport control, and customs procedures. The discretionary activities comprise what the passengers can do at their slack time in the terminal (i.e. those moments when they are moving between processing points), when they shop, eat, rest, exchange money, or do any other activity provided by the airport.

As regards the processing activities, passenger perception of quality has been typically associated with the efficiency of the processes, short waiting times and the positive attitude of the service staff (Rhoades *et al*., 2000; Caves and Pickard, 2001; Fodness and Murray, 2007). With reference to the discretionary activities, a variety of factors should be considered, including passenger perceptions on leisure/convenience alternatives and airport servicescape (i.e. the physical surroundings in which a service is performed, delivered, and consumed) (Bogicevic *et al.*, 2013; Mari and Poggesi, 2013; Breure and Van Meel, 2003; Van Oel and Van den Berkhof, 2013).

Another relevant point concerning service quality within the airport context is the high level of interaction among the different types of services providers in service delivery. Passenger perception of ASQ is usually dependent on the performance of different service providers (such as the airport, the airline, handling agents, public entities, and others) (Kramer *et al*., 2013; George *et al*., 2013; Zografos *et al*., 2013). In such a context, the different agents involved in the service delivery process must agree on the relevance, definition, and measurement of quality. Consequently, the more evident are the discrepancies between the views of these different agents, the more complex will be the service quality measurement.

Regarding the current ASQ measurement practices based on passenger perception, the literature review undertaken revealed a focus on analysis at the service-attribute level, in which the airport is divided into functional areas or specific services. Common measures include items related to the efficiency of specific services/processes, signage, cleanliness of the terminal areas, the attitude of the staff, availability of convenience facilities, and others. Additionally, as an elaborate servicescape, an airport comprises a complex service environment, in which visual appeal, functionality, and comfort might affect passenger perceptions of service quality. The effects of airport physical surroundings on passenger perceptions of ASQ has been more recently discussed (Ali *et al*., 2016; Moon *et al*., 2016; Jen *et al.*, 2013; Jeon and Kim, 2012).

In addition to the perceived quality approach, some studies have used objective measures, particularly in cases where passenger perception is contrasted or taken together with quantitative level of service parameters (Humphreys *et al*., 2002; Correia *et al*., 2008b; Yen *et al*., 2001). Examples of objective measures are mostly associated with observed wait time in processing activities, availability of equipment, and availability of area per passenger.

Service quality has also been subject to increasing interest within the airport industry, with a regular practice of measuring service quality based on the passenger perception. Surveys have been systematically carried out under the coordination of international agencies (ACI, 2015; IATA, 2015c), and there have been several ad hoc initiatives by regulators, airport operators and other organizations (Zidarova and Zografos, 2011; Bezerra and Gomes, 2015). Usually, those practices have been used as operational performance measurement tool and for benchmarking purposes. However, they have been more concerned with context-specific purposes, and considerations on reliability and validity aspects of the measurement instrument have received only limited attention (George *et al*., 2013; Fodness and Murray, 2007).

In summary, some significant gaps in the airport-related literature were identified, namely the search for a comprehensive framework of the antecedents of passenger´s perceptions of service quality and the influence of different service factors on passenger satisfaction and attitudes towards the airport (Fodness and Murray, 2007; Bogicevic *et al.*, 2013; Bezerra and Gomes, 2015). Moreover, there is the need for further investigation on the multidimensionality of the airport service quality and the validity and reliability of the measurement instruments used in the airport context (Fodness and Murray, 2007; George *et al*., 2013; Bezerra and Gomes, 2015).

3.4.4. Final Considerations on the Service Quality Review

Based on this discussion, four main issues are particularly relevant for this present Thesis. First, the perceived service quality is a multidimensional construct, yet there is no agreement on the content and nature of the quality dimensions, which is usually considered dependent on the particular service context. Second, reports on the use of generic measurement instruments have stressed caveats and the need for covering the specific characteristics of the service provision. Third, the process of service quality evaluation necessarily comprises customer expectations regarding the service and their background, even when considering a performance-based approach (Brady and Cronin, 2001; Brady *et al*., 2002; Pantouvakis, 2010). Fourth, service quality is an antecedent of customer satisfaction and related to customer attitudes towards the service provider (Sureshchander *et al*., 2002; Falk *et al*., 2010; Lovelock and Wirtz, 2007).

Concerning the literature on airport service quality, though there are significant gaps, it seems that there is an increasing acknowledgment of the multidimensionality of ASQ. Studies previously referred have stressed passenger perception according to a multidimensional approach, and some factorial structures for measuring ASQ have been discussed (Fodness and Murray, 2007; Bezerra and Gomes, 2015; George *et al*., 2013). There is also the need for further investigation on the validity and reliability of service quality measurement in the airport context. In this Thesis, these gaps are covered with the study 2, reported in Chapter 6.

Regarding customer attitudes, several studies have emphasized the importance of service quality and its relationship with customer satisfaction, future purchase intentions, increased market share, and profitability (Oliver, 2015; Wilson *et al.*, 2012). In the next section, these relationships are considered in view of the literature and with a focus on the airport service context.

3.5. CUSTOMER SATISFACTION

Satisfying customers has been of pivotal importance for any organization, no matter the product or service provided. Currently, customer satisfaction is recognized as a key intermediate objective in service operations (Pantouvakis, 2010). In this sense, the study of customer satisfaction and its relationships has dominated the services literature for more than four decades (Hill and Alexander, 2006; Oliver, 1996).

Within the airport context, there is a growing interest in the nature of customer satisfaction, mainly regarding the passengers. In this context, passenger´s expectations, their perceptions of service quality, and the concept of airport experience have been associated with passenger satisfaction in the airport context (Wattanacharoensil *et al*., 2016; Moon *et al*., 2016; Bezerra and Gomes, 2015; Kirk, 2013).

This section aims at providing theoretical support for the accomplishment of the research objective 4 (i.e., to examine the relationships between passenger perception of airport service quality and passenger attitude towards the airport). Thus, a literature review on customer satisfaction and airport-related research is reported. The next subsection comprises a brief overview of the evolution of customer satisfaction literature. Afterward, a discussion on customer satisfaction measurement and theoretical models for the satisfaction construct is provided. Finally, the current issues and practices related to passenger satisfaction within the airport context are described.

3.5.1. Background

Customer satisfaction has been a popular topic in the service practice and academic research since the seminal study of Cardozo (1965 *apud* Oliver, 1980) on customer effort, expectations and satisfaction. Subsequently, the increasing interest in the subject reflected in further experiments in the laboratory and a number of survey research (Oliver, 1980). Based on the emergent literature covered by Oliver (1980), understanding customer satisfaction with a product or service has always been considered a quite complex issue.

Several studies have been published, covering the most different objectives, focus, methods, and results. Extensive reviews on the literature were provided at different times (e.g. Grigoroudis *et al*., 2008; Johnson *et al*., 2001; Oliver, 1980; Yi, 1990). Moreover, there are a number of books entirely dedicated to the subject or at least comprising key aspects of it (e.g. Woodruff and Gardial, 1996; Wilson *et al*., 2012; Lovelock and Wirtz, 2007; Hill and Alexander, 2006; Oliver, 1996).

Customer satisfaction is typically defined as a post-consumption evaluative judgment concerning a specific product or service. According to the well-known definition of Oliver (1996:13):

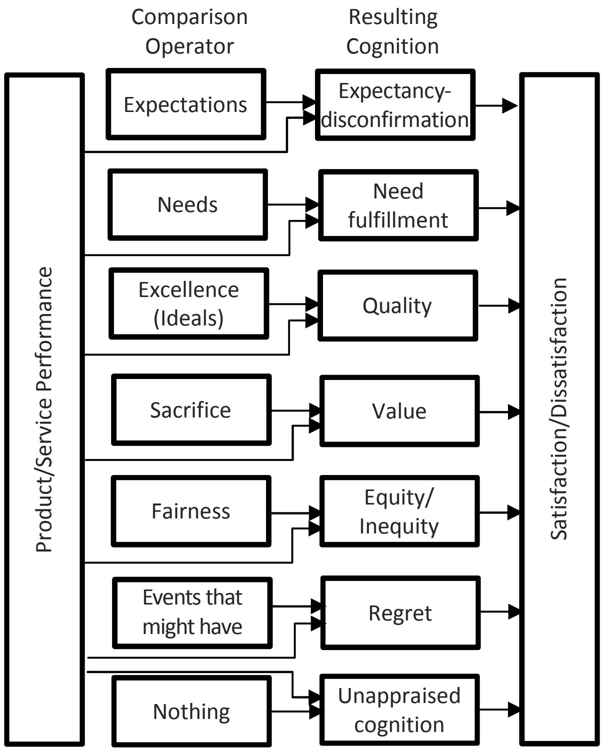
> "Satisfaction is the consumer's fulfillment response. It is a judgment that a product or service feature, or the product of service itself, provided (or is providing) a pleasurable level of consumption-related fulfillment, including levels of under or over fulfillment."

Despite there is a debate on the particularities of this evaluative judgment process, two main constructs are recognized to play a major role in it, the performance-specific expectation and the expectancy disconfirmation (Yuksel and Yuksel, 2001b; Oliver, 1996). Therefore, it is expected that customer´s perception of high performance is likely to improve their level of satisfaction with the product/service. However, the customer is also expected to define their satisfaction based on an evaluative process that contrasts pre-purchase expectations with perceptions of performance during and after the consumption experience.

Based on these assumptions, in the course of development of the customer satisfaction literature, a number of competing theories have been postulated. Yuksel and Yuksel (2001a) summarized the different contributions, including the Expectancy-Disconfirmation Paradigm, the Value-Precept Theory, the Attribution Theory, the Equity Theory, the Comparison Level Theory, the Evaluation Congruity Theory, the Person-Situation-Fit model, the Performance-Importance model, the Dissonance, and the Contrast Theory. The authors stressed that there is a widespread consensus that satisfaction is an evaluative judgment, which results from a comparison of product/service performance to some forms of evaluation standard. Essentially, the nature of this evaluative judgment is the main conceptual divergence among these theories.

According to Oliver (1980:460): “expectations are thought to create a frame of reference about which one makes a comparative judgment”. In his book, Oliver (1996) has elaborated on the nature of this judgment, including types of disconfirmation and their implications. In the new edition of this book (Oliver, 2015), a framework of the satisfaction process is delivered with the different comparison operators stressed (Figure 19).

Figure 19. A framework of the customer satisfaction process.



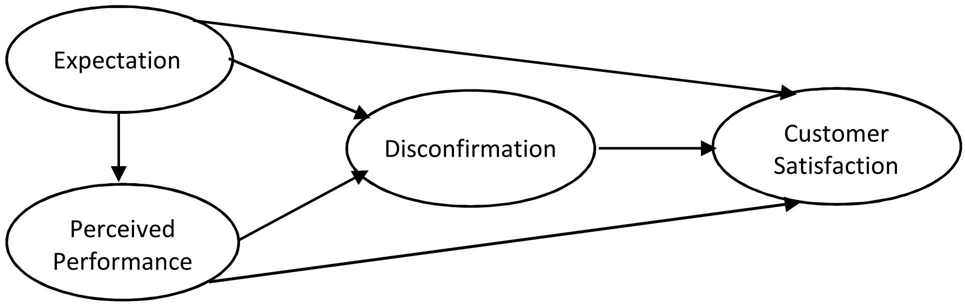
Source: Based on Oliver (2015)

The author suggests that the expectancy-disconfirmation model consisting of expectations, performance, and the outcome of comparison provide a good mechanism for measuring satisfaction. However, it depends on a particular customer to use all elements of the model or to select some elements (Oliver, 2015).

The Expectancy-Disconfirmation Paradigm (EDP) has been the standard theoretical framework for the assessment of customer satisfaction (Yuksel and Yuksel, 2001b; Morgeson, 2012). This model implies that customers have pre-purchase expectations regarding the anticipated performance. Therefore, this expectation becomes a standard against which the perceived performance is compared (Oliver, 2015).

The interaction between theory building and testing of the relationships among expectation, disconfirmation, and satisfaction has resulted in the refinement of this EDP model over time (Morgeson, 2012). Figure 20 depicts the most popular variant of the expectancy-disconfirmation model.

Figure 20. The expectancy-disconfirmation paradigm.



Source: Based on Morgeson (2012).

According to this model, customer satisfaction is a function of the level of expectation the customer has regarding the product or service and the perceived performance. Those constructs are mediated by the disconfirmation attitude (Morgeson, 2012).

Regarding empirical research and practical purposes, a main concern is the necessity to operationalize the concept of customer satisfaction in order to measure it (Hill and Alexander, 2006). Accordingly, looking for assuring validity, there is the need for explicitly assuming some model of the subject matter.

In this respect, this present Thesis does not aim to elaborate on the customer satisfaction theories, nor on the several models of customer satisfaction, as comprehensive reviews and comparative have already been provided (Oliver, 1980; Yi, 1990; Johnson *et al.*, 2001; Grigoroudis *et al*., 2008; Erevelles and Leavitt, 1992; Yuksel and Yuksel, 2001a). Coherently with the Thesis objectives, a process-oriented approach to customer satisfaction is espoused, as it spans the entire consumption experience and supports the use of unique measures capturing unique components of each stage (service encounters) of the evaluation process (Yi, 1990). Moreover, in the interest of performance measurement in the airport context and focusing on the service quality-satisfaction link, the analysis of the antecedents and consequences of passenger satisfaction with the airport is grounded on the rationale provided by the national customer satisfaction index models, which is discussed in the following section.

3.5.2. The Customer Satisfaction Index Models

Due to the relevance of the subject in the business context, understanding customer satisfaction and how it is associated with customer attitude towards the organization have been broadly studied since the late 1960´s. Firstly, the research focus was towards pre-consumption activities and their impacts on satisfaction. Later, the consequences of satisfaction in the customer post-consumption attitude were also emphasized (Yi, 1990).

The development of more comprehensive models for the antecedents and consequences of customer satisfaction appeared to be a normal response to the increasing interest in the subject. In this context, the emergence of those models is justified by the motivation in predicting customer satisfaction and understanding how satisfaction or dissatisfaction determine customer attitudes towards the product/service or the firm itself (Fornell *et al.*, 1996; Johnson, *et al.*, 2001).

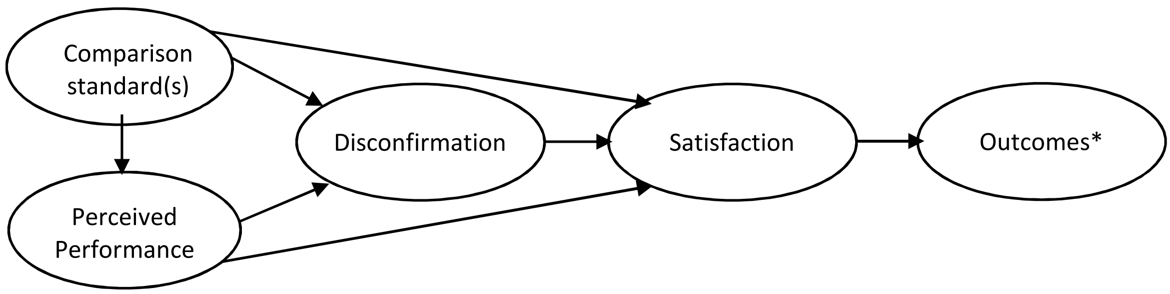
Early models have focused on the customer expectation and perceived performance (or perceived quality) as antecedents (or determinants) of satisfaction. The role of expectation in the customer´s evaluative judgment has been a leading topic in the 1980s (Oliver, 1996; Zeithaml *et al*., 1990). Along with expectation, the perceived performance has also been ubiquitous in customer satisfaction models. Concerning the service literature in particular, the quality-satisfaction relationship is among the most recurrent objects in empirical studies (Falk *et al*., 2010; Sureshchander *et al*., 2002).

In the side of the consequences, customer complaint strategies in reaction to dissatisfaction have received substantial attention (Yi, 1990; Ndungu and Kibera, 2014; Woodruff and Gardial, 1996). Soon, word-of-mouth communication and repurchase intention were inserted into comprehensive models for the customer responses to their consumption experience, driven by the recognition of customer loyalty as a critical issue for any organization in competitive markets (Oliver, 1999).

It is argued that customer loyalty towards a product/service or firm is grounded on customer satisfaction, for which service quality is a key input. In this sense, highly satisfied customers are more likely to become loyal, consolidate their buying with the supplier, and spread positive word of mouth. In contrast, dissatisfaction is expected to drive customers away and has significant influence in switching behavior (Lovelock and Wirtz, 2007).

A generic macro-model of customer satisfaction, based on the expectancy-disconfirmation paradigm, with satisfaction as the central construct, and accounting for both antecedents and consequences is illustrated in figure 21 (Woodruff and Gardial, 1996). To be noted the resemblance with the EDP model (Oliver, 1980, 1996) and the causality pattern that is usual in the current customer satisfaction models.

Figure 21. A generic macro-model of customer satisfaction.



Note: *Relates to the customer post-consumption behavior.

Source: Based on Woodruff and Gardial (1996).

With the evolution of the literature and practice of measuring satisfaction, the first customer satisfaction models designed for providing a continuing measurement of overall satisfaction appeared by the 1990s. According to Johnson *et al*. (2001), the development of the national satisfaction indices in Sweden (Fornell, 1992), the United States (Fornell *et al.*, 1996) and Norway (Andreassen and Lindestad, 1998), for example, has given customer satisfaction national and international significance. By the end of the 1990s, satisfaction indices had also been used in New Zealand, Austria, South Korea, and the European Union

(Fornell *et al.*, 1996; Anderson and Fornell, 2000). In the next decade, other countries were working on similar projects (Grigoroudis, *et al*., 2008).

These national customer satisfaction models are arguably uniform enough to allow comparison among organizations or even industries (Johnson *et al.*, 2001). Within the models, customer satisfaction is treated as an overall evaluation of the consumption experience, and it is assumed that customer perception of the product/service quality drives satisfaction. In this context, customer satisfaction is operationalized with the objective to provide different benchmarks that customers may use to evaluate their overall experience, comprising expectancy, competing products/services, category norms, and personal values (Johnson *et al*., 2001).

Moreover, these models share a number of other similarities. Given the purpose of this Thesis, the following similarities are highlighted:

a) The customer satisfaction has the central role in the models.
b) Relationships among customer satisfaction, its antecedents and consequences are hypothesized.
c) The models provide an index for customer satisfaction that is comparable across firms, industries, and sectors.
d) The approaches used recognize that customer satisfaction and the other constructs in the model represent different types of customer evaluations that cannot be directly measured (i.e. they are latent variables).
e) Validity and reliability measurement issues are of key importance for the validity of the results.

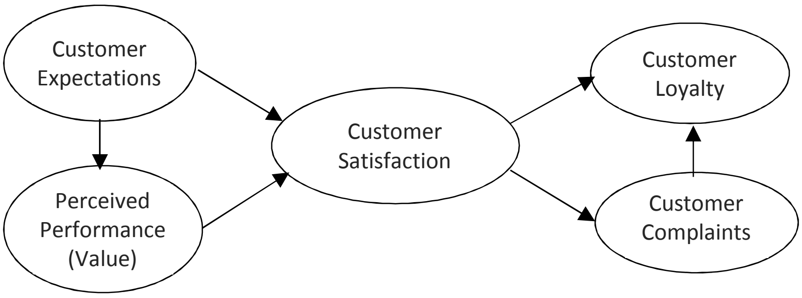
According to the review of Johnson *et al*. (2001), the Swedish Customer Satisfaction Barometer (SCSB) was the first truly national customer satisfaction model. Released in 1989, it comprises the two primary antecedents of customer satisfaction, i.e. expectation regarding performance and the customer´s recent performance experience with the product of service (Fornell, 1992). The model contains two consequences of customer satisfaction. It is expected that an increased satisfaction should increase customer loyalty towards the firm and decrease customer complaints.

Consistent with the expectancy-disconfirmation paradigm, the SCSB model assumes that customer expectations capture their prior consumption experience with the product/service as well as advertising and word-of-mouth information. Therefore, expectations are expected to forecast a firm´s ability to provide future performance, and it has a positive effect on customer satisfaction (Fornell, 1992). Customer expectation is also positively related to the perceived performance, which captures customer more recent experience with the product/service.

In the SCSB model, perceived performance is mainly associated with the customer perception of value, intending to capture the customer evaluation of the perceived level of quality relative to the price paid for the product/service. This particular relationship is expected to capture customer's abilities to learn from their experience and predict the level of performance to be received (Johnson *et al*., 2001). In the model, the perceived performance is directly associated with customer satisfaction.

As regards the consequences of customer satisfaction, it is assumed that satisfied customers are less likely to complain and more likely to present predisposition to repurchase from the firm. Also, there is a predicted relationship from complaint behavior and loyalty, but the direction of this relationship is considered to be dependent on the firm´s ability to handle customer complaints (Fornell, 1992). Johnson *et al*. (2001) explain that these consequences of satisfaction stress the importance of systematic monitoring customer satisfaction. The SCSB model is represented in figure 22.

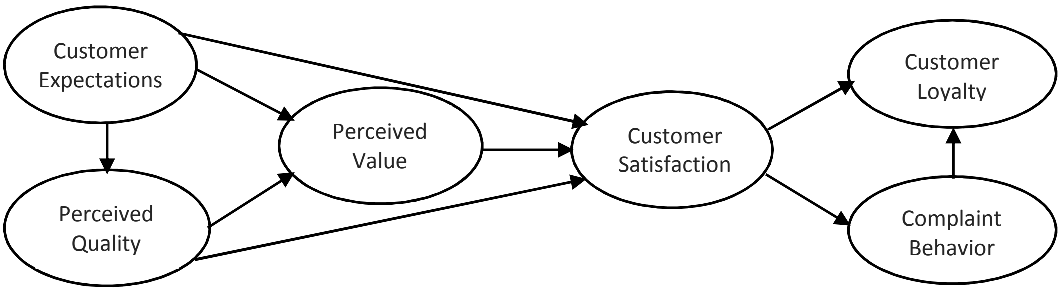
Figure 22. The Swedish Customer Satisfaction Barometer model.



Source: Based on Fornell (1992).

Built upon the SCSB model, the American Customer Satisfaction Index (ACSI) model appeared in 1994 (Fornell *et al.*, 1996). As regards model structure, the main difference comparing to its predecessor is the addition of a perceived quality construct distinct from the perceived value (Figure 23). Actually, comparing the ACSI model with the SCSB model, the similarity is evident.

Figure 23. The American Customer Satisfaction Index model.



Source: Based on Fornell *et al*. (1996).

The inclusion of both perceived quality and perceived value are meant to provide relevant diagnosis information concerning the relative impact of quality and value on customer satisfaction. Accordingly, using both constructs it is possible to find whether customers are more sensitive to price variation (Fornell *et al*., 1996). For instance, as the impact of value increases relative to the perceived quality, the price is a more important determinant of satisfaction than quality. In addition, to be noted that as quality is a component of value, the ACSI model also predicts a direct effect from perceived quality to perceived value (Johnson *et al*., 2001).

In the original ACSI model, the perceived quality comprises both the degree to which a product or service provides key customer requirements and how reliably these requirements are delivered. Additionally, an overall perception of quality is considered for customer evaluation. Concerning the perceived value, the ACSI model comprises the same two measures used in the original SCSB model, which are the customer perception of the quality received for the price paid and the perception about the price paid for the quality received (Fornell *et al*., 1996).

The customer expectation is also measured based on the same customer anticipation ideas about customization, reliability, and overall quality. Subsequent developments expanded the ACSI model so that to comprise two distinct types of perceived quality, i.e. products (physical goods) and service quality (Johnson *et al*., 2001).

Regarding customer satisfaction, a multidimensional approach is assumed, as usual among the national models. Within the ACSI model, three measures are used: i. an overall and comprehensive rating of satisfaction with the product/service, ii. the degree to which the product/service performance meets expectations (expectancy confirmation or disconfirmation), and iii. an evaluation of the performance perceived relative to the customer´s ideal product or service (Fornell *et al.*, 1996; Anderson and Fornell, 2000). It is assumed that using this approach the satisfaction construct is not confounded by either performance or expectations.

Customer complaints and loyalty are consequences of satisfaction included in the model, which is based on the exit-voice theory (Hirschman's, 1970 *apud* Anderson and Fornell, 2000). According to this theory, the immediate consequences of customer satisfaction are a decrease in customer complaints and increased customer loyalty. Therefore, a customer that had a bad experience is likely to exit (i.e. going to a competitor) or voicing their complaints to the firm. Otherwise, an increased satisfaction should increase customer loyalty towards the firm.

In the ACSI model, the construct customer complaints is measured simply with a "yes-no" question asking whether a customer has formally complained (Fornell *et al*., 1996).

Concerning customer loyalty, two measures are used. The first relates to the customer repurchase intention and the second measure is intended to capture customer tolerance to the prices.

The ACSI is considered as model of reference in this Thesis, so that to achieve the research objective of examining the relationships between passenger perception of airport service quality and the passenger attitude towards the airport, including passenger satisfaction. The model has been widely used in several service settings, including the air transport industry (Rhoades and Waguespack Jr, 2008; Chen, 2008). In addition, the ACSI model has been the basis for a number of other National Customer Satisfaction Indices, as the Norwegian Customer Satisfaction Barometer (NCSB) and the European Customer Satisfaction Index (ECSI) (Johnson *et al*., 2001). Moreover, the ACSI model structure is open to modifications in the questionnaires to be suitable to a specific industry (Fornell, Morgeson and Bryant, 2008).

Notwithstanding, some subsequent developments with the European Customer Satisfaction Index (ECSI) model are of interest for this Thesis. In the ECSI model, customer expectations, perceived quality, perceived value, customer satisfaction, customer loyalty, and complaints are modeled the same as in the ACSI (Johnson *et al*., 2001). The main differences comprise: i. the inclusion of the construct image as a latent variable with direct effects on customer expectation, customer satisfaction, and loyalty; ii. the inclusion of other aspects of product/service quality for perceived quality measurement; iii. the measures for customer loyalty include the likelihood of repurchase, price tolerance, and the likelihood of recommending the firm or brand; iv. the measures for customer complaints incorporate perception about complaints management effectiveness (with different questions depending on the customer had complained or not). In this thesis, items iii and iv are incorporated into the model to be estimated in the empirical study 3.

Besides these modifications imported from the ECSI model, other specific changes in the questionnaire are processed in order to cope with particularities of the airport context. All the modifications to the original ACSI model are described and justified in Section 4.4., along with the presentation of methods for model estimation and other methodological aspects of the study.

3.5.3. Passenger Satisfaction in the Airport Context

In this subsection, an overview of the literature on passenger satisfaction in the airport context is provided. According to Halpern and Graham (2013), until the 1980s airports usually adopted a passive approach to customer services, including customer satisfaction analysis. However, with the changes in the airport industry over the last decades, the interest in customer satisfaction has substantially increased, mostly concerning passengers (Bogicevic *et al*., 2013; Moon *et al*., 2016).

According to Bogicevic *et al*. (2013), airport companies have been measuring passengers´ perceptions of service and satisfaction in order to evaluate airport performance, however without clearly understanding passenger expectations. Bezerra and Gomes (2015) suggested that even the effects of service quality on passenger satisfaction have not been fully researched within the airport context.

Some studies have addressed the problem of identifying and measuring the effects of service quality attributes or dimensions on the passenger satisfaction with the airport. Eboli and Mazzulla (2009) measured passenger satisfaction with an Italian airport aiming to identify the critical aspects of the service. Logistic regression analysis was used, and the results stressed the attributes of the airport service and facilities with higher and lower effects on satisfaction. The study of Güres *et al*. (2009) focused on identifying the nature of the relationships between demographic and flight characteristics of a sample of passengers and their level of satisfaction and fairness perceptions about Turkish airports.

Gkritza *et al*. (2006) examined the degree of passenger satisfaction concerning the security inspection process as dependent on attributes of the process performance and passenger characteristics. Data from passengers in USA airports was used. Results of a multinomial regression analysis showed that wait times are significant determinants of passenger satisfaction, but many other factors also play an important role. Moreover, the results suggested that the determinants of satisfaction are not stable over time.

Jen *et al*. (2013) focused on the airport physical surroundings and its impact on the passenger satisfaction. Their study explored the relationship between servicescape and satisfaction through structural equation modeling (SEM) and Importance-Performance Analysis (IPA). Survey data was obtained from a main Taiwanese international airport. Based on the results, the perceived servicescape significantly affected passenger satisfaction, and the ambient conditions had the highest effect on the perceived servicescape.

The influence of the airport physical environment on passenger satisfaction and delight was examined by Ali *et al*. (2016). This study also assessed the moderating role of national identity on passenger delight and satisfaction. The results from the structural analysis of data from a Malaysian airport suggested that airport physical environment influences both passenger delight and satisfaction. Moreover, national identity moderates the relationships among physical environment, passenger delight, and satisfaction.

Bezerra and Gomes (2015) examined the effects of service quality dimensions on passenger's overall satisfaction with an airport together with variables related to passenger characteristics. The service quality dimensions were obtained by exploratory factorial analysis of traditional service and facilities attributes related to the airport services. Probabilistic regression analysis was used for data related to a major South-American airport. They found that the ambience dimension, measured by comfort-related attributes and cleanliness of the airport presented the highest effect on passenger satisfaction. Moreover, frequent flyers were less likely to present higher levels of satisfaction, and the earlier the passenger arrives at the airport, the more likely they were to present a high level of overall satisfaction.

The relationship between fairness perceptions and satisfaction was examined by Sindhav *et al*. (2006), specifically the relationships between different aspects of justice and passenger satisfaction in the context of facilitating service under legally imposed constraints, as the case of airport security screening. SEM was used for analysis of survey data obtained from departing passengers at a US airport. The findings provided evidence that passenger fairness perceptions had a significant and substantial effect on their satisfaction with the overall experience.

Chang *et al*. (2008) widened the approach to this particular research problem, covering the relationships among social justice, service quality, satisfaction, and future complaint intentions in a Taiwanese international airport. This study emphasized the degree to which unsatisfactory experiences are reported and the ways in which they are handled. SEM was used for data analysis. Social justice and service quality were modeled as antecedents of customer satisfaction, with complaint intention as a direct consequence. Based on the results, service quality presented significant effect on customer satisfaction, as well as distributive justice and interactional quality (two dimensions of social justice). Customer satisfaction had a negative effect on complaint intention, as predicted in the literature.

Other studies have provided a more comprehensive approach to the subject of satisfaction within the airport context. Park and Jung (2011) examined passenger´s perceptions of service quality and their influence on value, satisfaction, airport image, and passenger post-consumption behavior. SEM was used to analyze survey data collected from transfer passengers at a South Korean International Airport. Based on the results, airport service quality is likely to raise the level of transfer passengers' satisfaction, value perceptions, and airport image. In addition, service quality had an indirect effect on the passenger behavior by means of value, satisfaction, and airport image. The post-consumption behavior was determined by satisfaction, perceived value, and image.

Nesset and Helgesen (2014) used a cause-and-effect model to analyze the effects of different service quality and choice attributes on passenger satisfaction. As consequences of satisfaction, image and loyalty were considered. The model also comprised direct and indirect effects of perceived switching costs in loyalty. The results for an airport in a Norwegian multi-airport region stressed the relevance of service quality for customer satisfaction. Moreover, switching costs presented a direct positive effect on loyalty, as well as the interaction term of Switching costs and Satisfaction.

Chen *et al*. (2015) examined the determinants of passenger satisfaction with the airport, the nature of the relationship between customer satisfaction and customer value, and the moderating effect of service innovation to enhance customer value. Data was collected through an online survey to passengers from different Asian countries. Data analysis was based on SEM. In their study, three service dimensions (Accessibility, Security check, and Terminal facilities) determined customer satisfaction. Perceived value was a consequence of satisfaction, whose relationship was moderated by a construct named service innovation comprising examples of innovative ancillary services in airports (e.g. micro-hotels and sleep boxes, use of social media, and kiosks). As regards the results, only terminal facilities did not present significant effect on customer satisfaction. The path satisfaction-value was significant, as well as the moderating effect of service innovation.

Moon *et al*. (2016) aimed at investigating the relationships among the variables of airport physical environments, customer emotion (pleasure and arousal), and customer satisfaction. They also verified which attribute of the airport physical environment had a significant impact on customer emotion, and examined the mediating role of emotion between airport physical environments and customer satisfaction. According to the findings from the SEM analysis, three components of airport physical environments had decisive effects on customer pleasure, arousal had no influence on satisfaction, and customer emotion played a mediator role between the attributes of airport physical environments and customer satisfaction.

Table 10 provides an overview of these previous studies on passenger satisfaction in the airport context, stressing the data analysis method and the constructs used.

Although an airport serves a number of different customers and interacts with several stakeholders, it is noteworthy that literature research is focused on passenger satisfaction and more particularly in departing passengers. The service quality-satisfaction relationship has been emphasized, but a diversity of service quality models and different approaches to measuring passenger satisfaction were considered.

Moreover, authors have used different theoretical model for the relationships examined. In this sense, it is to be noted that the models are not always consistent with the literature on the antecedents and consequences of customer satisfaction, as discussed in the preceding subsections. Some studies did not even provide clear justification for the research hypotheses or for the construct operationalization and measurement items used. In this context, it seems that more research on the antecedents and consequences of passenger satisfaction with the airport is needed.

Table 10. Studies on passenger satisfaction in the airport context.

Reference	Data analysis	Constructs
Moon *et al*. (2016)	SEM	Airport physical environment dimensions (including layout accessibility, facility aesthetics, functionality, cleanliness); Customer emotion (including pleasure and arousal); Customer satisfaction (multi-item measurement).
Bezerra and Gomes (2015)	Probabilistic Regression analysis	Service quality dimensions (Seven dimensions); Satisfaction (measured by one single variable).
Jen *et al*. (2013)	SEM and Importance-performance analysis	Servicescape (reflected in the Ambient conditions; Spatial layout and functionality; and Sign, symbols, and artifacts); Satisfaction (measured by one single variable).
Eboli and Mazzulla (2009)	Probabilistic Regression analysis	Individual service quality attributes; Satisfaction (measured by one single variable).
Chang *et al*. (2008)	SEM	Social justice dimensions (including distributive justice, procedural justice, and interactional justice); Service quality (four items related to general aspects of the service/facilities); Satisfaction (multi-item measurement); Complaint Intention (multi-item measurement).
Chen *et al*. (2015)	SEM	Service quality (including accessibility, security check, and terminal facilities); Satisfaction (multi-item measurement); Customer value; Service innovation.
Sindhav *et al*. (2006)	SEM	Justice (including the dimensions: distributive justice, procedural justice, interpersonal justice, informational justice); Satisfaction (measured by one single measure).
Nesset and Helgesen (2014)	SEM	Facility, Price, Service Quality, Flight offers; Satisfaction (multi-item measurement); Image; Loyalty.
Ali *et al*. (2016)	SEM	Physical environment; Satisfaction (multi-item measured); Delight.
Gkritza *et al*. (2006)	Multinomial regression analysis	Attributes of the security inspection process and passenger characteristics.
Park and Jung (2011)	SEM	Service quality; Perceived value; Satisfaction (multi-item measured); Image; Loyalty (including reuse intentions and word-of-mouth).

Note: SEM – Structural equation modeling.

3.5.4. Final Considerations on the Customer Satisfaction Review

Based on this review on customer satisfaction and passenger satisfaction within the airport context, some inferences are relevant for this Thesis. Several studies have been published, covering diverse objectives, focus, methods, and sectors. Notwithstanding, customer satisfaction has been broadly recognized as an evaluative judgment concerning a specific product or service.

The increasing interest in the relationships among customer satisfaction, its determinants and influences on customer behavior has led to the development of comprehensive frameworks for the antecedents and consequences of customer satisfaction, including customer satisfaction indices models. These models have regularly been used in different service settings, including the air transport industry.

Concerning the airport sector, the service quality-satisfaction relationship has been emphasized, mostly for passengers. Different theoretical models for the relationships have been used, but only a few investigations were based on a more comprehensive approach to the complex relationships among the various aspects related to passenger satisfaction with the airport.

Furthermore, the models used within the airport context were not always grounded on theory and some studies did not provide justification for the research hypotheses, construct operationalization and measurement items used. In addition to these findings, it is noteworthy that there are still few investigations on the complex relationships among the several aspects related to customer satisfaction within the context of airport service provision.

Accordingly, based on the state-of-art of the research on airport passenger satisfaction, in this Thesis the ACSI model is chosen as the theoretical model for the antecedents and consequences of satisfaction with the airport. Given the particular characteristics of the services provision within airports, however, some modifications related to service quality measurement and passenger post-consumption behavior were considered necessary. These modifications are explained in the Methodology Chapter.

3.6. CHAPTER CONCLUSIONS

In this chapter, a review of the literature on the three main topics related to the research problem was reported. The subjects of Performance Measurement, Service Quality, and Customer Satisfaction provided a consistent background for the forthcoming empirical studies.

The main current issues related to performance measurement were emphasized, comprising the need for a clear approach to the performance construct, the design and implementation of PMS, benchmarking, and the relevance of taking into account the stakeholder´s needs in the context of performance measurement.

A systematic literature review on performance measurement in the airport setting provided relevant information on the literature evolution and performance dimensions emphasized within this particular industry. For this review, research articles and other relevant documents published between 1970 and 2015 were analyzed, following explicit criteria and replicable procedures. Based on this extensive literature review, a framework of the airport performance dimensions was proposed.

Although there is vast literature research, including some recent extensive reviews focusing on airport efficiency and best practice guidelines, there is a lack of systematized knowledge on current performance measurement practices in the airport industry. Moreover, there has been increasing interest in service quality measurement in the airport context.

Regarding service quality, a brief overview of the literature was provided, including considerations on the particular characteristics of quality within the service context and the most frequently used service quality models based on customer perception. Afterward, a review of the literature dedicated to service quality in the airport environment emphasized the evolution of the research and practices, the current issues, and the challenges associated with the validity and reliability of measurement practices within this particular service setting.

Finally, the problem of measuring customer satisfaction in service environments was discussed, and a review of the literature related to airport services was provided. Particularly, the evolution of customer satisfaction models was highlighted in order to address the research objective of examining the relationships between passenger perceptions of airport service quality and passenger attitudes about the airport.

PART II – EMPIRICAL STUDIES

CHAPTER 4 - METHODOLOGY

4.1. INTRODUCTION

The previous chapter provided theoretical background and stressed the relevance and timeliness of the subject of performance measurement in the current airport business context. Particularly, it was emphasized the need for a more comprehensive approach to airport performance and for integrating service quality measurement and passenger attitudes into airport management practices. In this present chapter, the methodological aspects related to the research effort are presented.

Regarding the research paradigm, this Thesis is grounded on a positivist approach. The positivism adheres to the perspective that scientific knowledge must be based on factual knowledge gained through observation, which may include different methods. In this sense, the researcher shall collect and interpret data through objective methods. Accordingly, the findings are usually observable and quantifiable (Vergara, 2014).

Based on the state-of-art of the literature on airport performance, particularly concerning the multidimensionality of performance, the increasing importance of service quality, and the characteristics of the passenger-airport interaction, a deductive approach is embraced. According to Wilson (2010), the deductive approach is concerned with developing a hypothesis (or hypotheses) grounded on existing theory, and then designing a research strategy to test the hypothesis (or hypotheses).

In this context, three main theoretical hypotheses are considered in this Thesis. First, airport performance is a multifaceted construct with different dimensions, and airport executives are not likely to give the same treatment to all these dimensions. Second, perceived airport service quality can be explained and measured with a multidimensional approach. Third, the relationships between antecedents and consequences of passenger satisfaction with the airport can be explained by a cause-and-effect model. In addition, other more specific research hypotheses derived from these main hypotheses are presented in the particular studies, when applicable.

Concerning research strategy, the quantitative approach is used. A quantitative research usually consists of drawing a sample from the population of interest, measuring particular behavior and characteristics of that sample, and attempting to construct generalizations regarding the research findings (Wilson, 2010). In this sense, the quantitative approach involves the use of quantifiable data.

In view of the research questions and the multiple objectives, this Thesis comprises three independent but interrelated empirical studies. The first empirical study has an exploratory purpose. Several performance measures derived from an extensive literature review are presented to a sample of airport executives in Brazil. Based on the literature reviewed and the findings arising from this exploratory study, the subsequent studies focused on airport service quality and its relationships with passenger attitudes towards the airport.

In the second study, a measurement model for airport service quality, consistent with a multidimensional approach, is built upon typical service quality measures within the airport industry. A confirmatory approach is used for testing for the model´s validity, invariance, and cross-validation, including different groups of passengers and distinct airport settings.

The third study aims to examine the relationships between the passenger perception of service quality and their behavioral attitudes towards the airport according to a theoretical model of the antecedents and consequences of customer satisfaction. By using a structural equation modeling approach these relationships are estimated simultaneously.

In addition to the information on the research design presented in the introductory chapter, Table 11 presents key elements of each empirical study, including summarized information on the research methods and the connection between the study and the research questions and objectives stated in the introductory chapter.

Table 11. A synthesis of the empirical studies.

Study number	1	2	3
Title	Examining performance measurement practices in airport settings	Measuring Airport Service Quality: A Multidimensional Approach	Antecedents and Consequences of Passenger Satisfaction with the airport
Research question	What is the current profile of airport operators concerning performance-related practices?	How to integrate service quality measurement and passenger attitudes within the context of airport management?	How to integrate service quality measurement and passenger attitudes within the context of airport management?
Research objective	To examine performance measurement practices at Brazilian airports, in order to identify the current profile of airport executives concerning performance measurement	To develop a measurement model for airport service quality accounting for the multifaceted nature of the service quality construct	To examine the relationships between the passenger perception of airport service quality and passenger attitudes towards the airport
Data collection:	Internet Survey	Secondary data and Paper-based survey	Paper-based survey
Target-public	Airport executives in Brazil	Departing passengers in two main Brazilian airports	Departing passengers in a main Brazilian airport
Data analysis	Cluster Analysis; Multiple Regression Analysis; Gap Analysis.	Confirmatory factor analysis	Structural equation modeling
Thesis´ objective linked	Objective 2	Objective 3	Objective 4

After this brief introduction, in the following sections the research objectives, research strategies, and the methods to be used in the three empirical studies are subsequently presented. For this purpose, distinct sections are dedicated to each study.

4.2. STUDY ON PERFORMANCE MEASUREMENT PRACTICES (Study 1)

This first empirical study aims at examining performance measurement practices at Brazilian airports, in order to identify the current profile of airport executives concerning to the frequency of use, the relevance, and the ease of acquisition of a set of performance measures related to eleven categories of performance. For this purpose, an internet survey applied to airport executives is carried out.

The use of survey research is consistent with the study´s objective. With a survey, the researcher can gather and describe data and information on specific aspects of a given population in a quantitative manner (Fowler Jr, 2009). By definition, a survey is a mean for gathering information about characteristics, actions, or opinions of a group of people, usually based on structured questionnaires (Pinsonneault and Kraemer, 1993). In this study, data collection process is based on a self-administered questionnaire placed on a website and managed with specialized software[8]. The unit of analysis is the airport, and the respondent is the occupant of the highest post within the organizational structure of each airport.

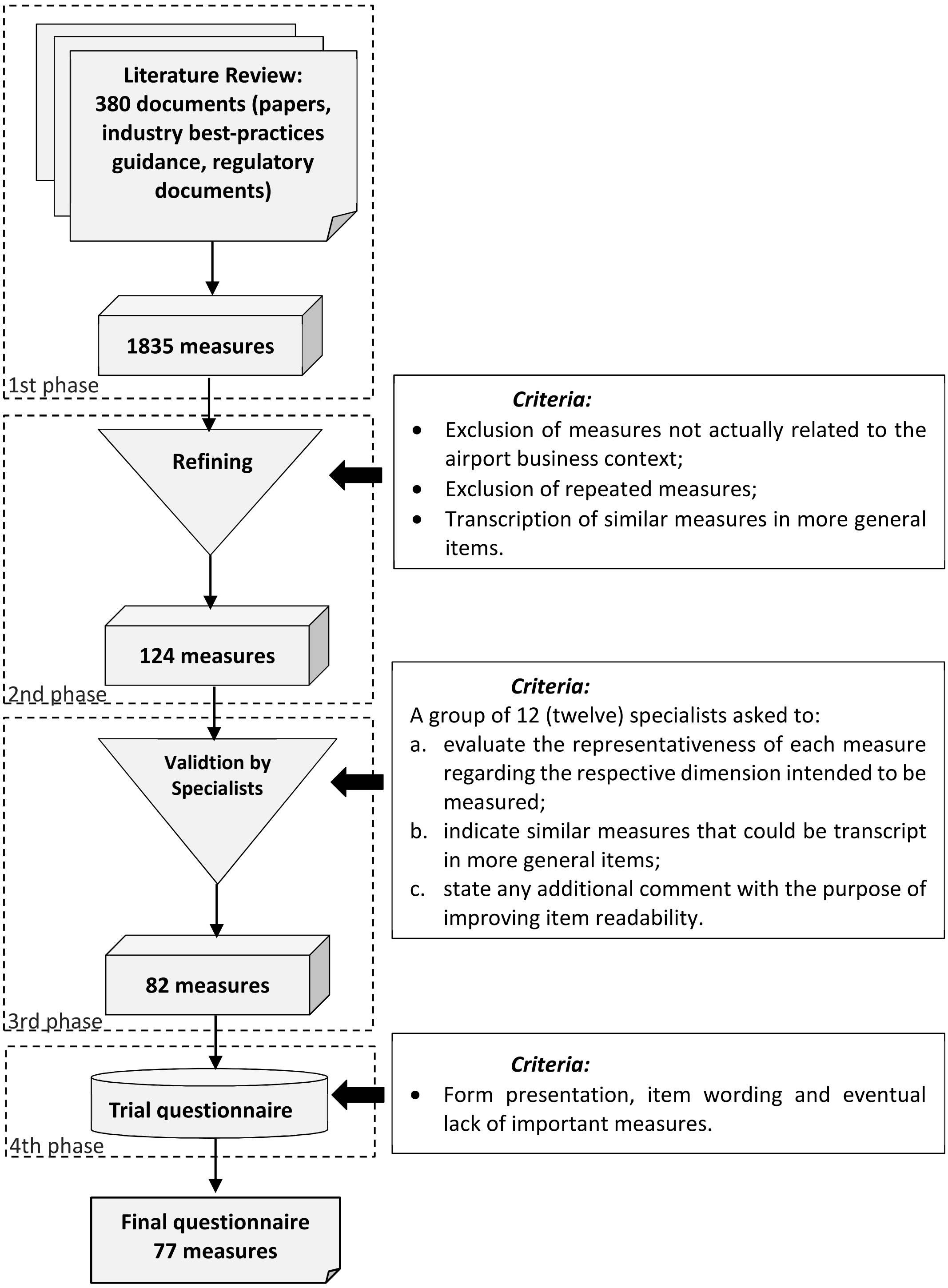
4.2.1. The Research Instrument

The development process of the research instrument comprised four phases, as depicted in Figure 24. The first phase was based on the Systematic Literature Review (SLR) reported in section 3.3. Hence, a set of performance measures was obtained from an extensive review of 380 studies among literature research, practical guidance, and

[8] Software QualtricsTM (http://www.qualtrics.com/about, accessed: 12/10/2015).

regulatory documents. These measures are associated with the performance dimensions proposed in section 3.3., comprising Efficiency-productivity, Service Quality, Safety, Security, Commercial, Economic-financial, Environmental, Social, and Competitiveness.

Figure 24. Development process of the research instrument.



In the second phase, this initial set was searched for measures not actually related to the airport business context. Additionally, repeated measures were excluded, and similar performance measures were rewritten in more general items. After this second phase, 124 different measures remained.

In the third phase, the remaining set of measures was submitted to content validation by a group of 12 specialists, including researchers (5), airport professionals (3), and experts from the Civil Aviation Authority (CCA) in Brazil (4). These specialists were given a set of performance measures according to their specific area of knowledge and asked to indicate in a scale from 1 to 5 the representativeness of each measure regarding the respective dimension intended to be measured. They were also asked to indicate similar measures that could be rewritten in more general items and to state any additional comment with the purpose of improving item readability. This third phase produced four significant contributions:

i. Presenting operational measures in their original version (i.e. with no ratios, as considered in the efficiency/productivity dimension)[9]. Thus, another performance dimension was included, called Operational;
ii. Presenting Level of Service measures separated of Service Quality measures[10];
iii. Using the category of information “Perceived Relevance” instead of “Predictive Value”, as used in previous research[11], and;
iv. Warnings on the length of the questionnaire.

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9 Justification for this contribution relies on the assumption that airport executives may have different patterns of use for the same measure while considered alone or within ratio measures of efficiency/productivity.

10 Justification relies on the assumption that airport managers have different approaches to Level of Service and Service Quality and, hence they could have different patterns of utilization.

11 Differently from previous studies (Dempsey *et al.*, 1997; Gomes & Yasin, 2013; Simões *et al.*, 2015), the category “Perceived Relevance” was used instead of “Predictive Value”. This modification was a result of the validation process and has a twofold justification. First, the term “Predictive” is largely used within the aviation sector as a type of approach to safety management (ICAO, 2013; Leva *et al.*, 2015). Second, the equivalent of “predictive value” in Portuguese language (i.e. *valor preditivo)* was not considered clear by the Brazilian specialists during the validation process of the questionnaire. The term “Perceived Relevance” is in accordance with previous studies on performance issues (Campbell, 1990; Schawb & Miner, 2008).

After validation by specialists, the number of performance measures decreased to 82 measures. Finally, a trial questionnaire with these 82 measures was sent to three airport directors and two CAA specialists in order to judge form presentation, item wording, and the eventual lack of any important measure. In this last phase, the specialists provided suggestions on item wording and on the exclusion of measures with the justification that they were not adequate to the Brazilian case due to the particular regulatory context.

After these four phases of development of the research instrument, the final version of the questionnaire comprised 77 performance measures representative of 11 categories of airport performance. Based on the developing process, two more categories of performance were added to the nine performance dimensions proposed in the framework of airport performance dimensions (section 3.3.): Operational (OPE) and Level of Service (LOS).

The performance measures used in the questionnaire are presented in Table 12.

Table 12. Performance measures in the questionnaire

EFF – EFFICIENCY/PRODUCTIVITY • Number of passengers or WLU/Terminal area • Number of passengers/Number of employees • Number of passengers or WLU/Costs • Number of aircraft/Runway area • Number of aircraft/Number of employees • Revenues/Number of passengers or WLU **ASQ - SERVICE QUALITY** • Formal inspection of purchased products and services • Availability of equipment and facilities (Elevators, Moving stairs, Baggage systems, etc.) • Terminal temperature monitoring • Customer complaints • Airlines satisfaction surveys • Concessionaires satisfaction surveys • Passengers satisfaction surveys • Processing time of passengers with reduced mobility (PRM) **ENV - ENVIRONMENTAL** • Water consumption reduction • Energy consumption reduction • Gaseous pollutant emission • Noise level • Number of houses or population within a certain noise contour • Solid waste generated	**OPE – OPERATIONAL** • Number of passengers or WLU by airline • Number of passengers or WLU by number of routes • Number of passengers during peak hours • Number of passengers by type of traveler (tourism, business, others) • Number of aircraft during peak hours • Number of aircraft by type of flight (commercial/general aviation; regular/no regular; civil/military, etc.) • Flight delays • Total time of runway closed in a given period **LOS - LEVEL OF SERVICE** • Congestion level of waiting areas/lounges • Runway system capacity • Congestion level of aprons • Processing time at checkpoints (check-in, security inspection, etc.) • Wait time at checkpoints (Check-in, Security inspection, etc.) • Curb time per vehicle • Baggage delivery time **COP - COMPETITION** • Airport market share • Airlines competition in the airport

• % of waste sent to recycling • Occurrence of spills **SOC - SOCIAL** • Direct-Indirect job generation • Minority representation in workforce • Number of citations by the media • Number of meetings with airlines and other organizations involved in the airport activities • Sponsorship for sport, educational or cultural activities • Social activities for local communities **EFN - ECONOMIC-FINANCIAL** • Operating costs • Expenditures evolution • Revenues evolution • Investment • Debt • EBITDA (Earnings before interest, depreciation, and amortization) • Cash flow • Profit/Loss • Operating margin • Profitability ratios (ROA, ROE, ROI, etc.) • Internal rate of return (IRR)	• Number of destinations (non-stop) measured over the course of a year (including seasonal services) • Airlines costs with airport fees **SAF - SAFETY** • Aeronautical accident-incident • Bird strike-Wildlife strike • Wildlife in maneuvering area • Foreign Objects (FO) • Ground operations occurrences • Runway incursion occurrences • Number of safety training-promotion events • Number of safety reports • Emergency response time (real events and simulations) **SEC - SECURITY** • Occurrence of serious events at the airport (theft, robbery, others) • Occurrence of hysteria events inside terminal • Number of security procedures breaches • Number of security badges breaches **COM - COMMERCIAL** • % commercial area leased • Duration of lease • % cargo space leased • Parking occupation (Note: if existing) • Retail sales • Concessions revenues

The category Efficiency/Productivity (EFF) comprises ratios of physical and financial inputs and outputs related to the airport services processing. The category Service quality (ASQ) contains measures related to the airport facilities and service attributes, including customer-based measures. In category Safety (SAF), the occurrence of undesirable events and typical indicators from Safety Management Systems are considered. Likewise, category Security (SEC) comprises measures related to the occurrence of security events. In category Commercial (COM), the measures are related to the non-aeronautical activities. The category Environmental (ENV) includes measures of bad outputs related to the airport activities with impact on the environmental. The category Social (SOC) comprises aspects of airport corporate social responsibility. In the category Economic/Financial (EFN), common economic and financial measures are represented. The category Operational (OPE) comprises measures related to the airport processing services. Finally, in category Level of Service (LOS), quantitative measures typically related to the level of service of the airport terminal are concealed. This categorization is not intended to be definitive but might provide a frame of reference for the respondents[12]. Furthermore, it also served as a reference for the forthcoming analyses.

For each measure, the respondents were asked to indicate their opinions as regards three information categories according to five-point scales[13]: a. the frequency of use in the process of evaluating the performance of the airport (Frequency of Use - FU), b. the perceived relevance of the measure to predict airport performance as regards the respective dimension (Perceived Relevance - PR), and c. the ease of acquisition of the data/information necessary for using the measure (Ease of Acquisition - EA).

Additionally, a few questions related to the time experience of the respondent and information on the airport characteristics were included in the questionnaire to provide sample characterization. In Appendix I, there are examples of pages of the online questionnaire used by the respondents. The original text and items comprised in the final version of the questionnaire are presented in Appendix II, in the Portuguese language. Appendix III provided a full list of the respective codes and items description.

4.2.2. Models and Data Analysis for the Empirical Study 1

The responses to the information categories (Frequency of Use - FU, Perceived Relevance - PR and Ease of Acquisition - EA) are expected to reveal a profile of the airport executives concerning their extent of utilization of different measures in assessing different aspects of the airport performance. To examine this profile, data analysis comprised the use of

[12] This categorization attempts to best capture the intended purpose of each measure, based on the perspective of the airport executives and considering the specific context of this research. Moreover, it aims to provide clear communication with the specific target public.

[13] The statements in Portuguese language were based on the questionnaire used by Gomes and Yasin (2013), for Portuguese service organizations.

multivariate techniques, namely cluster analysis, multiple regression analysis, and gap analysis.

First, cluster analysis is used to evaluate how the 77 performance measures could be grouped according to their average frequency of use, executive´s perception on their relevance for predicting airport performance, and availability of data/information for using the respective measure. Accordingly, observation unit was the average of the responses for each measure and information categories. The K-mean method of cluster analysis was used.

The K-mean method is suitable for the observation unit in this study and can classify a data set according to a fixed number of *k* clusters. The algorithm defines *k* centroids - one for each cluster - as far away as possible from each other using the within-cluster variation as a measure to form homogenous clusters. In the clustering process, each observation is associated to its nearest centroid by successive interactions in order to produce a result in which within-cluster variation is minimized (i.e. the squared distance from each observation to the centroid of its associated cluster is the minimum) (Mooi and Sarstedt, 2011; Hair *et al.*, 2014).

This method of clustering is particularly adequate to cases when the researcher already has hypotheses or requisites concerning the number of clusters to be as distinct as possible (Mooi and Sarstedt, 2011). Regarding this study, the number of clusters was predefined to five as to provide an analogy with the 5-point scale used on the questionnaire (Dempsey *et al.*, 1997; Simões *et al*., 2015; Gomes and Yasin, 2013). Therefore, the performance measures can be grouped accordingly to five levels for each of the three information categories (frequency of use, perceived relevance, and ease of acquisition).

In the second phase of data analysis, multiple regression analysis is used. The frequency of use (FU) of a given measure is assumed to be a linear function of its perceived relevance (PR) and ease of acquisition (EA). Thus, the model to be tested can be expressed in the following terms:

$FU = f\,(PR, EA)$

This model assumes that rational decision-makers will utilize information up to the point where its marginal costs and benefits are reasonable (Dempsey *et al*., 1997). Therefore, it is expected that if any data/information has significant value to the airport executives they will likely to be motivated to expend resources to obtain it.

The linear function to be estimated is presented as:

$$FU_i = \alpha_0 + \alpha_1 PR_i + \alpha_2 EA_i + e_i$$

Where:

FU_i – The mean score for frequency of use on the *ith* measure.
PR_i – The mean score for perceived relevance on the *ith* measure.
EA_i – The mean score for ease of acquisition on the *ith* measure.
e_i – the residuals.
a_0, a_1 and a_2 – the linear parameters.

The observation unit is the average of the responses for each measure and information category. Since the variables used represent mean values, they are of a continuous nature and therefore suitable for linear modeling. With a number of 77 measures, sample size is sufficient to model estimation by the ordinary least square (OLS) method (Hair *et al.*, 2014). The assumptions of the linear regression analysis are verified beforehand, comprising the distribution for the residuals, linearity, homoscedasticity, and independence of the residuals (Webster, 2006; Hair *et al.*, 2014).

The first model estimates a general profile of the airport executives concerning the relative use of different performance measures accounting for the concurrent influence of the perceived relevance (PR) and the ease of acquisition (EA). Additionally, significant deviations from the linear regression function, as indicated by the standardized residuals, will provide information on the measures that are used with more and less frequency comparing to the predicted linear model. In other words, what measures present a profile of utilization the most different from the average profile estimated? In this study, observations out of the 80% confidence interval are considered significant, consistent with previous studies (Dempsey *et al*., 1997; Gomes and Yasin, 2013; Simões *et al*., 2015).

The multiple regression analysis is also used to test for any difference regarding the profile of relative use of performance measures between different airports in size. Airports are considered to operate under the most varied circumstances regarding the aeronautical and commercial activities carried out, site constraints, governance, ownership structures, and other aspects (Graham, 2014; Ashford *et al*., 2013). In this context, airport size has been widely used as a proxy for airport organization complexity, both within the literature research and for regulatory purposes (Bazargan and Vasigh, 2003; Assaf, 2009; Merkert and Mangia, 2014). Accordingly, it is expected that larger airports are likely to focus on more aspects of airport performance and different measures comparing to smaller airports.

In this case, the linear function to be estimated is:

$$FU_i = \alpha_0 + \alpha_1 PR_i + \alpha_2 EA_i + \alpha_3 AS_i + e_i$$

Where AS_i is a dummy variable for airport size, with a value of one it the airport was classified as Class IV[14] according to the Brazilian Civil Aviation Regulation RBAC 153 (ANAC, 2012), and zero otherwise. The α_3 is the linear parameter associated with AS_i and the other variables are in accordance with the previous equation.

Afterward, in the third phase of the data analysis, gap analysis is used to examine the relative importance of the several performance measures as perceived by the airport executives. The objective of this phase is to identify differences between the average scores for the perceived relevance and the ease of information/data acquisition for each of the 77 measures. The GAP indicator for a given measure "*i*" is obtained by this

[14] According to the RBAC 153, there are four classes for airport classification in Brazil. The Class IV is the highest, comprising any airport that has processed more than one million passengers in the last three years (ANAC, 2012). The number of passengers processed is largely used as criteria for airport classification in the Brazilian regulatory framework.

difference multiplied by the average score for the perceived relevance of the respective measure, according to this equation:

$$GAP_i = (PR_i - EA_i)PR_i$$

The multiplication of the difference of the averages of PR and EA by the average of PR has two purposes: i. multiplying the differences can expand them for a more accurate comparison among the performance measures; and ii. to emphasize the relative importance of the perceived relevance of a given measure for its frequency of use. Consequently, the differences related to the measures with a higher value of perceived relevance are emphasized.

Accordingly, positive values might indicate a deficit of information. The larger this gap indicator is, the greater the discrepancy between the perceived relevance of the measure and its data/information availability. Small and negative values, otherwise, might indicate an excess of information. In line with previous studies (Dempsey *et al.*, 1997; Gomes *et al*., 2011; Gomes and Yasin, 2013; Simões *et al*., 2015), the performance measures with positive values are divided into two groups based on the mean value of the positive gap indicators. This procedure aims at identifying which measures are subjected to the highest pressure for information in the context of airport management.

4.3. STUDY ON AIRPORT SERVICE QUALITY MEASUREMENT (Study 2)

Measuring service quality has become ever more important for airports (Graham, 2009; Halpern, 2010; Merkert and Assaf, 2015). As discussed in the literature review chapter, the increasing interest in airport service quality (ASQ) has been reflected in the systematic use of surveys as a method for obtaining data to assess service quality and its effects on passenger satisfaction with the airport.

In this second empirical study, the research objective is to develop a measurement model for airport service quality, accounting for the multifaceted nature of the service quality construct. To achieve this research objective, four more specific objectives are sequentially pursued. First, to fit a measurement model for perceived ASQ based on typical service quality measures within the airport industry. Second, to test for the equivalence of this proposed model across groups of international and domestic passengers. Third, testing for the factorial validity of a hierarchical ASQ model. Fourth, testing for the suitability of the proposed hierarchical model in a different airport setting.

Accordingly, this research effort comprises four stages of data analysis and two sets of sample data. One sample was obtained from a survey applied to departing passengers at Guarulhos International Airport (SBGR), in Brazil. The second sample resulted from a survey applied to departing passengers at São Paulo-Congonhas Airport (SBSP), also in Brazil[15]. It should be noted that in the case of SBGR, passengers of international and domestic flights are processed. As for the sample from SBSP, it consists only of domestic passengers, as the airport does not handle international flights.

Figure 25 outlines these four stages of data analysis with their specific objectives and data sources.

First, sample data of departing passengers at SBGR is used for testing for the factorial validity, equivalence, and cross-validation of a measurement model of ASQ. Afterward, sample data of departing passengers at SBSP is used for testing for the suitability of the proposed ASQ model in a different airport setting.

Data related to SBGR originates from a survey conducted under the coordination of the Brazilian Government (SAC, 2014). Access to the data is granted under formal requirement (Appendix IV). Thus, data related to SBGR are secondary data in this study.

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[15] The ICAO code is used for designating aerodromes around the world. These codes are defined by the International Civil Aviation Organization (ICAO), and published in the "ICAO Document nº 7910 - Location Indicators". Henceforth, the respective ICAO codes for both airports are used in some parts of the text, instead of the airports usual names. Therefore, SBGR stands for Guarulhos International Airport. SBSP stands for the São Paulo-Congonhas Airport.

Data related to SBSP is collected specially for this present Thesis. Data collection was carried out in cooperation with the Aeronautical Institute of Technology, in Brazil (*Instituto Tecnológico de Aeronáutic*a - ITA)[16].

Figure 25. Stages of the ASQ study.

Stage 1 - Testing for the Factorial Validity of a First-Order Model

Objective: To fit a measurement model of perceived ASQ built on typical service measures within the airport industry

Data Source: Survey applied to international departing passengers at SBGR

Stage 2 - Testing for the Equivalence of the First-Order Model for International and Domestic passengers

Objective: To test for the equivalence of the ASQ model across groups of international and domestic passengers

Data Source: Survey applied to international and domestic departing passengers at SBGR

Stage 3 - Testing for the Factorial Validity and Cross-Validation of a Hierarchical ASQ Model

Objective: To test for the factorial validity and cross validation of a hierarchical ASQ model

Data Source: Survey applied to international and domestic departing passengers at SBGR

Stage 4 - Testing for the Suitability of the ASQ model in a different Airport Setting

Objective: To test for the suitability of the hierarchical ASQ model in a different airport setting

Data Source: Survey applied to departing passengers at SBSP

Concerning data collection procedures, in both surveys passengers were approached at the departure lounges according to a probability systematic sampling criteria. At SBGR, the respondents were interviewed. In the case of the survey applied at SBSP, self-response questionnaires were used.

4.3.1. The Research Instrument

With reference to the research instruments, the set of measurement items comprises typical attributes related to services/processes performance and airport terminal

[16] This cooperation is based on request from the Coordination of the Business Management Course of the School of Economics of the University of Coimbra (FEUC) (Appendix V).

facilities. These items are aligned to industry best practice guidelines (ACI, 2015; IATA, 2015c; Kramer *et al*., 2013) and are similar to several previous research (Correia *et al*., 2008b; Park and Jung, 2011; Yeh and Kuo, 2003; Medeiros *et al.*, 2016).

The present study focuses on those aspects of airport services and facilities directly or indirectly related to airport management regarding the passenger terminal, as previously considered by Bezerra and Gomes (2015). The measurement items to be used are presented in Table 13.

Table 13. The service quality measurement items.

Measurement items
Wait time at check-in
Check-in process efficiency
Courtesy and helpfulness of check-in staff
Availability of luggage carts
Wait-time at security checkpoints
Thoroughness of security screening
Courtesy and helpfulness of security staff
Feeling of being safe and secure
Wayfinding
Flight information
Walking distance inside terminal
Availability and quality of food facilities
Availability and quality of stores
Availability of Banks/ATM/Exchange
Courtesy and helpfulness of airport staff*
Prices at food facilities
Prices at stores
Availability of washroom/toilets
Cleanliness of washroom/toilets
Departure lounge comfort
Cleanliness of airport facilities
Thermal comfort
Acoustic comfort

Notes: * "excluding check-in and security staff" for SBGR survey, "excluding check-in staff, security staff and commercial staff" for SBSP survey[17].

In the survey applied in SBGR airport, passengers indicate their opinion by rating on a five-point scale, according to current international practices in the airport industry (SAC,

[17] This modification in item wording was motivated by the findings from the analyses with SBGR data, which preceded the survey at SBSP. The purpose was to discriminate best the groups of staff personnel to be considered for passenger evaluation.

2015a; ACI, 2015). The performance rating scale comprises the following indications: 1 – very poor, 2 – poor, 3 – regular, 4 – good, and 5 – very good.

Since the survey applied to departing passengers at SBSP airport was planned exclusively for this Thesis, a seven-point scale replaced the five-point scale used in SBGR. The rating scale ranges from 1 – very poor to 7 – very good, with a central point in 4 – Regular. To be noted that this scale retains the extreme and central labels used on the five-point scale for SBGR airport.

Three main reasons justify this change in scale. First, larger scales are expected to enhance the information that is transmitted in the surveying process, which might be associated with greater precision and reliability (Preston and Colman, 2000; Anderson and Fornell, 2000b). Second, there is the interest in not attaching labels to the response categories, which may increase error due to a violation of the interval data assumption (Chen *et al*., 2015). Third, it is expected that larger scales reduce the likelihood of significant deviation from multivariate normality (Byrne, 2010), which is a relevant issue for data analysis.

Also concerning scale length, even though larger scales have been mostly associated with improving the scale sensitiveness for detecting variation, very larger scales are considered to be unease for the respondent. In this context, the seven-point scale is assumed to present a good balance between having enough points for discrimination without confusing the respondent (Preston and Colman, 2000).

As long as the measurement items are broadly used within the airport industry, no face or content validation assessment procedures were undertaken. In addition to the measurement items shown in Table 13[18], the questionnaires presented a group of items for respondent characterization. The questionnaire used in SBGR comprise the items

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[18] The set of ASQ measurement items in both questionnaires are the same, but for three modifications:

- The note for “Courtesy and helpfulness of airport staff”, as identified in Table 12.
- Exclusion of the item “Availability of luggage carts” for the survey in SBSP, based on the findings of the stages 1 and 2.
- Inclusion of other items for measuring other aspects of the convenience offerings at the airport. These items however are not used in this Thesis.

presented in the official reports provided by SAC (SAC, 2014). The form used in SBSP is presented in Appendix VI[19].

4.3.2. Models and Data Analysis for the Empirical Study 2

Bezerra and Gomes (2015) used exploratory factor analysis (EFA) to extract service quality factors from a set of typical service attributes within the airport industry, based on responses of international departing passengers at Guarulhos International Airport, in Brazil. As a result of this study, an ASQ framework comprising seven factors representative of the passenger perception of airport services and facilities was provided (Table 14).

Table 14. ASQ factors and measurement items.

ASQ Factors	Code	Measurement items
Check-in	CHK1	Wait time at check-in
	CHK2	Check-in process efficiency
	CHK3	Courtesy and helpfulness of check-in staff
	CHK4	Availability of luggage carts
Security	SEC1	Wait-time at security checkpoints
	SEC2	Thoroughness of security screening
	SEC3	Courtesy and helpfulness of security staff
	SEC4	Feeling of being safe and secure
Mobility	MOB1	Wayfinding
	MOB2	Flight information
	MOB3	Walking distance inside terminal
Convenience	CON1	Availability and quality of food facilities
	CON2	Availability and quality of stores
	CON3	Availability of Banks/ATM/Exchange
	CON4	Courtesy and helpfulness of airport staff
Prices	PRC1	Prices at food facilities
	PRC2	Prices at stores
Basic Facilities	BAS1	Availability of washroom/toilets
	BAS2	Cleanliness of washroom/toilets
	BAS3	Departure lounge comfort

[19] To be noted that the questionnaire applied to SBSP passengers comprised two parts of measurement items, with part II being dedicated to the ASQ measurement items used in this present study and part I being specific for the items related to the model of the antecedents and consequences of passenger satisfaction. This questionnaire is the same used for study number 3.

Ambience	AMB1	Cleanliness of airport facilities
	AMB2	Thermal comfort
	AMB3	Acoustic comfort

Source: Bezerra and Gomes (2015).

Following the stages presented in figure 25, in the present study, this ASQ framework is tested for its factorial validity and equivalence while a first-order measurement model. Afterward, the factorial validity while a hierarchical model is tested and cross-validated. All these analyses used SBGR passenger samples. Finally, the resulting higher-order ASQ model is tested in a different airport setting, in the case of SBSP.

Consistent with the study´s purposes, exploratory factor analysis and confirmatory factor analysis are used. Factor analysis is a generic term for referring to a class of statistical techniques used for examining the underlying structure of a dataset (Hair *et al.*, 2014). In using these techniques, the research examines the covariation among a set of observed variables in order to gather information on their underlying latent constructs (i.e. the factors) (Byrne, 2010).

Exploratory Factor Analysis

As the name suggests, the exploratory factor analysis (EFA) is usually designed for exploratory approaches, with the purpose to determine how, and to what extent, the observed variables are associated with their underlying factors (Byrne, 2010). In this study, EFA is used for examining unidimensionality of the service quality factors (i.e. whether the ASQ measurement items properly reflect one single factor). The EFA are processed with the software IBM Software Package for Social Sciences - SPSS, version 22.

The Kaiser-Mayer-Olkin (KMO) measure of sampling adequacy and the Barlett´s test of Sphericity are used for verifying sample data adequacy for the factor analysis. The KMO measure is obtained by comparing the magnitude of the observed correlation coefficients to the magnitudes of the partial correlation coefficients. Therefore, large values indicate that sample is adequate for the factor analysis (Field, 2009). This measure ranges from 0 to 1, with values higher than 0,6 considered to indicate a sufficient degree of sample adequacy (Hair *et al.*, 2014).

The Barlett´s test of sphericity provides the statistical significance that the correlation matrix has significant correlations among at least some of the variables in the analysis (Hair *et al*., 2014). Specifically, it tests whether the correlation matrix is an identity matrix[20]. For the analysis to be considered suitable, the test results must present statistical significance at 0,05 level (Hair *et al*., 2014).

After these preliminary verifications, the EFA proceeds with the factor extraction, rotation, and interpretation of the results related to each service quality factor. The principal component method is used for factor extraction. This method accounts for the total variance and summarizes most of the original variance in a minimum number of factors (or components) (Hair *et al*., 2014). Concerning the number of components to be retained for rotation, the Kaiser criterion is used. Accordingly, all factors with eigenvalues greater than 1,0 are retained. It represents the norm in the literature, and it is often the default in statistical software packages (Field, 2009). The orthogonal method with the varimax criterion is chosen for factor rotation. With this approach, it is expected to obtain a rotated solution in which each factor represents only a small number of variables. Therefore, the differentiation among the factors is maximized, and the interpretation of the results is simplified (Abdi, 2003).

In addition to the unidimensionality assessment, the results provided by the EFA are also used for a preliminary test of reliability of the service quality factors as measured by the respective items. The concept of reliability is related to the fact that a scale should consistently reflect the construct it is measuring (Field, 2009). The internal consistency is a measure of reliability, which applies to the consistency among the variables in a summated scale. In using summated scales, as the case of the service quality factors in

[20] An identity matrix or unit matrix is a square matrix with ones on the main diagonal and zeros elsewhere. Such a matrix denotes no correlations among the variables.

this study, the assumption is that the individual measurement items should be measuring the same construct. Thus they must be highly correlated (Hair *et al.*, 2014).

Two measures of reliability are derived from the EFA, the Cronbach´s alpha and the item-to-total correlation. The Cronbach´s alpha is used as a coefficient of reliability of the entire scale. This measure is a function of the number of measurement items and the average inter-correlation among them. The equation for the standardized Cronbach´s alpha (α) is the following:

$$\alpha = \frac{N.\bar{c}}{\bar{v}+(N-1).\bar{c}}$$

Where N is the number of measurement items, $\bar{c}$ is the average inter-item covariance among the items and $\bar{v}$ stands for the average variance. The coefficient α ranges from 0 to 1, with the lower limit being usually considered to be 0,6 or 0,7 (Hair *et al.*,2014; Field, 2009).

The item-to-total correlation is a measure of the correlation between each item and the total score for the scale. For high reliability is expected that all items measuring a given factor should reasonably correlate with the total score, so the items with low values should be considered not to correlate very well with the scale and should be excluded for improving reliability (Field, 2009). The lower limit is usually 0,3 or 0,4, depending on the sample size (Field, 2009; Hill and Hill, 2004). The more conservative threshold of 0,4 will be considered for the forthcoming analyses.

This preliminary assessment of reliability is a necessary but not sufficient to assure scale suitability before conducting structural equation modeling (SEM) analysis (Hair *et al.*, 2014). Other measures of reliability and validity based on confirmatory factor analysis are discussed in the next topic.

Confirmatory factor analysis

The confirmatory factor analysis (CFA) is appropriate when an underlying latent factor structure is assumed. Based on theory, empirical research, or both, a researcher can postulate relations between the observed variables and the underlying factor structure, and then this hypothesized structure is tested (Byrne, 2010).

The CFA is classified as a SEM technique[21]. In this context, it is essentially used with the purpose to evaluate how well a theoretical measurement model fits data from a given covariance matrix or correlation matrix. Confirmative in nature, it seeks to determine the extent to which the postulated structure is consistent with the sample data in analysis (Crisci, 2012). Several authors have explored the fundamentals of SEM techniques and presented formal demonstrations (for instance, (Jöreskog, 1993; MacCallum *et al*., 1996; Fornell and Larcker, 1981; Anderson and Gerbing, 1988; Kline, 2011; Hair *et al.*, 2014). For the sake of objectivity, in this section, the practical issues and references guiding the particular study are emphasized.

Concerning the model specification, a reflective measurement model is considered. According to this specification, the measurement items (i.e. the service attributes) are assumed to represent reflections (or manifestations) of the construct they are intended to measure (Coltman *et al.*, 2008; Edwards and Bagozzi, 2000). This reflective approach assumes that a measure is function of a latent variable plus error (Edwards and Bagozzi, 2000). The reflective approach has been the most used in business research, including service quality measurement (Coltman *et al.*, 2008; Collier and Bienstock, 2009).

An important consideration in using SEM is related to the modeling strategy. Three distinct alternatives in the application of structural equation modeling are referred: i. confirmatory strategy, ii. competing model strategy, and iii. model development strategy. Each alternative is related to specific research objectives (Hair *et al.*, 2014). In this

[21] The term structural equation modeling (SEM) does not designate a single statistical technique but instead refers to a family of related procedures (Kline, 2011). In this second empirical study the confirmatory factor analysis (CFA) is used.

present study, confirmatory modeling strategy and model development strategy are considered. The confirmatory strategy is based on the specification of a model of interrelationships and its assessment on how well it fits the data. In the model development strategy, the theory provides a starting point for the development of a theoretically justified model that can be empirically supported (Hair *et al.*, 2014). The model development strategy is particularly applicable to stages 3 and 4, as presented in figure 25.

A fundamental difference between SEM and other multivariate techniques is that it is a covariance structure analysis technique rather than a variance analysis technique (Hair *et al.*, 2014). Accordingly, it is focused on explaining the covariation among the observed variables. For this purpose, either the covariance matrix or correlation matrix can be used as input for model estimation. In this study, the analyses are based on the covariance matrix, which is the conventional alternative in Social Sciences (Byrne, 2010). The CFA models are estimated with the software IBM AMOS, version 21.

In working with SEM, an important initial caveat is the problem of identification. This issue is directly associated with the transposition of the variance-covariance matrix of observed variables into the model parameters under study (Byrne, 2010). In this respect, if a unique solution can be found, the model is considered to be just-identified (i.e. the number of data variances and covariances equals the number of parameters to be estimated). If the number of estimate parameters is less than the number of data variances and covariances observed (the sample moments), the model is considered overidentified. Alternatively, if there are more parameters to be estimated than sample moments, the model cannot be identified, and thus it cannot be evaluated empirically (Marôco, 2010; Hair *et al.*, 2014). The following equation for degrees of freedom illustrates this comparison, also referred to as t-rule. The number of degrees of freedom shall be ≥ zero:

$$df = \frac{v(v+1)}{2} - t$$

Where:

df = degrees of freedom

v = number of observed variables for the latent constructs

t = number of estimate parameters

Kline (2011) identifies two general requirements for identifying any structural equation model: a. the model degrees of freedom (df) must be at least zero; b. every latent variable (including the residuals) must be assigned a scale (usually by constraining one factor-loading parameter in each congeneric set of loadings and the residuals to 1). However, these requirements are considered necessary but insufficient for identification. The particularities of the model structure may impose additional requirements with regard to the number of degrees of freedom (Kline, 2011). Byrne (2010) exemplifies with the case of hierarchical models, in which there is the need for checking the identification status of the higher order portion of the model. In short, the aim in SEM is to specify a model that meets the criterion of overidentification, so to allow for testing for model rejection, thereby rendering it of scientific use (Byrne, 2010).

Model estimation

The maximum likelihood estimation – MLE method is used[22]. This method has been the most used in SEM analysis and may provide more efficient and unbiased estimates under the assumption of normality and sufficient sample size (Byrne, 2010; Hair *et al.*, 2014; Marôco, 2010; Kline, 2011; Iacobucci, 2010). The objective with the MLE is to reproduce the covariance matrix of the observed variables by means of the model parameters. The use of the MLE in SEM is based on some assumptions (Kline, 2011):

[22] The principle of MLE states that the desired probability distribution is the one that makes the observed data ‘‘most likely,’’ which means that the researcher must seek the value of the parameter vector that maximizes the likelihood function. Once sample data have been collected and the likelihood function of a model given the data is determined, it is possible to make statistical inferences about the population based on the probability distribution that underlies the data (Myung, 2003).

- Independence of the scores (i.e. data is collected from distinct cases or subjects);
- Independence of the exogenous variables and error terms;
- Multivariate normality;
- Correct specification ot the model.

Independence of the scores is assumed given that data collection is based on survey procedures with sampling criteria. With regard to the independence of the exogenous variables and error terms, they are based on preliminary content validation anticipated by the ASQ framework of Bezerra and Gomes (2015). Likewise, model specification is preliminarily supported by the use of typical measurement items within the airport industry and the ASQ framework of Bezerra and Gomes (2015).

Usually, survey data are not of continuous nature and may do not present multivariate normal distribution (Byrne, 2010; Marôco, 2010; Kline, 2011). However, empirical studies and simulations have demonstrated that MLE may provide reliable estimates even in the case where the normality assumption is not assured (Hair *et al.*, 2014; Byrne, 2010; Marôco, 2010; Iacobucci, 2010). Generally, the effects of non-normality in the maximum likelihood estimates will depend on the extent to which sample data departs from the normal distribution (Hair *et al*., 2014)[23].

Authors agree that the maximum likelihood estimates may be robust against violation of the normality assumption when the skewness and kurtosis of the observed variables are not excessive, and the sample size is sufficient (Marôcco, 2010; Myung, 2003; Kline, 2011). Moreover, for analysis with usual sample size (as the case of this present study),

[23] There has been intense debate on the applicability of the maximum likelihood method for estimating data originated from surveys. The key point is that this type of data usually does not present normal distribution, thus it should not be suitable for the MLE method (Byrne, 2010; Marôco, 2010; Kline, 2011). However, studies have suggested these alternative methods, such as the ADF (asymptotic distribution free) and WLS (weighted least squares), only will produce adequate results with samples of greater size (Marôco, 2010). West, Finch, and Curran (1995) indicated that samples as big as 1000 to 5000 observations should be necessary for these alternative methods. Concerning MLE, a useful rule of thumb points to a sample size correspondent to 10 times the number of parameters to be estimated (Marôco, 2010). On the other hand, empirical studies and simulations have demonstrated that MLE seems to provide reliable estimates even in the case where the normality assumption is not assured (Marôco, 2010; Byrne, 2010; Iacobucci, 2010; Hair *et al*., 2014; Flinch *et al*., 1997).

the estimates obtained by alternative methods are worse than those obtained by MLE (Marôcco, 2010).

As regards sample size, samples as big as 200 observations have been considered adequate for MLE. However, samples should be bigger in the cases of more complex models and when there is evidence of problems with the model specification (Hair *et al*., 2014). As regards this present study, in using samples with size varying between 400 to 1100 observations, the conclusion is that they have sufficient sample size for using this estimation method (Hair *et al*., 2014; Kline, 2011).

Concerning the assumption of normality, univariate skewness and kurtosis are used for assessing univariate normality. As regards these measures, absolute values higher than 3 for skewness and 10 for kurtosis might indicate a severe violation of the univariate normality assumption (Kline, 2011). Other authors suggest that biased results might be obtained from values higher than two and seven for skewness and kurtosis, respectively (Marôcco, 2010). For the sake of parsimony, the more conservative limits are considered for the data analyses.

The standardized Mardia´s coefficient is used for assessing multivariate normality (Byrne, 2010). In using this measure, values greater than five would suggest precaution as regards the results of the tests based on the chi-squared distribution (Byrne, 2010). However, it is to be noted that any decision for excluding observations from a sample should not be justified only in the interest of improving the statistics, but also it should be grounded on theoretical and practical reasons (Byrne, 2010).

Mahalanobis´ distance is used for identification of multivariate outliers, i.e. cases differing in great extent to the others in the sample. The squared Mahalanobis´ distance (D^2) measures the distance (based in standard deviation units) between a set of scores for one case and the sample means for all variables (centroids) (Byrne, 2010). Usually, an outlier will present a D^2 value that stands distinctively apart from all the other values. The greater is this statistic, the more significant is the specific case for the multivariate normality deviation. Thus, in excluding the case, it is expected to reduce the degree of deviation. On the other hand, excluding cases based on this statistic value will also result in loss of information. In this sense, any decision for excluding observations must consider this trade-off and additional references from the literature (Byrne, 2010). Particularly, Hair *et al*. (2014) recommendation of using the ratio (D^2/df) for practical interpretation is used along with the univariate methods. Based on a more conservative approach, the ratio value of 2,5 is considered to designate possible outliers.

Model assessment

The primary interest in SEM is evaluating the extent to which a hypothesized model adequately explains sample data. For this purpose, there are different and complementary approaches for assessing a model´s goodness of fit. Several goodness-of-fit statistics were developed, mostly concerned with the estimation process of yielding parameter values such that the discrepancy between the sample covariance matrix and the population covariance matrix implied by the model is minimized. Basically, three groups of measures should be considered (Marôco, 2010):

a) Measures based on the chi-square distribution test;
b) Empirical or approximate goodness-of-fit indexes;
c) Analyses of the residuals, parameters estimate, and individual reliability of the measurement items.

Based on the chi-square distribution test, low statistic values that result in p-values higher than 0,05 will indicate that the covariance matrices are not statistically different, thus suggesting an excellent degree of model fit to the data. Notwithstanding, for sample size greater than 200 observations and models with an expressive number of variables, this test is considered very sensitive to deviations from multivariate normality and may present a tendency of inaccurately rejecting models (Hair *et al*., 2014; Byrne, 2010). Accordingly, using the ratio of the chi-square statistic against the degrees of freedom is considered more appropriate. Based on this statistic, ratio values lower than 5 may indicate an acceptable goodness of fit (Hair *et al*., 2014; Byrne, 2010; Kline, 2011).

As regards the empirical or approximate goodness-of-fit indexes, contrasting to the chi-square test, their outcomes are not pointing to a dichotomous decision to reject or retain a null hypothesis. Instead, they are intended to provide a continuous measure of model-data correspondence (Kline, 2011). Usually, their values are standardized ranging from 0 to 1 where a value of 1 will indicate the best fit. Three categories of approximate fit indexes are considered: i. absolute fit indexes, ii. incremental or comparative fit indexes, and iii. parsimony-adjusted fit indexes[24].

According to Kline (2011), the absolute fit indexes can be interpreted as the proportion of the covariances in the sample data matrix that is explained by the model. However, it is to be noted that explaining a high proportion of the sample covariances does not by itself indicate the model is adequate, as adding parameters to the point where no degrees of freedom remain will result in just-identified models that will perfectly explain the observed covariances.

The incremental or comparative fit indexes are indicative of the relative improvement in model goodness of fit compared with a statistical baseline model. This baseline model is typically the independence (null) model (i.e. the baseline model assumes zero population covariances among the observed variables).

As for the parsimony-adjusted fit indexes, these measures comprise a built-in correction for model complexity (i.e. a penalty). This correction is related to the model´s degrees of freedom. Hence, as more parsimonious models have higher degrees of freedom, given two models with a similar fit, a parsimony-adjusted index would favor the simpler model (Kline, 2011).

In this Thesis, consistent with the literature, the models´ goodness-of-fit are evaluated with the use of several measures. Table 15 presents the statistics to be used in the following analyses along with the respective threshold values.

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[24] These categories are not mutually exclusive and some measures can be classified under more than one category (Kline, 2011).

Table 15. Goodness-of-fit statistics for SEM models.

Measures	References
χ2 (CMIN) and p-value	Small values for the *χ2*; *p-value* > 0,05
χ2/df or CMIN/DF	> 5 – Bad fit]2; 5] – Acceptable fit]1; 2] – Good fit ≤ 1 – Very good fit
CFI (Comparative Fit Index) *GFI (Goodness of Fit Index)* *IFI (Incremental Fit Index)* *TLI (Tucker-Lewis Index)*	< 0,90 – Bad fit [0,90; 0,95] – Good fit > 0,95 – Very good fit
PGFI (Parsimony GFI) *PCFI (Parsimony CFI)*	< 0,60 – Bad fit [0,60; 0,80] – Good fit > 0,80 – Very good fit
RMSEA (Root Mean Square Error of Approximation) *(Interval of confidence - I.C. 90%)*	> 0,08 – Bad fit]0,05; 0,08] – Good fit ≤ 0,05 – Very good fit High limit ≤0,08
MECVI (Modified Expected Cross-Validation Index)	There is no reference. This measure is used for model comparison (especially nested models) The lower the value, the better.

Note: * Interval of confidence.
Source: Hair *et al.*, 2014; Marôco, 2010; Byrne, 2010.

Regarding the analysis of the residuals, it is related to the difference between a model-implied correlation and an observed (sample) correlation (i.e. they are the standardized covariance residuals between the observed and predicted covariances). Kline (2011) refers to a practical rule that residuals with absolute values greater than 0,1 may suggest potential problems of model specification. A more usual approach to the analysis of the residuals is based on the standardized residuals, which is the ratio of a covariance residual over its standard error. In sufficiently large samples, this ratio is interpreted as a *z* test of whether the population covariance residual is zero. Hence, if this test is statistically significant, then the hypothesis that the corresponding population covariance residual is zero is rejected. Standardized residuals greater than 2,58 are worthy of concern, as they suggest the residual is statistically significant at 0,05 level (Jöreskog and Sörbom, 1996; Byrne, 2010).

Concerning model specification, it is common practice to produce modifications in the model by deleting parameters that are not significant and adding parameters that improve model fit (Hair *et al.*, 2014; Byrne, 2010). Evidence of misfit in this regard may be captured by the modification indices (M.I.) provided by the AMOS software. The M.I. can be conceptualized as a $\chi 2$ statistic with one degree of freedom (Byrne, 2010). Specifically, the M.I. value represents the expected drop in overall $\chi 2$ value if the parameter were to be freely estimated. Associated with each M.I., there is the expected parameter change (EPC) value, which represents the predicted estimated change, in either a positive or negative direction, for each fixed parameter in the model (Byrne, 2010). Those modifications, however, should always be supported by theoretical and practical background. Otherwise, they might be associated only with particular sample characteristics, and these efforts can lead to inappropriate and nonreplicable models (Hair *et al.*, 2014).

Lastly, as regards parameter estimate and item reliability, the interpretation of the standardized factor loadings (also called standardized regression weights) is the same as any coefficient in a regression model. Thus, the factor loadings shall be statistically significant and a measure of the explained variance is obtained by the squared factor loading, the squared multiple correlations (SMC), also referred to as R^2. According to the literature, the higher is the SMC value, the higher is the proportion of explained variance (Kline, 2011).

Construct validity and reliability

Construct validity is defined as the extent to which the operational definition of a variable reflects the theoretical meaning of this variable (i.e. whether the observed variables actually measure the conceptual variable or construct it is designed to measure) (Cozby and Bates, 2012). Usually, it involves four basic criteria: face validity, content validity, convergent validity, and discriminant validity (Cozby and Bates, 2012). Additionally, nomological validity is particularly relevant for confirmatory approaches such as the use of SEM analysis (Anderson and Gerbing, 1988; Hamann *et al.*, 2013).

Once the construct operationalization is based on well-recognized industry practices, face validity and content validity are assumed beforehand. Face validity is related to the extent to which a given observed variable appears to be an adequate measure of the construct (Cozby and Bates, 2012). Content validity is related to the extent to which the observed variables is perceived as adequately covering the construct they are designated to measure (Haynes *et al*., 1995; Cozby and Bates, 2012). Accordingly, in this study, the assessment of construct reliability, convergent validity, and discriminant validity is of particular interest. This assessment is based on Fornell and Larcker (1981).

Concerning construct reliability, in addition to the Cronbach´s alpha coefficient, the composite reliability (CR) is also used as an indicator of reliability and internal consistency of the measurement items representing a latent construct. This measure provides the total amount of scale score variance that is accounted for by all underlying factors (i.e. excluding the variance attributed to the error) (Fornell and Larcker, 1981). It ranges from 0 to 1, with higher values indicating high composite reliability of the overall scale. Usually, values greater than 0,7 are considered to provide an acceptable degree of reliability. The composite reliability (CR) is obtained according to this equation.

$$CR = \frac{\left(\sum_{i=1}^{n} L_i\right)^2}{\left(\sum_{i=1}^{n} L_i\right)^2 + \left(\sum_{i=1}^{n} e_i\right)}$$

Where L_i represents the standardized factor loading for item i and e_i represents the respective error variance for the specific item. This error variance is estimated based on the standardized loading (L) as ei = $1 - L_i^2$.

The construct validity is related to the extent to which a set of measurement items actually represents the latent construct they are are designed to measure (Hair *et al*., 2014). It is a broad term for the procedures used to measure a given construct and can comprise different forms of validity (Goodwin and Goodwin, 2012). Evidence of construct validity is necessary for providing confidence that measures taken from a sample represent the actual true score for the population (Hair *et al*., 2014).

Within SEM applications, as the case of confirmatory factor analysis, the assessment of convergent validity and discriminant validity is particularly emphasized (Marôco, 2010); Hair *et al*., 2014). The convergent validity is indicative that the items measuring a specific construct share a high proportion of variance in common (Hair *et al.*, 2014). In other words, it is related to the degree to which these items are reflecting a given construct. Conversely, discriminant (or divergent validity) demonstrates that a given construct is different from other constructs that might be present in the study (Goodwin and Goodwin, 2012).

Consistent with the literature (Fornell and Larcker, 1981), the convergent validity is assessed based on the size of the factor loadings and using the average variance extracted (AVE) measure. Thus, all factor loadings should be statistically significant and higher than 0,5 in terms of standardized estimates (Hair *et al.*, 2014). As regards the AVE measure, it indicates the amount of variance captured by a construct in relation to the variance due to random measurement error. This measure is calculated with this equation:

$$AVE = \frac{\sum_{i=1}^{n} L_i^2}{n}$$

Where L_i is the standardized factor loading for item *i and n* represents the number of items. Accordingly, for *n* items, the AVE is the total of all squared standardized factor loadings divided by the number of items measuring the construct. Based on the literature, AVE values higher than 0,5 may suggest adequate convergence (Fornell and Larcker, 1981).

Concerning to discriminant validity, it may be assumed when a given construct (ξ_j) accounts for more variance in its associated measurement items than it shares with other constructs in the model (Fornell and Larcker, 1981). In this sense, to satisfy this requirement, the square root of the AVE for each construct ($\sqrt{AVE\xi_i}$) must be compared with the correlations with the other constructs in the model (Φ_{ij}). Discriminant validity shall be assumed when the square root of the AVE for a given construct is greater than all the correlations of this construct with other constructs in the measurement model (Fornell and Larcker, 1981), as follow:

$$\sqrt{AVE\xi_j} \geq \Phi_{ij}, \forall i \neq j$$

Another relevant form of construct validity to be assessed is the nomological validity. It assesses whether a construct relates to other constructs in the way that is expected, based on theory (Hair *et al*., 2014). In this study, at examining the measurement model, it is expected significant factor loadings from the latent constructs towards their measurement items. Moreover, some significant covariances among the service quality factors are plausible, once the passenger is likely to present a consistent level of expectation and a similar pattern for evaluating the services and facilities (Collier and Bienstock, 2009).

Finally, as sample data are originated from surveys, there is the need for assessing the problem of common method variance. It is related to the amount of variance that may be attributed to the measurement method, rather than to the constructs the measures are assumed to reflect. Hence, it is a potential problem in survey data and can lead to misleading conclusions (Podsakoff *et al*., 2003). Based on Podsakoff *et al*. (2003), the existence of common method bias was assessed using two approaches, the Harman´s single factor test and the common latent factor approach.

According to the Harman´s test, the full set of variables used in the study is considered for exploratory factor analysis. The results may suggest a significant amount of common method variance in two cases: i. when a single factor emerge from the factor analysis, or ii. when one factor accounts for the majority of the variance explained (Podsakoff *et al*., 2003).

The common latent factor test is based on the CFA technique. This second approach to the problem of common method variance is more stringent (Podsakoff *et al*., 2003). For this procedure, a factor is included in the CFA model with all the variables linked to it with factor loadings constrained to one. If there is the situation where the common method variance is largely responsible for the relationship among the variables, this model should fit the data well and some original factor loadings will present loss of statistical significance.

Provided with these references, the following sequence related to the research procedures is followed:

- Data inspection as regards missing values and missing value treatment;
- Assessment of sampling adequacy for factor analysis using KMO coefficient and Barlett´s test of sphericity;
- Testing for the construct unidimensionality by within-scale exploratory factor analysis;
- Scale reliability and item reliability assessment by Cronbach´s alpha and item-to-total correlation;
- Univariate normality assessment by Skewness and Kurtosis;
- Multivariate normality assessment by Mardia´s coefficient;
- Multivariate outlier identification by Mahalanobis´ squared distance;
- Assessment of the measurement model by confirmatory factor analysis;
- Evaluation of the model´s goodness-of-fit;
- Construct validity and reliability assessment;
- Common method variance assessment.

Graphical representations of the observed and latent variables, path effects, and covariances are usual in SEM analysis. This study emphasizes this form of representation in harmony with the conventions of the SEM literature (Hair *et al.*, 2014; Kline, 2011; Byrne, 2010; Marôco, 2010). Accordingly, the models are drawn using standard graphical symbols for model diagrams, such as:

- Observed variables with rectangles;
- Latent variables (constructs) with ellipses;
- Residual error with circles;
- Hypothesized directional effects of one variable on another with a line with a single arrowhead (e.g. ⟶);
- Covariances and correlations between independent variables with a curved line with two arrowheads (e.g. ↔).

4.4. STUDY ON THE ANTECEDENTS AND CONSEQUENCES OF PASSENGER SATISFACTION WITH THE AIRPORT (Study 3)

As discussed in the literature review chapter, there has been significant advances in the research on customer satisfaction, including the development of models for the antecedents and consequences of customer satisfaction. Notwithstanding, regardless of the increasing importance of customer satisfaction for nowadays airports, the airport industry still presents a noteworthy gap associated with the antecedents and consequences of the passenger satisfaction, as previously referred.

In this context, the objective of this third empirical study is to examine the relationships among the passenger perception of airport service quality (ASQ) and the passenger attitude towards the airport. Accordingly, by using a theoretical model of the antecedents and consequences of passenger satisfaction with the airport, the following more specific objectives are considered:

a) To examine the effects of typical antecedents of customer satisfaction in the passenger satisfaction level with the airport;
b) To test for the suitability of the ASQ model resulting from the second empirical study of this Thesis within a passenger satisfaction model;
c) To examine the effects of satisfaction in the passenger complaint attitude and loyalty towards an airport in a multi-airport region (MAR);
d) To examine the effects of the perception of switching costs for changing airports in the passenger loyalty attitude towards an airport in a MAR.

Consistent with these specific objectives, a survey applied to departing passengers is used. Data collection process comprises the application of self-administered questionnaires delivered to passengers at the airport departure lounges. Hence, the unit of analysis is the passenger responses.

Based on the literature reviewed and accounting for particularities of the airport service, a theoretical model for the antecedents and consequences of passenger satisfaction is presented in the next section. In the sequence, construct operationalization procedures are described, followed by information on the research instrument. Then, there is a section dedicated to the specific research hypotheses. Afterward, data analysis procedures to be applied are presented.

4.4.1. The Theoretical Model

The relationships among customer satisfaction, its antecedents, and the customer post-consumption attitudes have been widely discussed, as previously emphasized. In this study, the theoretical model is fundamentally based on the rationale of the customer satisfaction index models.

The ACSI is used as a model of reference in this Thesis, so to achieve the research objective of examining the relationships between passenger perception of ASQ and the passenger attitude towards the airport, including passenger satisfaction. This model is considered appropriate for the present study for three particular reasons. First, is has been largely used in several service settings, including the air transport industry (Rhoades and Waguespack Jr, 2008; Chen, 2008). Second, the ACSI model has been the basis for a number of other National Customer Satisfaction Indices (Johnson *et al*., 2001). In this respect, as this present study is one of the first applications of a customer satisfaction index model in airport settings, the use of such a well-stablished model seems to be a reasonable and conservative alternative. Third, the ACSI model structure is open to modifications in the questionnaires to be more appropriate to each specific industry (Fornell *et al*., 2008).

This ACSI model is a cause-and-effect model, in which customer satisfaction is positioned as central construct. As regards the antecedents of customer satisfaction, the model originally accounts for expectations, perceived service quality, and perceived value. The effects of satisfaction are covered in the second part of the model. Originally, the ACSI model includes customer loyalty and the complaining intention as a mediator variable for the effects of satisfaction on customer loyalty.

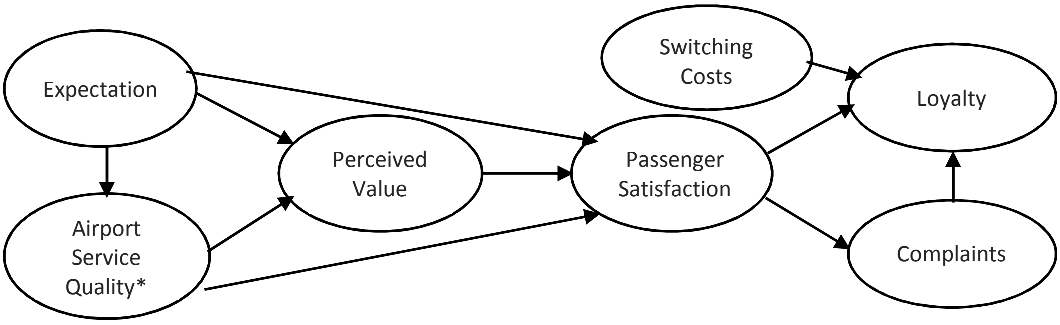
Given the particularities of the airport business, two significant modifications were implemented to the ACSI model. The first one is related to the measurement of perceived service quality. As previously discussed, the airport service environment presents a high level of complexity, and some particularities of the passenger-airport interaction are not adequately covered by generic service quality scales (Fodness and Murray, 2007; George *et al*., 2013; Pantouvakis, 2010). In this context, the perceived service quality is measured with the ASQ developed in this Thesis, presented in chapter 6.

The second main modification in the original ACSI model refers to the inclusion of the construct switching costs. In this study, switching costs is related to the perceived economic and psychological costs associated with changing from one airport to another in the same multi-airport region (Jones *et al.*, 2007). In the context of competition for catchment area, passenger perceptions of the switching costs for changing airports seem to be a highly relevant issue (Jen *et al*., 2011; Yang and Peterson, 2004; Nesset and Helgesen, 2014). Airports are considered to present significant market power. Hence, it is pertinent to examine whether the passenger loyalty attitude towards the airport is influenced by their perception of switching costs for changing to another airport in a multi-airport region, as the case of São Paulo, in Brazil.

In addition to these main modifications, other minor changes related to construct operationalization were carried out. Some developments concerning the national customer satisfaction models, particularly the European Customer Satisfaction Index (ECSI) model, are appropriate for this present study. Two changes based on the ECSI model are associated with the operationalization of the constructs loyalty and customer complaints. Besides these modifications imported from the ECSI model, other specific changes in measurement items are processed in order to cope with particularities of the airport context. These modifications to the original ACSI model are described and justified in the following section.

The conceptual model for the antecedents and consequences of passenger satisfaction with the airport is schematically represented as follow (Figure 26):

Figure 26. The conceptual model for the antecedents and consequences of passenger satisfaction.



Note: *This construct is operationalized with the ASQ model presented in chapter 6.

In the next section, construct operationalization and the research instrument are discussed.

4.4.2. Construct Operationalization

The theoretical model for the antecedents and consequences of passenger satisfaction comprise seven constructs. As already explained, this model is based on the ACSI model, including two major modifications related to the measurement of service quality and the inclusion of the effect of switching costs on the passenger attitude of loyalty towards the airport. Additionally, some minor modifications concerning construct operationalization are also applied.

Within the research context in Social Science, a construct represents the particular characteristic or trait that is to be assessed. Constructs are latent variables, which means that they cannot be measured directly, but with the use of indicators[25] (Cozby and Bates, 2012). Construct operationalization is hence the process of defining observed variables

[25] Also referred to as manifest variables, observed variables, or measurement items.

(i.e. measurable variables) to measure a given latent variable (i.e. the construct) (Cozby and Bates, 2012).

As regards the measurement model, a reflective specification is used. In a reflective measurement model, the latent variable (construct) is assumed to exist in an absolute sense, independent of the measures (Coltman *et al.*, 2008). Accordingly, the measurement items represent reflections (or manifestations) of the construct, meaning that variation in a construct leads to variation in its measures (Edwards and Bagozzi, 2000). Edwards and Bagozzi (2000) explains that reflective measurement underlies classical test theory, reliability estimation, and factor analysis, each of which treats a measure as a function of a latent variable plus error. In fact, the most part of the scales used in business research have a reflective approach (Coltman *et al*., 2008; Collier and Bienstock, 2009). According to the conventions of SEM notation, the effect of construct variation in the measures is represented by single-headed arrows originated from the construct (ellipse) to the measurement items (rectangles).

For the constructs expectation, perceived value, satisfaction, complaints, and loyalty, the measurement items are entirely adapted from the original ACSI model, with minor modifications motivated by the particular characteristics of the airport service context and based on contributions from the literature. Regarding the ASQ construct, it is measured with the ASQ model originated from the empirical study 2, presented in chapter 6. The construct switching cost is operationalized based on previous studies (Nesset and Helgesen, 2014; Jen *et al*., 2011; Yang and Peterson, 2004; Carlsson and Löfgren, 2006).

The constructs are described in the sequence they appear in the theoretical model, along with their respective measurement items. It is to be noted that for some statements, item wording was adapted for the use with an attitude scale and items were originally used in the Portuguese language, as presented in the example of questionnaire in Appendix VI.

Expectation

According to the literature, individuals implicitly make summary comparative judgments as an input to their feelings of satisfaction (Oliver, 2015; Wilson *et al.*, 2012). This assumption implies that customer expectations will create a frame of reference about which their comparative judgment will be made. Consequently, service outcomes perceived as poorer than expected are rated below this benchmark (negative disconfirmation), whereas those outcomes perceived as better than expected are likely to be evaluated above this threshold (positive disconfirmation) (Oliver, 2015).

Consistent with the literature reviewed, the construct expectation should reflect the attributes or characteristics associated with the airport experience that are anticipated or predicted by the passenger (Oliver, 2015). Based on these attributes or characteristics, the passenger will evaluate their experience in the airport, comprising perceptions about the service quality and value, and then they form their satisfaction with the whole experience.

In the original ACSI model, the construct expectation is operationalized using three measures, comprising the customer´s overall expectation, the level of expected customization, and the expected service reliability. As regards the airport context, the most basic passenger expectations about the service will typically comprise service reliability and an acceptable level of comfort (Caves and Pickard, 2001; Bogicevic *et al.*, 2013). Accordingly, two more measurement items were added to the original scale, the passenger expectation about the quickness and efficiency of service provision, and the expectation about to feel comfortable and safe at the airport.

In Table 16, the measurement items for the construct expectation are presented.

Table 16. Measurement items for the construct expectation.

Code	Measurement items
EXP1	I had high expectation about the airport quality
EXP2	I expected the airport to fully meet my needs as a passenger
EXP3	I expected no failure in the service provision
EXP4	I expected the services to be speedy and efficient
EXP5	I expected to feel comfortable and safe at the airport

Perceived value

The most recurrent approach to the perceived value construct is based on the idea of a trade-off between the benefits ("what is received") and the sacrifices ("what is given") in a market exchange (Zeithaml, 1988; Zauner *et al*., 2015). This comparison between the benefits and sacrifices is usually referred as the Zeithaml´s trade-off (Chen, 2013).

According to Chen (2013), this construct can be identified as unidimensional or multidimensional, which is dependent on the specific study´s purpose and the number of variables to be used. Some frameworks have been proposed, but even those with a multidimensional approach are usually based on the perception of different benefits and sacrifices components (Prebensen, Woo, Chen, *et al.*, 2013; Chen, 2013; Sweeney and Soutar, 2001).

In line with this trade-off perspective, the ACSI model comprises the perceived value construct as a measure of quality relative to the price paid. It is operationalized using two survey questions, including a rating of the price paid for the quality received and a rating of the quality received for the price paid (Fornell *et al*., 2008). According to Johnson *et al*. (2001), the perception of value has been largely used for comparison among competitive products/services. The inclusion of perceived value into the ACSI model is claimed to provide relevant diagnostic information. For instance, as the impact of value increases relative to the perceived quality, price is a more important determinant of customer satisfaction.

Based on the complexity of the airport business and accounting for the increasing relevance of the non-aeronautical revenues for airports worldwide, this logic of trade-off was slightly adapted for the airport context. Even with different approaches, recent developments on specific ASQ scales seem to suggest that passenger perceptions about the airport can distinct between the core airport activities from the convenience or leisure alternatives (Fodness and Murray, 2007; George *et al*., 2013; Bezerra and Gomes, 2015). Since the core airport activities are covered by the airport fees, while food facilities and stores are usually free for pricing their offerings as convenience products/services, in this study the construct perceived value covers these two nature of “market exchanges” activities. The construct is operationalized with the following measurement items (Table 17).

Table 17. Measurement items for the construct perceived value.

Code	Measurement items
VAL1	Considering the overall airport quality, the price of airport fee is fair
VAL2	Considering the price of airport fee, the airport services are very good
VAL3	Considering the price of airport fee, the comfort is very good
VAL4	Considering the quality of the products/services, the prices in the commercial facilities are fair
VAL5	Considering the prices in the commercial facilities, the quality of the products/services is very good

Airport service quality

In the original ACSI model, perceived quality is measured based on two sets of items. First, customers are asked to rate general aspects of quality, including customization quality, reliability quality, and overall quality. Then, the more specific survey questions used in the sector studied are asked (Johnson *et al*., 2001).

In recognition of the significant drawbacks in using generic scales in the airport service context (Ladhari, 2009; George *et al*., 2013; Fodness and Murray, 2007; Jeon and Kim, 2012), in this study, the perceived service quality is operationalized with the ASQ model resulting from the empirical study 2, presented in chapter 6. After cross-validating the ASQ model and testing for its suitability for the SBSP airport context, the model will be used to measure perceived quality within the theoretical model of the antecedents and consequences of passenger satisfaction. Furthermore, using this proposed ASQ model to operationalize service quality within the theoretical model can be considered another relevant test for the ASQ model, particularly regarding its nomological validity.

The measurement items for perceived service quality are then presented in Chapter 7, based on the results of the empirical study 2.

Satisfaction

As long as the theoretical model characterizes the antecedents and consequences of passenger satisfaction with the airport, the construct satisfaction has a central role. Nevertheless, measuring customer satisfaction is not simple. According to Oliver (2015), customer satisfaction is related to attitude; it mediates changes between pre-purchase and post-purchase attitudes. In this sense, it is necessary to distinguish the aspects that effectively impact on customer satisfaction of the aspects that leads to the customer decision for a product/service (Oliver, 2015; Yuksel and Yuksel, 2001a).

The ACSI model assumes that satisfaction is based on the size and direction of the disconfirmation experience at comparing the perceived performance against expectations (Fornell *et al.*, 1996; Anderson and Fornell, 2000). Accordingly, in the original ACSI, customer satisfaction is operationalized through three measurement items: i. an overall rating of satisfaction; ii. the degree to which the perceived performance exceeds the expectations; and iii. a rating performance relative to the customer´s ideal product of service in the category.

In addition to these original measures, two more items are included. The first additional item is related to the feeling of making a good choice in choosing the airport (Parasuraman *et al*., 1988; Bodet, 2008). This specific item is supposed to measure the passenger satisfaction as regards their cost of opportunity for not choosing another airport. The second item added is related to the passenger perception about their overall experience with the service encounter. The relevance of this item is to reflect an eventual change from focusing only on the fact that the passenger is trapped in the airport servicescape toward a more commercial concept of airports as stimulating places for the passengers (Breure and Van Meel, 2003; Van Oel and Van den Berkhof, 2013; Bogicevic *et al.*, 2013). Both items were recently used in the airport context (Moon *et al*., 2016).

Therefore, in this study, passenger satisfaction is measured through the following items (Table 18).

Table 18. Measurement items for the construct satisfaction.

Code	Measurement items
SAT1	Overall, I am very satisfied with the airport
SAT2	The airport exceeds my expectations
SAT3	This airport represents what I understand for an ideal airport
SAT4	I feel I have made the right decision in choosing this airport
SAT5	Overall, my experience with the airport is very pleasant

Complaints

Customer complaints management has become increasingly important for organizations operating in competitive markets (Davidow, 2003; Knox and Van Oest, 2014). Recognized the impracticality of fulfilling all the customer expectations all the time, the question to be addressed in nowadays organizations is how to manage complaints in order to positively affect customer justice evaluations and, consequently, customer satisfaction and loyalty? (Homburg and Fürst, 2005).

In the ACSI model, the construct complaints is measured as a percentage of respondents who indicate they have complained about a product or service within a specified period (Fornell *et al*., 2008). In this present study, four more items are added. Three items are intended to reflect passenger attitude to complain. This approach is consistent with previous studies and assumes that customers may very often do not formalize their dissatisfaction with the organization (Knox and Van Oest, 2014; Homburg and Fürst, 2005). Concerning the airport setting, Chang *et al*. (2008) suggested that the most of the passengers unsatisfied with the airport or just having unpleasant experience is not willing to inform the customer service staff. Moreover, another item related to the passenger perception about how the complaints are solved by the organization is included.

In this sense, the construct is better operationalized as complaint handling, which has similarities with the ECSI model operationalization (Johnson *et al*., 2001). The measurement items for this construct are presented in Table 19.

Table 19. Measurement items for the construct complaints.

Code	Measurement item
COP1	I have already formally complained to the airport
COP2	I have (or have had) intention to formally complain to the airport
COP3	I have complained (or I am likely to complain) about the airport to family or friends
COP4	Passengers that have complained to the airport are likely fair
COP5	I do not believe that complaints are properly solved by the airport

Loyalty

Customer loyalty has been approached in different ways. Loyalty has been operationalized both as unidimensional or multidimensional construct, depending basically on the study´s purposes (Bobâlca, Gatej and Ciobanu, 2012; Bodet, 2008; Hill and Alexander, 2006). Usually, the two most important components in the loyalty construct are the attitude and behavior, which reflects the customer psychological attachment and behavioral consistency. The former component is associated with cognitive, affective, and conative elements, while the latter is specifically related to customer actions (i.e. repeat repurchase) (Oliver, 1999; Wilson *et al.*, 2012).

In consequence of this multifaceted nature, several definitions for loyalty will generally comprise objective aspects, such as the repeat purchasing frequency or the relative volume of same-brand purchasing (Oliver, 1999; Bodet, 2008). Consistent with this perspective, in the ACSI model, loyalty is seen as a combination of the customer's declared repurchase intention, and their tolerance to increase in the prices, i.e. the likelihood to purchase a company’s products or services at various price points.

With the purpose of covering particularities of the airport context, in this study, customer tolerance to the prices will account for changes in the airport fees and flight fares. This modification is supported by the notion that passengers will likely differ among these costs in their decision-making process as regards airport choice (Nesset and Helgesen, 2014; Polk and Bilotkach, 2013; Tam and Lam, 2005; Yang *et al*. 2014).

In order to extend the approach to the construct, a measure for word-of-mouth behavior is included. This modification is aligned with the ECSI model (Johnson. *et al.*, 2001) and supported by the literature (Oliver, 2015; Mason, 2008). The term word-of-mouth refers to any situation when the customer spontaneously talks about a product or service in their surroundings (Mason, 2008). The content of this communication can be either positive or negative. Positive word-of-mouth is considered indicative of customer loyalty (Sweeney, Soutar and Mazzarol, 2012). In this study, the likelihood to recommend the airport to family and friends is associated with positive word-of-mouth, as in Nesset and Helgesen (2014).

Another measurement item to reflect passenger preference for using the airport is included. This item is intended to provide a long-term perspective as regards passenger preference in the particular multi-airport region. Using this item within the airport context is supported by previous study on the air transport industry (Akamavi, Mohamed, Pellmann, *et al.*, 2015).

Table 20 outlines the measurement items for loyalty.

Table 20. Measurement items for the construct Loyalty.

Code	Measurement items
LOY1	I will use this airport for my next flight departing from São Paulo
LOY2	Even if another airport in the city offers a much cheaper fee, I prefer to use this airport
LOY3	Even if another airport in the city has an equivalent flight much cheaper, I prefer to use this airport
LOY4	I will recommend this airport to my family and friends departing from São Paulo
LOY5	I always prefer using this airport for domestic flights departing from São Paulo

Switching Costs

In this study, the construct switching costs characterizes the perceived economic and psychological costs associated with changing from one airport to another in the same multi-airport region (Jones *et al.*, 2007). According to Oliver (1999), a relevant issue in studying loyalty is to understand why would a customer appear to be so naive that he or she would seek out the same organization to fulfill his or her needs. In a competitive environment, loyalty means that the customer believes that the organization continues to offer the best choice alternative.

Actually, the adoption of service strategies based on increase customer perception of switching costs has been increasingly recognized as a way to keep customers in a relationship with the firm (Jones *et al.*, 2007; Yang and Peterson, 2004). These strategies are usually related to building an affective relationship with the brand or more utilitarian approaches as loyalty programs.

In the case of the airport business, there has been recent interest in branding strategies as differentiation (Castro and Lohmann, 2014; Wattanacharoensil *et al*., 2016). Loyalty programs are also an emergent marketing practice (Nesset and Helgesen, 2014; Chen *et al*., 2015). Notwithstanding, none of those practices are present in the specific context of this study, in São Paulo multi-airport region.

Within the airport industry, analysis of substitutability should involve examining the available alternatives (for both the airlines and their customers) and the viability of customers switching to those alternatives (Polk and Bilotkach, 2013). Although the scope for competition in the airport sector has widened after the deregulation process carried out in several countries (Adler and Liebert, 2014; Merkert and Mangia, 2014; Jimenez, Claro and De Sousa, 2013; Adler *et al*., 2015), the existence of airport market power is still a relevant issue in the air transport sector (Maertens, 2012; Pels *et al*., 2003; Polk and Bilotkach, 2013).

In effect, regarding airports, the facts that would lead to passenger loyalty (as measured by customer attitude) may not be so evident. The problem of airport choice has been usually associated with the perception of an airline-airport offer and encompasses aspects of airport access and convenience in using the airport (Tierney and Kuby, 2008; Cho *et al*., 2015; Yang *et al*. 2014; Postorino and Praticò, 2012). In this context, passengers will differ concerning the best airport to use within a particular multi-airport region or even between hub airports.

Consistent with the literature on switching costs, the construct is reflected by direct monetary expenses and non-monetary costs (Jones *et al*., 2000; Jones *et al.*, 2007; Yang and Peterson, 2004; Nesset and Helgesen, 2014; Carlsson and Löfgren, 2006). Considering the particular characteristic of the airport business, the feeling of being obliged to use the same airport due to convenience is also covered. Table 21 shows the measurement items for switching costs.

Table 21. Measurement items for the construct Switching Costs.

Code	Measurement item
SWC1	For me, it would be more expensive using another airport in this city
SWC2	It would demand more personal efforts using another airport in this city
SWC3	It would take much time if I decided for using another airport in this city
SWC4	For me, it would be very inconvenient to use another airport in this city
SWC5	For convenience, I feel practically obliged to use this airport for domestic flights from São Paulo

4.4.3. The Research Instrument

The survey instrument consists of three parts. The first part comprises the measurement items used for the antecedents and consequences of passenger satisfaction (expectation, perceived value, passenger satisfaction, complaints, loyalty, and switching costs), with exception to the airport service quality construct. The second part contains the set of measurement items related to the ASQ model, based on typical service quality measures in the airport industry and the results from the empirical study 2, presented in chapter 6. The third part contains a few questions related to characterization of the respondents[26] (Appendix VI).

The measurement items are based on the literature and construct operationalization procedures earlier described. As regards the rating scale, seven-point scales were used in both parts I and II. In part I, a Likert-scale is used to allow passengers to indicate the extent to which they agree or disagree with each statement. This scale ranges from 1 – strongly disagree to 7 – strongly agree, and has a central point in 4 – neither agree or

[26] Note: the research instrument is the same used in study 2 for SBSP data. For the purpose of study 2, however, only part II and III of the questionnaire were used.

disagree. In part II, a performance rating scale is used. This scales ranges from 1 – Very poor to 7 – Very good, with a central point in 4 – Regular.

As already discussed in section 4.3.1., the option for seven-point scales is based on the interest in improving scale sensitiveness for detecting variation (Preston and Colman, 2000) and trying to reduce deviation from multivariate normality (Byrne, 2010). Considering the alternatives for the number of responses categories in rating scales, the seven-point scale tends to provide a balance between improving scale sensitiveness and ease of use by the respondent (Preston and Colman, 2000).

Preparatory procedures related to the survey instrument were carried out, including consultation with experts and a trial survey. The set of measurement items used in the second part of the questionnaire was sent to content validation by a group of ten experts, including researchers (4), airport professionals (3), and experts from the Brazilian Government (3). These experts were asked to indicate their opinion on the validity and relevance of each measurement item as regard the respective construct intended to be measured (i.e. face validity). Moreover, they were requested to state any additional comment with the purpose of improving item readability and suggesting any other measure to be included[27].

The most significant contributions of this consultation process were the support for face validity, the need for item wording revision, and minor modifications to the questionnaire layout. Particularly concerning face validity, although the measurement items are based on the ACSI model and research literature, this assessment based on expert opinion is relevant as some modifications are implemented comparing to the original ACSI model and there is a lack of similar studies in the airport-related literature.

After this process, a trial on-line survey was undertaken with the use of specialized software[28]. Target population was people that had used any Brazilian airport for a

[27] As explained in section 4.3.1., the set of measurement items for airport service quality are assumed to present sufficient face validity as long as they have been broadly used within the airport industry. Thus, they were not included in this validation process.

[28] Software QualtricsTM by Qualtrics LCC (http://www.qualtrics.com/about, accessed on 12/10/2015).

departing flight in the last three months. Approach to the target population was based on social network websites. In addition to the responses to the measurement items, the respondents had the opportunity to present additional comments on the readability of the questionnaire or any other suggestion. After 45 days (comprising July and August 2015), a sample consisting of 39 respondents was obtained. Due to the limited sample size, no scale reliability analyses were undertaken. The main contributions were related to item wording and warnings on the length of the questionnaire.

As results of these preparatory procedures, the final questionnaire comprised 59 measurement items[29], as presented in Appendix VI.

4.4.4. The Research Hypotheses

This study is grounded on the theoretical hypothesis that relationships between passenger satisfaction with the airport and passenger behavioral attitudes can be explained by a cause-and-effect model. In addition to this fundamental hypothesis, other research hypotheses specifically related to the relationships between the constructs are stated in the following subsections.

The effects of passenger expectation

Customer satisfaction literature stresses the importance of customer expectations as a determinant of perceived service quality (Oliver, 1996; Parasuraman *et al.*, 1994; Morgeson, 2012). However, the nature of passenger expectation with the airport service

[29] To be noted that four items in Part II were not used in this study. They were collected for future research.

is still under-researched (Fodness and Murray, 2007; Bogicevic *et al.*, 2013; Bezerra and Gomes, 2015; Hussain *et al*., 2015).

Based on the literature reviewed, the construct expectation reflects service attributes or characteristics of the airport services anticipated by the passenger (Oliver, 2015; Anderson and Fornell, 2000b). Accordingly, passenger expectation may be determined by a number of different factors, including prior experiences, passenger characteristics, and a cognitive forecast of the airport´s ability to deliver service quality.

Altogether, these determinants provide a frame of reference about which the passenger will judge the service performance and value obtained from the service delivered. Finally, these judgments will influence their perception about the experience with the airport and their level of satisfaction (Oliver, 2015).

According to the literature and the ACSI model, the hypothesized relationships for the construct expectation comprise direct and positive effects on service quality, perceived value, and satisfaction:

Hypothesis H1a. Passenger expectation positively affect the perceived airport service quality.
Hypothesis H1b. Passenger expectation positively affect the perceived value.
Hypothesis H1c. Passenger expectation positively affect passenger satisfaction.

The effects of perceived airport service quality (ASQ)

The perceived service quality is usually considered a critical element for customer satisfaction. Actually, while a psychological phenomenon, satisfaction is function of the customer experience with the product or service performance (Anderson and Fornell, 2000b; Falk *et al*., 2010; Sureshchander *et al*., 2002; Oliver, 2015). In this context, a positive effect of ASQ on passenger satisfaction is expected.

In addition to this direct effect on satisfaction, service quality is also expected to directly contribute to positive customer perception about the price for value as regards the service delivered (Johnson. *et al.*, 2001). In the passenger satisfaction model to be estimated, the perceived value is measured as the level of service quality experienced based on the price related to two fundamental aspects of the airport service: i. the core airport activities and facilities; and ii. the convenience services, including commercial activities.

The following research hypotheses about the effects of airport service quality are stated:

Hypothesis H2a. Perceived airport service quality positively affects the perceived value.

Hypothesis H2b. Perceived airport service quality positively affects passenger satisfaction.

The effect of perceived value

The customer perception of value relates the service performance (considering their several quality factors) to the price paid (Anderson and Fornell, 2000b; Johnson. *et al.*, 2001; Zauner *et al*., 2015). Therefore, it is expected that a high perceived value would positively influence customer satisfaction with the service encounter.

Consistent with the ACSI model, in this study, the research hypothesis associated with perceived value is that there is a positive effect on the passenger satisfaction with the airport:

Hypothesis H3. Perceived value positively affects passenger satisfaction.

The effects of passenger satisfaction

The passenger satisfaction is the central construct in the model, mediating changes between customer pre-purchase and post-purchase attitudes. The literature has emphasized customer satisfaction as consequence of a cognitive process of disconfirmation, which is also the perspective embraced in this study (Oliver, 2015).

Based on the ACSI model, passenger satisfaction is reflected in different aspects related to the passenger experience with the airport, comprising: i. an overall satisfaction level, ii. the fulfillment of expectations, iii. the performance relative to an ideal airport. Additionally, in the interest of this study, two other measures were included, comprising passenger evaluation about making a good choice in choosing the airport, and an overall perception on the experience with the airport. This construct operationalization provides a comprehensive approach to the satisfaction phenomenon.

Passenger satisfaction is then expected to have a positive direct influence on passenger loyalty towards the airport and to negatively influence the passenger attitude of complaining about the airport. These relationships have been studied in different service settings, as presented in Section 3.5.

Concerning the airport context, the effects of passenger satisfaction on loyalty has been examined by Nesset and Hegelson (2014) and Park and Jung (2011). In both studies, the hypothesis of a direct positive effect was supported. With regard to the negative effect of satisfaction in passenger complaining attitude, Chang *et al*. (2008) found a significant negative effect from passenger satisfaction on passenger complaining intention. Consequently, as long as the passengers are satisfied with the airport experience, they are less likely to have any intention to complain. Notwithstanding, there is still a significant gap concerning the examination of these relationships in the airport context, as previously discussed.

The hypothesized consequences of passenger satisfaction are the following:

Hypothesis H4a. Passenger satisfaction positively affects passenger loyalty towards the airport.

Hypothesis H4b. Passenger satisfaction negatively affects the passenger attitude of complaining.

The effect of complaints on the loyalty attitude towards the airport

The number of complaints has been considered an important indicator of customer satisfaction and opportunity for identifying weakness in the service performance (Homburg and Fürst, 2005). Customer complaining attitude is associated with the idea that customer expectations have not been met, and this might be related to some type of service failure. Accordingly, customer experiences a poor service encounter which results in dissatisfaction (Lovelock and Wirtz, 2007).

Notwithstanding, the complaining attitude is not always materialized for the organization (Wilson *et al.*, 2012). In the context of airport services, Chang *et al*. (2008) suggested that the most of the passengers displeased with the airport is not willing to voice their dissatisfaction to the airport staff.

In this present study, a comprehensive approach to complaint attitude is considered. In accordance with previous research it is assumed that customers may not formalize their dissatisfaction and the focus was placed on their declared intentions (Knox and Van Oest, 2014; Homburg and Fürst, 2005).

In the original ACSI model, the construct complaint is operationalized as a ratio of complaining customers and the total number of customers. Therefore, the sign of this effect in the ACSI model is dependent on the effectiveness of the organization´s complaint-handling system (Fornell *et al*., 1996).

Concerning this Thesis, bearing in mind that no airport-specific study was found to account for the consequences of passenger complaints, and other measurement items reflecting passenger attitude to complain were included, the effect of complaints on passenger loyalty is expected to be negative (Shen *et al*., 2016; Deng *et al*., 2013; Knox and Van Oest, 2014).

Accordingly, the hypothesis related to the effect of complaints is:

> *Hypothesis H5.* Passenger attitude of complaining about the airport negatively affects the passenger loyalty towards the airport.

The effect of switching costs in the passenger loyalty attitude towards the airport

The effect of switching costs on passenger loyalty is introduced with the purpose of exploring the particular nature of loyalty in the airport context. Previous studies have already stressed the relevance of customer perception on the existence of switching costs as a determinant of loyalty, particularly as regards repurchase intention (Yang and Peterson, 2004; Nesset and Helgesen, 2014; Jones *et al*., 2000; Jen *et al*., 2011; Jones *et al.*, 2007).

In this Thesis, the switching costs construct is operationalized as the perceived economic and psychological costs associated with changing from one airport to another in the multi-airport region (MAR) (Jones *et al.*, 2007). Regarding airports, the analysis of substitutability includes examining the available alternatives and the viability of customers effectively to switch to those alternatives (Polk and Bilotkach, 2013). In this context, the introduction of this specific effect can shed light on the existence of market power and competition in the specific MAR (Carlsson and Löfgren, 2006; Maertens, 2012; Murça and Correia, 2013; Johnson *et al*., 2014; Cho *et al*., 2015).

The specific hypothesis to be tested is the existence of a significant positive effect of passenger perception of switching costs on their loyalty attitude towards the airport.

> *Hypothesis H6.* Perception of significant switching costs positively affects the passenger loyalty towards the airport.

4.4.5. Models and Data Analyses for the Empirical Study 3

In this third empirical study, a theoretical model of the antecedents and consequences of passenger satisfaction with the airport is examined. The hypothesized relationships are estimated with structural equation modeling (SEM) techniques. In using SEM, a series of dependence relationships can be examined simultaneously (Hair *et al*., 2014). Hence, it is particularly useful in testing the multiple relationships previously described.

As already mentioned, SEM is essentially used for confirmatory purposes, such as to evaluate how well a theoretical model of relationships fits data from a given covariance matrix or correlation matrix. In this sense, a series of interdependent multiple regression equations can be simultaneously estimated, according to the structural model specified. The structural model comprises the relationships among independent and dependent variables, including cases when a variable act as dependent in a relationship and independent variable in other relationship (Hair *et al*., 2014).

Moreover, SEM can comprise latent constructs in this analysis, using them as variables in the structural model. In this regard, the constructs are indirectly measured by multiple observed variables (Hair *et al*. 2014). This capability is argued to provide significant benefits for applied social science research, as the case of this present study (Kline, 2011).

Since a latent construct is by definition an unobserved concept (i.e. an abstraction), its measurement process based on observed variables will necessarily be subjected to measurement error (Byrne, 2010). In SEM, the measurement model specifies the correspondence between observed variables and latent constructs. Any number of variables can be used for measuring a single construct[30], and then the measurement model is used to assess scale reliability and construct validity (Hair *et al*., 2014).

In the typical two-step approach for SEM, the relationships between the constructs (i.e. the structural model) are estimated only after the constructs have met the required measurement standards. Consistent with the literature and regular practices, in this study, this two-step approach is followed (Hair *et al.*, 2014; Byrne, 2010; Marôco, 2010; Kline, 2011; Anderson and Gerbing, 1988).

Considerations on conceptual and operating aspects of the measurement model has already been presented in Section 4.3.2., with reference to the empirical study 2. As these considerations are entirely applicable to this present study, in this section only those aspects related to the structural model are emphasized.

In the structural model, latent constructs are identified as exogenous or endogenous variables. Exogenous variables are synonymous with independent variables, as they are expected to cause variations in the values of other variables in the model. The changes in the exogenous variable, however, are not explained by the model, since they are considered influenced by external factors. The endogenous variables are expected to be influenced by the exogenous variables in the model, either directly or indirectly (Byrne, 2010).

As regards modeling strategy, three distinct alternatives in SEM are referred by Hair *et al*. (2014): confirmatory, competing model strategy, and model development strategy. Each alternative is related to specific research objectives. The confirmatory modeling strategy is the most used in the literature (Hair *et al*., 2014; Marôco, 2010). It is also appropriate for this present study, as it comprises the specification of a model consisting of a set of interrelationships and the assessment on how well the model fits the data.

[30] Concerning the number of observed variables for construct, authors agree that three variables are a minimum desired. Conversely, a great number of observed variables may demand greater sample size (Hair, Black, Babin, *et al.*, 2014; Kline, 2011; Marôco, 2010).

With regard to model estimation, the procedures to be applied are the same already described for the empirical study 2, in section 4.3.2. Namely, the input for model estimation is the covariance matrix and the maximum likelihood estimation – MLE method is used. The analyses are processed with the software IBM AMOS, version 22.

Also, the same procedures for the modeling process are followed, according to the specialized literature (Hair *et al.*, 2014; Byrne, 2010; Marôco, 2010; Kline, 2011), with the addition of the structural model assessment:

- Data inspection as regards missing values and missing value treatment;
- Assessment of sampling adequacy for factor analysis using KMO coefficient and Barlett´s test of sphericity;
- Testing for the construct unidimensionality by within-scale exploratory factor analysis;
- Scale reliability and item reliability assessment by Cronbach´s alpha and item-to-total correlation;
- Univariate normality assessment by Skewness and Kurtosis;
- Multivariate normality assessment by Mardia´s coefficient;
- Multivariate outlier identification by Mahalanobis´ squared distance;
- Assessment of the measurement model by confirmatory factor analysis;
- Evaluation of the model´s goodness-of-fit;
- Construct validity and reliability assessment;
- Common method variance assessment;
- Assessment of the structural model.

Furthermore, besides the construct validity assessment described in section 4.3.2., nomological validity is also considered in the context of the structural model. Given acceptable convergent and discriminant validities, the test of the structural model constitutes a confirmatory assessment of nomological validity (Anderson and Gerbin, 1988). In other words, it assesses whether constructs that are theoretically related are actually empirically related (Hair *et al*., 2014). Accordingly, it is expected that the research hypotheses about the construct relationships in the structural model are supported, which is interpreted as indicative of nomological validity.

Concerning the assessment of the structural model, it is also confirmatory in nature. Explicitly, the postulated causal relationships between the constructs in the hypothesized model must be grounded in theory and/or empirical research (Byrne, 2010). Typically, the test of the hypotheses is based on the interpretation of the maximum likelihood estimates for the path coefficients (i.e. factor loadings or regression weights) (Kline, 2011; Hair *et al*., 2014).

The path coefficients are interpreted just as regression coefficients in regression analysis models. They are tested for statistical significance based on the critical ratios and respective p-values. Likewise, the squared multiple correlations (SMC) computed for the endogenous variables represents the proportion of variance that is explained by the predictors of the specific variable in question (Byrne, 2010).

4.5. CHAPTER CONCLUSIONS

This chapter presented further considerations on the research design, comprising the three empirical studies undertaken in this Thesis. Moreover, it stressed and described the particular research objectives, data collection procedures, and the methods to be used in each study. In this respect, three distinct sections were presented.

In section 4.2., the research instrument, data collection, variables, and data analysis for the exploratory study on performance measurement practices in Brazilian airports were described. Section, 4.3. was dedicated to the second study, which uses a confirmatory approach to fit a measurement model for airport service quality as perceived by the passengers. Concerning the study on the antecedents and consequences of passenger satisfaction, the theoretical model, construct operationalization, the research instrument, and the research hypotheses were presented in section 4.4.

In the next chapters, the results of these studies are reported along with discussion on their related findings in view of the research questions, research objectives, and the literature. Considerations on the theoretical and practical implications derived from these studies and limitations are also delivered.

CHAPTER 5 – EXAMINING PERFORMANCE MEASUREMENT PRACTICES AIRPORT SETTINGS

5.1. INTRODUCTION

Establishing an appropriate performance measurement system (PMS) in complex and dynamic service settings such as airports is certainly a practical challenge. As previously mentioned, accounting for the several interacting parts involved in the air transport activities plus the stakeholders´ interests requires an open-system approach to airport performance. Accordingly, a set of measures of different nature and covering the diversity of performance dimensions are necessary.

In the current business environment, with increasing pressures for improving efficiency and service quality while adopting practices of corporate social responsibility, airport executives are confronted with conflicting objectives and the need for monitoring different aspects of their airport performance (Skouloudis *et al*., 2012; Graham, 2014; Adler *et al*., 2013).

According to the methodology described in section 4.2., in this present chapter the objective is to examine performance measurement practices at Brazilian airports, in order to identify the current profile of airport executives concerning to the frequency of use, the relevance, and the ease of acquisition of performance measures related to eleven categories of performance.

In the next section data collection and sample characteristics are described. Afterward, the study´s results are presented and discussed. Finally, the findings, conclusions and some final considerations on the study are delivered.

5.2. DATA COLLECTION AND SAMPLE

For the purpose of identifying airports of interest for the survey, the database maintained by the Brazilian Civil Aviation Authority was used[31]. At the time of this study, there were over seven hundred public aerodromes registered in Brazil, but few more than one hundred with commercial flights (ANAC, 2015). Since small airports usually have a very simple organizational structure, consisting of just basic operational and maintenance activities (Ashford *et al.*, 2013), target population was based on the regulatory criterion for the implementation of a full rescue-and-firefighting system (ANAC, 2013). Hence, only the airports with at least six regular weekly operations of aircraft category 4 or higher were considered[32]. Accordingly, the target population consisted of 94 airports distributed in the 26 states and the Federal District.

The survey respondent was the occupant of the highest post within the airport organizational structure. For regulatory purposes, this professional must be formally indicated to the Civil Aviation Authority (ANAC), and they are required to be provided with the necessary authority to represent the airport in all regulatory acts[33] (ANAC, 2012). Given these requirements, it is expected that this professional have a deeper knowledge of the current airport activities.

A list of the respective names, email addresses, and telephone numbers of these professionals was provided by ANAC upon request. Despite the several denominations that may be used, henceforth these professionals will be referred to as "airport executives" or just "executives". These airport executives were firstly contacted by email

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[31] Access was granted upon request to the Superintendency of Airport Infrastructure (*Superintendência de Infraestrutura Aeroporuária*).

[32] According to the Annex 1 to the Resolution ANAC nº 279/2013, an aircraft category 4 comprises any fixed-wing aircraft with the following dimensions: 18m ≤ aircraft length < 24m or width ≤ 4m. This might be considered a convenient proxy for airport complexity because of the number of passengers processed in each operation.

[33] According to the Regulation, this person is designated "*Operador do Aeródromo*", meaning Airport Operator.

and invited to participate in the online survey anonymously. Follow-up emails were sent within a 15-day interval.

After this research effort, 54 responses were obtained, which represented a response rate of 57,5%. However, eight forms were returned completely blank, and 15 forms presented only information on the respondent characterization, which was asked on the first page of the online questionnaire. These forms were excluded, and a final sample with 31 useful responses yielded an effective response rate of approximately 33%.

Regarding sample characteristics, information on time of experience of the airport executives is presented in Table 22. There was a significant variation in the length of experience concerning sector, the airport, and management positions. Notwithstanding, on average, airport executives were well experienced in the airport sector.

Table 22. Sample Characteristics (Time of experience of airport executives in years).

Characteristic	N	Mean	Std.Dev.	Min	Max
Time of experience in the airport sector	31	20,9	9,99	2	35
Time of experience in the airport	30	9,6	9,41	1	29
Time of experience in management positions	30	11,9	7,47	1	29

Note: Std.Dev. = Standard deviation

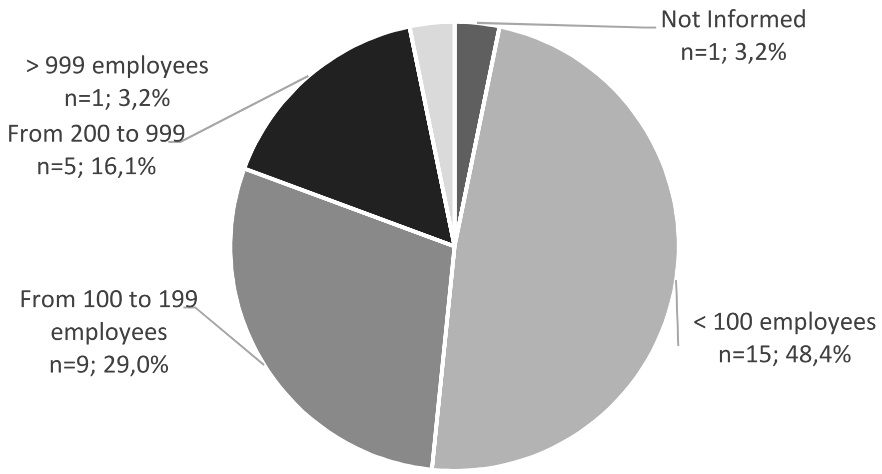
As for the airport category according to the Brazilian regulation, frequency distribution based on the classes for airport certification is presented in Table 22. These classes are based on the average number of passengers processed in the last three years.

Table 23. Sample Characteristics (Classification according to the RBAC 153).

Class	Number of PAX	Freq.	%
I	< 100.000	9	29,0
II	≥ 100.000 / < 400.000	7	22,6
III	≥ 400.000 / < 1.000.000	5	16,1
IV	≥ 1.000.000	10	32,3

Concerning the number of employees, the most of the airport executives declared up to 99 employees (48,4%), followed by the following category (from 100 to 199 employees) (29%). Only one respondent declared more than 999 employees (Figure 27).

Figure 27. Airports by the number of employees.



Another set of questions were related to the implementation of common management tools associated with performance measurement practices. Table 24 shows the sample characteristics according to the use of these management tools.

Table 24. Sample characteristics based on the use of management tools.

Management tool	Freq.
Safety Management System – SMS	24
Benchmarking practices	23
Quality Management System – ISO 9001	17
Environmental Management System – ISO 14001	1
Occupational Health and Safety Assessments Series – OSHAS	0
Airport Manual*	11
None	2

*required by regulation for Class IV airports

Safety management system (SMS) and benchmarking practices were the most frequent management tools. The standard for quality management systems (ISO 9001) was also present in more than half of the airports. Conversely, the Occupational Health and Safety Assessments standard (OSHAS) and the Environmental management system (ISO14001) were the least declared by the airport executives. To be noted that the SMS and the airport manual are required by regulation (ANAC, 2013), however, the airport manual is only mandatory for airports with more than 1.000.000 passengers processed per year. Out of the 31 respondents, two executives informed to use none of the alternatives listed. Both respondents are responsible for Class I airports.

Analysis of non-response bias was based on the comparison of the sample characteristics regarding the classification according to the RBAC 153 with the target population of airports (which was the only official information available for comparison). There was found a higher non-response rate of smaller airports (i.e. airports classes I and II). In relative terms, these classes of airports are underrepresented in the sample. This finding may be associated with the small organizational structure and a possible lack of familiarity of executives of smaller airports with the subject or performance measurement.

In addition to this sample characterization, descriptives are provided in Appendix VII, including the number of responses, minimum and maximum values, mean values, standard error, standard deviation, coefficient of skewness and kurtosis for each performance measure in the questionnaire.

5.3. RESULTS AND DISCUSSIONS

Consistent with the three phases of data analysis described in the methodology chapter (section 4.2.), the results are presented and discussed in the following three subsections. The first subsection is dedicated to the results of the clusters analysis for each information category. In the second subsection, the multiple regression analyses based on the average values for each variable and information category are featured. To finish, concerning the third phase of data analysis, the results of the gap analysis are presented and discussed.

5.3.1. Cluster Analysis

The observation unit used in the cluster analyses was the average score of each performance measure as regards its frequency of use (FU), perceived relevance (PR) and ease of information acquisition (EA). The K-mean method was used to classify these average scores in five groups, so as to provide an analogy with the five-point scale used. Based on these procedures, the results revealed how the 77 performance measures differ as regards their level of utilization, relevance and the ease of information/data acquisition according to the average perception of the respondents.

The results of the Cluster Analyzes for the frequency of use, perceived relevance and ease of acquisition are reported in tables (Table 25 to Table 30). The first column in each table indicates the cluster number. In the second and third columns are the measure description and its code, respectively[34]. The average of the airport executives' responses is reported in the fourth column. Finally, the standard deviation and the coefficient of variation are presented in the last two columns. The performance measures within the same cluster are interpreted to present a similar level of use, relevance, or availability of information.

Regarding the frequency of use (FU), 35 measures from ten performance categories were classified in the two clusters representing the most used measures (Table 25). There was more incidence of safety (7 out 9 measures), economic-financial (6 out of 11 measures), and operational measures (5 out of 8 measures), which suggest that performance measurement practices in Brazilian airports are still mostly based on operational aspects, comprising expected outcomes of the operating processes and safety issues. Moreover, it is to be noted that even the economic-financial measures appearing in these clusters are associated with short-term results, more than long-term results, which is also supportive of this focus on operational issues.

[34] This category code indicates which of the eleven performance categories the measure belongs to.

Table 25. Cluster analysis results for Frequency of Use (FU) (Most frequently used measures).

Cluster	Measure	Cat.	Mean	Stancd. Dev.	Coeffic. Variat.
1	Expenditures evolution	EFN2	4,08	1,08	0,26
1	Foreign Objects – FO	SAF4	4,03	0,93	0,23
1	Number of aircrafts by type of flight	OPE6	4,00	1,10	0,28
1	Customer complaints	ASQ4	4,00	1,11	0,28
1	Operating margin	EFN9	3,96	1,21	0,31
1	Number of passengers in peak-hours	OPE3	3,94	1,09	0,28
1	Concession revenues	COM6	3,89	1,16	0,30
1	Emergency response time	SAF9	3,86	0,88	0,23
1	Number of passenger or WLU/airline	OPE1	3,84	1,07	0,28
1	Operating costs	EFN1	3,84	1,11	0,29
1	Social activities for local communities	SOC6	3,82	0,96	0,25
1	Duration of lease	COM2	3,81	0,94	0,25
1	Cash flow	EFN7	3,80	1,23	0,32
1	% commercial area leased	COM1	3,78	1,12	0,30
2	Energy consumption reduction	ENV2	3,74	1,01	0,27
2	Occurrence of spills	ENV8	3,73	1,32	0,35
2	Number of aircrafts during peak-hours	OPE5	3,71	1,24	0,33
2	Revenues/Number of passengers or WLU	EFF6	3,71	1,16	0,31
2	Wildlife in maneuvering area	SAF3	3,70	1,24	0,34
2	Revenues evolution	EFN3	3,68	1,11	0,30
2	Ground operations occurrence	SAF5	3,67	1,27	0,35
2	Number of safety reports	SAF8	3,67	1,27	0,35
2	Water consumption reduction	ENV1	3,65	0,98	0,27
2	Flight delays	OPE7	3,63	0,89	0,25
2	Availability of equipment and facilities	ASQ2	3,63	1,04	0,29
2	Number of security badges breaches	SEC4	3,62	1,43	0,40
2	Bird strike/wildlife strike	SAF2	3,57	1,41	0,39
2	Profit/Loss	EFN8	3,56	1,29	0,36
2	Runway system capacity	LOS2	3,54	1,29	0,36
2	Number of security procedures breaches	SEC3	3,52	1,35	0,38
2	Aeronautical accident/Incident	SAF1	3,50	1,61	0,46
2	Congestion level of waiting areas/lounges	LOS1	3,46	1,20	0,35
2	Number of aircrafts/Runway area	EFF4	3,44	1,12	0,33
2	Processing time of passengers with reduced mobility	ASQ8	3,42	1,07	0,31
2	Curb time per vehicle	LOS6	3,39	1,07	0,32

The finding that safety measures are predominant among the most frequently used is consistent with the fact that airports are under strict regulation. According to international standards and national regulations worldwide, airports are supposed to measure safety performance within their Safety Management Systems (SMS) (ANAC, 2012; ICAO, 2013; Pacheco *et al.*, 2014). This finding might also be indicative of the existence of a strong safety culture among the air transport agents, as identified in the literature (Yadav and Nikraz, 2014; Fu and Chan, 2014).

The fourth and fifth clusters based on the frequency of use contain the least used performance measures (Table 26). Measures associated with the categories Competition, Environmental, and Social are predominant here. Three out of four measures related to competitiveness are presented, which might suggest that competition is not of great concern for Brazilian airports currently. Furthermore, three measures related to the environmental and social dimensions were also classified in these clusters. It is also noteworthy that the economic-financial measures associated with profitability ratios and rates of return are presented in these clusters, as well as the use of surveys applied to airlines and concessionaires. The last note is that the performance measure with the lowest mean for frequency of use was the "number of citation by media".

Table 26. Cluster analysis results for Frequency of Use (FU) (Less frequently used measures).

Cluster	Measure	Cat.	Mean	Stand. Dev.	Coeffic. Variat.
4	Number of passenger or WLU/Costs	EFF3	2,92	1,06	0,36
4	Occurrence of serious events at the airport	SEC1	2,90	1,52	0,52
4	Profitability ratios (ROA, ROE, ROI, etc.)	EFN10	2,88	1,30	0,45
4	Internal rate of return	EFN11	2,88	1,20	0,42
4	Number of passenger or WLU/Number of routes	OPE2	2,84	1,19	0,42
4	% cargo space leased	COM3	2,79	1,53	0,55
4	Airline competition in the airport	COP2	2,76	1,05	0,38
4	Airlines costs with airport fees	COP4	2,76	1,05	0,38
4	Number of meetings with airlines and other organizations involved in the airport activities	SOC4	2,74	1,32	0,48
4	Airport Market share	COP1	2,72	1,28	0,47
4	Number of passengers by type of traveler	OPE4	2,70	1,15	0,43
4	Direct/indirect job generation	SOC1	2,70	1,15	0,43
4	Noise level	ENV4	2,68	1,36	0,51
4	Concessionaires satisfaction surveys	ASQ6	2,59	1,15	0,44
4	Wait time at check points	LOS5	2,57	1,29	0,50
4	Number of houses or population within a certain noise contour	ENV5	2,57	1,33	0,52
4	Airlines satisfaction surveys	ASQ5	2,52	1,12	0,44
4	Gaseous pollutants emission	ENV3	2,50	1,23	0,49
5	Number of citation by media	SOC3	1,87	1,06	0,57

As regards the clusters based on the perceived relevance (PR), the most relevant measures are presented in Table 27. Once more, the industry concern on safety is revealed by the presence of 100% of the safety-related measures, with four measures appearing at the top of the list. Economic-financial measures were also identified as very relevant, with eight measures (out of eleven) classified in these clusters. Operational, Service Quality and Level of Service categories were also considered of higher relevance according to the executives´ opinion.

Table 27. Cluster analysis results for Perceived Relevance (PR) (Most relevant measures).

Cluster	Measure	Code	Mean	Stand. Deviat.	Coeffic. Variat.
1	Emergency response time	SAF9	4,43	0,68	0,15
1	Ground operations occurrence	SAF5	4,40	0,86	0,20
1	Foreign objects (FO)	SAF4	4,30	0,79	0,18
1	Wildlife in maneuvering area	SAF3	4,28	0,84	0,20
1	Expenditures evolution	EFN2	4,24	0,93	0,22
1	Operating margin	EFN9	4,24	0,93	0,22
1	Customers complaints	ASQ4	4,22	0,97	0,23
1	Operating costs	EFN1	4,20	0,96	0,23
1	Aeronautical accident/incident	SAF1	4,17	1,21	0,29
1	Number of safety training/promotion events	SAF7	4,17	1,23	0,29
1	Revenues evolution	EFN3	4,16	0,80	0,19
1	Cash flow	EFN7	4,16	0,99	0,24
1	Runway system capacity	LOS2	4,14	1,15	0,28
1	Bird strike/Wildlife strike	SAF2	4,13	1,07	0,26
1	Water consumption reduction	ENV1	4,13	0,97	0,23
1	Processing time of passengers with reduced mobility (PRM)	ASQ8	4,12	1,11	0,27
1	% commercial area leased	COM1	4,11	1,01	0,25
1	Number of passengers during peak hours	OPE3	4,10	0,98	0,24
1	Number of aircrafts by type of flight	OPE6	4,10	0,87	0,21
1	Runway incursion occurrences	SAF6	4,10	1,09	0,27
1	Number of safety reports	SAF8	4,10	0,96	0,23
1	Energy consumption reduction	ENV2	4,09	1,00	0,24
1	Profit/Loss	EFN8	4,08	0,95	0,23
2	Social activities for local communities	SOC6	4,05	0,90	0,22
2	Number of security badges breaches	SEC4	4,03	1,30	0,32
2	Curb time per vehicle	LOS6	4,00	0,82	0,21
2	Concessions revenues	COM6	4,00	1,17	0,29
2	Revenues/Number of passengers or WLU	EFF6	4,00	0,93	0,23
2	Occurrences of spills	ENV8	4,00	1,11	0,28
2	Number of security procedures breaches	SEC3	3,97	1,32	0,33
2	Apron congestion	LOS3	3,96	1,00	0,25
2	Passenger surveys	ASQ7	3,96	1,02	0,26
2	Total time of runway closed in a given period	OPE8	3,94	0,96	0,24
2	Processing time at check points	LOS4	3,93	0,90	0,23
2	Availability of equipment and facilities	ASQ2	3,93	0,96	0,24
2	Number of aircrafts during peak-hours	OPE5	3,90	1,17	0,30
2	Waiting areas/lounges congestion	LOS1	3,89	1,10	0,28
2	EBITDA (Earnings before interest, depreciation and amortization)	EFN6	3,88	1,13	0,29
2	Number of passengers or WLU by airline	OPE1	3,87	0,85	0,22
2	Baggage delivery time	LOS7	3,86	1,04	0,27
2	Duration of commercial lease	COM2	3,85	0,97	0,25
2	Flight delays	OPE7	3,81	0,87	0,23
2	Amount of investment	EFN4	3,80	1,04	0,27
2	Number of aircrafts/Runway area	EFF4	3,76	0,93	0,25

Conversely, Table 28 shows the measures with the smallest average values for perceived relevance (PR). Just a relatively small group of 13 out of 77 measures examined was classified in these two clusters. Measures related to the environmental and social dimensions are most recurring (with three measures each). Based on this finding, it seems there is no emphasis on the undesirable outcomes of the airport activities, such as gas emission, noise, and waste. Moreover, airport interaction with the local community does not appear as relevant issue in the average opinion of the respondents.

Table 28. Cluster analysis results for Perceived Relevance (PR) (Least relevant measures).

Cluster	Measure	Code	Mean	Stand. Deviat.	Coeffic. Variat.
4	Gaseous pollutants emission	ENV3	3,36	0,95	0,28
4	Number of houses or population within a certain noise contour	ENV5	3,33	1,11	0,33
4	Solid waste generated	ENV6	3,32	1,21	0,36
4	Airport market share	COP1	3,28	1,14	0,35
4	Airline competition in the airport	COP2	3,24	0,93	0,29
4	Parking occupation	COM4	3,20	1,40	0,44
4	Number of passenger or WLU/Number of routes	OPE2	3,13	1,02	0,33
4	Number of passenger by type of traveler	OPE4	3,13	1,17	0,37
4	Number of meetings with airlines and other organizations involved with the airport activities	SOC4	3,09	1,28	0,41
4	Wait time at checkpoints (check-in, security inspection, etc.)	LOS5	3,04	1,07	0,35
4	Direct/indirect job generation	SOC1	3,04	1,02	0,34
4	% cargo space leased	COM3	2,88	1,57	0,55
5	Number of citations by media	SOC3	2,57	1,31	0,51

Still concerning table 28, it is noteworthy that measures related to competitiveness were also ranked as less relevant, namely airport market share and airline competition in the airport. Taken together with the low relevance attributed to the number of passengers by type of traveler and routes, this also might be suggestive that airport executives in Brazil are not concerned with competition issues.

The third category of analysis is related to the ease of data or information acquisition. Based on the responses, the performance measures with the highest scores were classified according to Table 29.

Table 29. Cluster analysis results for Ease of Acquisition (EA) (Most available measures).

Cluster	Measure	Code	Mean	Stand. Deviat.	Coeffic. Variat.
1	Number of aircrafts by type of flight	OPE6	4,29	1,04	0,24
1	Number of passengers or WLU by airline	OPE1	4,13	0,99	0,24
1	Foreign Objects (FO)	SAF4	4,10	1,01	0,25
1	Ground operations occurrences	SAF5	4,07	1,08	0,27
1	% commercial area leased	COM1	4,04	1,19	0,29
2	Aeronautical accident/incident	SAF1	3,93	1,39	0,35
2	Number of safety reports	SAF8	3,93	1,02	0,26
2	Baggage delivery time	LOS7	3,93	1,05	0,27
2	Number of passengers during peak hours	OPE3	3,90	1,17	0,30
2	Emergency response time	SAF9	3,90	1,19	0,31
2	Runway system capacity	LOS2	3,89	1,07	0,28
2	Concessions revenues	COM6	3,88	1,24	0,32
2	Runway incursion occurrences	SAF6	3,87	1,31	0,34
2	Duration of lease	COM2	3,85	1,32	0,34
2	Number of aircrafts during peak hours	OPE5	3,84	1,27	0,33
2	Total time of runway closed in a given period	OPE8	3,84	1,04	0,27
2	Expenditures evolution	EFN2	3,84	1,31	0,34
2	Number of security badges breaches	SEC4	3,83	1,18	0,31
2	Number of safety training/promotion events	SAF7	3,83	1,39	0,36
2	Number of passengers/Number of employees	EFF2	3,83	1,01	0,26
2	Operating margin	EFN9	3,83	1,34	0,35
2	Social activities for local communities	SOC6	3,82	1,30	0,34
2	Flight delays	OPE7	3,81	1,01	0,27
2	Water consumption reduction	ENV1	3,78	1,24	0,33
2	Energy consumption reduction	ENV2	3,78	1,28	0,34
2	Occurrence of spills	ENV8	3,77	1,11	0,29
2	Revenues/Number of passenger or WLU	EFF6	3,75	1,19	0,32
2	Customer complaints	ASQ4	3,74	1,06	0,28
2	Bird Strike/wildlife strike	SAF2	3,73	1,14	0,31
2	Occurrence of hysteria events inside terminal	SEC2	3,70	1,26	0,34
2	Profits/Loss	EFN8	3,68	1,38	0,38
2	Cash flow	EFN7	3,64	1,44	0,40
2	Number of security procedures breaches	SEC3	3,63	1,19	0,33

It is not surprising that data/information related to operational aspects were the most available. The performance measures associated with Safety (8 out of 9 measures) and Operational (6 out of 8 measures) are dominant in these clusters of highest ratings. Security measures were also represented with three out of four measures. However, it might be considered unusual that a significant number of economic-financial measures were not present in these clusters.

Economic-financial related measures have been considered the most used within performance measurement practices (Dempsey *et al.*, 1997; Neely *et al*., 2001; Bourne *et al*., 2013; Yasin and Gomes, 2010; Simões *et al*., 2015), including airport settings

(Humphreys and Francis, 2002; Humphreys *et al*., 2002). Nevertheless, only four out of eleven economic-financial measures were classified into these two clusters, particularly those related to controlling activities, such as Expenditures evolution, Operating margin, Profit/Loss, and Cash flow.

Since other economic-financial measures were considered relevant for performance measurement (See Table 27), it might indicate that airports operating in networking and under the coordination of a central organizational structure may not have access to some economic-financial data/information, only restricted to higher organizational levels. Comparing to previous studies focused on the airport industry in other countries (Doganis and Graham, 1987; Humphreys and Francis, 2002; Humphreys *et al*., 2002; Fry *et al*., 2005) and other service settings (Gomes and Yasin, 2013; Yasin and Gomes, 2010), this finding is particularly interesting.

To be noted that measures associated with the categories Efficiency-productivity, Service Quality, and Level of Service are not largely presented in these first clusters, even though they have been the most emphasized in the airport performance literature, as demonstrated in section 3.3.

Also regarding table 28, it is noteworthy the absence of measures of airport competition and that only one out of four measures representative of the social dimension is presented. This apparent lack of information for using competition and social measures are probably associated with the fact that these performance measures demand data/information from external sources, which could hardly ever be available to the airport executives.

Concerning the performance measures with the lowest ratings for ease of acquisition (EA), Environmental measures are highlighted, with five measures (out of 8 measures) related to the undesirable outcomes of the airport activities (i.e. gas emissions, noise, and waste) (Table 30). Performance measures associated with competitiveness and social aspects were also frequent in these two clusters. To be noted that data/information from surveys applied to the airlines and concessionaires were considered less available. It is still noteworthy that the measure “Retail sales” is classified in these clusters, although airport revenues worldwide have been increasingly dependent on retail sales (Gillen and Mantin, 2014).

Table 30. Cluster analysis results for Ease of Acquisition (EA) (Least available measures).

Cluster	Measure	Code	Mean	Stand. Deviat.	Coeffic. Variat.
4	Solid waste generated	ENV6	3,18	1,37	0,43
4	Retail sales	COM5	3,15	1,20	0,38
4	Profitability ratios (ROA, ROE, ROI, etc.)	EFN10	3,13	1,42	0,45
4	% of waste sent to recycling	ENV7	3,05	1,28	0,42
4	Airlines competition in the airport	COP2	3,00	1,16	0,39
4	Internal rate of return	EFN11	3,00	1,47	0,49
4	Airport market share	COP1	2,96	1,31	0,44
4	Airlines costs with airport fees	COP4	2,96	1,17	0,40
4	Direct/indirect jobs generated	SOC1	2,96	1,26	0,43
4	Number of meetings with airlines and other organizations involved in the airport activities	SOC4	2,96	1,33	0,45
4	% cargo space leased	COM3	2,92	1,67	0,57
4	Wait time at check points	LOS5	2,89	1,26	0,44
5	Concessionaires satisfaction surveys	ASQ6	2,70	1,01	0,41
5	Airlines satisfaction surveys	ASQ5	2,67	1,07	0,40
5	Number of passengers by type of traveler	OPE4	2,65	1,14	0,43
5	Number of citations by the media	SOC3	2,57	1,38	0,54
5	Number of houses or population within a certain noise contour	ENV5	2,52	1,21	0,48
5	Noise level	ENV4	2,45	1,26	0,51
5	Gaseous pollutants emission	ENV3	2,32	1,25	0,54

This first phase of data analysis provided patterns concerning the frequency of use, the perceived relevance, and the availability of the performance measures individually. In addition, it is also interesting to examine how the average responses for the measures associated with a given performance dimension are ranked according to the three information categories (i.e. FU, PR, and EA) (Table 31).

The average of the measures associated with the safety dimension is the highest in the three categories. The measures related to operational category were the second more frequently used and available, however, concerning perceived relevance it was low ranked. The economic-financial dimension was the third in frequency of use and second in relevance but surprisingly presented a much lower rank in the ease of acquisition, which might be related to the pattern of organizational structure for small airports in Brazil, as already discussed in this section.

Table 31. Average of the responses for performance dimension.

Dimensions	Mean FU	Rank	Mean PR	Rank	Mean FA	Rank
Safety	3,599	1	4,231	1	3,886	1
Operational	3,497	2	3,747	6	3,726	2
Economic-Financial	3,481	3	3,966	2	3,498	6
Commercial	3,388	4	3,573	9	3,512	5
Security	3,284	5	3,817	4	3,633	3
Level of Service	3,250	6	3,832	3	3,439	7
Efficiency	3,224	7	3,660	8	3,607	4
Service Quality	3,192	8	3,797	5	3,214	8
Environment	3,126	9	3,686	7	3,108	10
Social	2,920	10	3,324	11	3,183	9
Competition	2,862	11	3,386	10	3,105	11

Usually, economic-financial-related measures have a higher frequency of use, since organizations are expected to monitor this performance dimension for compliance with accounting regulation (Dempsey *et al.*, 1997; Neely, 2005; Watts and McNair-Connolly, 2012). In the case of the Brazilian airports, it is interesting that safety-related measures are better ranked, what can be associated with regulatory provisions, but might also indicate that safety is inherent to the air transport industry (Fu and Chan, 2014; Roelen and Blom, 2013; Pacheco *et al*., 2014).

Looking to the end of the table, the dimensions Environmental, Social, and Competition alternated the last positions in the rankings. This finding can be related to the predominance of an operating-focused approach to the airport performance. In this context, as previously suggested with the airport performance framework presented in Section 3.3., these performance dimensions are associated with a broader domain of organizational performance (Hamann *et al.*, 2013).

As for the other performance dimensions, there was a significant variability comparing the three rankings. It is particularly interesting the patterns for Commercial, as its position in PR ranking is much lower comparing to FU and EA rankings. This finding suggests that measures associated with this dimension are on average less relevant for the executives, despite their frequency of use and availability of information.

As for Service Quality and Level of Service, the interpretation leads to an opposite conclusion, i.e. the related measures might have been less used than intended, which may be indicative of difficulties in obtaining necessary data/information for the measures. Although their frequency of use and ease of data/information acquisition are low ranked in relative terms, the perceived relevance is quite high.

Concerning the Efficiency/Productivity dimension, it was mid-ranked for both FU and PR regardless of the availability of information, which may suggest that airport executives do not put emphasis on this dimension even though it is the most recurrent in empirical studies on airport performance (see section 3.3).

In summary, these findings indicate that performance measurement practices in Brazilian airports mainly emphasize operational aspects of the airport business. This might be associated with the fact that airport industry is strictly regulated concerning its operating activities, including safety and security aspects of the service provision. In this context, it is not surprising that airport executives are supposed to pay close attention to these performance dimensions, what will certainly demand time and other limited resources. Accordingly, measuring performance according to a broader perspective of the airport business, including its competitiveness, long-term economic-financial results, and the environmental and social impacts of airport activities is still less evident within the sample of airports.

In addition to this general profile, based on the results related to the perceived relevance, it is possible to identify that airport executives are aware of the relevance of measuring service quality and the level of service of their airports. To be noted that measures associated with these two categories are within the scope of service quality, as described in the framework of the airport performance dimensions, presented in Table 7. Notwithstanding it seems that the data/information necessary to utilize these measures might not be easily available, as indicated by the results of the ease of acquisition analysis.

Provided with these results from the cluster analyses, it is useful to examine whether the current frequency of use for a given performance measure might be explained by the perceived relevance regarding this given measure and the availability of the data/information necessary for using the measure.

5.3.2. Regression Analyses

The previous analyses considered the three information categories separately. This phase of data analysis aims to explain the frequency of use of the performance measures. For this purpose, the effects of the perceived relevance and ease of information acquisition on the frequency of use of a given measure were firstly examined according to the following linear regression model[35]:

$$FU_i = \alpha_0 + \alpha_1 PR_i + \alpha_2 EA_i + e_i$$

Since the observation unit is the average of the responses for each measure, no missing value treatment was necessary. Regarding inspection of the linear regression assumptions, namely normality of the residuals, homoscedasticity, linearity, and residuals independence, the tests are presented in Appendix VIII. According to the tests results, there were no concerns.

Table 32 shows the regression results. The model properly explained the frequency of use (FU), revealing that almost 85% (R^2=0,847) of the variance of the mean score for FU has been explained by the two explanatory variables (PR and EA), with statistical significance for the estimated regression coefficients (p-value < 0,01).

[35] Where: FU_i – the mean score for frequency of use on the ith measure; PR_i – the mean score for perceived relevance on the ith measure; EA_i – the mean score for ease of acquisition on the ith measure; e_i – residuals; $\alpha_0, \alpha_1, \alpha_2$ – linear parameters.

Table 32. Regression results – general model.

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-0,713	0,205		-3,477	0,001
Perceived Relevance (PR)	0,618	0,083	0,522	7,447	0,000
Ease of Acquisition (EA)	0,484	0,074	0,458	6,538	0,000

Notes: R=0,920; R^2=0,847.

Based on these results, the following equation may represent the average profile of utilization of a performance measure, given the perceived relevance of this measure and the ease of acquisition of the data/information necessary to its utilization:

$$FU_i = -0{,}713 + 0{,}618PR_i + 0{,}484EA_i$$

According to this equation, the perceived relevance has a higher effect on the frequency of use of a given performance measure. This finding might suggest that airport executives are willing to use relevant measures despite the costs associated with their acquisition. Moreover, since airports operate under strict regulation concerning their operating activities, it is reasonable to expect pressures for acquiring information related to those aspects of airport performance subjected to regulation.

This estimated model represents an average behavior profile for airport executives regarding the frequency of use of performance measures. Additionally, it is important to evaluate the performance measures that presented significant deviations from the estimated model. For this specific purpose, the standard residuals were examined to identify the observations out of the confidence interval for a significance level of α=0,10.

In Table 33, two groups of measures are shown. In the first group, there are six measures with positive signs, representing the measures most used in comparison to the estimated profile of utilization. Half of them belong to the Commercial dimension, while the others are associated with Economic-financial, Service Quality, and Environmental. In general, these measures were classified into clusters of higher ease of acquisition and relevance. Only the measure “solid waste generated - ENV6” was not associated with a high availability of information and high relevance.

The second group of measures comprises the nine measures with higher negative deviation from the estimated profile. Therefore, their actual frequency of use appeared as significantly lower than expected. Overall, these measures presented ease of information acquisition and they were perceived as highly relevant. With four measures in this group, the Safety dimension was predominant.

Table 33. Departure of residual errors from the estimated profile.

Measures	Category	Standard Residual
Significant positive standard residuals (more use than estimated)		
Expenditures evolution	EFN2	1,705
% cargo space leased	COM3	1,683
Customers complaints	ASQ4	1,601
Duration of commercial lease	COM2	1,521
Solid waste generated	ENV6	1,423
Concessions revenues	COM6	1,373
Significant negative standard residuals (less use than estimated)		
Number of passengers / Number of employees	EFF2	-1,301
Number of citations by media	SOC3	-1,355
Total time of runway closed in a given period	OPE8	-1,418
Occurrence of hysteria events inside terminal	SEC2	-1,439
Aeronautical Accident/Incident	SAF1	-1,449
Ground operations occurrences	SAF5	-1,666
Baggage delivery time	LOS7	-1,767
Runway incursion occurrences	SAF6	-2,686
Number of safety training/promotion events	SAF7	-2,816

Note: Measures with significant standardized residuals (α = 0,10).

Airport size is usually considered a significant factor that may influence airport performance (Bazargan and Vasigh, 2003; Assaf, 2009). After estimating a general behavior profile for airport executives and examining the measures departing from this first model, the suitability of this general profile for groups of airports with more and less organizational complexity was tested. For this purpose, following the methodology proposed, a dummy variable was included in the multiple regression model according to this equation:

$$FU_i = \alpha_0 + \alpha_1 PR_i + \alpha_2 EA_i + \alpha_3 AS_i + e_i$$

In this second linear model, AS_i is a dummy variable for the airport size with a value of one if the airport was classified as Class IV and zero otherwise[36]. The results of this second model are presented in Table 34.

Table 34. Regression results – linear model with dummy variable for airport size.

	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	-0,776	0,178		-4.536	0,000
Perceived Relevance (PR)	0,653	0,065	0,564	10.043	0,000
Ease of Acquisition (EA)	0,462	0,058	0,399	7.950	0,000
Airport Size (AS)	0,036	0,047	0,033	0,777	0,439

Notes: R=0,896; R^2=0,803.

Based on the results, there is no statistical significance for the dummy variable, which is interpreted as existing no significant differences between the profiles of airport executives despite their airports size. Therefore, the general model previously estimated is considered more appropriate to represent the relationships between the frequency of use and the explanatory variables for all airports.

5.3.3. Gap Analysis

As for examining the reasons behind the apparent lack of relative use of some measures, the relationships between the perceived relevance (PR) values and the ease of data/information acquisition (EA) values for each of the 77 measures were analyzed. The differences between the scores for the perceived relevance and ease of

[36] A Class IV airport processes more than one million passengers per year. At the time of this research, there were 35 airports in Brazil in this condition. This group of airports has most demanding provisions regarding safety and operating aspects, including organizational structure. Hence, the hypothesis is that this group may present significant difference with regard to management practices, including performance measurement.

data/information acquisition were multiplied by the PR values to find the GAP indicator, obtained by the following equation[37]:

$$GAP_i = (PR_i - EA_i)PR_i$$

In using the average value for PR as weighting criteria, the larger the gap indicator is, the greater is the disparity between the perceived relevance of the measure and its data/information availability. Accordingly, a negative or relatively small value for the gap indicator might suggest an excess of information given the perceived relevance of the measure. Otherwise, greater positive values suggest that airport executives might have difficulties in obtaining data for using an important performance measure. This approach is consistent with previous research (Dempsey *et al.*, 1997; Gomes *et al.*, 2013).

The 77 performance measures considered in this study were then classified into two groups. The first group included the measures with negative gap indicators, i.e. the measures that on average presented an excess of information availability (Table 35).

Table 35. Measures with negative gap indicator.

Rank	Measure	Code	PR	EA	GAP
71	% cargo space leased	COM3	2,88	2,92	-0,12
72	Parking occupation	COM4	3,20	3,24	-0,12
73	Baggage delivery time	LOS7	3,86	3,93	-0,28
74	Number of passengers or WLU by number of routes	OPE2	3,13	3,35	-0,71
75	Number of aircraft by type of flight	OPE6	4,10	4,29	-0,79
76	Number of passengers or WLU by airline	OPE1	3,87	4,13	-1,00
77	Number of passengers/Number of employees	EFF2	3,46	3,83	-1,30

Note: Column named Rank stands for the ranking order based on the gap indicator.

Just a relatively small number of seven out of the 77 measures presented a virtual excess of data/information availability. Four of these measures are related to core processing activities, as the case of ratios involving the number of passengers and aircraft processed. The others are associated with commercial activities and the baggage delivering process. This finding suggests that some aspects of the operating activities are easily available relating their perceived relevance.

[37] As explained in the methodology chapter, the differences are multiplied by the PR value to allow the gap indicator to reflect the measure relative importance as perceived by the executives.

Based on the methodology proposed, the second group comprised the performance measures with positive gap indicators larger than the average of positive gap values (Table 36). These measures present the largest disparity between perceived relevance and information availability, indicating that airport executives might be willing to obtain data/information to use these measures.

Table 36. Measures with gap indicator higher than the average positive value.

Rank	Measure	Code	PR	EA	GAP
1	Noise levels	ENV4	3,59	2,45	4,08
2	Gaseous pollutants emission	ENV3	3,36	2,32	3,52
3	Processing time for passengers with reduced mobility (PRM)	ASQ8	4,12	3,31	3,32
4	Concessionaires satisfaction surveys	ASQ6	3,59	2,70	3,19
5	Passengers satisfaction surveys	ASQ7	3,96	3,22	2,94
6	Wildlife in maneuvering area	SAF3	4,28	3,60	2,89
7	Curb time per vehicle	LOS6	4,00	3,32	2,71
8	Number of house/population within a certain noise contour	ENV5	3,33	2,52	2,70
9	Airlines satisfaction surveys	ASQ5	3,44	2,67	2,68
10	Operating costs	EFN1	4,20	3,60	2,52
11	Revenues evolution	EFN3	4,16	3,56	2,50
12	Emergency response time	SAF9	4,43	3,90	2,36
13	Congestion level of waiting areas/lounges	LOS1	3,89	3,29	2,36
14	% of waste sent to recycling	ENV7	3,67	3,05	2,27
15	Congestion level of aprons	LOS3	3,96	3,39	2,27
16	Processing time at check points	LOS4	3,93	3,36	2,24
17	Cash flow	EFN7	4,16	3,64	2,16
18	Profitability ratios (ROA, ROE, ROI, etc.)	EFN10	3,71	3,13	2,16
19	Costumers complaints	ASQ4	4,22	3,74	2,03
20	EBITDA (Earnings before interest, depreciation and amortization)	EFN6	3,88	3,36	2,02
21	Internal rate of return	EFN11	3,52	3,00	1,83
22	Availability of equipment and facilities	ASQ2	3,93	3,48	1,74
23	Operating margin	EFN9	4,24	3,83	1,72
24	Expenditures evolution	EFN2	4,24	3,84	1,70
25	Bird strike/Wildlife strike	SAF2	4,13	3,73	1,65
26	Profit/Loss	EFN8	4,08	3,68	1,63
27	Number of passengers by type of traveler	OPE4	3,13	2,65	1,53
28	Amount of investment	EFN4	3,80	3,40	1,52
29	Airline costs with airport fees	COP4	3,40	2,96	1,50

Environmental issues are at the top of the list, which may suggest that monitoring aeronautical noise and gases emissions are being perceived as increasingly necessary, despite the difficulties for acquiring related data/information. Moreover, four out of the eight environmental related measures are presented in this table. This particular finding is consistent with the results presented in Table 30, where five environmental measures were classified as having the least available information. This may also be associated with the increasing pressures for monitoring the environmental impact of the aeronautical activities (Martini *et al*., 2013; Cohen *et al.*, 2008).

It is noteworthy that ten out of eleven economic-financial measures presented positive gaps, which suggests that relevant information related to the economic-financial performance of the airport is not sufficiently available to the airport executives. As previously discussed, this finding might be related to the fact that some airports in Brazil are operated in networking under the coordination of a central organizational structure (this is the case of airports operated by INFRAERO and State Departments, for instance). It seems that some of the airport executives are not provided with the necessary information to using these measures.

Another performance dimension with significant relative lack of information is the service quality, with six out of eight measures presenting positive gaps. As regards this particular finding, the use of surveys for service quality evaluation presented a significant lack of availability, comparing to its perceived relevance. Similarly, four out of seven measures of level of service, which are essentially related to the service quality dimension, presented a significant lack of information.

Regardless of the increasing interest in airport service quality (as discussed in section 3.4.), including official programs for service quality monitoring in the main Brazilian airports (SAC, 2015a; Bezerra and Gomes, 2014; Medeiros *et al.*, 2016), on average, the airports participating in this study seem to be under pressure for obtaining information on this important issue for current airport business.

5.4. CONCLUDING REMARKS

As a complex multi-service organization, main airports worldwide are not only facing increasing pressures for delivering efficient and high quality services but they are also expected to improve their corporate social responsibility (Skouloudis *et al*., 2012; Adler *et al*., 2013; Graham, 2014). In this context, airport executives may be confronted with conflicting objectives and the need for monitoring different aspects of their airport performance.

In this first empirical study, performance measurement practices at Brazilian airports were examined. Accordingly, the findings are associated with the second research question and the second research objective, related to the examination of performance measurement practices in order to identify the current profile of airport operators concerning performance measurement.

Despite the timeliness and relevance of understanding performance measurement practices in the airport context, none or just limited attention has been given to this subject (see Graham, 2014 and the results of the SLR in section 3.3.). In this context, this present study is a piece of contribution to this important research area.

The findings are representative of the performance measurement practices in the Brazilian airport context. Based on the framework of the airport performance dimensions proposed in this Thesis, a set of performance measures was presented to airport executives. The responses for the three information categories (frequency of use – FU, perceived relevance – PR, and ease of acquisition – EA) were used for different data analysis procedures.

Overall, this study has significant implications for performance measurement and management within the airport context. The findings point to the need for broadening the approach to airport performance as a business service organization, which may require different data/information sources.

Based on the findings of the cluster analyses, it was identified prevalence of safety, economic-financial, and operational measures as the most used, which suggest that measurement practices are still mostly based on operational aspects. It is noteworthy that even the most used economic-financial measures are associated with short-term results, rather than long-term results, which is supportive of this apparent focus on operational issues. Concerning the least used measures, Competition, Environmental, and Social dimensions were predominant, which might be suggestive that Brazilian airports do not see competition and socio-environment aspects as current concerns.

Based on the results associated with the perceived relevance, airport executives emphasize safety, economic-financial and service quality measures. In contrast, the results related to competition, along with the environmental and social outcomes of the airport activities, may suggest that these performance dimensions are not stressed. In this context, it is to be asked why airport executives are not putting emphasis on important aspects of the airport performance, such as noise and gas emissions, and other undesirable outcomes of the airport activities, for instance (Upham and Mills, 2005).

The findings of the analysis of ease of acquisition may partially explain the lack of use of some performance measures. Based on the results, it seems that data/information related to some environmental measures, as well as competitiveness and social aspects are not sufficiently available to the airport executives.

The estimated regression model suggested that executive´s perception of the relevance of a given measure for predicting performance is determinant for using this specific measure. This finding might suggest that airport executives are willing to use relevant performance measures despite the costs associated with their acquisition. Furthermore, since airports operate under strict regulation, it is reasonable to expect a pressure for acquiring information regarding those aspects subjected to regulation. Additionally, no difference as regards airport size was found concerning an average profile of performance measurement.

The findings from the gap analysis indicated that environmental and service quality issues are being perceived as necessary for performance monitoring, despite the difficulties for acquiring related data/information. Particularly regarding the service quality dimension, the use of surveys for service quality evaluation presented a significant lack of availability. Similarly, more data/information associated with measures of level of service, that are essentially related to the service quality dimension, seem to be necessary. In agreement with the increasing interest in airport service quality, as reported in the literature review chapter, the airports participating in this study seem to be under pressure for obtaining information on this important issue for the current airport business.

It is also noteworthy that economic-financial measures also presented positive gaps, what may suggest that relevant information related to the economic-financial performance of the airport is not sufficiently available to some airport executives. This finding might reveal that some airports operating in networking under the coordination of a central organizational are not provided with the necessary information for using these measures.

Another contribution of this study is related to the methodological approach used itself. Particularly, the use of the three information categories (FU, PR and EA) might be effective both for the case of a specific airport diagnosis concerning their performance measurement practices, as well as for benchmarking airports within the same airport operator or network, including the interests of different stakeholders.

Concerning the framework proposed in Section 3.3., this study is supportive of the suitability of the performance dimensions and domains (operational and organizational domains) for practical purposes. Actually, it seems that airport executives have different perspectives regarding the diverse performance dimensions, as revealed by the three phases of data analysis. In this regard, the findings support the first theoretical hypothesis.

As for the modifications applied to the original set of performance dimensions (i.e. introduction of operational and level of service categories), based on the results, it was possible to verify substantial difference between the average profiles as regards the categories Operational and Efficiency. On the other hand, there was no substantial difference between the average profiles for the categories Service quality and Level of service. Furthermore, it is to be noted that the introduction of the operational dimension also represented an enlargement of the framework scope, as it covers internal activities not directly affecting external stakeholders' perceptions on airport performance. Regarding this point, more research on the empirical validation of the proposed framework of airport performance dimensions would be interesting.

These findings must be taken in view of the research limitations. First, findings are specific to the Brazilian airport context. Also, as sample representativeness of the population of airports is questionable due to non-response bias, caution is needed before generalization of the findings. Moreover, despite being sufficient for the statistical techniques used in this study, the relatively small sample constrained further analyses on data. Nevertheless, the findings may be useful for researchers and practitioners interested in the subject, particularly for providing an overview of the actual performance measurement practices.

CHAPTER 6 – MEASURING AIRPORT SERVICE QUALITY: A MULTIDIMENSIONAL APPROACH

6.1. INTRODUCTION

As traffic volume rises, airport managers struggle for optimizing infrastructure while adopting a customer-oriented focus to achieve better performance (Fodness and Murray, 2007; Halpern and Graham, 2013). Meanwhile, non-aeronautical revenues have become critical for airport sustainability, which leads to increasing concerns with the marketing of retail areas within airport terminals (Gillen, 2011; Halpern and Graham, 2013). Therefore, the relevance of understanding passenger perceptions on airport service quality (ASQ) has become ever more important.

Within the airport industry, service quality measures based on passenger perception have been typically used for operational performance measurement and benchmarking purposes. Moreover, regulators and policy makers might use service quality monitoring to assure the interests of airport users are not being compromised (Francis *et al*., 2002). With the growing interest in this subject, ASQ surveys have been systematically carried out by international agencies, regulatory authorities, airport operators, and other organizations (Fodness and Murray, 2007; Zidarova and Zografos, 2011; ACI, 2015; IATA, 2015c; Kramer *et al*., 2013).

More recently, some approaches and methods usually applied in other services industries appeared to have gained momentum. For instance, analysis of passengers expectations concerning the airport service, research on the multidimensional nature of service quality, and the use of structural equation modeling approaches to the complex relationships among passengers attitudes and ASQ (Fodness and Murray, 2007; Park and Jung, 2011; Jeon and Kim, 2012; Bogicevic *et al.*, 2013; Nesset and Helgesen, 2014;

Bezerra and Gomes, 2015; George *et al*., 2013). It seems that there is increasing interest in understanding ASQ multidimensionality and the multifaceted nature of the passenger-airport interaction.

Notwithstanding, due to the complexity of the airport service environment, an effective process of measuring and analyzing passenger perceptions of ASQ is not simply achieved. Generic measurement approaches might not be able to cover more particular aspects of the passenger-airport interaction (Pantouvakis, 2010; George *et al*., 2013). Otherwise, current practices within the airport industry have usually been based on service attribute analyses with none or only limited consideration for the validity and reliability of the measurement instruments. These concerns are certainly relevant to avoid misinterpreting passenger perceptions.

In this context, the objective of this second empirical study is to develop a model of airport service quality that accounts for the multifaceted nature of the service quality construct. According to the figure 25, in section 4.3., four specific stages were followed. First, to fit a measurement model of perceived ASQ based on typical service quality measures within the airport industry. Second, Testing for the equivalence of this proposed measurement model across groups of passengers. Third, testing for the factorial validity and cross validation of a hierarchical ASQ model. Fourth, testing for the suitability of the proposed hierarchical model in a different airport setting.

Regarding chapter structure, besides this introduction, there are three other sections. In the next section, information on data collection and samples are provided. Afterward, the results related to each specific stage of research are presented and discussed. To finish, some concluding remarks on the findings and research limitations are provided at the end of the Chapter.

6.2. DATA COLLECTION AND SAMPLES

For the purpose of this study, two sample data were used. One sample was obtained from a survey applied to departing passengers at Guarulhos International Airport (SBGR), in Brazil. The second sample was obtained from another survey applied to departing passengers at Congonhas Airport (SBSP), also in Brazil[38].

Data related to SBGR was collected from January to December of 2014. This survey was undertaken under the coordination of Brazilian Government (SAC, 2015a). Access to the data was granted upon formal request (Appendix IV). Data related to SBSP was collected for the specific purposes of this Thesis, as already mentioned in section 4.3.

Regarding data collection procedures, besides the information presented in chapter 4, some highlights are provided. Both surveys followed basically the same criteria. The passengers were approached at the departure lounges to assure that they have had the opportunity to experience the full range of airport services, processes and facilities. Moreover, in departure lounges, the passenger is usually just waiting for the flight or doing some discretionary activity. Hence, they have sufficient time to participate in the research. Further information on the survey coordinated by the Brazilian Government is presented in SAC (2015a). Concerning the sample from SBSP passengers, data collection criteria are presented in Appendix IX.

In the case of SBGR, 2.485 forms were collected from departing passengers. As sample size was big enough to proceed with the proposed multivariate techniques, and looking for a more conservative approach, missing value treatment was listwise exclusion (Hair *et al.*, 2014; Byrne, 2010). Therefore, the useful sample comprised 1.155 observations,

[38] The ICAO code for both airports are henceforth used in some parts of the text, instead of the airport´s usual names. Therefore, SBGR stands for Guarulhos International Airport and SBSP stands for the São Paulo-Congonhas Airport.

with 762 passengers of international flights and 393 passengers departing on domestic flights.

The sample of international passengers was firstly used for testing for factorial validity and model specification. The sample of domestic passengers was subsequently used for testing for the equivalence of the measurement model across groups of passengers. The relevance for this test relies on the fact that international and domestic passengers may have different interaction and behavioral patterns during their experience with the airport.

Univariate normality was assessed by Skewness and Kurtosis coefficients. Mahalanobis´ squared distance was used for outlier identification and 40 observations with the highest values were excluded from the sample of international passengers, remaining 722 observations. Sample characteristics of international and domestic departing passengers are presented in Table 37.

Table 37. Sample characteristics of departing passengers at SBGR.

Characteristic	**International**		**Domestic**	
Nationality	Freq.	%	Freq.	%
Brazilian	683	94,6	370	94,1
Other	39	5,4	23	5,9
Total	722	100,0	393	100,0
Gender	Freq.	%	Freq.	%
Male	346	47,9	234	59,5
Female	376	52,1	159	40,5
Total	722	100,0	393	100,0
Travel frequency	Freq.	%	Freq.	%
0 to 2 trips	79	10,9	164	41,7
3 to 5 trips	395	54,7	136	34,6
> 5 trips	248	34,3	93	23,7
Total	722	100,0	393	100,0
Trip purpose	Freq.	%	Freq.	%
Non-business (Includes leisure and other purposes)	442	61,2	252	64,1
Business	279	38,6	141	35,9
Total	722	100,0	393	100,0
Antecedence of arrival at the airport	Freq.	%	Freq.	%
Less than 1 hour	2	0,3	59	15,0
Equal or more than 1 hour and less than 2 hours	27	3,7	189	48,1
Equal or more than 2 hours and less than 3 hours	187	25,9	74	18,8
Equal or more than 3 hours	506	70,1	71	18,1
Total	722	100,0	393	100,0

This table indicates a majority of Brazilian passengers. As regards gender, both international and domestic samples are fairly balanced. Concerning travel frequency, international passengers presented more frequency comparing to domestic passengers. As for trip purpose, non-business passengers (including leisure and other purposes) account for more than 60% of both samples. Finally, as regards the categories for antecedence of arrival at the airport, the samples present notable differences. As expected, international passengers usually arrive at the airport with much more antecedence prior to their flight departure time, which is associated with formal requirements and the need for more complex processing activities.

After validating the measurement model and testing for its equivalence across groups of international and domestic passengers, these two samples were assembled and used for testing for the validity of a hierarchical measurement model of ASQ. In this third stage of data analyses, the full useful sample (n=1.115) was randomly divided in order to test for the cross-validation of a higher-order ASQ model. For this purpose, approximately 2/3 of the sample (n=740) was used for model fitting, as the remaining 1/3 of the sample (n=375) was used for cross-validation. This approach to cross-validation is consistent with the literature (Hair *et al*., 2014; Byrne, 2010).

At the fourth stage, the sample from SBSP departing passenger was used. As regards this sample, 503 forms were collected. However, in 21 forms the respondent indicated to be in transfer at the airport. Since transferring passengers might not have been in contact with all the airport services and facilities (De Barros *et al*., 2007; Park and Jung, 2011), these forms were excluded. Other 35 forms were excluded for presenting more than 10% of missing values. As the remaining forms presented no pattern for the missing values, consistent with the literature, missing values were replaced by the series mean (Hair *et al.*, 2014; Byrne, 2010; Field, 2009).

Regarding the sample from SBSP, there were no concerns with univariate normality assessment according to the Skewness and Kurtosis coefficients (See Appendix X). Multivariate outliers were assessed based on the Mahalanobis´ distance, and the conclusion was no evidence of serious multivariate outliers (Byrne, 2010). After these procedures, a useful sample of 447 forms was considered for the analyses related to the application of the ASQ model in SBSP. The sample characteristics are presented in Table 38.

Table 38. Sample characteristics of departing passengers at SBSP.

Characteristic	Distribution	
Living in the city of São Paulo	Freq.	%
Yes	143	32,0
No	300	67,1
Non response	4	0,9
Total	447	100,0
Gender	Freq.	%
Male	302	67,6
Female	142	31,8
Non response	3	0,7
Total	447	100,0
Travel frequency	Freq.	%
0 to 2 trips	65	14,5
3 to 5 trips	109	24,4
> 5 trips	269	60,2
Non response	4	0,9
Total	447	100,0
Trip purpose	Freq.	%
Non-business (Includes leisure and other purposes)	149	33,3
Business	292	65,3
Non response	6	1,3
Total	447	100,0
Antecedence of arrival at the airport	Freq.	%
Less than 1 hour	166	37,1
Equal or more than 1 hour to 2 hours	226	50,6
More than 2 hours	51	11,4
Non response	4	0,9
Total	447	100,0
Number of departures from the airport in the last 12 months	Freq.	%
First time	56	12,5
2 to 3 times	116	26,0
3 to 5 times	78	17,4
6 to 10 times	193	43,2
Non response	4	0,9
Total	447	100,0

According to information provided by the airport administration, a number of 45.053 passengers departed from SBSP in the days of the survey application. Therefore, the useful sample represents 1,1% of the population of departing passengers in these days. Based on the sampling criteria (Appendix IX), the useful sample size is greater than the minimum for a confidence level of 95% and margin of error of 5%.

The acknowledged characteristic of serving a high proportion of business passengers (Ueda, 2012) is evident in the sample (65,3% declared business as trip purpose). This particular characteristic might also be associated with the Travel Frequency results (60,2% with more than five flights), and the number of departures from the airport in the last 12 months (43,2% with 6 to 10 departures). Additionally, it is noteworthy the predominance of male passengers (67,6%) and people that informed do no live in São Paulo (67,1%).

After this brief discussion on the samples characteristics, the descriptive statistics for the measurement items related to the SBGR and SBSP are detailed in Tables 39 and 40, respectively. To be noted that items related to the factor Prices and the item "CHK4 - availability of luggage carts", were not used in SBSP survey. This modification was based on the findings arising from the stages 1 and 2 of this present study.

Table 39. ASQ measurement items descriptive for SBGR samples.

Variables	International passengers			Domestic passengers		
	Mean	SE	SD	Mean	SE	SD
CHK1 - Wait time at check-in	3,46	0,039	1,061	3,88	0,050	0,988
CHK2 - Check-in process efficiency	3,55	0,036	0,976	4,11	0,044	0,874
CHK3 - Courtesy and helpfulness of check-in staff	3,53	0,039	1,043	4,13	0,047	0,923
CHK4 - Availability of luggage carts	3,16	0,053	1,416	4,14	0,065	1,073
SEC1 - Wait-time at security checkpoints	3,56	0,034	0,909	4,05	0,042	0,834
SEC2 - Thoroughness of security screening	3,54	0,034	0,913	3,96	0,043	0,852
SEC3 - Courtesy and helpfulness of security staff	3,57	0,032	0,871	4,07	0,040	0,802
SEC4 - Feeling of being safe and secure	3,43	0,034	0,910	3,87	0,045	0,895
CON1 - Availability and quality of food facilities	2,55	0,044	1,176	3,45	0,058	1,144
CON2 - Availability and quality of stores	2,84	0,041	1,110	3,45	0,058	1,144
CON3 - Availability of Banks/ATM/Exchange	2,85	0,040	1,076	3,62	0,055	1,094
CON4 - Courtesy and helpfulness of airport staff*	3,37	0,039	1,055	4,10	0,044	0,848
AMB1 - Cleanliness of airport facilities	3,13	0,032	0,857	3,95	0,042	0,835
AMB2 - Thermal comfort	3,16	0,033	0,898	3,86	0,044	0,879
AMB3 - Acoustic comfort	3,10	0,034	0,927	3,82	0,046	0,918
BAS1 - Availability of washroom/toilets	3,11	0,044	1,195	3,86	0,053	1,045
BAS2 - Cleanliness of washroom/toilets	3,06	0,044	1,173	3,79	0,052	1,040
BAS3 - Departure lounge comfort	3,02	0,041	1,111	3,58	0,055	1,097
MOB1 - Wayfinding	3,36	0,034	0,908	3,84	0,048	0,947
MOB2 - Flight information	3,36	0,036	0,962	3,81	0,047	0,934
MOB3 - Walking distance inside terminal	3,27	0,037	0,986	3,67	0,052	1,027
PRC1 - Prices at food facilities	1,87	0,036	0,960	2,37	0,063	1,251
PRC2 - Prices at stores	2,35	0,041	1,110	2,56	0,064	1,233

Notes: SE – Standard error; SD – Standard deviation; *excluding check-in and security staff.

Table 40. ASQ measurement items descriptive for SBSP sample.

Measurement items	N	Mean	SE	SD
CHK1 - Wait time at check-in	445	4,58	0,073	1,55
CHK2 - Check-in process efficiency	443	4,91	0,070	1,46
CHK3 - Courtesy and helpfulness of check-in staff	440	5,01	0,069	1,44
SEC1 - Wait-time at security checkpoints	446	4,91	0,073	1,55
SEC2 - Thoroughness of security screening	443	4,87	0,075	1,58
SEC3 - Courtesy and helpfulness of security staff	442	4,79	0,071	1,50
SEC4 - Feeling of being safe and secure	445	4,66	0,073	1,54
CON1 - Availability and quality of food facilities	444	3,60	0,076	1,60
CON2 - Availability and quality of stores	440	3,97	0,071	1,50
CON3 - Availability of Banks/ATM/Exchange	439	4,03	0,073	1,53
CON4 - Courtesy and helpfulness of airport staff*	444	4,36	0,068	1,43
AMB1 - Cleanliness of airport facilities	444	4,85	0,067	1,41
AMB2 - Thermal comfort	446	4,50	0,078	1,64
AMB3 - Acoustic comfort	447	4,41	0,079	1,67
BAS1 - Availability of washroom/toilets	444	4,50	0,071	1,50
BAS2 - Cleanliness of washroom/toilets	444	4,27	0,080	1,69
BAS3 - Departure lounge comfort	444	4,08	0,073	1,54
MOB1 – Wayfinding	446	4,84	0,078	1,64
MOB2 - Flight information	443	4,93	0,078	1,63
MOB3 - Walking distance inside terminal	442	4,29	0,077	1,63

Notes: SE – Standard error; SD – Standard deviation; *excluding check-in staff, security staff, and commercial facilities staff.

According to the stages presented in Figure 25, the original ASQ framework of Bezerra and Gomes (2015), consisting of the variables in Table 39, is tested for its factorial validity and equivalence while a first-order measurement model. Afterward, the factorial validity while a hierarchical model is tested and cross-validated. All these analyses used SBGR passenger samples. Finally, the proposed hierarchical ASQ model is tested in a different airport setting in the fourth stage, using the sample from SBSP.

6.3. RESULTS AND DISCUSSION

6.3.1. Testing for the Factorial Validity of a First-Order Model

In this first stage of data analysis, the factorial validity of the seven-factor ASQ framework proposed by Bezerra and Gomes (2015) was tested with the useful sample of SBGR international departing passengers (n=722). According to the procedures described in the methodology chapter, exploratory factor analysis (EFA) was used for examining item reliability and the unidimensionality of the service quality factors.

Table 41 summarizes the variables and the respective factors, along with the Cronbach´s alpha values for each factor and other results that support factor unidimensionality and item reliability.

Table 41. EFA results for SBGR international departing passengers.

Factors and observed variables	α	α if item deleted	Item-total correlation	KMO	% variance extracted
CHK – Check in	0,873			0,767	73,40
CHK1 - Wait-time at check-in		0,791	0,737		
CHK2 - Check-in process efficiency		0,761	0,828		
CHK3 - Courtesy and helpfulness of check-in staff		0,765	0,801		
CHK4 - Availability of luggage carts		0,922	0,497		
SEC – Security	0,931			0,844	83,01
SEC1- Wait-time at security checkpoints		0,899	0,876		
SEC2 - Thoroughness of security screening		0,896	0,883		
SEC3 - Courtesy and helpfulness of security staff		0,927	0,787		
SEC4 - Feeling of being safe and secure		0,920	0,812		
CON – Convenience	0,840			0,725	67,86
CON1 - Availability and quality of food facilities		0,793	0,684		
CON2 - Availability and quality of stores		0,762	0,752		
CON3 - Availability of Banks/ATM/Exchange		0,778	0,720		
CON4 - Courtesy and helpfulness of airport staff		0,850	0,546		
AMB – Ambience	0,865			0,677	78,98
AMB1 - Cleanliness of airport facilities		0,911	0,629		
AMB2 - Thermal comfort		0,730	0,831		
AMB3 - Acoustic comfort		0,773	0,786		
BAS – Basic Facilities	0,933			0,763	88,23
BAS1 - Cleanliness of washroom/toilets		0,886	0,883		
BAS2 - Availability of washroom/toilets		0,912	0,850		
BAS3 - Departure lounge comfort		0,909	0,855		
MOB – Mobility	0,909			0,715	84,65
MOB1 - Walking distance inside terminal		0,855	0,836		
MOB2 – Wayfinding		0,927	0,746		
MOB3 - Flight information		0,817	0,879		
PRC – Price	0,650			0,500	74,06
PRC1 - Prices at food facilities		NC	0,481		
PRC2 - Prices at stores		NC	0,481		

Note: a. α - Cronbach´s Alpha; b. Bartlett´s Test of Sphericity with statistical significance < 0,01 for all factors.

Accordingly, sample data of SBGR international departing passengers presented a satisfactory degree of sampling adequacy, with the exception of factor Prices presenting a KMO value of 0,5, as measured with only two variables. The Barlett´s test of Sphericity presented statistical significance at 0,01 for all the seven EFA, indicating data was adequate for factor analyses.

The Cronbach´s alpha values indicated good internal reliability for all the ASQ factors, but for the factor Prices. In effect, this particular factor presented just an ordinary internal reliability, as revealed by its α=0,650. Regarding item–total correlation values, they are indicative of sufficient individual reliability.

Provided with these results, in the CFA model, the 23 observed variables were assumed to load only on their respective factors, as indicated in Table 41. The seven factors were assumed to be inter-correlated, while the measurement errors of the observed variables to be uncorrelated.

Overall, this first CFA model revealed an acceptable goodness-of-fit (CMIN/df=4,688; RMSEA=0,072,]0,067: 0,076]; GFI=0,889; PGFI=0,673; CFI=0,941; PCFI=0,778; TLI=0,929; IFI=0,942). All the factor loadings presented positive signs and statistical significance (p-value < 0,01 level).

However, examining item reliability, the variable CHK4 (Availability of luggage carts) presented a low value of squared multiple correlations (SMC=0,251). Thus, only about 25% of its variance was explained by the factor Check-in. In addition, its standardized regression weight was much lower (0,501) comparing with the other variables reflecting the factor (all with values greater than 0,800). These results point to the exclusion of this variable and may suggest that passengers do not perceive the availability of luggage carts necessarily related to the quality of the check-in process.

As regards construct validity and reliability, there were significant concerns related to the factor Prices. The composite reliability (CR=0,650) and the average variance extracted (AVE=0,482) indicated reliability and convergent validity issues. Moreover, the square root of its AVE was lesser than the absolute value of the correlation with the factor Convenience (r=0,848), indicating no sufficient discriminant validity for this factor Prices.

Customers usually evaluate prices based on their perception of value as regards the service performed (Cronin *et al*., 2000; Ravald and Grönroos, 1996; Chen, 2013), which may explain the strong correlation and the lacking of discriminant validity. These results support the idea that passenger perception about the prices in the airport should be considered as a different construct in a customer satisfaction model (i.e. perceived value, for instance) (Anderson and Fornell, 2000; Chen, 2008; Chen *et al*., 2015).

Given these results and the theoretical and practical issues associated, conclusion was for misspecification of this initial model. Therefore, factor Prices and variable CHK4 were excluded from the following analyses. As a result, a second model presented goodness-of-fit improvement (CMIN/df=4,539; RMSEA=0,070,] 0,065: 0,075]; GFI=0,907, PGFI=0,669, CFI=0,955, PCFI=0,779; TLI=0,944; IFI=0,955). Additionally, no validity or reliability issues were identified.

For the purpose of measurement model specification, the standardized residual covariances (SRC) were examined. The only concern was variable CON4 with 15 out of 20 residuals higher than the threshold of 2,58 (Jöreskog and Sörbom, 1996). Moreover, based on the modification indices (M.I.), this variable presented significant crossloadings to the other five factors.

Passenger opinion about staff attitude (in this case, excluding check-in and security processes) is certainly important for understanding their perception of ASQ. However, it seems that item wording might not be sufficiently discriminant, and passengers may have led to considering different groups of staff, such as retail stores, food facilities, information desks, and others. Hence, the decision was to exclude this variable, and no significant SRC or M.I. remained.

A six-factor model excluding factor Prices and the variables CHK4 and CON4 presented a better factor structure and goodness-of-fit statistics. Hence, there was no justification for further model fitting (CMIN/df=3.607; RMSEA=0,060,]0,054:0,066]; GFI=0,932; PGFI=0,672; CFI=0,969; PCFI=0,777; TLI=0,962; IFI=0,970). Compared with the initial model, there was significant improvement as indicated by the difference in the $\chi 2$

statistic between the two models (Δχ2) (Δχ2[72] = 485.614, p-value < 0,01). Additionally, the expected cross-validation index for maximum likelihood estimation was much smaller (MECVI=0,837) than the initial model (MECVI=1,551), which indicated a higher likelihood of cross-validation for this refined model comparing to the initial one.

Item reliability was confirmed by the statistical significance of the factor loadings and squared multiple correlations (SMC). The CFA Results, including, factor loadings estimates are presented in Table 42. The average variance extracted (AVE) and composite reliability (CR) support construct reliability and convergent validity.

Table 42. CFA results, convergent validity, and reliability.

Construct	Item	Estimate	S.E.	C.R.	P-value	Stand. Estimate	AVE	CR	α
Check-in	CHK3	1,00	-	-	-	0,92	0,811	0,928	0,922
	CHK2	0,99	0,022	44,75	***	0,97			
	CHK1	0,89	0,029	30,29	***	0,80			
Security	SEC4	1,00	-	-	-	0,85	0,778	0,933	0,931
	SEC3	0,93	0,034	27,81	***	0,83			
	SEC2	1,01	0,032	33,91	***	0,93			
	SEC1	1,08	0,032	34,05	***	0,92			
Convenience	CON3	1,00	-	-	-	0,88	0,686	0,865	0,850
	CON2	1,09	0,034	31,82	***	0,92			
	CON1	0,82	0,041	19,82	***	0,66			
Ambience	AMB3	1,00	-	-	-	0,89	0,708	0,877	0,865
	AMB2	1,02	0,029	35,08	***	0,93			
	AMB1	0,70	0,033	21,04	***	0,68			
Basic Facilities	BAS3	1,00	-	-	-	0,90	0,825	0,934	0,933
	BAS2	1,07	0,030	35,76	***	0,89			
	BAS1	1,09	0,028	39,45	***	0,93			
Mobility	MOB3	1,00	-	-	-	0,96	0,782	0,931	0,909
	MOB2	0,78	0,027	29,32	***	0,79			
	MOB1	0,96	0,024	40,46	***	0,90			

Notes: S.E. – Standard error; C.R. – Critical ratio; *** – denotes p-value < 0,01; AVE – Average variance extracted; CR – Composite reliability; α – Cronbach´s alpha.

Regarding discriminant validity, according to the results in Table 43, there was adequate discriminant validity, once the square root of the AVE for each construct was greater than the correlations of this construct with the other constructs in the model (Fornell and Larcker, 1981).

Table 43. Discriminant validity assessment.

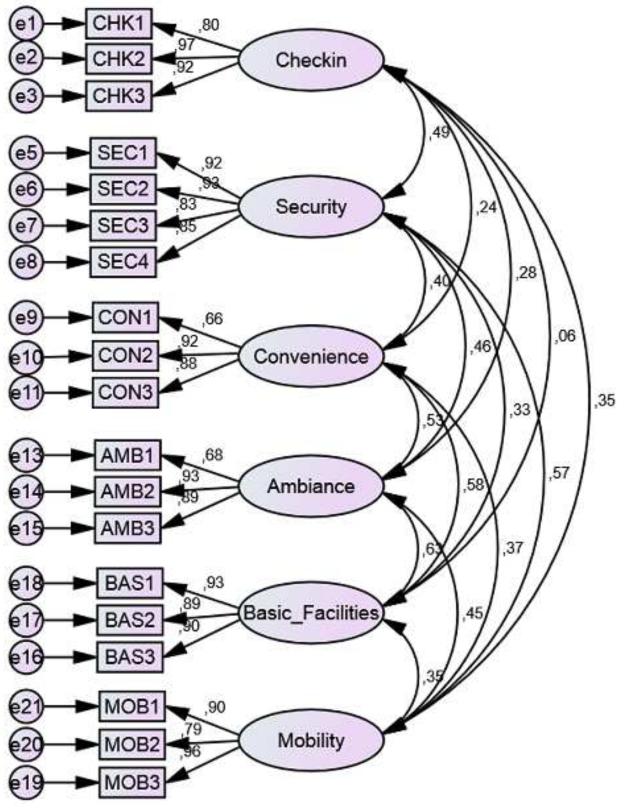
	CHK	SEC	MOB	AMB	BAS	CON	AVE
Check-in – CHK	0,901						0,811
Security – SEC	0,494*	0,882					0,778
Mobility - MOB	0,346*	0,569*	0,884				0,782
Ambience – AMB	0,281*	0,460*	0,446*	0,841			0,708
Basic facilities – BAS	0,060	0,332*	0,355*	0,629*	0,908		0,825
Convenience – CON	0,240*	0,404*	0,372*	0,531*	0,583*	0,828	0,686

Notes: In the main diagonal, the square root of the AVE; The other values are correlations among constructs; *Significance level <0,01 for the correlations.

Sample data was then assessed on the existence of common method bias by the Harman's single factor test and the common latent factor approach (Podsakoff *et al.*, 2003). The unrotated solution of an exploratory factorial analysis with the number of factors constrained to be one revealed a single factor accounting for only 38,7% of the variance extracted. The CFA model with the inclusion of a common latent factor presented an acceptable fit, however the factor loadings from the original factors presented no significant change in their standardized values. Based on these results, conclusion was for no significant concerns regarding common method variance.

Figure 28 illustrates the model structure along with the output for international departing passengers, including the standardized factor loadings and correlations. The relationships between the observed variables and respective service quality factors were statistically significant (p-value<0,01). The standardized factor loadings were reasonably high.

Figure 28. The first-order CFA model output for international departing passengers.



After these procedures, the equivalence of this factor structure and its metric invariance across groups of international and domestic passengers were tested. Testing for the factor structure equivalence or invariance is necessary to examine the suitability of the model for the different groups of passengers.

6.3.2. Testing for the Equivalence of the Measurement Model

A CFA model consistent with Figure 28 was estimated with the sample of domestic departing passengers. Overall, the results indicated good fit (CMIN/df=2,197; RMSEA=0,055,]0,047: 0,064]; GFI=0,926; PGFI=0,668; CFI=0,960; PCFI=0,769; TLI=0,951; IFI=0,961). Factor loadings and covariances were statistically significant (p-value < 0,01). Individual item reliability was confirmed. No validity or reliability concerns were identified.

For the purpose of comparison, the standardized factor loadings and correlations estimated with the samples of international and domestic departing passengers are presented in the following tables (Tables 44 and 45).

Table 44. Standardized factor loadings for the first-order CFA models.

Estimates			International Passengers	Domestic Passengers
CHK1 - Wait time at check-in	<---	Check-in	0,804*	0,667*
CHK2 - Check-in process efficiency	<---	Check-in	0,974*	0,933*
CHK3 - Courtesy and helpfulness of check-in staff	<---	Check-in	0,916*	0,917*
SEC1- Wait-time at security checkpoints	<---	Security	0,919*	0,798*
SEC2 - Thoroughness of security screening	<---	Security	0,928*	0,819*
SEC3 - Courtesy and helpfulness of security staff	<---	Security	0,827*	0,823*
SEC4 - Feeling of being safe and secure	<---	Security	0,849*	0,693*
CON1 - Availability and quality of food facilities	<---	Convenience	0,659*	0,654*
CON2 - Availability and quality of stores	<---	Convenience	0,923*	0,688*
CON3 - Availability of Banks/ATM/Exchange	<---	Convenience	0,878*	0,784*
BAS1- Cleanliness of washroom/toilets	<---	Basic Facilities	0,933*	0,863*
BAS2 - Availability of washroom/toilets	<---	Basic Facilities	0,891*	0,825*
BAS3 - Departure lounge comfort	<---	Basic Facilities	0,900*	0,688*
AMB1 - Cleanliness of airport facilities	<---	Ambience	0,677*	0,803*
AMB2 - Thermal comfort	<---	Ambience	0,934*	0,803*
AMB3 - Acoustic comfort	<---	Ambience	0,891*	0,833*
MOB1 - Walking distance inside terminal	<---	Mobility	0,899*	0,736*
MOB2 – Wayfinding	<---	Mobility	0,789*	0,839*
MOB3 - Flight information	<---	Mobility	0,956*	0,788*

Note: *Significant at < 0,01 level.

Table 45. Correlations for the first-order CFA models.

Estimates			International	Domestic
Check-in	<-->	Security	0,494*	0,622*
Check-in	<-->	Convenience	0,240*	0,407*
Check-in	<-->	Ambience	0,281*	0,500*
Check-in	<-->	Basic Facilities	0,060	0,324*
Check-in	<-->	Mobility	0,346*	0,421*
Security	<-->	Convenience	0,404*	0,538*
Security	<-->	Ambience	0,460*	0,596*
Security	<-->	Basic Facilities	0,332*	0,463*
Security	<-->	Mobility	0,569*	0,677*
Convenience	<-->	Ambience	0,531*	0,603*
Convenience	<-->	Basic Facilities	0,583*	0,630*
Convenience	<-->	Mobility	0,372*	0,529*
Ambience	<-->	Basic Facilities	0,629*	0,712*
Ambience	<-->	Mobility	0,446*	0,522*
Basic Facilities	<-->	Mobility	0,355*	0,499*

Note: *Significant at < 0,01 level.

Provided with these results, the baseline model for both groups were assumed the same and then configural invariance was assessed. The configural model presented good fit (CMIN/df=2,902; RMSEA=0,041, [0,038:0,045[; GFI=0,930; PGFI=0,671; CFI=0,967; PCFI=0,775; TLI=0,959; IFI=0,967). Hence, the factor structure was considered equivalent across groups, i.e. the measurement items were properly explained for their respective factors, no matter the respondent is an international or domestic passenger.

Afterward, the metric invariance was tested. International and domestic passengers served as distinct groups for multi-group analysis based on the comparison of that configural model (unconstrained) and two constrained models:

- Model 1: The factor loadings constrained to be equal.
- Model 2: Both factor loadings and covariances constrained to be equal.

In testing for metric invariance, two approaches were followed. The $\chi 2$ difference between the comparing models ($\Delta\chi 2$), and the difference in the CFI (ΔCFI). The former is considered to be excessively stringent, while the latter is reported to make more practical sense (Byrne, 2010; Cheung and Rensvold, 2002). The values for $\chi 2$ (CMIN) and CFI for the three models are presented in Table 46.

Table 46. First-order CFA models comparison.

Model	CMIN	DF	CFI
Unconstrained	795,140	274	0,967
1. Factor Loadings constrained	849,252	287	0,964
2. Factor Loadings and covariances constrained	880,741	302	0,963

Note: Assuming model unconstrained to be correct.

The differences between model 1 and the unconstrained model were $\Delta\chi 2(13) = 54{,}112$ (p-value < 0,01) and ΔCFI = 0,003. As regards model 2, $\Delta\chi 2(28) = 85{,}601$ (p-value < 0,01) and ΔCFI = 0,004. Based on the ΔCFI tests, the results suggested invariance across the groups of international and domestic passengers (Cheung and Rensvold, 2002). However, with the $\Delta\chi 2$ being statistically significant, we focused on identifying which parameters could have been contributing to the partial invariance specified by the $\Delta\chi 2$ test. The progressive strategy based on the $\chi 2$ difference was followed (Byrne, 2010).

Only the variables CON2 (availability and quality of stores), AMB1 (cleanliness of airport facilities), and MOB2 (wayfinding) presented a significant difference between groups. This finding suggests that these items are operating somewhat differently for international and domestic passengers. This finding may be related to the differences in the interaction and behavioral patterns of each group of passengers. For instance, usually international passengers may carry more luggage, and they are asked to arrive at the airport with more antecedence prior to the flight departure time. Passengers with more luggage are usually more awkward for moving within the terminal and checkpoints (De Barros and Tomber, 2007; Perboli *et al.*, 2014). The effect of the amount of time spent in the airport on passenger perception has already been stressed (Bezerra and Gomes, 2015; Crawford and Melewar, 2003; Chung, 2015). Moreover, there may be a substantial difference between domestic and international areas/terminals regarding retail area and convenience facilities within the airport setting.

As regards the covariances, only the covariance between factors Check-in and Basic facilities were nonequivalent. This covariance had no statistical significance for the group of international passengers while it was significant for domestic passengers. However, it is to be noted that this parameter estimate was relatively low for both groups.

Overall, these results supported the suitability of the ASQ model for both groups of passengers. In summary:

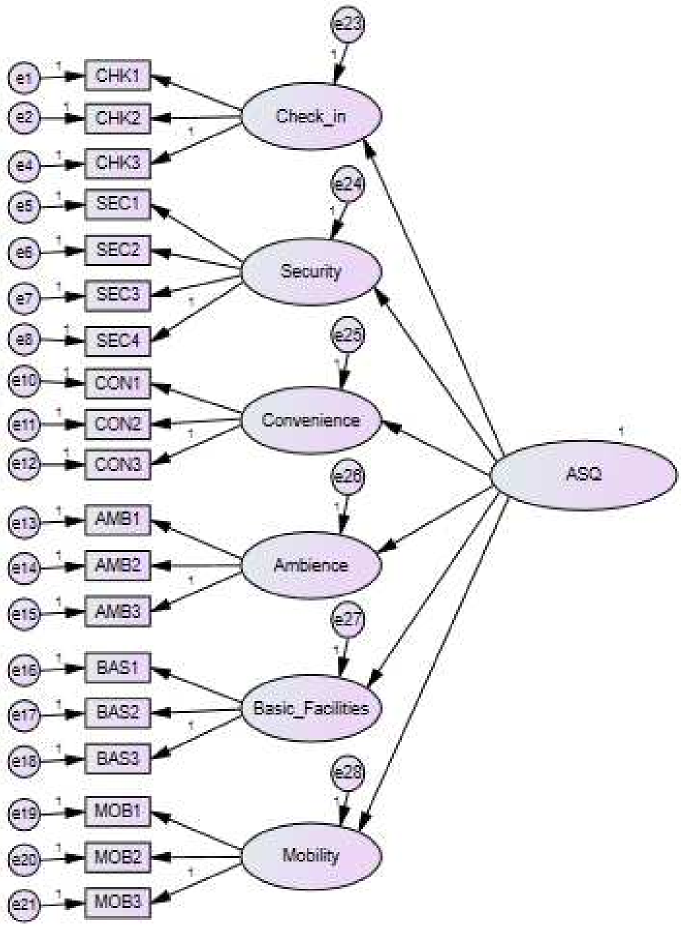
a) Configural invariance between the models estimated with the samples of international and domestic passengers;
b) Indication of equivalence provided by the ΔCFI tests, and;
c) Nonequivalent parameters identified by the $\Delta\chi 2$ test are just a small number within the measurement model (no more than one per factor).

Accordingly, it is reasonable to assume that the partial invariance identified by the $\Delta\chi 2$ tests does not compromise the suitability of the model for both groups of passengers. In this sense, it should not inhibit the use of the measurement model for perceived service quality (Cheung and Rensvold, 2002; Sass, 2011).

6.3.3. Testing for the Factorial Validity of a Hierarchical ASQ Model

The preceding analyses focused on testing for the validity and invariance of the measurement model consisting of six first-order factors operating as independent latent variables. Since service quality is usually represented as a multidimensional construct (Kang and James, 2004; Brady and Cronin, 2001; Parasuraman *et al*., 1994; Ladhari, 2009; Duggal and Verma, 2013), in this section, the hypothesis to be tested is that a higher order ASQ factor properly explains the variance and covariance related to these first-order factors. For this purpose, a second-order CFA model was estimated according to the structure depicted in Figure 29.

Figure 29. The second-order CFA model for ASQ.



As regards model specification, three modifications were applied to the first-order model. First, the two arrowheads for the covariances between factors were replaced by regression paths from the second-order factor to each of the first-order factors. Second, as the first-order factors operate as both independent and dependent variables, a residual error term is associated with factor. Third, for achieving model identification, the variance of the ASQ factor is constrained to 1, so that the second-order factor loadings could be freely estimated (Byrne, 2010).

Consistent with the procedures specified in the methodology chapter, the second-order CFA model was estimated with the first subsample of all departing passengers (approximately 2/3, n=740). Overall, the results revealed an acceptable fit (CMIN/df=4,603; RMSEA=0,070]0,065:0,075]; GFI=0,910; PGFI=0,699; CFI=0,953; PCFI=0,814; TLI=0,945; IFI=0,953). All the factor loadings were reasonably strong and statistically significant, particularly for the paths between the ASQ factor and the first-order factors. Item reliability was assessed based on the significance of the factor loadings and squared multiple correlations.

Examining the modification indices (M.I.), two significant covariances were especially noteworthy. The covariance between the residuals of the factors Check-in and Security presented the highest M.I. value (M.I.=64,076, Par Change=-0,155). Also, the modification index associated with the covariance between the residuals of the factors Ambience and Basic Facilities was similarly high (M.I.=63,102, Par Change=-0,150). As regards the M.I. associated with the factor loadings, there were significant M.I. suggesting crossloadings of the measurement items in both pairs of factors.

These results seem to indicate some misspecification associated with these two pairs of factors. The significant covariances for the residuals, in particular, may derive from similar measurement items characteristics (Byrne, 2010). In some extent, these factors are measured for quite similar items. Check-in and Security are typical airport processes where the passenger will likely experience waiting lines and service staff interaction (Caves and Pickard, 2001; De Barros and Tomber, 2007; Correia *et al*., 2008b). In the case of Ambience and Basic Facilities, their set of measurement items put together comprise aspects related to a broad perception about the facilities, feeling of comfort, and the terminal environment.

From the airport management perspective, these associations are reasonable. Although the check-in and security processes have different purposes and activities, they are based on similar elements, comprising staff, technology, and checking procedures (Horonjeff *et al*., 2010; Ashford *et al*., 2013; Correia *et al*., 2008b). Moreover, they are usually seen as the "bottlenecks" in the terminal processing capacity (Gkritza *et al*., 2006; Andreatta *et al*., 2007). As regards the pair Ambience and Basic Facilities, both factors are in great extent associated with elements of the terminal infrastructure that relates to the passenger experience in the airport (Jeon and Kim, 2012; Ali *et al*., 2016).

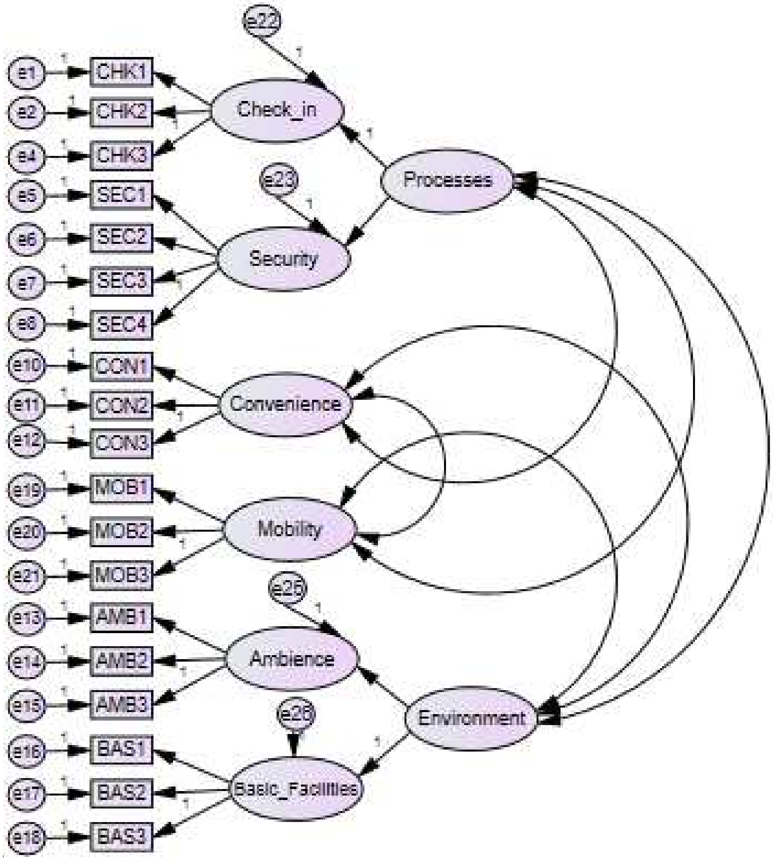
These findings are also consistent with the literature on airport service quality. The significant interaction between check-in and security factors may be associated with the categorization of passenger activities in processing and discretionary activities (Caves and Pickard, 2001; Popovic *et al*., 2010, 2009; Kirk, 2013). As both factors reflect an experience of being processed, including waiting in lines and providing elements for verification, they have a similar nature.

As for the factors ambience and basic facilities, passenger perceptions of the airport servicescape, which is a trendy topic in the literature related to airport service quality, is covered by measurement items in both factors (Fodness and Murray, 2007; Jeon and Kim, 2012; Bogicevic *et al.*, 2013; Jen *et al.*, 2013; Moon *et al*., 2016; Ali *et al*., 2016). Thus, taken together these factors capture an overall perception on the airport environment.

Based on the above discussion, it seems to be the case that interactions between these pairs of factors may be explained by the existence of second-order factors. Accordingly, the factors check-in and security could be associated with a second-order factor to be named "Processes". In the case of ambience and basic-facilities, a second-order factor named "Environment" could account for explaining the variance in these factors.

These particular hypotheses regarding model specification were then firstly tested with the following factor-structure (Figure 30). The factorial validity of this measurement model was tested as in the previous stages. The covariances among the factors were freely estimated. For identification reasons, one factor loading in each second-order factor was constrained to be equal one[39].

Figure 30. The CFA model for the ASQ second-order factors.



This model is well fitted to the data, based on the following measures: CMIN/df=3,320; RMSEA=0,056, [0,050: 0,062[; GFI=0,938; PGFI=0,704; CFI=0,971; PCFI=0,806; TLI=0,965; IFI=0,971. All factor loadings presented statistical significance and sufficient item reliability. The correlations among the factors were all statistically significant. Construct validity and reliability was also assured, as demonstrated in Table 47.

39 For the purpose of testing the significance of each path, four models were estimated (one for each combination of path constraint). In each alternative model, the statistical significance of the regression weights was confirmed based on the usual test.

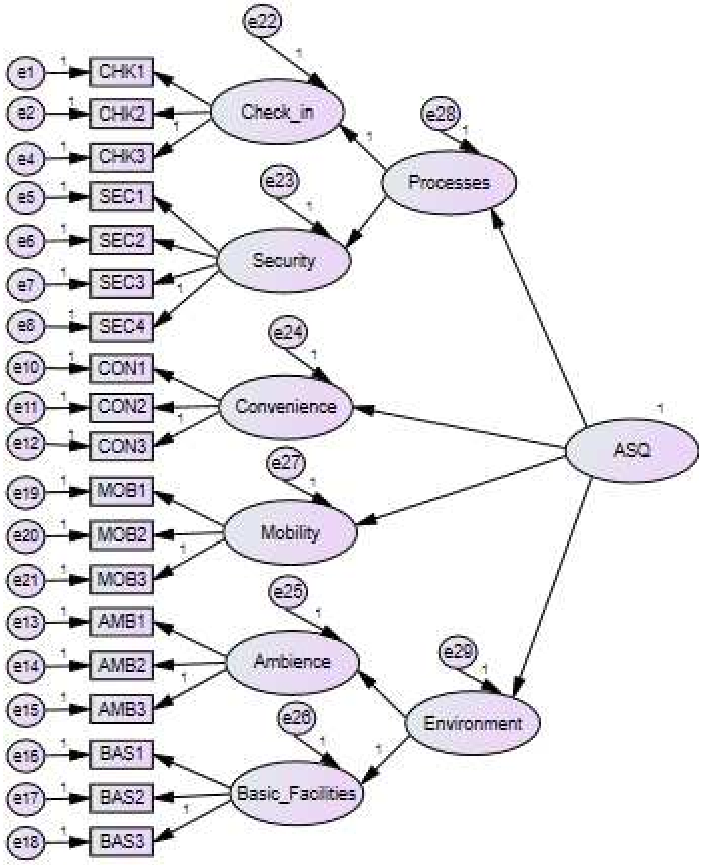
Table 47. Factorial validity and reliability of the second-order CFA model.

Factor	PRO	CON	MOB	ENV	α	CR	AVE
PRO – Processes	0,776				0,901	0,745	0,603
CON – Convenience	0,552*	0,803			0,837	0,843	0,644
MOB – Mobility	0,712*	0,463*	0,863		0,889	0,897	0,745
ENV – Environment	0,631*	0,723*	0,551*	0,834	0,906	0,820	0,696

Notes: In the main diagonal, the square of the AVE; *Significance level <0,01 for the correlations; *α* - Cronbach´s Alpha; CR – Composite Reliability; AVE – Average Extracted Variance.

After these assessment procedures, the refined higher-order CFA model of ASQ was tested. The covariances among the factors were then replaced by the higher-order ASQ factors "Processes" and "Environment", which are assumed to account for the correlations among the first-order factors. Figure 31 illustrates the model to be estimated.

Figure 31. The refined higher-order ASQ model.



Overall, this model presented a better fit comparing to the previous one (i.e. the second-order model in figure 29), presenting the following statistics: CMIN/df=3,674; RMSEA=0,061, [0,056: 0,067[; GFI=0,931; PGFI=0,705; CFI=0,964; PCFI=0,812; TLI=0,958; IFI=0,965. Moreover, the expected cross-validation index for maximum likelihood estimation was smaller (MECVI=0,863 vs. MECVI=1,032). Additionally, the $\Delta\chi^2$ between this model and the second-order model was significant ($\Delta\chi^2(2)$ = 128,57, p-value <0,01). The factor loadings were reasonably strong and statistically significant, including the additional paths between ASQ and the second-order factors (Table 48).

Table 48. Estimates for the higher-order ASQ model (SBGR).

Factor Loading			Estimate	S.E.	C.R.	P-value	Stand. Estimate
Processes	<---	ASQ	0,508	0,042	12,217	***	0,846
Environment	<---	ASQ	0,593	0,044	13,551	***	0,805
Mobility	<---	ASQ	0,638	0,037	17,397	***	0,734
Convenience	<---	ASQ	0,721	0,043	16,746	***	0,716
Security	<---	Processes	1,135	0,090	12,574	***	0,904
Check-in	<---	Processes	1				0,616
Basic Facilities	<---	Environment	1				0,751
Ambience	<---	Environment	1,069	0,071	15,123	***	0,921
CHK3_1	<---	Check-in	1				0,926
CHK2_1	<---	Check-in	0,974	0,022	45,111	***	0,967
CHK1_1	<---	Check-in	0,857	0,029	29,241	***	0,782
SEC4_1	<---	Security	1				0,824
SEC3_1	<---	Security	0,990	0,037	26,895	***	0,831
SEC2_1	<---	Security	1,103	0,036	30,75	***	0,909
SEC1_1	<---	Security	1,070	0,035	30,276	***	0,894
CON3_1	<---	Convenience	1				0,873
CON2_1	<---	Convenience	0,993	0,038	26,191	***	0,854
CON1_1	<---	Convenience	0,818	0,043	19,048	***	0,662
AMB3_1	<---	Ambience	1				0,876
AMB2_1	<---	Ambience	1,002	0,030	33,959	***	0,914
AMB1_1	<---	Ambience	0,846	0,034	25,206	***	0,771
BAS3_1	<---	Basic Facilities	1				0,862
BAS2_1	<---	Basic Facilities	1,099	0,032	33,856	***	0,917
BAS1_1	<---	Basic Facilities	1,090	0,033	32,716	***	0,896
MOB3_1	<---	Mobility	1				0,849
MOB2_1	<---	Mobility	1,041	0,033	31,646	***	0,916
MOB1_1	<---	Mobility	0,903	0,034	26,531	***	0,820

Notes: Estimate – Factor loadings; S.E – Standard error; C.R. – Critical ratio; *** statistical significance at 0,01 level; Stand. Estimate – Standardized factor loadings.

Based on these results, the introduction of the two second-order factors significantly improved the overall goodness-of-fit when compared to the model in figure 29. This modification in the ASQ measurement model is also supported by the airport-related literature. The higher-order ASQ factor seems to account reasonably for the correlations among the service quality factors, including the second-order factors. Nonetheless, once it represented a significant change in the model specification, this higher order model was tested for cross-validation with the other subsample of departing passengers.

6.3.3.1. Cross-validation of the Refined Higher-Order Model

In the sequence of data analyses stages, it was necessary to verify if the proposed refined model was invariant across different samples of departing passengers at SBGR. Cross-validation was then tested according to the procedures already described in section 6.3.2. A model consistent with Figure 31 was estimated using the second subsample of departing passengers (n=375). This strategy for cross-validation is in accordance with the literature (Byrne, 2010).

The results for the second subsample indicated good overall fit (CMIN/df=2,219; RMSEA=0,057,]0,049: 0,066]; GFI=0,920; PGFI=0,697; CFI=0,967; PCFI=0,815; TLI=0,961, IFI=0,967). Based on these results, the baseline model for both groups (i.e. the subsamples) were assumed the same. The estimated configural model also presented a good overall fit (CMIN/df=2,997; RMSEA=0,042,]0,039: 0,046; GFI=0,927; PGFI=0,702; CFI=0,965; PCFI=0,813; TLI=0,959, IFI=0,965).

The two subsamples served as distinct groups for multi-group analysis. The comparison was between the configural model (unconstrained) and three constrained models, as follow:

- Model 1: The factor loadings of the measurement items constrained to be equal.
- Model 2: Both factor loadings of the measurement items and structural regression weights constrained to be equal.

- Model 3: The factor loadings, the structural regression weights, and the structural residuals constrained to be equal.

Table 49 presents the values for χ^2 (CMIN) and CFI for the four models.

Table 49. Models comparison.

Model	CMIN	DF	CFI
Unconstrained	863,047	288	0,965
1. Factor loadings constrained	882,898	301	0,965
2. Factor loadings and structural regression weights constrained	891,073	307	0,965
3. Factor loadings, structural regression weights, and structural residuals constrained	904.181	315	0,965

Note: Assuming model unconstrained to be correct.

The differences between model 1 and the unconstrained model were $\Delta\chi^2(13)$=19,851 (p-value=0,099) and ΔCFI=0,000. As regards model 2, $\Delta\chi^2(19)$=28,026 (p-value=0,083) and ΔCFI=0,000. Finally, the differences between model 3 and the unconstrained model were $\Delta\chi^2(13)$ =41,134 (p-value=0,040) and ΔCFI=.000. Both tests suggested invariance across the subsamples for the three models. In the case of model 3, the $\Delta\chi^2$ test was significant at α=0,05 level. In effect, this model 3 assumes that even the structural residuals are invariant, which is considered to be excessively stringent (Byrne, 2010; Cheung and Rensvold, 2002).

Based on these results, it is reasonable to assume the proposed higher-order ASQ model was significantly invariant across the independent subsamples, which is indicative of its cross-validation. Therefore, this model could be considered suitable for measuring ASQ according to a multidimensional approach and should be tested with passenger data from other airport settings.

6.3.4. Testing the ASQ model in a Different Airport Setting

As earlier emphasized in the literature review (Section 3.4.), customer perceptions of service quality is context-dependent and may vary according to more than a few factors.

In this sense, service quality is highly dependent on the circumstances where the service is performed. Hence, it is expected that service quality will vary from provider to provider, from customer to customer, and even from event to event of consumption (Parasuraman *et al*., 1985; Wilson *et al.*, 2012). In this respect, airports are considered to differ in a large extent from each other. According to Graham (2014), there is no typical airport and beyond the basic operational functions, they may have little in common.

The previous analyses and model development procedures were entirely based on data from Guarulhos International Airport (SBGR), in Brazil. In this fourth stage of analysis, the proposed higher-order ASQ model was applied to a different airport setting, with the purpose of examining the model suitability and gaining insights on its generalization to other airports.

Accordingly, sample data of departing passengers at Congonhas Airport (SBSP) was used. Congonhas has several different characteristics comparing to Guarulhos Airport when it comes to passenger services, including its much smaller passenger terminal and the exclusive use for domestic flights. In addition to these aspects, Congonhas has a predominance of short-haul and mid-haul flights because of regulatory constraints concerning aircraft performance (ANAC, 2007). Due to these constraints, flight offer in Congonhas was also less varied comparing to Guarulhos. Moreover, there is a higher proportion of business passengers. In this respect, business passengers are usually more sensitive to service quality (Pakdil and Aydın, 2007; Park, 2010).

In Table 50, the variables and the respective factors are summarized, along with the Cronbach´s alpha values for each factor and other results that support factor unidimensionality, as obtained from the within-scales EFA.

Table 50. EFA results for SBSP departing passengers.

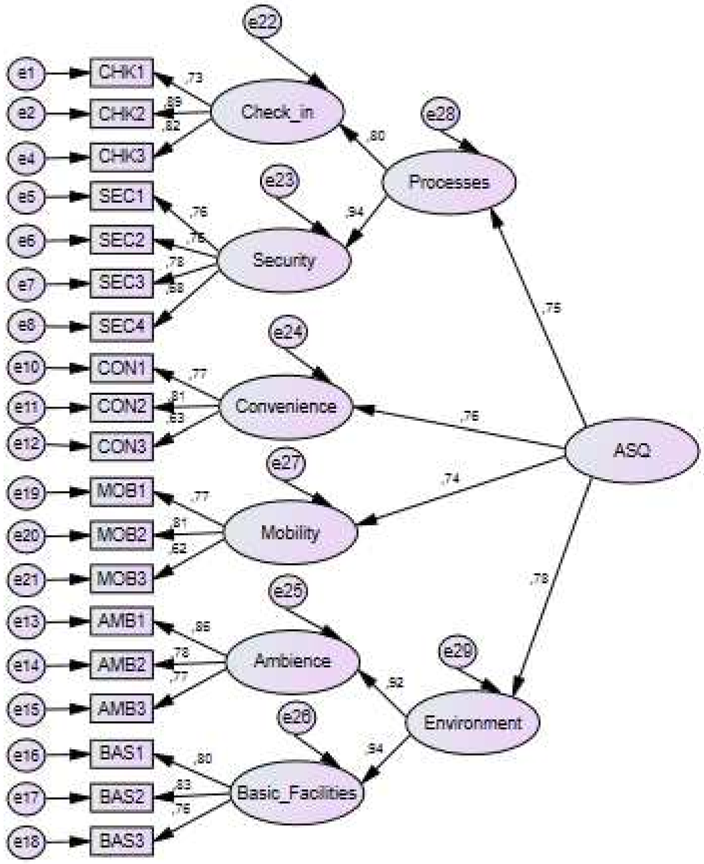
Factors and observed variables	α	α if item deleted	Item-total correlation	KMO	% variance extracted
CHK – Check in	0,850			0,688	77,033
CHK1 - Wait-time at check-in		0,845	0,662		
CHK2 - Check-in process efficiency		0,709	0,801		
CHK3 - Courtesy and helpfulness of check-in staff		0,809	0,696		
SEC – Security	0,833			0,792	66,714
SEC1 - Wait-time at security checkpoints		0,794	0,651		
SEC2 - Thoroughness of security screening		0,776	0,690		
SEC3 - Courtesy and helpfulness of security staff		0,770	0,704		
SEC4 - Feeling of being safe and secure		0,814	0,605		
CON – Convenience	0,772			0,688	68,821
CON1 - Availability and quality of food facilities		0,659	0,634		
CON2 - Availability and quality of stores		0,619	0,673		
CON3 - Availability of Banks/ATM/Exchange		0,786	0,517		
AMB – Ambience	0,848			0,729	76,663
AMB1 - Cleanliness of airport facilities		0,802	0,700		
AMB2 - Thermal comfort		0,764	0,734		
AMB3 - Acoustic comfort		0,785	0,714		
BAS – Basic Facilities	0,832			0,697	74,910
BAS1 - Cleanliness of washroom/toilets		0,747	0,714		
BAS2 - Availability of washroom/toilets		0,707	0,749		
BAS3 - Departure lounge comfort		0,834	0,619		
MOB – Mobility	0,772			0,678	68,838
MOB1 - Walking distance inside terminal		0,657	0,640		
MOB2 – Wayfinding		0,640	0,654		
MOB3 - Flight information		0,775	0,531		

Note: a. α - Cronbach´s Alpha; b. Bartlett´s Test of Sphericity with statistical significance < 0,01 for all factors.

According to these results, passenger data from SBSP presented a satisfactory level of sampling adequacy, with all the KMO values greater than 0,6. The Barlett´s test of Sphericity returned statistical significance (p-value < 0,01). Cronbach´s alpha values suggested internal consistency for the service quality factors. Likewise, item–total correlation values are indicative of sufficient individual reliability.

The hierarchical ASQ model was then estimated with the sample of SBSP passengers. The model presented a good overall fit (CMIN/df=3,132; RMSEA=0,069, [0,062: 0,076[; GFI=0,906; PGFI=0,686; CFI=0,931; PCFI=0,784; TLI=0,918; IFI=0,931). The factor loadings were significant (p-value < 0,01) and reasonably strong, as presented in Figure 32 and Table 51.

Figure 32. The ASQ model results for departing passengers at Congonhas Airport.



Accordingly, the four factors directly reflecting the ASQ construct presented similar standardized factor loadings. In examining the indirect effects, the relationships between the score for ASQ and each first-order construct reflecting the second-order factors may also be promptly assessed. Table 51 summarizes the factor loadings estimates.

Table 51. Estimates for the higher-order ASQ model (SBSP).

Factor Loadings			Estimate	S.E.	C.R.	p-value	Stand. Estimate
Processes	<---	ASQ	0,714	0,070	10,18	***	0,755
Environment	<---	ASQ	0,852	0,075	11,352	***	0,780
Mobility	<---	ASQ	0,742	0,073	10,101	***	0,739
Convenience	<---	ASQ	0,734	0,073	10,096	***	0,764
Security	<---	Processes	1,038	0,107	9,663	***	0,944
Check-in	<---	Processes	1				0,804
Basic Facilities	<---	Environment	1				0,940
Ambience	<---	Environment	1,07	0,098	10,9	***	0,915
CHK3	<---	Check-in	1				0,823
CHK2	<---	Check-in	1,099	0,055	19,954	***	0,887
CHK1	<---	Check-in	0,963	0,060	16,039	***	0,733

SEC4	<---	Security	1				0,676
SEC3	<---	Security	1,115	0,078	14,295	***	0,780
SEC2	<---	Security	1,152	0,084	13,652	***	0,763
SEC1	<---	Security	1,137	0,084	13,498	***	0,765
CON3	<---	Convenience	1				0,632
CON2	<---	Convenience	1,249	0,104	12,041	***	0,808
CON1	<---	Convenience	1,275	0,108	11,8	***	0,769
AMB3	<---	Ambience	1				0,766
AMB2	<---	Ambience	1,003	0,059	16,961	***	0,782
AMB1	<---	Ambience	0,942	0,055	17,084	***	0,855
BAS3	<---	Basic Facilities	1				0,756
BAS2	<---	Basic Facilities	1,204	0,075	16,011	***	0,830
BAS1	<---	Basic Facilities	1,021	0,066	15,414	***	0,797
MOB3	<---	Mobility	1				0,621
MOB2	<---	Mobility	1,305	0,109	11,985	***	0,806
MOB1	<---	Mobility	1,260	0,106	11,877	***	0,772

Notes: Estimate – Factor loadings; S.E – Standard error; C.R. – Critical ratio; *** statistical significance at 0,01 level; Stand. Estimate – Standardized factor loadings.

Overall, the findings of this fourth stage of data analysis indicate that the proposed hierarchical ASQ model might properly measure passenger perceptions of ASQ also in the context of Congonhas Airport. In view of the Thesis´s objectives, this is a relevant indicative that supports the ASQ model´s generalizability.

6.3.5. The Airport Service Quality model – ASQ model

Based on the results of this second empirical study, the proposed ASQ model presents sufficient factorial validity and reliability. The service quality factors were properly measured by their measurement items in the two airport settings investigated. The introduction of higher-order factors provided consistent results for both airport cases and significant practical implications.

The ASQ model covers relevant issues related to airport service quality as perceived by the passengers. Hence, it may provide a meaningful approach to service quality measurement in the airport context. A brief description of the six ASQ factors is provided in Table 52.

Table 52. The ASQ factors.

Factors	Comments
Check-in	This ASQ factor includes typical service performance indicators related to the check-in procedures, such as passenger perceptions related to wait time, process efficiency, and the attitude of service staff.
Security	Also comprises service performance indicators (wait-time and attitude of service staff). Includes the thoroughness of security screening and passenger's feeling of safety, which are aspects associated with a broader perception of ASQ. As security procedures have been enforced worldwide, this ASQ factor is increasingly important for airports.
Convenience	In the model, reflects on the availability and quality of convenience facilities and services. As commercial revenues are becoming critical for airport sustainability, providing alternatives for passengers enjoying their free time is a very important issue. As regards future developments, other items should be included to provide a more comprehensive analysis of passenger perceptions concerning this ASQ factor.
Mobility	Comprises aspects related to wayfinding, flight information and the walking distance inside the terminal. Mobility is a major concern for airport design and operations. Proper mobility solutions may help to minimize the time and uncertainty for passengers when moving within the terminal. They may also allow passengers to stay more relaxed in their interaction with the airport setting.
Ambience	Comprises the service surroundings of the passenger terminal, including thermal and acoustic comfort, and airport cleanliness. The airport physical environment is nonetheless critical for passenger evaluation on ASQ. Researchers have tried to provide further understanding on how it is perceived and how it can affect passenger satisfaction (Fodness and Murray, 2007; Jen *et al.*, 2013; Jeon and Kim, 2012; Ali *et al*., 2016; Moon *et al*., 2016). Developments should embrace outcomes arising from these studies and others.
Basic Facilities	Differentiates from the Ambience factor for comprising items associated with the satisfaction of the most basic passenger needs during their stay at the airport. Washroom availability and cleanliness, as well as departure lounge facilities, are basic elements of airport design (Horonjeff *et al.*, 2010) and typical examples of dissatisfiers, as assumed prerequisites for the airport service performance (Mikulic and Prebežac, 2008).

Essentially, these six ASQ factors are related to four main issues concerning the passenger-airport interaction. The first issue relates to the core activities associated with passenger processing, comprising the check-in and security screening. Accordingly, a second-order factor named "Processes" may account for the relationships between these first-order factors and their measurement items. The factor Convenience comprises those discretionary activities that a passenger is able or willing to do in the airport. The factor Mobility is associated with passenger perception of how ease is to move within the airport terminal. Finally, the basic facilities and other aspects of the airport ambience are representative of the passenger needs for being comfortable at the airport. In this sense, based on the study´s results, a second-order factor named

“Environment” seems to explain the relationships between the factors Basic facilities and Ambience.

Combining the use of the proposed ASQ model with the SEM approach, passenger survey data could be examined at different levels of analysis, consistent with the particular perspective intended. Based on a multidimensional perspective, starting with the ASQ construct, one can compare the effects on different first-order and second-order factors. These effects related to the ASQ construct are readily provided by the higher-order factor loadings. Moreover, towards a more specific perspective, a service-attribute level analysis can be obtained by examining the factor loadings from the first-order factors to the observed variables.

Additionally, as soon as ASQ is operationalized as a higher-order construct, an ASQ global score can be computed (Marôco, 2010; Hair *et al*., 2014). There are some alternatives to calculate factor scores, however multiple regression is frequently used to derive estimated factor scores that are weighted combinations of the indicators and the factor (Kline, 2011). The software AMOS provides regression weights for predicting the unobserved variables (constructs) from the observed variables values (measurement items). For instance, based on the results for the SBSP sample, the following equation can be used to estimate the ASQ scores for a given respondent “i””.

$$ASQ_i = 0{,}068*MOB1_i + 0{,}082*MOB2_i + 0{,}036*MOB3_i + 0{,}047*BAS1_i + 0{,}051*BAS2_i + 0{,}037*BAS3_i + 0{,}059*AMB1_i + 0{,}032*AMB2_i + 0{,}029*AMB3_i + 0{,}074*CON1_i + 0{,}099*CON2_i + 0{,}044*CON3_i + 0{,}042*SEC1_i + 0{,}041*SEC2_i + 0{,}047*SEC3_i + 0{,}028*SEC4_i + 0{,}014*CHK1_i + 0{,}039*CHK2_i + 0{,}024*CHK3_i$$

These individual ASQ scores can be used in more than a few situations. Multivariate analyses could provide meaningful information as regards passenger perception of airport service quality. For instance, based on the individual scores, the passengers could be grouped according to their patterns of evaluation or based on their individual characteristics. Furthermore, the ASQ scores could also be used for predictive purposes.

6.4. CONCLUDING REMARKS

An effective service quality measurement is a relevant issue for practitioners and researchers. Although measurement practices are customary within the airport industry, little attention has been given to the validity and reliability of the measurement instruments and quality models employed. Focusing on this gap, in this chapter, a measurement model for perceived airport service quality (ASQ) was developed and tested for its validity, reliability and equivalence across groups of domestic and international passengers. Afterward, a higher-order model was tested and cross-validated with independent samples. Finally, the proposed ASQ model was tested in another airport setting.

The results suggested that the higher-order ASQ model based on six service quality factors measured by typical indicators within the airport industry might provide a meaningful multidimensional approach for measuring passenger perceptions of ASQ. The measurement items were properly explained by their respective factors; no matter the respondent was an international or domestic departing passenger. Moreover, the higher-order factor structure properly reflected the relationships between the service quality factors and their measurement items in the different airport settings studied.

Since airports are complex service settings, generic approaches for measuring service quality might not adequately cover particular characteristics of the service provision and passenger-airport interaction (Pantouvakis, 2010; George *et al*., 2013). In this sense, the proposed model covers relevant issues related to the passenger perception of ASQ. It comprises the performance of core airport processes (check-in and security screening), along with aspects related to the passenger-airport interaction in their way through the terminal, including leisure/convenience alternatives and elements of the airport servicescape.

To be noted that these different ASQ dimensions are closely related within the airport management context. In fact, efficient and reliable processes may result in more relaxed passengers with more time for discretionary activities. More relaxed passengers may have different perceptions of their airport experience and, consequently, different attitudes towards the airport (Popovic *et al*., 2010; Wattanacharoensil *et al*., 2016). In this context, passengers with more time to spend at the airport are more likely to stay and purchase at airport retail areas or other convenience facilities (Crawford and Melewar, 2003; Jeon and Kim, 2012; Kalakou and Moura, 2015), which is determinant for increasing non-aeronautical revenues.

This proposed model may represent a suitable alternative for a more parsimonious and practical analysis of ASQ, instead of considering a vast set of items individually. It may provide a valid and reliable approach for both operating and strategic perspectives of the airport services. Since the perceived level of quality is an antecedent of passenger satisfaction and their attitudes towards the airport, measuring service quality according to this approach may also support airport managers, regulators, policymakers and other decision-makers with a passenger-oriented focus for airport planning and management.

There are limitations to this study. Since the perceived service quality is subjective and context dependent (Brady and Cronin, 2001; Wilson *et al*., 2012), some more specific results of the models estimation need to be interpreted within the particular airport context and should not be generalized. Moreover, given the lack of previous similar studies in the airport industry, the results cannot be directly compared to other airports. In addition, although the measurement items have been widely used in the airport industry and proved valid in this study, there is the need for further investigation on passenger behavior and expectations. The findings of such a research could provide relevant insights on passenger perceptions of ASQ.

Concerning the need for extracting the most relevant information as regards ASQ, the airport industry could benefit in great extent from the advances from other service settings, namely the modeling of the antecedents and consequences of customer satisfaction. With this in mind, in the forthcoming Chapter, this ASQ model is integrated into a comprehensive customer satisfaction model accounting for the antecedents and consequences of passenger satisfaction with an airport.

CHAPTER 7 – ANTECEDENTS AND CONSEQUENCES OF PASSENGER SATISFACTION WITH THE AIRPORT

7.1. INTRODUCTION

In the current business environment, airports have been ever more compelled to operate as self-sufficient service organizations (Graham, 2014; Adler *et al*., 2015). Consequently, airport executives are expected pay close attention to service quality and the passenger level of satisfaction (including core airport services and the ancillary ones) (Van Oel and Van den Berkhof, 2013; Bogicevic *et al.*, 2013; Halpern and Graham, 2013). In this regard, there is increasing need for integrating service quality measurement and passenger attitudes towards the airport within the context of performance measurement and management.

As previously discussed in the literature review chapter, there has been important advances in the research on customer satisfaction, including the development of theoretical models for examining the antecedents of customer satisfaction and their attitudes towards the product/service or organization. Notwithstanding, regardless of the timeliness and relevance of this subject, based on the literature reviewed, it was found a significant gap concerning studies accounting for the antecedents and consequences of the passenger satisfaction with the airport.

Given this background, this study´s objective is to examine the relationships between passenger perception of airport service quality and their attitudes towards the airport. Based on the customer satisfaction literature and the state-of-the-art of the research on passenger satisfaction within the airport context, the approach to this research objective was based on the antecedents and consequences of the passenger satisfaction with the airport.

For this purpose, a theoretical model centered on the relationships hypothesized by the American Customer Satisfaction Index (ACSI) model was used. In addition, due to the particular characteristics of the airport business, some modifications were applied to the original ACSI model, including the use of the ASQ model proposed in this Thesis and the effects of switching costs on passenger loyalty to the airport. The conceptual model for the antecedents and consequences of passenger satisfaction was presented in section 4.4. The following specific objectives were pursued:

a) To examine the effects of typical antecedents of customer satisfaction in the passenger satisfaction with the airport;

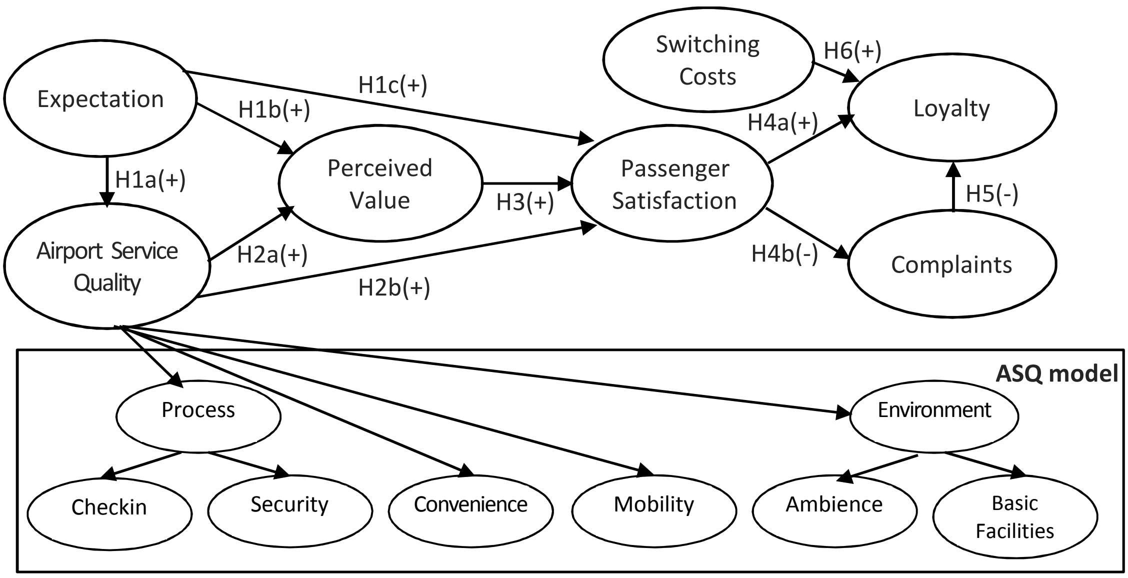
b) To test for the suitability of the ASQ model resulting from this Thesis within the passenger satisfaction model;

c) To examine the effects of satisfaction on the passenger complaining attitude and loyalty towards an airport in a multi-airport region;

d) To examine the effects of the perception of switching costs for changing airports on the passenger loyalty attitude towards the airport.

The structural model and the respective hypotheses of relationships between the constructs are presented in figure 33.

Figure 33. The passenger satisfaction model.



Comparing to the conceptual model presented in section 4.4., this model includes the higher-order ASQ model derived from the empirical study 2, presented in Chapter 6. It also comprises the hypothesis for the relationships between the constructs. The full measurement model, including the measurement items, parameter estimates, and residuals, is presented in Appendix XI.

Construct operationalization was described in the methodology chapter, excepting for the ASQ construct. The operationalization of the ASQ construct is based on typical attributes related to the airport services and facilities, according to the ASQ model developed in this Thesis. Table 53 presents the measurement items for the ASQ construct. The questionnaire used in this study is presented in Appendix VI.

Table 53. Measurement items for the ASQ construct.

ASQ factor	Code	Measurement items
Check-in	CHK1	Wait-time at check-in
	CHK2	Check-in process efficiency
	CHK3	Courtesy and helpfulness of check-in staff
Security	SEC1	Wait-time at security checkpoints
	SEC2	Thoroughness of security screening
	SEC3	Courtesy and helpfulness of security staff
	SEC4	Feeling of being safe and secure
Convenience	CON1	Availability and quality of food facilities
	CON2	Availability and quality of stores
	CON3	Availability of Banks/ATM/Exchange
Ambience	AMB1	Cleanliness of airport facilities
	AMB2	Thermal comfort
	AMB3	Acoustic comfort
Basic Facilities	BAS1	Cleanliness of washroom/toilets
	BAS2	Availability of washroom/toilets
	BAS3	Departure lounge comfort
Mobility	MOB1	Walking distance inside terminal
	MOB2	Wayfinding
	MOB3	Flight information

Data collection procedures and sample characteristics are discussed in the next section. The results are presented in the sequence, followed by further discussion on the findings. To finish, concluding remarks are provided at the end of the chapter.

7.2. DATA COLLECTION AND SAMPLE

Data used in this study is originated from the survey applied to departing passengers at Congonhas Airport (SBSP). Data collection procedures were the same undertaken for the fourth stage of study 2 (See Figure 25). The full sample consisted of 503 forms. However, 21 forms fulfilled by transfer passengers and other 39 forms presenting more than 10% of missing data were excluded. Since the remaining 443 forms presented no pattern for the missing values, missing data were replaced by the series mean (Hair *et al*., 2014; Kline, 2011; Field, 2009).

The sample was assessed concerning univariate normality by Skewness and Kurtosis, with results suggesting no significant deviation (Appendix X). Concerning multivariate normality, Mardia´s coefficient was greater than the upper threshold limit (Byrne, 2010). Accordingly, Mahalanobis´ distance (D^2) was used for multivariate outlier identification. Although some observations might have been considered outliers based on the D^2 statistic, the criteria for assessing the relative magnitude of the D^2 statistic based on the number of variables involved (D^2/df) suggested no significant concerns, with no observation having a D^2/df value exceeding 2,5 (Hair *et al*., 2014). Furthermore, excluding cases based on the D^2 statistic only produced a marginal reduction in the multivariate normality deviation. In this context, considering that there was no reason for assuming error in the responses or data insertion, and univariate normality was assured, looking for a more conservative and practical approach, the decision was for excluding no observation.

After these procedures, a useful sample consisting of 443 observations was considered for the forthcoming analyses. Sample characteristics[40] are presented in Table 54.

[40] To be noted that sample characteristics are basically the same as in the fourth stage of the empirical study 2. However, Because of the missing value treatment procedures, the sample used in this study has minus four observations comparing to study 2.

Table 54. Sample characteristics (Passenger satisfaction model).

Characteristic	Distribution	
Living in the city of São Paulo	Freq.	%
Yes	142	32,1
No	298	67,3
Non response	3	0,7
Total	443	100,0
Gender	Freq.	%
Male	299	67,5
Female	142	32,1
Non response	2	0,5
Total	443	100,0
Travel frequency	Freq.	%
0 to 2 trips	65	14,7
3 to 5 trips	109	24,6
> 5 trips	266	60,0
Non response	3	0,7
Total	443	100,0
Trip purpose	Freq.	%
Non-business (Includes leisure and other purposes)	149	33,6
Business	289	65,2
Non response	5	1,1
Total	443	100,0
Antecedence of arrival at the airport	Freq.	%
Less than 1 hour	165	37,3
Equal or more than 1 hour to 2 hours	225	50,8
More than 2 hours	50	11,3
Non response	3	0,7
Total	443	100,0
Number of departures from the airport in the last 12 months	Freq.	%
First time	56	12,6
2 to 3 times	116	26,2
3 to 5 times	77	17,4
6 to 10 times	191	43,1
Non response	3	0,7
Total	443	100,0

This useful sample corresponds to approximately 1,1% of the passengers departing from SBSP in the days of the survey application. Based on the sampling criteria used (Appendix IX), sample size is sufficiently representative of the population of departing passengers, with 5% of margin of error and 95% of confidence level. The descriptive statistics for the measurement items are presented in Table 55.

Table 55. Descriptive statistics for the passenger satisfaction model.

Measurement items	N	Mean	SE	SD
EXP1 - I had high expectation about the airport quality	440	4,62	0,079	1,44
EXP2 - I expected the airport to fully meet my needs as a passenger	439	5,20	0,070	1,47
EXP3 - I expected no failure in the service provision	440	5,29	0,080	1,67
EXP4 - I expected the services to be speedy and efficient	443	5,49	0,075	1,58
EXP5 - I expected to feel comfortable and safe at the airport	434	5,61	0,078	1,63
VAL1 - Considering the overall airport quality, the airport fee is fair	442	3,62	0,085	1,79
VAL2 - Considering the airport fee, the airport services are very good	443	3,55	0,080	1,68
VAL3 - Considering the airport fee, the comfort is very good	438	3,63	0,079	1,65
VAL4 - Considering the quality of products/services, the prices in commercial facilities are fair	441	2,35	0,074	1,56
VAL5 - Considering the prices in commercial facilities, the quality of products/services is very good	441	3,05	0,076	1,61
SAT1 - Overall, I am very satisfied with the airport	443	3,79	0,076	1,60
SAT2 - The airport exceeds my expectations	441	3,22	0,078	1,65
SAT3 - The airport represents what I understand for an ideal airport	440	2,94	0,078	1,63
SAT4 - I feel I have made the right decision in choosing this airport	438	4,05	0,072	1,52
SAT5 - Overall, my experience with the airport is very pleasant	439	4,06	0,074	1,54
COP1 - I have formally complained to the airport	442	2,25	0,085	1,78
COP2 - I have (or have had) intention to formally complain to the airport	438	3,20	0,099	2,07
COP3 - I have complained (or I am likely to complain) about the airport to family or friends	439	3,48	0,101	2,11
COP4 - Passengers that have complained to the airport are likely fair	436	4,43	0,083	1,73
COP5 - I do not believe that complaints are properly solved by the airport	438	4,47	0,084	1,75
SWC1 - For me, it would be more expensive using another airport in this city	439	4,62	0,089	1,87
SWC2 - It would demand more personal efforts using another airport in this city	440	5,15	0,088	1,85
SWC3 - It would take much time if I have decided for using another airport in this city	437	5,25	0,090	1,89
SWC4 - For me, it would be very inconvenient to use another airport in this city	439	4,92	0,093	1,94
SWC5 - For convenience, I feel practically obliged to use this airport for domestic flights from São Paulo	441	4,94	0,098	2,06
LOY1 - I will use this airport for my next flight departing from São Paulo	442	5,27	0,073	1,54
LOY2 - Even if another airport in the city offers a much cheaper fee, I prefer using this airport	440	4,16	0,094	1,98
LOY3 - Even if another airport in the city has an equivalent flight much cheaper, I prefer to use this airport	441	3,59	0,094	1,98
LOY4 - I will recommend this airport to my family and friends departing from São Paulo	441	4,25	0,074	1,56
LOY5 - I always prefer using this airport for domestic flights departing from São Paulo	443	4,79	0,084	1,77
CHK1 - Wait time at check-in	442	4,59	0,073	1,54
CHK2 - Check-in process efficiency	440	4,92	0,069	1,46
CHK3 - Courtesy and helpfulness of check-in staff	437	5,02	0,068	1,43
SEC1 - Wait-time at security checkpoints	442	4,92	0,073	1,54
SEC2 - Thoroughness of security screening	439	4,89	0,075	1,57
SEC3 - Courtesy and helpfulness of security staff	438	4,80	0,071	1,49
SEC4 - Feeling of being safe and secure	441	4,68	0,073	1,54
CON1 - Availability and quality of food facilities	440	3,60	0,076	1,60
CON2 - Availability and quality of stores	436	3,97	0,072	1,50
CON3 - Availability of Banks/ATM/Exchange	436	4,04	0,073	1,53
AMB1 - Cleanliness of airport facilities	440	4,86	0,067	1,40
AMB2 - Thermal comfort	443	4,51	0,078	1,64
AMB3 - Acoustic comfort	443	4,42	0,079	1,67
BAS1 - Availability of washroom/toilets	441	4,51	0,071	1,49
BAS2 - Cleanliness of washroom/toilets	440	4,29	0,080	1,69
BAS3 - Departure lounge comfort	440	4,09	0,073	1,54
MOB1 - Wayfinding	442	4,84	0,078	1,63
MOB2 - Flight information	439	4,93	0,078	1,63
MOB3 - Walking distance inside terminal	439	4,30	0,077	1,62

Notes: SE – Standard error; SD – Standard deviation.

The mean values ranged from 2,25 to 5,61. Measurement items related to passenger expectation about the most basic service and facilities attributes presented the highest mean values (EXP3, EXP4, and EXP5). On the other hand, the perceived value as regards the products and services in the commercial facilities (VAL4), the formal complaints (COP1), and the perception that the airport is close to the passenger´s idea of an ideal airport (SAT3) were the lowest rated items.

7.3. RESULTS

7.3.1. The Measurement Model

According to the methodological procedures described in section 4.4., the two-stage approach to structural equation modeling (SEM) was used. Thus, the measurement model was assessed as the first stage of data analysis. Before conducting the confirmatory factor analysis (CFA), a preliminary analysis on item reliability, scale´s internal consistency, and construct unidimensionality was carried out based on exploratory factor analyses (EFA).

Table 56 summarizes the variables and respective constructs, along with the Cronbach´s alpha values for each latent variable and other results that supported factor unidimensionality and item reliability.

Table 56. EFA results for the passenger satisfaction model.

Constructs and observed variables	α	α if item deleted	Item-total correlation	KMO	% variance extracted
EXP – Expectation	0,780			0,756	53,585
EXP1 - I had high expectation about the airport quality		0,782	0,420		
EXP2 - I expected the airport to fully meet my needs (…)		0,735	0,576		
EXP3 - I expected no failure in the service provision		0,739	0,561		
EXP4 - I expected the services to be speedy and efficient		0,704	0,660		
EXP5 - I expected to feel comfortable and safe (…)		0,736	0,570,		
VAL – Perceived value	0,806			0,751	76,928
VAL1 - Considering the overall airport quality, the airport fee (…)		0,767	0,606		
VAL2 - Considering the airport fee, the airport services are (…)		0,724	0,735		
VAL3 - Considering the airport fee, the comfort is very good		0,753	0,649		
VAL4 - Considering the quality of products/services, the prices (…)		0,798	0,497		
VAL5 - Considering the prices in the commercial facilities (…)		0,801	0,487		
SAT – Satisfaction	0,872			0,846	66,275
SAT1 - Overall, I am very satisfied with the airport		0,842	0,713		
SAT2 - The airport exceeds my expectations		0,837	0,733		
SAT3 - The airport represents what I understand for an ideal (…)		0,842	0,716		
SAT4 - I feel I have made the right decision in choosing this airport		0,861	0,635		
SAT5 - Overall, my experience with the airport is very pleasant		0,845	0,701		
COP – Complaints	0,767			0,760	73,007
COP1 - I have formally complained to the airport		0,797	0,323		
COP2 - I have (or have had) intention to formally complain (…)		0,685	0,662		
COP3 - I have complained (or I am likely to complain) about (…)		0,678	0,678		
COP4 - Passengers that have complained to the airport are (…)		0,720	0,576		
COP5 - I do not believe that complaints are properly solved by (…)		0,746	0,494		
SWC – Switching costs	0,854			0,814	63,563
SWC1 – For me, it would be more expensive using another (…)		0,846	0,567		
SWC2 – It would demand more personal efforts using another (…)		0,808	0,717		
SWC3 – It would take much time if I have decided for using (…)		0,797	0,755		
SWC4 – For me, it would be very inconvenient to use another (…)		0,797	0,752		
SWC5 – For convenience, I feel practically obliged to use this (…)		0,855	0,545		
LOY – Loyalty	0,809			0,766	56,817
LOY1 - I will use this airport for my next flight departing from (…)		0,783	0,552		
LOY2 - Even if another airport in the city offer a much cheaper (…)		0,742	0,679		
LOY3 – Even if another airport in the city has an equivalent (…)		0,780	0,570		
LOY4 – I will recommend this airport to my family and friends (…)		0,789	0,530		
LOY5 – I always prefer using this airport for domestic flights (…)		0,752	0,653		
CHK – Check in	0,847			0,686	76,664
CHK1 - Wait-time at check-in		0,841	0,657		
CHK2 - Check-in process efficiency		0,703	0,797		
CHK3 - Courtesy and helpfulness of check-in staff		0,806	0,690		
SEC – Security	0,829			0,789	66,166
SEC1- Wait-time at security checkpoints		0,789	0,645		
SEC2 - Thoroughness of security screening		0,771	0,683		
SEC3 - Courtesy and helpfulness of security staff		0,765	0,698		
SEC4 - Feeling of being safe and secure		0,809	0,598		
CON – Convenience	0,770			0,668	68,651
CON1 - Availability and quality of food facilities		0,656	0,633		
CON2 - Availability and quality of stores		0,617	0,670		
CON3 - Availability of Banks/ATM/Exchange		0,785	0,514		
AMB – Ambience	0,847			0,729	76,563
AMB1 - Cleanliness of airport facilities		0,801	0,699		
AMB2 - Thermal comfort		0,760	0,734		
AMB3 - Acoustic comfort		0,786	0,711		
BAS – Basic Facilities	0,834			0,701	75,144
BAS1 - Cleanliness of washroom/toilets		0,753	0,713		
BAS2 - Availability of washroom/toilets		0,713	0,749		
BAS3 - Departure lounge comfort		0,831	0,628		

MOB – Mobility	0,770			0,678	68,599
MOB1 - Walking distance inside terminal		0,655	0,635		
MOB2 – Wayfinding		0,638	0,650		
MOB3 - Flight information		0,770	0,530		

Note: a. α - Cronbach´s Alpha; b. Bartlett´s Test of Sphericity with statistical significance < 0,01 for all factors.

Based on the KMO values, sample data presented satisfactory sampling adequacy regarding each construct, with values greater than 0,6. The results of the Barlett´s test of sphericity was significant for all the within-scale EFA (p-value < 0,01). These results indicated data was suitable for the factor analyses (Hair *et al*., 2014).

The internal consistency of each scale was validated by the Cronbach´s alpha values greater than 0,7. The computed item-total correlations were indicative of sufficient item reliability, with exception of the variable “COP1 - I have already formally complaint to the airport”, with the value of 0,323 being lower than the threshold of 0,4 (Field, 2009).

Actually, given that the majority of passengers have totally disagreed with this statement, as indicated by the mode equal one (meaning the passenger have not formally complaint to the airport), this variable presented low correlation with the respective scale. Therefore, it was excluded from the forthcoming analyses. To be noted that this also implied a small improvement in the Cronbach´s alpha value for the construct Complaints.

Provided with these results, the measurement model was then assessed by CFA. For this purpose, the remaining 48 observed variables were assumed to load only on their respective constructs, as indicated in Table 56, while the constructs were assumed inter-correlated.

This first measurement model revealed a poor fit to the data (χ^2=2652,926; df=1031; χ^2/df=2,573; RMSEA=0,060,]0,057:0,062]; GFI=0,796; PGFI=0,698; CFI=0,853; PCFI=0,779; TLI=0,839; IFI=0,854). Consistent with the literature and methodological procedures described, the measurement model was then modified based on successive interactions. For this purpose, the following criteria were considered: a. item reliability (indicated by the standardized factor loadings and squared multiple correlations (SMC));

b. standardized residuals covariances (SRC); and c. modification indices (M.I.) estimated by the AMOS software (Byrne, 2010; Hair *et al*., 2014; Marôco, 2010).

Therefore, in this specification process, some measurement items were eliminated. The variable with the lowest standardized coefficients in each model estimation was excluded. The standardized residuals covariances and the modification indices were used as guidance for the cases in which: i. the two lowest standardized factor loadings and SMC were very similar; ii. there were significant covariances between error terms; and iii. there were significant crossloadings.

After this process, a measurement model with a better fit was obtained (Table 57).

Table 57. Measurement model - goodness-of-fit indices.

Measure	Value
χ^2/df	2,164
RMSEA [LO90: HI90]	0,051 [0,048:0,055]
GFI	0,864
PGFI	0,721
CFI	0,915
PCFI	0,806
TLI	0,904
IFI	0,916

χ^2=1412,738; df=653; p-value < 0,01.

This improvement in model fit was significant according to the difference in the χ^2 statistic between this final model and the initial one ($\Delta\chi^2$(378)=1240,188, p-value < 0,01). Moreover, the expected cross-validation index was much smaller comparing with the initial model (MECVI=3,828 vs MECVI= 6,740). Overall, the conclusion was for an acceptable fit of the measurement model.

Table 58 summarizes the CFA results, including the factor loading estimates, standard errors, critical ratios, statistical significance, and SMC for each observed variable. In general, the factor loadings were reasonably strong. Regarding the critical ratios, the statistics were greater than 10 (p-value < 0,01), providing evidence of statistical significance. Based on these results, individual convergent validity was assured.

Table 58. CFA Results.

Construct	Item/ Dimension	Estimate	S.E.	C.R.	p-value	Standard Estimate	SMC (R^2)
Expectation	EXP3	1,073	0,094	11,46	***	0,660	0,436
	EXP4	1,398	0,127	10,99	***	0,909	0,826
	EXP5	1	-	-	-	0,637	0,406
Perceived value	VAL1	0,918	0,060	15,37	***	0,711	0,506
	VAL2	1,050	0,054	19,45	***	0,865	0,748
	VAL3	1	-	-	-	0,845	0,714
Satisfaction	SAT1	1,158	0,074	15,69	***	0,791	0,626
	SAT2	1,248	0,077	16,14	***	0,831	0,691
	SAT3	1,163	0,076	15,33	***	0,782	0,612
	SAT5	1	-	-	-	0,714	0,510
Complaints	COP2	1,354	0,114	11,88	***	0,728	0,531
	COP3	1,619	0,133	12,13	***	0,852	0,726
	COP4	1	-	-	-	0,643	0,413
Switching costs	SWC1	0,744	0,057	13,09	***	0,617	0,381
	SWC2	0,952	0,054	17,48	***	0,796	0,634
	SWC3	1,072	0,054	20,03	***	0,881	0,776
	SWC4	1	-	-	-	0,798	0,637
Loyalty	LOY1	0,890	0,068	13,04	***	0,774	0,599
	LOY2	0,908	0,076	11,87	***	0,616	0,380
	LOY5	1	-	-	-	0,756	0,572
Processes	Check-in	1	-	-	-	0,838	0,702
	Security	0,955	0,095	10,03	***	0,902	0,814
Environment	Ambience	1	-	-	-	0,947	0,896
	Basic Facilities	0,863	0,075	11,43	***	0,901	0,812
Check-in	CHK1	0,971	0,061	15,85	***	0,732	0,536
	CHK2	1,102	0,056	19,74	***	0,884	0,781
	CHK3	1	-	-	-	0,818	0,669
Security	SEC1	1,137	0,086	13,20	***	0,762	0,580
	SEC2	1,144	0,086	13,33	***	0,755	0,570
	SEC3	1,112	0,079	14,01	***	0,775	0,601
	SEC4	1	-	-	-	0,672	0,452
Convenience	CON1	1,357	0,116	11,70	***	0,797	0,636
	CON2	1,245	0,103	12,05	***	0,786	0,618
	CON3	1	-	-	-	0,617	0,381
Mobility	MOB1	1,263	0,108	11,70	***	0,777	0,604
	MOB2	1,281	0,108	11,87	***	0,794	0,630
	MOB3	1	-	-	-	0,621	0,386
Ambience	AMB1	0,912	0,053	17,24	***	0,842	0,709
	AMB2	1,001	0,058	17,27	***	0,790	0,624
	AMB3	1	-	-	-	0,774	0,599
Basic Facilities	BAS1	1,001	0,065	15,38	***	0,790	0,624
	BAS2	1,194	0,074	16,10	***	0,831	0,691
	BAS3	1	-	-	-	0,765	0,585

Notes: CR – Critical ratios; “-“ – not estimated, factor loading constrained to 1 for model identification.

The measurement model was then tested for construct validity and reliability. The composite reliability (CR) values were greater than 0,7, which indicates sufficient reliability and that measurement items converge at a satisfactory level within their respective constructs. As for the average variance extracted (AVE), with values above 0,5, there was also evidence of sufficient convergent validity (Fornell and Larcker, 1981; Hair *et al*., 2014).

Consistent with Fornell and Larcker (1981), discriminant validity was assessed based on the comparison between the square root of the AVE and the construct correlations with all other constructs in the model. The AVE values ranged from 0,52 to 0,85, thus their respective square root were greater than the correlations with the other constructs. Overall, these results supported discriminant validity.

Table 59 summarizes the measures of construct validity and reliability, including composite reliability, average variance extracted, the Cronbach´s alpha values, and the correlations between the constructs.

Table 59. Measures of construct validity and reliability.

	PRC	EXP	VAL	SAT	COP	SWC	LOY	CON	MOB	ENV	α	CR	AVE
Processes - PRC	0,871										0,879	0,862	0,758
Expectation - EXP	0,096*	0,746									0,772	0,785	0,556
Value - VAL	0,484*	0,137*	0,810								0,846	0,850	0,656
Satisfaction - SAT	0,567*	0,133*	0,778*	0,781							0,861	0,862	0,609
Complaints - COP	-0,360*	0,090*	-0,359*	-0,401*	0,746						0,781	0,788	0,556
Switching Costs - SWC	0,009*	0,101*	-0,145*	-0,239*	0,259*	0,779					0,855	0,859	0,607
Loyalty - LOY	0,310*	0,175*	0,139*	0,195*	-0,032*	0,664*	0,719				0,757	0,761	0,517
Convenience - CON	0,549*	0,030*	0,514*	0,670*	-0,239*	-0,184*	0,071*	0,738			0,769	0,780	0,545
Mobility - MOB	0,618*	0,080*	0,334*	0,417*	-0,142*	-0,043*	0,221*	0,528*	0,735		0,770	0,777	0,540
Environment - ENV	0,551*	0,190*	0,584*	0,672*	-0,301*	-0,059*	0,265*	0,628*	0,546*	0,924	0,890	0,921	0,854

Notes: In the diagonal, values for the square root of the AVE; *Significance level <0,01 for the correlations; α - Cronbach´s Alpha; CR – Composite Reliability; AVE – Average Extracted Variance.

After these procedures, survey data was tested for common method variance. The Harman´s single factor test returned only 27,3% of variance explained by the single factor extracted. Concerning the common latent factor approach, the CFA model including the common latent factor presented acceptable fit, but there was no significant change in the standardized values for the original factor loadings. Based on these results, conclusion was that common method variance did not represent a significant concern in this study.

After assessing the measurement model, the hypothesized causal relationships were estimated in the second stage of the data analyses. The results of the structural model are presented and discussed subsequently.

7.3.2. The Structural Model

7.3.2.1. Preliminary analysis and model´s goodness-of-fit

The score for each construct computed as the average of their respective observed variables, and the correlations between the constructs were analyzed as initial approach. Table 60 presents the mean values and standard deviation. These values, along with the correlations presented in Table 59, provided relevant preliminary information on the research hypotheses.

Table 60. Descriptive statistics of the latent variables.

Construct	Code.	Mean	SD.
Expectation	EXP	5,46	1,34
Perceived value	VAL	3,60	1,49
Satisfaction	SAT	3,50	1,35
Complaints	COP	3,71	1,64
Switching costs	SWC	4,99	1,57
Loyalty	LOY	4,74	1,45
Processes	PRC	4,83	1,15
Convenience	CON	3,87	1,27
Mobility	MOB	4,69	1,34
Environment	ENV	4,45	1,26
Airport service quality	ASQ	4,46	0,98

Note: For this initial approach, ASQ was calculated as the arithmetic mean of the measurement items reflecting the six first-order service quality factors.

The constructs satisfaction and perceived value presented the lowest mean values (3,50 and 3,60, respectively), which may suggest that passengers are not very satisfied with the airport service. Nevertheless, it is also noteworthy that, on average, passenger willingness to complain was not necessarily high (mean=3,71).

This average profile for the passengers seems to indicate that, although they do not present high levels of satisfaction, they are possibly resigned to the level of service actually experienced. Moreover, they are not willing to complain in a formal way, which is consistent with the findings of Chang *et al*. (2008). The coefficient of variation for this latent variable show a high degree of data dispersion (approximately 44%). The correlations with the other constructs were usually weak and some of those not significant, as demonstrated in Table 59.

Switching costs and expectation were the constructs with the highest mean values (4,99 and 5,46, respectively). The passenger sensitiveness to switching costs was reasonably high and significantly correlated with passenger loyalty. As for passenger expectation, the finding that on average passengers presented a high level of expectation is particularly interesting, since this construct did not present high correlation with passenger satisfaction or perceived value (as expected). Moreover, regarding its correlations with the four higher-order service quality factors, only correlation with "airport environment" was statistically significant (Table 59).

After this preliminary analysis, the structural model of the relationships between the constructs was estimated. Overall, the model presented an acceptable fit to the sample data (Table 61). As expected, this cause-and-effect model presented similar goodness-of-fit statistics comparing to the measurement model (Byrne, 2010).

Table 61. Structural model - goodness-of-fit statistics.

Measure	Value
χ^2/df	2,259
RMSEA [LO90: HI90] (p-close)	0,053 [0,050: 0,057] (0,059)
GFI	0,850
PGFI	0,745
CFI	0,904
PCFI	0,834
TLI	0,896
IFI	0,904

χ^2=1545,112; df=684; p-value < 0,01.

According to Marôco (2010), the relative normed fit index (RNFI) statistic should be computed in order to evaluate the specific effects of the structural model in the overall model fit, separately from the measurement model. In the case of this study, the value of 0,903 suggests that the structural relationships present an acceptable overall fit (Mulaik *et al*., 1989 *apud* Marôco, 2010).

7.3.2.2. Hypotheses testing

The results supported seven out of ten research hypotheses, based on the tests of statistical significance of the regression weights. Only the hypotheses related to the effects of expectation on perceived value (H1b) and satisfaction (H1c), along with the hypothesis of the effect of complaints on passenger loyalty (H5) were not supported. All the other regression weights presented the expected coefficient signs and statistical significance.

Table 62 presents the hypothesized causal relationships, the respective hypotheses, the standardized estimates (λ), the critical ratios, the statistical significance of the estimates, and the conclusion about the hypothesis being supported or not[41].

Table 62. Results for the research hypotheses.

Hypothesized causal relationship			Hypothesis	Estimate λ	C.R.	p-value	Supported
Expectation	---->	Perceived ASQ	H1a(+)	0,141	2,390	**	yes
Expectation	---->	Perceived value	H1b(+)	0,044	0,909	n.s.	no
Expectation	---->	Satisfaction	H1c(+)	-0,001	-0,032	n.s.	no
Perceived ASQ	---->	Value	H2a(+)	0,643	11,102	***	yes
Perceived ASQ	---->	Satisfaction	H2b(+)	0,506	8,066	***	Yes
Perceived value	---->	Satisfaction	H3(+)	0,450	7,590	***	Yes
Satisfaction	---->	Loyalty	H4a(+)	0,314	5,896	***	Yes
Satisfaction	---->	Complaints	H4b(-)	-0,413	-6,865	***	Yes
Complaints	---->	Loyalty	H5(-)	-0,065	-1,267	n.s	No
Switching costs	---->	Loyalty	H6(+)	0,707	12,073	***	Yes

Notes: C.R. – Critical ratio; n.s. – non significant; *** – p-value < 0,01; ** – p-value < 0,05.

Regarding the hypotheses related to the construct expectation. The first hypothesis, concerning the positive effect of passenger expectation on perceived ASQ (H1a), was supported (λ = 0,141, p-value = 0,012). Thus, the greater is the passenger expectation

[41] Full estimates for the structural model are presented in Appendix XII.

about their airport experience, the more likely they are to rate higher levels of perceived service quality (*ceteris paribus*). However, this effect is only marginal for explaining ASQ, as indicated by the low standardized coefficient and small squared multiple correlation values (SMC=0,020).

The hypothesized relationships between expectation and perceived value (H1b) and expectation and satisfaction (H1c) were not supported (respectively: λ = 0,044, p-value = 0,363; and λ = -0,001, p-value = 0,974). These findings suggest that the expectation level did not directly explain the perceived value and passenger satisfaction within the model.

Nonetheless, according to the conceptual model, the passenger expectation was also expected to present indirect effects. The indirect effect of expectation on the perceived value was mediated by service quality, while the effects on satisfaction were mediated by both service quality and perceived value. Additionally, the indirect effects on the passenger attitude to complaint and loyalty were also mediated by the construct satisfaction. The bootstrapping estimation method was used for testing for the significance of these indirect effects (Hair *et al*., 2014). The results suggested significant but quite small effects (p-value < 0,05) (Table 63).

Concerning the second construct to be analyzed, the direct effects of perceived ASQ on the perceived value and passenger satisfaction were significant and reasonably strong (respectively, λ = 0,643, p-value < 0,01; and λ = 0,506, p-value < 0,01). These findings provide evidence for supporting hypotheses H2a and H2b. The indirect effects on passenger satisfaction (as mediated by the perceived value) and the effects on complaints and loyalty (also mediated by satisfaction) were also significant, as indicated by the bootstrapping results (Table 63). Accordingly, based on these findings, the relevance of service quality for determining passenger attitude towards the airport is highlighted.

The hypothesis related to the positive effect of perceived value on passenger satisfaction (H3) was also supported (λ = 0,450, p-value < 0,01). Moreover, their indirect effects on complaints and loyalty presented statistical significance (p-value < 0,01), based on the bootstrapping estimates.

Likewise, passenger satisfaction presented a significant and positive direct effect on passenger loyalty (λ = 0,314, p-value < 0,01), which supports hypothesis H4a. Therefore, the more satisfied is the passenger, the more likely they are to choose the same airport for a future departing flight. As regard the indirect effect of satisfaction in loyalty, as mediated by complaints, it presented no statistical significance (p-value = 0,192).

With respect to the negative effect of satisfaction on the passenger attitude to complain (H4b), this hypothesis was supported (λ = -0,413, p-value < 0,01). Accordingly, the more satisfied is the passenger; the lower is their willingness to complain, as measured by the specific items reflecting the complaining attitude.

As for the direct effect of complaints on passenger loyalty to the airport, the result was not consistent with the conceptual model. Although the estimate presented a negative sign that could suggest that passengers willing to complain are less likely to be loyal to the airport (which is reasonable), the research hypothesis H5 cannot be supported by the results (λ = -0,065, p-value = 0,205).

The last hypothesis is related to the positive effect of switching costs on passenger loyalty (H6). This direct effect was significant and reasonably strong (λ = 0,707, p-value < 0,01), which suggests the importance of passenger perception of switching costs for changing airports within the particular multi-airport region.

In Table 63, the standardized estimates and the statistical significance of the direct, indirect, and total effects on the perceived value, airport service quality, passenger satisfaction, complaints, and passenger loyalty are summarized.

Table 63. The direct, indirect and total effects.

Construct	Effects	VAL	ASQ	SAT	COP	LOY
Expectation (EXP)	DE	0,043	0,141	-0,001	-	-
	P	n.s.	**	n.s.	-	-
	IE	0,091	-	0,132	-0,054	0,044
	P	**	-	***	**	**
	TE	0,134	0,141	0,131	-0,054	0,044
	P	**	**	**	**	**
Perceived value (VAL)	DE	-	-	0,450	-	-
	P	-	-	***	-	-
	IE	-	-	-	-0,186	0,153
	P	-	-	-	***	***
	TE	-	-	0,450	-0,186	0,153
	P	-	-	***	***	***
ASQ	DE	0,642	-	0,506	-	-
	P	***	-	***	-	-
	IE	-	-	0,289	-0,328	0,271
	P	-	-	***	***	***
	TE	0,642	-	0,795	-0,328	0,271
	P	***	-	***	***	***
Satisfaction (SAT)	DE	-	-	-	-0,413	0,313
	P	-	-	-	***	***
	IE	-	-	-	-	0,027
	p	-	-	-	-	n.s.
	TE	-	-	-	-	0,340
	p	-	-	-	-	***
Complaints (COP)	DE	-	-	-	-	-0,065
	P	-	-	-	-	n.s.
	IE	-	-	-	-	-
	P	-	-	-	-	-
	TE	-	-	-	-	-
	P	-	-	-	-	-
Switching costs (SWC)	DE	-	-	-	-	0,707
	P	-	-	-	-	***
	IE	-	-	-	-	-
	P	-	-	-	-	-
	TE	-	-	-	-	0,707
	P	-	-	-	-	***

Notes:
a. Statistical significance calculated based on the bootstrapping method;
b. DE – standardized direct effects;
c. IE – standardized indirect effects;
d. TE – standardized total effects;
e. *** – significant at 0,01 level;
f. ** – significant at 0,05 level;
g. n.s – non-significant effect.

In structural equation modeling, the analysis of the total effects is particularly important, as they provide comprehensive information on the relationships hypothesized in the model (Byrne, 2010). The total effects of service quality on passenger satisfaction is noteworthy, which emphasizes its relevance for achieving excellence in service performance. It is also worth mentioning the significant indirect effects of service quality and perceived value on the loyalty attitude, in addition to the direct effects of satisfaction on the passenger loyalty. Furthermore, it is to be noted that the direct effect of the switching costs on passenger loyalty is more than twice the direct effect of satisfaction.

Overall, these findings are supportive of the importance of service quality and passenger satisfaction for the airport business. Notwithstanding, they also provide evidence on the relevance of the context-specific competitive dynamics for defining passenger loyalty to an airport.

7.4. DISCUSSION ON THE RESULTS

In this section, further discussion on the results is provided. The antecedents and consequences of passenger satisfaction with the airport, including the effects of switching costs, are analyzed in view of the theoretical background and the specific airport context. The relationships between the constructs are discussed according to the order they appeared in the description of the model.

7.4.1. The passenger expectation and its relationships

According to the expectation-disconfirmation paradigm supporting the original ACSI model, the passenger expectation regarding the airport was expected to impact positively on the perceived service quality, perceived value, and passenger level of satisfaction (Oliver, 2015; Anderson and Fornell, 2000b; Fornell *et al.*, 1996). These effects were expected to be both direct and mediated by the service quality and perceived value constructs.

Based on the results, passenger expectation presented only a marginal effect for explaining their perception of airport service quality. Actually, this effect was quite small, based on the standardized regression weight of 0,141 (p-value = 0,021). The direct effects on the perceived value and satisfaction presented no statistical significance, indicating that the level of expectation did not directly explain passenger perception of value and their satisfaction with the airport. The indirect effect on perceived value mediated by service quality was significant but small. As regards the indirect effects on satisfaction, there were also just small significant effects. Similar findings are valid for the subsequent indirect effects as hypothesized in the model.

Customer satisfaction literature suggests that customers may use different types of expectations when forming opinions about a service anticipated performance (Oliver, 2015; Wilson *et al.*, 2012; Teas, 1993). Usually, customer expectation comprises the concepts of "will expectation", "should expectation" and "ideal expectation". In this present study, based on the measurement items used, passenger expectation as regards the airport reflects the first concept (i.e. passengers are expecting efficient and reliable services and a satisfactory level of comfort at the airport). However, even limited to this nature of expectation, passenger perception of value and satisfaction were not related to the passenger expectation.

Previous studies in the air transport context suggested that passenger characteristics may drive to significant differences in passenger expectation about the service (Anderson *et al*., 2008; Fodness and Murray, 2007; Bogicevic *et al.*, 2013; Pakdil and Aydın, 2007). Accordingly, frequent flyers are usually more demanding comparing to less experienced passengers, for instance (Bezerra and Gomes, 2015; Park, 2010; Carlsson and Löfgren, 2006). The difference in expectation has also been associated with the trip purpose. In this sense, business passengers are more likely to present a higher level of expectation, particularly with service efficiency, reliability and comfort (Park *et al*., 2004; Tam *et al*., 2008; Pakdil and Aydın, 2007; Park, 2010). It is also noteworthy that once the airport service comprises a set of processes and different infrastructure elements, it is reasonably expected that passengers may have distinct expectations at different stages of the airport service chain (Chen and Chang, 2005; Zografos and Madas, 2006).

Based on the literature reviewed, it was evident a lack of research on airport service performance using the SEM approach. In fact, only a few studies were found to simultaneously estimate antecedents and consequences of passenger satisfaction in the airport context. The effects of passenger expectations have been especially overlooked. In this respect, the present study is a relevant contribution to the discussion on passenger expectations about the airport.

Other studies using SEM but focusing on the airline business might be of interest for this present discussion. In Park *et al*. (2004), passenger expectation was found to present significant positive effect on service quality, but significant negative effects on value and passenger satisfaction. In other study aiming to investigate relationships between expectation, service quality, perceived value, satisfaction, and behavioral intentions of airline passengers, Chen (2008) obtained results similar to this present Thesis. The effects of passenger expectation on both perceived value and overall satisfaction were non-significant for his sample of passengers.

Another relevant point for this discussion is that passenger expectation in this study can be quite realistic, based on the passengers' previous experience. From this angle, once the sample presented a noteworthy proportion of frequent flyers and passenger used to the airport, it is possible that past experience might have influenced the passengers anticipated idea about the airport service quality (Pantouvakis and Lymperopoulos, 2008). In this context, since passenger may be used to the airport, the nature of their expectation can be realistic and thus present no significant influence on their attitude towards the airport (Oliver, 2015).

Overall, the findings related to passenger expectation may be related to the different passenger characteristics and their interpretations about the expected service. In this sense, understanding the nature of passenger expectations is essential. There should be the case to explore the comparison operators that effectively supports passenger judgment about satisfaction with an airport, as proposed by Oliver´s framework (Oliver, 2015).

Regarding airport management, a lack of understanding or misunderstanding passenger expectations can lead to serious problems regarding resource allocation decisions (Chen and Chang, 2005; Fodness and Murray, 2007). Therefore, in order to efficiently provide the level of service their customers actually want, airport managers need to understand passenger expectations. In this respect, more research is necessary, including the nature of passenger expectations and their relationships with passenger attitudes.

7.4.2. The ASQ model and its relationships

Based on the results, the perceived service quality presented significant and reasonably strong positive effects both on passenger perception of value and satisfaction with the airport. Service quality alone explained about 42% of the variance in the perceived value (Appendix XII). Regarding the effects on passenger satisfaction, the standardized total effects were the highest in the model. Moreover, its indirect effects were significant for predicting passenger complaining attitude and loyalty, as expected.

Measuring service quality based on the customer perspective has been subject to intense debate, including the use of generic scales *versus* more context-specific approaches (Parasuraman *et al*., 1994; Seth *et al*., 2005; Brady *et al*., 2002; George *et al*., 2013; Adil *et al*., 2013; Pantouvakis, 2010). In this study, the proposed ASQ model consisting of typical measures within the airport industry presented good construct validity and reliability within the full measurement model for the antecedents and consequences of passenger satisfaction with the airport. Moreover, this ASQ model successfully operationalized passenger perception of service quality and its relationships with the other constructs in the passenger satisfaction model, which suggests nomological validity. Therefore, the findings of this study are supportive of the suitability of this more context-specific approach for airport settings.

Previous research on the effects of service quality on the passenger attitudes have considered different approaches to measuring service quality, including *ad hoc* measurement models. In this respect, the proposed ASQ model is a significant contribution to the research and practice on ASQ measurement, as it was submitted to validity and reliability assessment, including cross-validation.

As discussed in chapter 6, in using this higher-order ASQ model, it is possible to examine the extent to which different service quality factors are reflecting passenger experience. Based on the results for SBSP, the airport environment and convenience facilities presented similar standardized factor loadings, which suggest a similar weight in the passenger perception of quality. The airport processes and mobility were comparatively less relevant for the overall perception of quality (Appendix XII). These more particular findings could be useful for airport managers and researchers interested in examining airport service performance centered on the customer perspective.

The indirect effects of passenger expectation on the service quality factors provide a useful interpretation of the results related to the ASQ model. These effects can be obtained by the matrix of standardized indirect effects provided by the AMOS software (Appendix XIII). Accordingly, convenience and environment were the ASQ factors most influenced by passenger expectation. This specific finding is interesting for a more detailed analysis of ASQ.

Overall, the findings associated with the ASQ construct stress the need for airports to deliver high-quality services to their passengers. Actually, not only passengers can perceive different aspects of the airport service performance, as demonstrated by the distinct ASQ factors, but also the effects of service quality on the perceived value, satisfaction and post-consumption behavior are determinant. In the particular context of airport competition in a multi-airport region, as the case of this study, it is noteworthy that service quality still influences passenger post-consumption attitudes concerning the airport, even when the effects of switching costs were considered in the model.

7.4.3. The perceived value and its relationships

The perceived value presented a significant and direct positive effect on the passenger satisfaction with the airport. The perception of value also mediated the effects of expectation and service quality on passenger satisfaction. Furthermore, its indirect effects on loyalty and complaining attitude were significant, albeit not strong.

As long as there was sufficient discriminant validity for the constructs perceived value and service quality, these findings are suggestive of the suitability of this modified ACSI model in explaining passenger satisfaction in the context of airports. In this specific case, the model comprised different aspects of passenger perception of the airport as a "product", namely the service performance and the value given the prices.

In general terms, the perceived value can be defined as the trade-off between perceived benefits and perceived costs related to the airport service (Ravald and Grönroos, 1996; Zauner *et al.*, 2015). Accordingly, once the measurement items reflecting the construct in the final model are mostly associated with operational aspects of the airport service, including service efficiency and comfort, the findings emphasize the relevance of these core elements for the passenger´s perception of value.

As already discussed, the problem of understanding perceived value is very particular within the airport context. Regarding the core airport processes (i.e. check-in and security screening), passengers are usually expected to initiate and perform a part of the required activities related to these processes. In this sense, passengers are co-creators of the value (Grönroos and Voima, 2013).

Notwithstanding, passenger perception of value concerning these activities is not expected to occur directly. Actually, passengers are likely to see none significant value in these services (Wattanacharoensil *et al*., 2016). Thus, it is reasonable to assume that, if passengers have a choice, they would prefer skipping these airport processes (Gkritza *et al*., 2006; Sindhav *et al*. *et al.*, 2006; Kalakou and Moura, 2015). In this context, it may be suggested that perception of value seems to be essentially related to the reliability and perceived fairness regarding these processes.

Concerning the other aspects considered in this construct (i.e. the overall perception of comfort and the overall experience provided by convenience facilities and ancillary services), their value is expected to be directly perceived. In fact, recent research suggested that passenger experience in the airport are changing and they may desire that airport experience include work-related activities (in the case of business passengers) and a more extensive set of discretionary and leisure activities (Wattanacharoensil *et al.*, 2016; Bogicevic *et al.*, 2013; Popovic *et al*., 2010; Breure and Van Meel, 2003).

This current perspective for the airport experience is usually attributed to the introduction of more stringent security measures (Gkritza *et al*., 2006; Kalakou and Moura, 2015), which points to the need for arriving at the airport with more antecedence. Notwithstanding, it is also associated with airports´ efforts to present themselves as pleasant service environments, with additional value to the passenger (Halpern and Graham, 2013; Breure and Van Meel, 2003; Castro and Lohmann, 2014).

Moreover, considering the need for improving non-aeronautical revenues, it is necessary to dedicate attention to the perception of value regarding the commercial activities. Within this particular airport case, it is to be noted that measurement items related to commercial aspects have presented insufficient item reliability. In this context, it seems that more research is needed to improve the understanding on the effects of perceived value in the airport services context.

As for previous research, there is only a few studies covering the relationships among the perception of value and passenger attitudes. Park and Jung (2011) examined the effects of service quality on perceived value and passenger satisfaction. Positive effects were identified. More recently, Chen *et al*. (2015) used perceived value as dependent variable in a cause-and-effect model of passenger satisfaction. Based on their results, passenger satisfaction explained the perception of value and innovation presented significant moderating effects on perceived value. To be noted that both studies used *ad hoc* conceptual models, hence no direct comparison with our findings is possible.

Regardless of the implicit relevance of passenger perception of value for airports driven by a commercial perspective, it seems that there is a significant gap in the research literature. In this context, the findings of this Thesis provide empirical evidence on the relevance of this particular issue for airport management.

7.4.4. The passenger satisfaction and its effects on complaints and loyalty

As expected, the level of satisfaction explained passenger attitude of complaining and loyalty towards the airport. Based on the results, the more satisfied is the passenger, less likely they are to complain and higher their intention to use the airport for future flights departing from São Paulo. However, the indirect effect of satisfaction on passenger loyalty mediated by the construct complaints was not significant. These findings support the relevance of passenger satisfaction for passenger post-consumption attitudes, as predicted in the services-related literature (Johnson. *et al.*, 2001; Bodet, 2008; Oliver, 2015; Wilson *et al.*, 2012).

In the current airport business environment, understanding passenger satisfaction has become ever more important. Particularly, research literature has emphasized the effects of service attributes and passenger characteristics on the level of passenger satisfaction with the airport (Eboli and Mazzulla, 2009; Bezerra and Gomes, 2015; Jen, 2013; Ali *et al*., 2016; Bogicevic *et al.*, 2013; Zidarova and Zografos, 2011). The effects of satisfaction on the passenger attitude has also received attention, with studies focusing on loyalty, complaints, and customer value (Nesset and Helgesen, 2014; Moon *et al*., 2016; Chen *et al*., 2015; Chang *et al.*, 2008; Park and Jung, 2011).

The findings from this Thesis are similar to a few previous studies using the SEM approach for analyzing the passenger satisfaction and its related constructs. Concerning the negative effect of passenger satisfaction on the complaining attitude, the finding is consistent with Chang *et al*. (2008). To be noted that since the complaining attitude is not always materialized for the organization (Wilson *et al.*, 2012), the most of the passengers is not willing to voice their dissatisfaction. In this context, this present Thesis used a comprehensive approach to measure passenger complaining attitude, with focus on their declared intentions (Knox and Van Oest, 2014; Homburg and Fürst, 2005).

The positive effect of satisfaction on the passenger loyalty has also been evident in Nesset and Hegelsen (2014) and Park and Jung (2011). Both studies have measured passenger loyalty including both reuse intention and word-of-mouth measures, according to a more comprehensive approach to the loyalty construct[42]. However, the indirect effect of satisfaction on loyalty mediated by complaints was not considered in any of these previous studies.

As regards the intention to complain about the airport, its effect was not significant for explaining passenger loyalty. In the study´s context, this finding suggests that even passengers willing to complain about the airport service may be likely to choose this same airport for their next flights. It is reasonable to assume that complaints may not necessarily impact on customer loyalty when there is an effective service recovery system (Knox and Van Oest, 2014; Homburg and Fürst, 2005). Nevertheless, since the construct complaints was measured only with attitudinal measures, it does not seem to be the case for Congonhas Airport.

[42] While these studies retained the variables reflecting the word-of-mouth attitude, in this present Thesis the equivalent variable was excluded from the measurement model due to its low within-scale convergence and individual reliability.

Based on the background provided by the services-related literature and knowledge on the particular airport sector, justification for this particular finding might be associated with three main issues: i. the nature of passenger expectation as regards the airport service, ii. the offer of flights, and iii. the catchment area characteristics, which includes the effects of switching costs.

In this present study, passenger expectation about the airport is mostly associated with the idea of minimum tolerable performance (Chen, 2008; Teas, 1993), as reflected in the measurement items used. Furthermore, as previously discussed, the effects of expectation were only marginal in the model. In this respect, it seems that even passengers willing to complain about the service are not likely to decide for changing airports based solely on this previous experience.

Concerning the offer of flights, passenger loyalty to the airport seems to be in some extent associated with the perception of the air transport service as an airline-airport combination. Thus, reuse intention may be somewhat related to the offer of flight, including destination, frequency and prices. Actually, airport choice is influenced by several factors, including key determinants to which airport executives have little control over, such as access to the airport, offer of flights, and airfares (Ishii *et al*., 2009; Luca, 2012; Cho *et al*., 2015; Yang *et al*. 2014; Pels *et al*., 2003).

In this particular context, the characteristics of the multi-airport region (MAR) with influence in the catchment area competition are highly relevant for understanding passenger loyalty. Despite satisfaction with the airport was definitely important for passengers, it seems that their attitudes towards the airport-airline product are better explained with the inclusion of additional variables to reflect other determinants of airport choice.

Accordingly, based on the findings, some passengers willing to complain about the airport may not see changing airport as a convenient alternative. No matter how dissatisfied they could be, they would still maintain a relationship with the service provider to avoid switching costs (Jen *et al*., 2011; Jones *et al.*, 2007). In this context, it may be the case that passengers would prefer dealing with their feelings of dissatisfaction and including this experience in their future expectation about the airport. Concerning the particular characteristics of São Paulo MAR, the upcoming discussion on switching costs adds valuable information.

7.4.5. The switching costs and passenger loyalty to the airport

The last relationship considered is the direct effect of the switching costs for changing airports on the passenger loyalty. As expected, this effect was significant and reasonably strong. Indeed, its standardized effect was even greater than the effect of passenger satisfaction on loyalty. These findings suggest that departing passengers using Congonhas Airport perceive the existence of switching costs as a determinant factor for reusing the airport in their next domestic flight from São Paulo.

Nesset and Hegelsen (2014) also found a significant direct relationship between switching costs and loyalty in studying a Norwegian multi-airport region. However, in their study, the standardized direct effect of switching cost on loyalty was much smaller comparing with the effects of satisfaction with the airport.

Although passenger loyalty has been recognized as an important strategic issue within the airport sector, including the introduction of loyalty programs, there is still a lack of knowledge on the drivers of passenger loyalty towards the airport (Chen, 2008; Jen *et al*., 2011; Nesset and Helgesen, 2014). The literature on airport choice might once again be useful for discussing this present finding.

Several studies have debated about the passenger´s decision-making process regarding airport choice. Accordingly, a number of factors have been related to the passenger choice, such as access time, parking availability, service quality, airside operations, availability of ancillary services, airline availability (including low-cost carriers), baggage handling, airfares, security checks, and others. Notwithstanding, three primary factors have usually been treated as key airport choice determinants: i. the accessibility to the airport, ii. the offer of flights, and iii. the airfares (Pels *et al*., 2003; Ishii *et al*., 2009; Yang *et al*. 2014; Moreno and Muller, 2003; Tam *et al*., 2008; Luca, 2012). For the purpose of further discussing the findings, these three determinants are considered for the São Paulo MAR.

The availability and quality of the access alternatives to both airports in São Paulo have been considered in previous studies focused on airport choice. Moreno and Muller (2003) found that accessibility was determinant for airport choice in this specific MAR. Congonhas Airport (SBSP) is located close to the São Paulo city center, which includes the largest financial area in the country. Passengers usually arrive at SBSP airport by car, taxis or regular buses lines (SAC, 2016b). At the time of the survey research, there was no connection to the metro system. Guarulhos Airport (SBGR), the other main airport serving the city, is approximately 25 kilometers from the city center. The availability of access alternatives to the airport are basically the same. However, the regular buses lines are intercity lines (since SBGR airport is actually located in the nearby town Guarulhos). Traffic in São Paulo is usually hard, and passengers are always subjected to unexpected delays (Rolnik and Klintowitz, 2011).

Regular surveys carried out under the coordination of Brazilian government include questions related to the access alternative used for arriving at the airport and the passenger evaluation about the availability of public transportation to the airport. The official reports have consistently shown that public transportation is a common alternative for the surveyed passengers. However, private cars and taxis have been the most frequently used alternatives to access these airports (SAC, 2014, 2016b, 2015b).

Based on this discussion on the airport accessibility, the finding that departing passengers in SBSP are sensitive to the switching costs for changing airports may be associated in large extent with these specific characteristics of the catchment area. Thus, this finding seems to be coherent with the specific MAR´s context and previous studies.

Concerning the offer of flights, the airlines with the largest share in the Brazilian domestic market usually operate at both airports in the MAR. Also, the densest domestic routes are offered for both airports (ANAC, 2015). However, it is to be noted that the characteristics of the offer are significantly different in some aspects of particular interest for this discussion.

At the time of this research, Guarulhos Airport had a more extensive offer of domestic destinations, including direct flights to farther destinations, when comparing to Congonhas Airport. In addition to the differences concerning airport capacity, there was operational restrictions to airport opening hours and aircraft performance in SBSP, which might be determinant for this difference in the offer of flights. Furthermore, specific regulation prohibited longer routes from/to SBSP and connection flights (ANAC, 2007). In this context, SBSP has developed a vocation for shorter domestic and regional routes, some of those with significant density, and direct flights between São Paulo and other major Brazilian cities in the Southeast, South, and Central-West regions (ANAC, 2015).

Because of the better accessibility and reduced offer of flights, Congonhas has usually presented higher average airfares, comparing to Guarulhos. Ueda (2012) has identified that tickets for flights departing from SBSP were on average 5% higher than flights departing from SBGR. Another factor that can be related to this characteristic is that air travel demand presents a significant percentage of business passengers, whose are usually less sensitive to the prices and more concerned about their time (Park *et al*., 2004; Breure and Van Meel, 2003).

Overall, this discussion on the airport accessibility, offer of flights and airfares provided a reasonable explanation for the effect of switching costs on loyalty. Actually, it seems that the particular MAR context and the characteristics of the demand are determinant for passenger perceptions of the existence of switching costs for changing SBSP for SBGR. In this regard, it is noteworthy that some of the key determinants of passenger loyalty, particularly in the context of competition for catchment area, are not under the control of the airport manager.

Given the lack of previous studies covering the relationships between passenger satisfaction and other determinants of passenger loyalty in the airport context, the findings of this Thesis are innovative in the sense they explained the effects of passenger satisfaction simultaneously on the complaining attitude and loyalty, while accounting for the effects of the perceived switching costs on loyalty.

7.5. CONCLUDING REMARKS

Service quality and customer satisfaction have been subject to increasing interest within the airport industry over recent years. In the current airport business environment, understanding passenger perception of service quality and their attitudes towards the airport have become ever more important. In this context, up-to-date and reliable information on the passenger perceptions and attitudes can provide support for managerial decisions concerning the service performance.

As presented in the literature review chapter, airport service quality and passenger satisfaction has been studied according to different methodological approaches. Multicriteria decision analysis (MCDA) and econometrics methods have appeared as the most frequently used, while studies using structural equation modeling (SEM) only more recently emerged as a promissory approach.

In this study, the relationships between antecedents and consequences of passenger satisfaction with the airport were examined using a modified ACSI model. Given the particularities of the airport business, the passenger perception of service quality was measured with the ASQ model developed in this Thesis. Moreover, the modified ACSI model comprised the effects of the passenger perception of switching costs for changing airports within the São Paulo MAR.

Consistent with the two-step approach for SEM, a model for the relationships between passenger expectation, perceived value, perceived service quality, satisfaction, complaints, loyalty, and switching costs was analyzed. Based on the extensive literature reviewed, this is among the few research efforts with such a comprehensive approach to the problem of passenger satisfaction in the airport context.

The analysis of the structural model provided valuable information on these relationships. Some particularly relevant findings are stressed:

- Passenger expectation did not influence their perception of value and satisfaction. Furthermore, even its effects on perceived service quality were quite small. In this regard, more research on the nature of passenger expectation about the airport is needed;
- The ASQ model developed in this Thesis presented construct validity and reliability within the full measurement model for the antecedents and consequences of passenger satisfaction. Moreover, it properly operationalized the service quality construct within the structural model, which suggests nomological validity. These findings are evidence of the ASQ model suitability for measuring service quality in the airport context, instead of generic approaches;
- While passenger satisfaction presented a significant and reasonably strong effect on passenger loyalty, the effect of switching costs was noteworthy. Along with the non-significant effect of complaints on loyalty, this effect of switching costs emphasizes the importance of the competitive dynamics for airport management. This finding also stresses the relevance of examining the existence of market power in the airport context.
- Overall, the structural model presented sufficient explanatory power in predicting the hypothesized relationships, hence providing nomological validity for the underlying theory and construct operationalization.

Limitations must be highlighted. First, as Congonhas Airport was the single case study, some findings should be considered specific to the airport context. In view of this, a study on other major airports might have provided additional insights regarding the research objective. Specially, a comparative study with data of Guarulhos Airport would be relevant for understanding the effects of switching costs in the particular multi-airport region. Second, since the modifications applied to the ACSI model are context-based and innovative, some specific findings cannot be compared to other empirical researches in other service settings. Likewise, given the lack of previous similar studies in the airport industry, the results cannot be directly compared to other airports. Third, the moderate effects of switching costs on the satisfaction-loyalty relationship were not examined, as in the case of a Norwegian multi-airport region (Nesset and Hegelssen, 2014).

Considering the state-of-the-art of the literature related to airport performance, and particularly airport service quality, the findings of this research effort are valuable for understanding the effects of the airport service performance within a customer-oriented perspective for the airport business.

8. CONCLUSIONS

8.1. INTRODUCTION

Given the complexity of the current business environment, there is the need for obtaining up-to-date and accurate information on different aspects of an organization´s performance. Thus, a more comprehensive approach to performance measurement has been recognized as a critical factor for business effectiveness.

Within the theme of performance, this present thesis focused on the airport industry as an important but still under-researched area regarding performance measurement. As a consequence of trends in the air transport industry over recent decades, airports are no longer considered solely as huge facilities and public utilities, but complex service organizations not dependent on government support and comprising different processes, customers, and stakeholders (Gillen, 2011; Graham, 2014).

In this context, airports have been compelled to improve their performance in several aspects, including not only traditional operational performance dimensions, such as efficiency, service quality, and safety, but also other aspects related to a wider approach to airport effectiveness. Like any other service organization, what has become ever more important is the identification of key performance areas, their measurement, analysis, and extraction of relevant information regarding different facets of the airport business. Consequently, a broader perspective for measuring and analyzing airport performance is necessary.

In view of these considerations, this thesis concerns a broad perspective for measuring and analyzing airport performance, including the multidimensionality of the performance construct, the development of reliable measurement practices, and a customer-oriented approach. Based on the gaps identified in the literature, three research questions were stated as follows:

1) In view of the institutional and technological changes in the airport industry over recent decades, what are the relevant performance dimensions related to the airport business nowadays?
2) Given the importance of performance measurement for airports, what is the current profile of airport operators concerning performance-related practices?
3) Considering the increasing relevance of service quality for airports, how to integrate service quality measurement and passenger attitudes within the context of airport management?

These research questions were based on the extensive literature review undertaken. Accordingly, the need for a more comprehensive approach to airport performance and for integrating service quality measurement and passenger attitudes into airport management practices was emphasized.

The main research objective was to analyze airport performance from a multidimensional perspective, accounting for the multifaceted nature of performance and the interests of airport stakeholders. Given the state-of-the-art of the literature on performance measurement and the gaps identified in the airport-related research, the following specific objectives were pursued:

1) To identify the performance dimensions emphasized in the airport-related literature;
2) To examine performance measurement practices at Brazilian airports, in order to identify the current profile of airport executives concerning performance measurement;
3) To develop a measurement model of airport service quality, accounting for the multifaceted nature of the service quality construct;
4) To examine the relationships between passenger perceptions of airport

service quality and passenger attitudes towards the airport.

In view of the comprehensive approach to the research questions and research objectives, a Systematic Literature Review (SLR) study and three empirical studies were undertaken.

Based on a deductive approach, three main theoretical hypotheses were considered. First, airport performance is a multifaceted construct with different dimensions, and airport executives are not likely to give the same treatment to all these dimensions. Second, perceived service quality can be explained and measured with a multidimensional approach. Third, the relationships between the antecedents and consequences of passenger satisfaction with the airport can be explained by a cause-and-effect model. In addition, other more specific research hypotheses were presented in the particular studies, when applicable.

In the next section, the overall findings of this thesis are highlighted and discussed. The rest of the chapter comprises the main contributions, notes on research limitations, discussion on a future research agenda, and some final considerations.

8.2. KEY FINDINGS AND DISCUSSION

This section summarizes the key outcomes of this thesis and highlights the main findings in view of the research questions, theoretical hypotheses and research objectives. These findings were examined in detail in particular chapters, including further discussion on the results in view of the research literature.

Given the lack of systematized knowledge on airport performance measurement, an SLR study was undertaken to respond to the first research question, related to the identification of the main performance dimensions for the airport business. This SLR provided a comprehensive overview of the literature on airport performance, as reported in section 3.3. Moreover, grounded on the state-of-the-art of the literature and characterization of the airport sector, a framework for the performance dimensions related to the airport business was proposed and validated by experts. This framework provides a comprehensive perspective for airport performance measurement, beyond the traditional idea of key performance areas or functional activities. Nine performance dimensions were considered according to two domains of performance. The operational domain relates the outcomes of the airport´s internal activities and capabilities that may be perceived by the external stakeholders. The organizational domain is associated with an extended concept of airport effectiveness. These outcomes of the SLR are associated with the first research objective.

Afterward, a set of performance measures derived from the airport literature and representative of these performance dimensions was submitted to a sample of Brazilian airport executives to examine their current profile concerning measurement practices. This survey constitutes the empirical study 1, which is related to the second research question and the second research objective. The findings are representative of the measurement practices in the Brazilian context and suggested a focus on operational aspects of the airport business. Accordingly, airport executives seem to emphasize safety, economic-financial, and service quality measures. On the other hand, it appears that they do not see competition and socio-environmental aspects as major concerns. Based on the results, performance measures related to the interests of shareholders, passengers, and regulators seem to be emphasized.

A regression model suggested that the executive´s perception of the relevance of a given measure for predicting performance is determinant for using this specific measure. Thus, airport executives might be willing to use relevant performance measures despite the costs associated with their acquisition. The gap analysis indicated that environmental and service quality issues are relevant for performance monitoring but there are difficulties in obtaining related data/information. Particularly regarding the service quality dimension, the use of surveys and measures of level of service presented a significant lack of information. Consistent with the increasing interest in airport service quality in the literature, executives participating in this study seem to be under pressure to obtain information on this important issue for the airport business.

Overall, the findings of the SLR and empirical study 1 support the first theoretical hypothesis. Hence, there is evidence that airport performance is a multifaceted construct with different dimensions and airport executives in Brazil do no treat these dimensions the same way.

Considering the increasing relevance of service quality for today's airports, the empirical study 2 aimed at developing a measurement model for airport service quality (ASQ), accounting for the multifaceted nature of the service quality construct and particularities of the airport service context. This study is associated with the third research question, related to the integration of service quality measurement within the context of airport management, and third research objective, related to the development of a measurement model for ASQ.

Consistent with a multidimensional approach, an ASQ model was built upon typical service quality measures within the airport industry and tested for its validity, reliability, and invariance across groups of passengers and airports. The results suggested that a higher-order ASQ model based on six factors might provide a meaningful multidimensional approach for measuring passenger perception of ASQ. The measurement items were explained for their respective factors; no matter the respondent was an international or domestic departing passenger. Moreover, the higher-order factor structure properly reflected the relationships among the service quality factors in both airport settings studied. Overall, the findings are supportive of the second theoretical hypothesis, meaning that perceived ASQ might be explained and measured with a multidimensional approach. Also, the findings of this study are supportive of the suitability of a context-specific approach for measuring service quality within the airport business, instead of generic approaches.

Finally, in the empirical study 3, the relationships between passenger perceptions of ASQ and their attitudes towards the airport are examined according to the theoretical background provided by the customer satisfaction literature. This third study also addressed the third research question. The fourth research objective was achieved by testing for the suitability of a model of the antecedents and consequences of passenger satisfaction with the airport.

In this third study, the relationships between the antecedents and consequences of passenger satisfaction were examined using a modified ACSI model. Given the particularities of the airport services, passenger perception of service quality was measured with the ASQ model developed in this thesis. Moreover, the modified ACSI model comprised the effects of the switching costs for changing airports within the São Paulo multi-airport region. Key findings comprise: i. evidence of a non-significant direct influence of passenger expectation in their perception of value and satisfaction; ii. suitability of the ASQ model developed in this thesis within the model of the antecedents and consequences of passenger satisfaction; and iii. noteworthy effects of switching costs on passenger loyalty. All together, these findings are supportive of the third theoretical hypothesis, with evidence that relationships between antecedents and consequences of passenger satisfaction with the airport can be explained by a cause-and-effect model.

8.3. RESEARCH AND PRACTICAL IMPLICATIONS

Overall, the findings of this thesis are a relevant contribution for researchers and practitioners interested in a more comprehensive approach to performance measurement within the airport context, particularly concerning the multidimensionality of performance, service quality measurement, and the analysis of passenger attitudes. Furthermore, the findings are also valuable for discussing the generalizability of some assumptions derived from the business literature.

Previous studies have attempted to shed light on different aspects of airport performance. Notwithstanding, this thesis has four main contributions. The first contribution is related to performance measurement practices. In this respect, the proposed framework of the performance dimensions may be considered an improvement in the research and practice of performance measurement within the airport context, particularly for its broad approach to performance, covering the interest of different stakeholders. Concerning this framework, the results of the study on performance measurement practices support its suitability for practical purposes. Another significant outcome is related to the methodological approach used in the study on measurement practices. This approach might be useful for a specific airport diagnosis, as well as for benchmarking airports within the same airport operator or network. Since airports are open dynamic systems operating in a constantly changing environment, insights gained from this research may contribute to the understanding of the role and impact of performance measurement practices according to the airport executives´ perspective.

Regarding the second main contribution, given the increasing interest in service quality, this thesis contributes to the long-running debate on the use of generic measurement scales *versus* context-specific survey instruments. In the case of airports, it seems that generic approaches might not cover some specific characteristics of the service provision and passenger-airport interaction. In this context, the proposed ASQ model comprises relevant issues related to the passenger perception of service quality.

Furthermore, changing ASQ analysis from the service-attribute level to a multidimensional approach implies assuring the validity and reliability of the measurement instrument used. However, although ASQ measurement practices are largely usual within the airport industry, little attention has been given to validity and reliability issues. In this respect, the ASQ model may be considered a suitable approach to ASQ measurement. Overall, this research effort is a piece of contribution to the research on ASQ and stresses the need for reviewing current practices for measuring and analyzing service quality in the airport context.

The third main contribution is related to the relationships between service quality and passenger attitudes towards the airport. Although this is a regular topic within the services literature, there is still a significant gap in the airport industry. Based on the extensive review of the literature, this work is among the few research efforts with such a comprehensive approach to passenger satisfaction with the airport. Furthermore, it seems to be one of the first research efforts to apply the rationale of the customer satisfaction index models in this particular service setting, suggesting the suitability of this approach to the airport context. Additionally, the inclusion of the effects of the switching costs on passenger loyalty provides relevant information to the debate on competition in multi-airport regions.

The fourth main contribution is related to the particular relevance of the Brazilian context. Brazil is one of the biggest air transport markets in the world and has been through substantial changes in the last decade, including airline deregulation and an in-progress airport privatization program (Vasigh *et al*., 2014). As a result, airport management practices in Brazil are also expected to be moving towards a more commercial approach, including the interest of different stakeholders, such as shareholders, passengers, other customers, and local communities. Moreover, there is an increasing emphasis on service quality, which is motivated not only by this commercial approach but also by recent regulation and government programs (SAC, 2014, 2015b, 2016b). Overall, the findings of this thesis are representative of this important moment in the Brazilian airport industry.

8.4. LIMITATIONS

Limitations of the studies undertaken in this thesis were previously discussed in particular chapters. Here, some general considerations are provided, and these specific limitations are indicated. Two general limitations are associated with the research methods. First, the use of questionnaires for data collection usually raises concerns, including the problem of common-method bias. In this respect, assessment procedures recommended by the literature were applied and the results suggested no significant concerns. Second, another common limitation in management research is associated with the use of cross-sectional data, since they are related to one specific historical context.

Concerning the systematic literature review undertaken, despite the rigor applied, the results should be considered in view of the research criteria adopted. Also, it also should be noted that the framework of airport performance dimensions was based only on the perspective of the external stakeholders. Nonetheless, the findings may be useful for researchers and practitioners interested in the subject, particularly for providing an overview of the state-of-the-art and implications for performance measurement. Additionally, the proposed framework may be useful for researchers and practitioners looking for a more comprehensive approach to performance measurement.

Regarding the study on the performance measurement practices, the findings must be taken in view of some limitations. First, only airports in Brazil were surveyed. Hence, the findings may be considered context-specific. Sample representativeness is also questionable due to non-response bias, with a minor participation of small airports. Moreover, despite being sufficient for the statistical techniques used, the relatively small sample size constrained further analyses of the data. Another limitation relates to the lack of information on the executives´ perceptions about the different stakeholders, which could provide relevant information on stakeholder salience as in previous studies (Mitchell *et al*., 1997; Neville *et al*., 2011; Weber and Marley, 2012).

Concerning the study on ASQ, since the perceived service quality is subjective and context dependent, the most specific results must be interpreted within the particular airports´ contexts and should not be generalized. Also, given the lack of previous similar studies in the airport industry, the findings cannot be compared to other airports. Another important issue is associated with the measurement items used, as they are restricted to those aspects of the passenger terminal directly or indirectly related to airport management, not covering the performance of other service providers and public agents.

Limitations associated with generalizability of the particular findings also apply to the study on the antecedents and consequences of passenger satisfaction. As only passenger data of Congonhas Airport was examined, some particular findings are specific to the airport. Moreover, since the modifications applied to the ACSI model are context-based and innovative in the airport industry, the results of the model estimation cannot be compared directly to other empirical research. Also, no multi-group analyses were carried out, which could provide insights on different groups of passengers. Another limitation is associated with the moderate effect of switching costs on the satisfaction-loyalty relationship. Even though this effect has been hypothesized in the literature, it was not examined in this thesis.

8.5. FUTURE RESEARCH

Given the state-of-the-art of the performance literature and the particularities of the airport services, the following issues can be highlighted as valuable future extensions of the research effort undertaken.

Concerning performance measurement practices, more research is required to systematize the knowledge on current performance measurement practices within the airport industry, including the problem of considering the stakeholders' needs and their contributions to the business.

Based on the literature reviewed, airport benchmarking is among the main topics for researchers. In recognition of the relevance of benchmarking for improving airport performance, empirical research should move from an efficiency-based perspective, which is the usual approach, towards the identification of organizational practices that might be related to superior performance.

Regarding the need for a comprehensive and reliable approach to airport performance, the airport performance framework proposed in this thesis should be tested for its practicality and suitability in other airport settings. Specially, it would be interesting to investigate whether the proposed framework provides an effective answer to approach the problem of assessing the overall performance of airports.

Given the relevant findings related to performance measurement practices in Brazilian airports, similar studies should be extended to other air transport markets. This line of research would result in comparative analyses and could support empirical studies on airport benchmarking. Also, it would contribute to improving the understanding of the organizational role and impact of performance measurement practices. Additionally, future research should include the interests of other airport stakeholders within empirical studies, which could provide relevant information on stakeholder analysis and guidance on the use of effective performance measurement systems.

As regards the increasing relevance of service quality within the airport context, further research on this subject is necessary, particularly on the multidimensional nature of ASQ. In addition, since the services provided by the airport, airlines, handling firms, and public agencies share a significant area of overlap, this interaction should be further investigated. In this respect, it is reasonable to assume that passenger perceptions of service quality would be sensitive to the performance of other service providers. Furthermore, although the set of measurement items used in this thesis has been widely used in the airport industry, an extensive investigation of passenger expectations and behavior could provide valuable insights on the service quality dimensions and item wording. These issues seem to be major challenges for the research on ASQ.

Concerning the ASQ model proposed in this thesis, as it presented sufficient validity and reliability for measuring service quality in both airports studied, it should be tested in other airport settings. Future developments of this model should consider broadening the approach to the service environment. For instance, the addition of variables related to the airport servicescape and convenience services/facilities would be valuable, as recent literature advocates that passengers could be looking for more pleasant experiences and non-aeronautical revenues are ever more important for airport sustainability (Wattanacharoensil *et al.*, 2016; Graham, 2014). In this context, another relevant issue is related to the particular effects of the airport environment on passenger purchasing behavior and post-consumption attitude. Still on the ASQ model, using this model in association with the CFA approach allow passenger data to be examined at different levels of analysis, including the use of individual ASQ scores, as previously discussed in chapter 6.

As for the antecedents and consequences of passenger satisfaction, since there are only a few studies on this particular issue, further investigation on the relationships associated with the passenger experience and attitudes seems to be necessary. In particular, the nature of passenger expectations and their effects on perceived value, service quality, and satisfaction should be emphasized. Moreover, some modifications could be applied to the model used in this thesis to capture the problem of airport choice and its effects on passenger attitudes. In addition to the perception of switching costs, airport choice could better explain passenger intention to use a given airport.

Moreover, there should be more research on the effects of switching costs on passenger attitudes towards an airport, mainly in the context of competition in multi-airport regions. In the specific case of the city of São Paulo, a comparative study with data of Guarulhos airport would provide relevant insights for understanding the effects of switching costs in this particular multi-airport region.

8.6. FINAL CONSIDERATIONS

This chapter highlighted the overall findings of this thesis, the research and practical implications, the research limitations, and considerations for a future research agenda related to airport performance. Overall, the findings are a relevant contribution for researchers and practitioners interested in a more comprehensive approach to performance measurement within the airport context, particularly in cases where the multidimensionality of performance and its practical implication for airport management are considered.

Concerning the more commercial approach to airport management, since non-aeronautical revenues become ever more important for airport sustainability, there is an increasing emphasis on service quality and passenger experience with the airport. In this sense, the integration of service quality measurement within the airport management context, including the relationships between perceived service quality and passenger attitude, is paramount. This particular interest in service quality and passenger attitudes is associated with the current perspective of airports as modern service organizations. In this respect, this thesis also contributes to ASQ measurement and knowledge on the antecedents and consequences of passenger satisfaction with the airport.

Since more and more airports worldwide are operated as business organizations, airport managers are challenged to effectively identify and meet their stakeholders´ needs. Particularly, properly measuring airport performance and understanding passenger attitudes towards the airport are major concerns. In this respect, airport performance must be measured according to a broader perspective in which measures should be derived from the stakeholders´ needs, more than just a prescriptive exercise.

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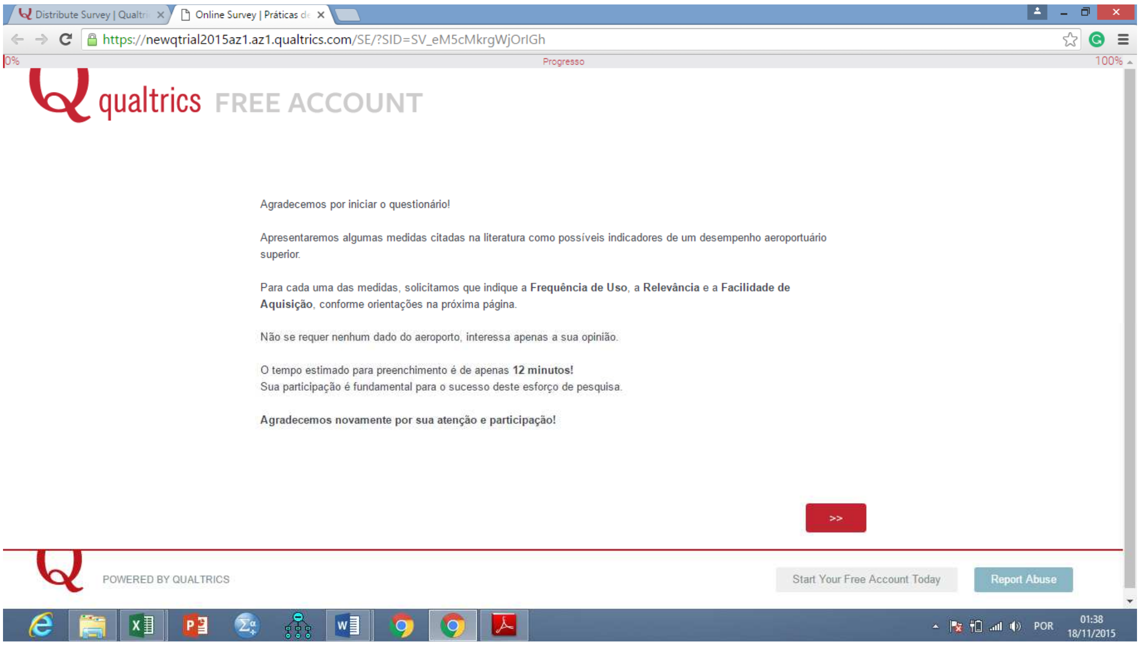
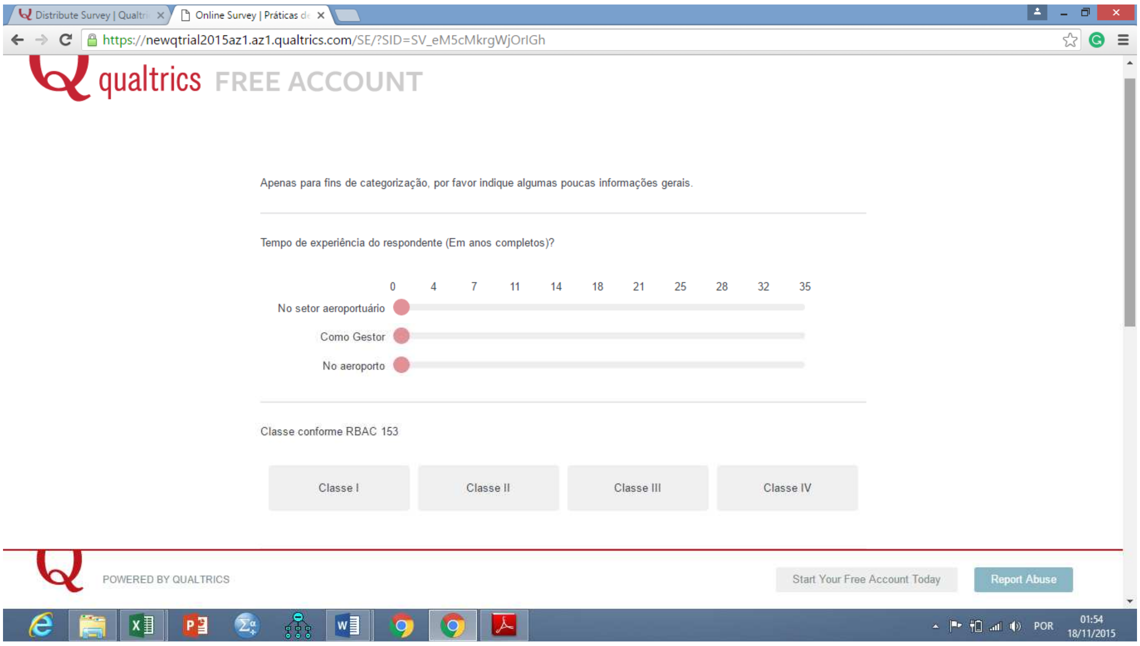
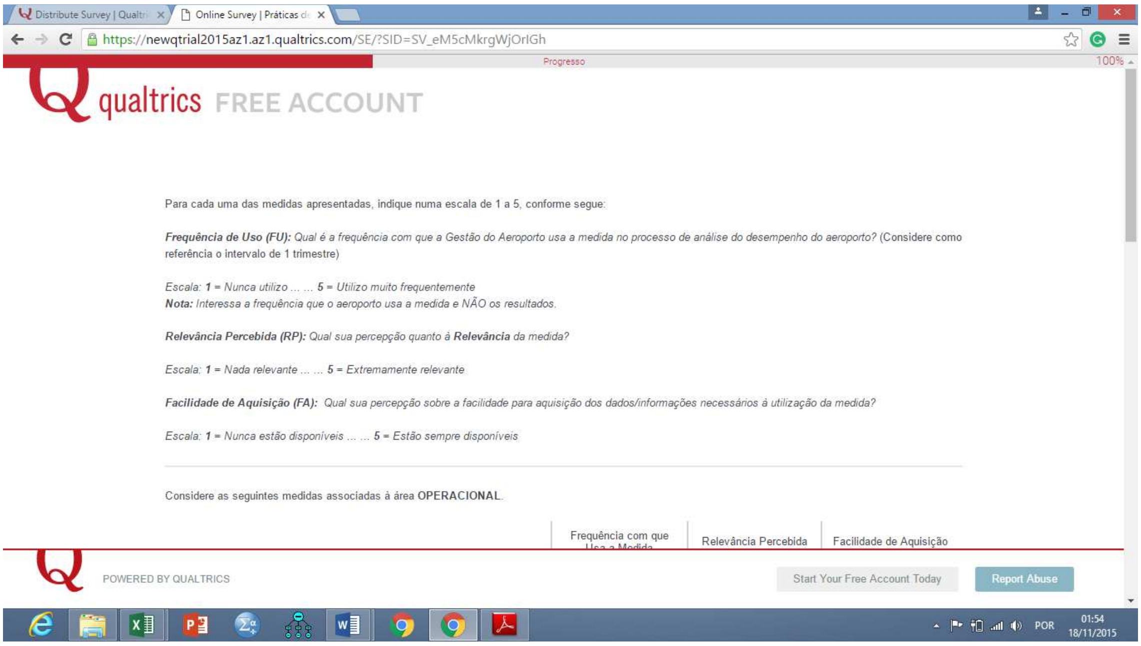
APPENDIXES

APPENDIX I – EXAMPLES OF THE RESEARCH INSTRUMENT – STUDY 1







Para cada uma das medidas apresentadas, indique numa escala de 1 a 5, conforme segue:

Frequência de Uso (FU): *Qual é a frequência com que a Gestão do Aeroporto usa a medida no processo de análise do desempenho do aeroporto?* (Considere como referência o intervalo de 1 trimestre)

Escala: ***1*** *= Nunca utilizo … …* ***5*** *= Utilizo muito frequentemente*
Nota: *Interessa a frequência que o aeroporto usa a medida e NÃO os resultados.*

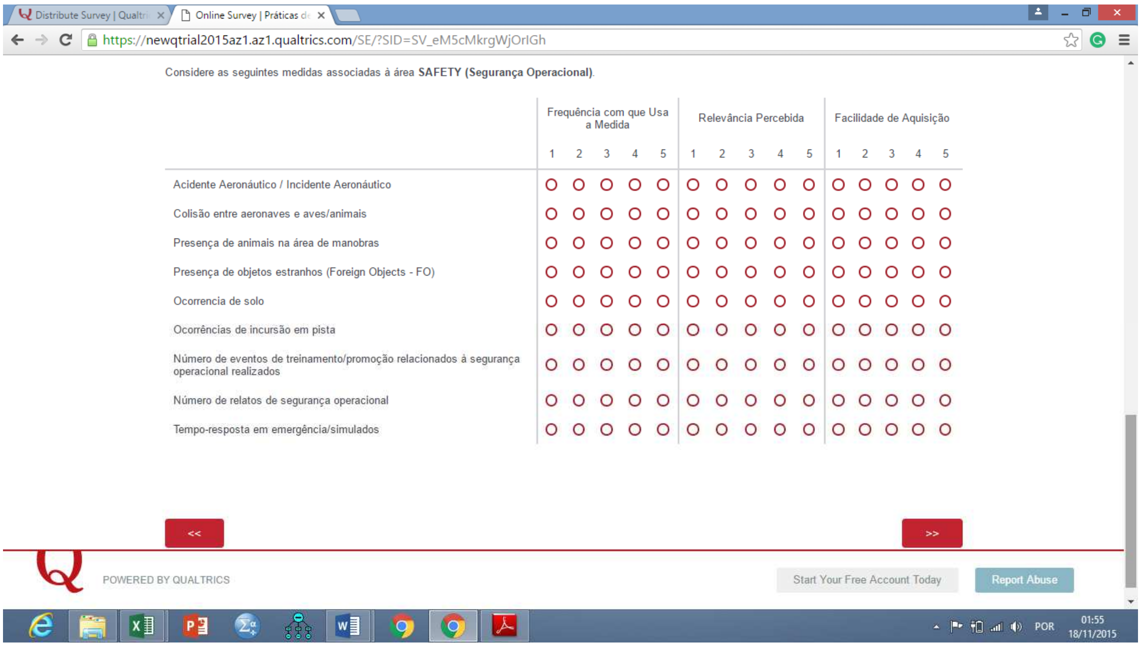
Relevância Percebida (RP): *Qual sua percepção quanto à* ***Relevância*** *da medida?*

Escala: ***1*** *= Nada relevante … …* ***5*** *= Extremamente relevante*

Facilidade de Aquisição (FA): *Qual sua percepção sobre a facilidade para aquisição dos dados/informações necessários à utilização da medida?*

Escala: ***1*** *= Nunca estão disponíveis … …* ***5*** *= Estão sempre disponíveis*

Considere as seguintes medidas associadas à área **OPERACIONAL**.



Considere as seguintes medidas associadas à área **SAFETY (Segurança Operacional)**.

	Frequência com que Usa a Medida					Relevância Percebida					Facilidade de Aquisição				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Acidente Aeronáutico / Incidente Aeronáutico															
Colisão entre aeronaves e aves/animais															
Presença de animais na área de manobras															
Presença de objetos estranhos (Foreign Objects - FO)															
Ocorrencia de solo															
Ocorrências de incursão em pista															
Número de eventos de treinamento/promoção relacionados à segurança operacional realizados															
Número de relatos de segurança operacional															
Tempo-resposta em emergência/simulados															

APPENDIX II – TEXT AND ITEMS IN THE QUESTIONNAIRE – STUDY 1

INTRODUÇÃO

Agradecemos por iniciar o questionário!
Apresentaremos algumas medidas citadas na literatura como possíveis indicadores de um desempenho aeroportuário superior.
Para cada uma das medidas, solicitamos que indique a Frequência de Uso, a Relevância e a Facilidade de Aquisição, conforme orientações na próxima página.
Não se requer nenhum dado do aeroporto, interessa apenas a sua opinião.
O tempo estimado para preenchimento é de apenas 12 minutos!
Sua participação é fundamental para o sucesso deste esforço de pesquisa.
Agradecemos novamente por sua atenção e participação!

BLOCO 1

Apenas para fins de categorização, por favor, indique algumas poucas informações gerais.

1. Tempo de experiência do respondente (Em anos completos)?
   No setor aeroportuário
   Como Gestor
   No aeroporto
2. Classe conforme RBAC 153
3. O aeroporto possui algum desses tipos de Certificação ou Aprovação?
   [ISO 9001; ISO14001; OSHAS; SGSO; MOPS; Nenhuma]
4. Realiza Benchmarking (Ou seja, compara os resultados do aeroporto com outro(s) aeroporto(s))? (SIM ou NÃO)
5. Número de empregados diretos?
   [Até 99 / de 100 até 199 / de 200 até 499 / de 500 até 999 / Mais de 1000]

BLOCO 2

Para cada uma das medidas apresentadas, indique numa escala de 1 a 5, conforme segue:

<u>Frequência de Uso (FU):</u> Qual é a frequência com que a Gestão do Aeroporto usa a medida no processo de análise do desempenho do aeroporto? (Considere como referência o intervalo de 1 trimestre)

Escala: 1 = Nunca utilizo ... ... 5 = Utilizo muito frequentemente

Nota: Interessa a frequência que o aeroporto usa a medida e NÃO os resultados.

<u>Relevância Percebida (RP):</u> Qual sua percepção quanto à Relevância da medida?

Escala: 1 = Nada relevante ... ... 5 = Extremamente relevante

<u>Facilidade de Aquisição (FA):</u> Qual sua percepção sobre a facilidade para aquisição dos dados/informações necessários para utilização da medida?

Escala: 1 = Nunca estão disponíveis ... ... 5 = Estão sempre disponíveis

BLOCO 2 (Continuação)

Considere as seguintes medidas associadas à área OPERACIONAL

- Movimentação de passageiros ou WLU por companhia aérea
- Movimentação de Passageiros ou WLU por número de rotas
- Movimentação de passageiros em hora pico
- Movimentação de passageiros por tipo de viajante (turismo, negócios, outros)
- Movimentação de aeronaves em hora pico
- Movimentação de aeronaves por tipo de voo (comercial/aviação geral; regular/não regular; civil/militares, etc)
- Ocorrências de atrasos de voos
- Total de tempo de pista(s) fechada(s) em dado período

Considere as seguintes medidas associadas à área SEGURANÇA DA AVIAÇÃO CIVIL (SECURITY).

- Ocorrências de eventos graves (furtos, roubos e outros)
- Ocorrências de eventos de tumultos no(s) terminal(is) de passageiros
- Ocorrências de falhas em procedimentos de segurança
- Ocorrências de ausência de crachás de identificação em áreas de segurança

Considere as seguintes medidas associadas à área SAFETY (Segurança Operacional).

- Acidente Aeronáutico / Incidente Aeronáutico
- Colisão entre aeronaves e aves/animais
- Presença de animais na área de manobras
- Presença de objetos estranhos (Foreign Objects FO)
- Ocorrências de solo
- Ocorrências de incursão em pista
- Número de eventos de treinamento/promoção relacionados à segurança operacional
- Número de relatos de segurança operacional
- Tempo-resposta em emergência/simulados

Considere as seguintes medidas associadas à área NÍVEL DE SERVIÇO.

- Nível de congestionamento em áreas de espera (checkin, inspeção de segurança, etc.)
- Capacidade do sistema de pistas
- Nível de congestionamento de aeronaves nos pátios
- Tempo de processamento nos pontos de controle no aeroporto (Checkin,
- Inspeção de Segurança, etc.)
- Tempo de espera nos pontos de controle (Checkin, Inspeção de Segurança, etc.)
- Tempo de uso do acostamento por veículo
- Tempo para restituição de bagagem

Considere as seguintes medidas associadas à área QUALIDADE DE SERVIÇO.

- Avaliação formal dos serviços e produtos adquiridos de terceiros

- Disponibilidade dos equipamentos e instalações (Elevadores, escadas rolantes, Sistema de processamento de bagagens, etc.)
- Medição da temperatura no(s) terminal(is)
- Queixas de clientes
- Pesquisa de satisfação das empresa aéreas
- Pesquisa de satisfação dos concessionários
- Pesquisa de satisfação dos passageiros
- Tempo de Atendimento à Passageiros com Necessidades de Assistência Especial (PNAE).

Considere as seguintes medidas associadas à área COMERCIAL.

- % de área comercial alugada
- Duração dos contratos de aluguel de área comercial
- % de área de armazenagem de carga ocupada
- % ocupação do estacionamento pago (Obs: se não possuir, não marcar)
- Vendas dos estabelecimentos comerciais
- Receitas com aluguel de áreas

Considere as seguintes medidas associadas à EFICIÊNCIA/PRODUTIVIDADE (os indicadores consideram a razão entre duas medidas).

- Movimentação de passageiros ou WLU / Área de terminal
- Movimentação de passageiros / Número de empregados
- Movimentação de passageirous ou WLU / Custos
- Movimentação de aeronaves / Área de pista de pouso e decolagem
- Movimentação de aeronaves / Número de empregados
- Receitas / Número de passageiros processados ou WLU

Considere as seguintes medidas associadas à área COMPETIÇÃO.

- Participação de mercado (Market Share) entre aeroportos
- Nível de competição entre empresas aéreas no aeroporto
- Número de destinos diretos disponíveis (mesmo que sazonais) no período de um ano
- Custo das empresas aéreas com taxas aeroportuárias no aeroporto

Considere as seguintes medidas associadas à área ECONÔMICO-FINANCEIRA.

- Custo dos serviços prestados
- Evolução das despesas
- Evolução das receitas
- Montante de investimento
- Montante da Dívida
- EBITDA (Earnings before interest, depreciation and amortization)
- Fluxo de caixa
- Lucro ou Prejuízo
- Margem operacional

- Índices de Rentabilidade (ROA, ROE, ROI, etc.)
- Taxa Interna de Retorno

Considere as seguintes medidas associadas à área AMBIENTAL.

- Redução no consumo de água
- Redução no consumo de energia elétrica
- Emissão de gases poluentes
- Emissão de ruído aeronáutico
- Número de residências ou população dentro de uma área de curva de rúido
- Volume de resíduos sólidos gerados
- % de resíduos enviados para reciclagem
- Ocorrências de derramamento de combustível/óleo ou outro fluído

Considere as seguintes medidas associadas à área SOCIAL.

- Número de empregos diretos/indiretos gerados
- % de colaboradores representantes de minorias (na força de trabalho)
- Número de citações no aeroporto pela mídia
- Número de reuniões com empresas/entidades com atuação no aeroporto
- Patrocínio a atividades esportivas, educacionais ou culturais
- Realização de atividades sociais voltadas para públicos da comunidade do entorno

APPENDIX III – LIST OF PERFORMANCE MEASURES – STUDY 1

Dim.	Code	Perfomance measure
EFFICIENCY	EFF1	Number of passengers or WLU/Terminal area
	EFF2	Number of passengers/Number of employees
	EFF3	Number of passengers or WLU/Costs
	EFF4	Number of aircraft/Runway area
	EFF5	Number of aircraft/Number of employees
	EFF6	Revenues/Number of passengers or WLU
ASQ	ASQ1	Formal inspection of purchased products and services
	ASQ2	Availability of equipment and facilities (elevators, moving stairs, baggage systems, etc.)
	ASQ3	Terminal temperature monitoring
	ASQ4	Customer complaints
	ASQ5	Airlines satisfaction surveys
	ASQ6	Concessionaires satisfaction surveys
	ASQ7	Passengers satisfaction surveys
	ASQ8	Processing time of passengers with reduced mobility (PRM)
ENVIRONMENTAL	ENV1	Water consumption reduction
	ENV2	Energy consumption reduction
	ENV3	Gaseous pollutant emission
	ENV4	Noise level
	ENV5	Number of houses or population within a certain noise contour
	ENV6	Solid waste generated
	ENV7	% of waste sent to recycling
	ENV8	Occurrence of spills
SOCIAL	SOC1	Direct/Indirect job generation
	SOC2	Minority representation in workforce
	SOC3	Number of citations by media
	SOC4	Number of meetings with airlines and other organizations involved in the airport activities
	SOC5	Sponsorship for sport, educational or cultural activities
	SOC6	Social activities for local communities
ECONOMIC-FINANCIAL	EFN1	Operating costs
	EFN2	Expenditures evolution
	EFN3	Revenues evolution
	EFN4	Investment
	EFN5	Debt
	EFN6	EBITDA (Earnings before interest, depreciation and amortization)
	EFN7	Cash flow
	EFN8	Profit/Loss
	EFN9	Operating margin
	EFN10	Profitability ratios (ROA, ROE, ROI, etc.)
	EFN11	Internal rate of return (IRR)
OPERATIONAL	OPE1	Number of passengers or WLU by airline
	OPE2	Number of passengers or WLU by number of routes
	OPE3	Number of passengers during peak hours
	OPE4	Number of passengers by type of traveler (tourism, business, others)
	OPE5	Number of aircraft during peak hours
	OPE6	Number of aircraft by type of flight (commercial/general aviation; regular/no regular; civil/military, etc.)
	OPE7	Flight delays
	OPE8	Total time of runway closed in a given period

LEVEL OF SERVICE	LOS1	Congestion level of waiting areas/lounges
	LOS2	Runway system capacity
	LOS3	Congestion level of aprons
	LOS4	Processing time at check points (check-in, security inspection, etc.)
	LOS5	Wait time at check points (Check-in, Security inspection, etc.)
	LOS6	Curb time per vehicle
	LOS7	Baggage delivery time
COMPETITION	COP1	Airport market share
	COP2	Airlines competition in the airport
	COP3	Number of destinations (non-stop) measured over the course of a year (including seasonal services)
	COP4	Airlines costs with airport fees
SAFETY	SAF1	Aeronautical accident/incident
	SAF2	Bird strike/Wildlife strike
	SAF3	Wildlife in maneuvering area
	SAF4	Foreign Objects (FO)
	SAF5	Ground operations occurrences
	SAF6	Runway incursion occurrences
	SAF7	Number of safety training/promotion events
	SAF8	Number of safety reports
	SAF9	Emergency response time (real events and simulations)
SECURITY	SEC1	Occurrence of serious events at the airport (theft, robbery, others)
	SEC2	Occurrence of hysteria events inside terminal
	SEC3	Number of security procedures breaches
	SEC4	Number of security badges breaches
COMMERCIAL	COM1	% commercial area leased
	COM2	Duration of lease
	COM3	% cargo space leased
	COM4	Parking occupation (Note: if existing)
	COM5	Retail sales
	COM6	Concessions revenues

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Secretaria de Aviação Civil da Presidência da República
A/C Senhor Nelson Edmundo Forte Fernandes de Negreiros Deodato Filho
Secretário de Aeroportos
Edifício Parque Cidade Corporate
SCS – Quadra 9 – Lote C
Torre C – 5° andar
Brasília – DF / Brasil
CEP: 70.308-200

Coimbra, 3 de dezembro de 2013

Exm° Senhor Secretário:

O estudante de doutoramento em Gestão de Empresas da Faculdade de Economia da Universidade de Coimbra, Dr. George Christian Linhares Bezerra, Passaporte n° SB034672, emitido pelo Ministério das Relações Exteriores Brasileiro, está neste momento em fase de preparação da sua tese de doutoramento, subordinada ao tema "Análise Multidimensional do Desempenho Aeroportuário". O Dr George Linhares Bezerra pediu-me apoio para a sua solicitação de acesso a dados dependentes da Secretaria que V. Exª superiormente dirige. Informo que esta Direção é favorável ao pedido do estudante, no pressuposto de que, sendo possível a sua disponibilização, serão seguidos os melhores procedimentos académicos no uso dos dados, ficando o próprio como responsável pela posse dos dados e por zelar pelos requisitos de confidencialidade adequados.

Os dados de que o Dr George Linhares Bezerra necessita são os referidos pelo processo administrativo registrado sob n° 00055.001318/2012-14, que trata de publicação de Edital para realização de Pregão Eletrônico para "Contratação de empresa especializada, ou consórcio de empresas, para a prestação de serviços de coleta de dados presencial, distribuição e geração de resultados de indicadores de desempenho das operações aeroportuárias do lado terra dos aeroportos", nomeadamente no que se refere aos indicadores elencados no item 10 e no Apêndice I do Termo de Referência, Anexo A do citado Edital.

Com os melhores cumprimentos,

Prof. Doutor José Reis
Diretor da Faculdade de Economia da Universidade de Coimbra

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FEUC FACULDADE DE ECONOMIA
UNIVERSIDADE DE COIMBRA

Instituto Tecnológico de Aeronáutica – ITA
A/C Prof. Dr. Anderson Ribeiro Correia
Pró-reitor de extensão e cooperação do Instituto Tecnológico de Aeronáutica – ITA
Divisão de Engenharia Civil
CTA - ITA - IEI
Praça Marechal Eduardo Gomes, 50
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Tel/Fax: (+55) (1 2) 3947-6801

Coimbra, 8 de julho de 2015.

Exmº Senhor Pró-reitor de extensão e cooperação:

O estudante de doutoramento em Gestão de Empresas da Faculdade de Economia da Universidade de Coimbra - FEUC, Sr. George Christian Linhares Bezerra, está neste momento em fase de preparação de sua tese de doutoramento, subordinada ao tema "Análise Multidimensional do Desempenho Aeroportuário". O referido estudante pediu-me apoio para a solicitação de cooperação por parte do Instituto de Tecnologia Aeroespacial – ITA para a aplicação de inquérito, no âmbito da investigação, objeto de sua Tese. Estando de acordo com a relevância do pedido, e em alusão aos entendimentos prévios alcançados entre V. Exª e o referido estudante, venho, no interesse da investigação científica ora em curso, muito respeitosamente, solicitar a valiosa cooperação desse Instituto para a aplicação de questionário estruturado, junto à população de passageiros em embarque no Aeroporto de São Paulo/Congonhas.

Em decorrência dessa cooperação, é certo que ficariam os dados recolhidos também à disposição do ITA para, se assim o desejar, utilizar em investigações futuras, inclusivamente em colaboração com o Doutoramento em Gestão de Empresas desta Faculdade. Colaboração essa que, em nosso entendimento, poderia avançar significativamente na área de desempenho aeroportuário.

Os critérios para aplicação do referido instrumento de recolha de dados são apresentados em anexo, para o que solicitamos as contribuições ou adaptações que possam julgar necessárias em consideração ao trabalho de recolha de dados a ser realizado.

Com os melhores cumprimentos,

UNIVERSIDADE DE COIMBRA
FACULDADE DE ECONOMIA

Prof. Dr. Carlos Alberto Esteves Ferreira Gomes
Coordenador do Doutoramento em Gestão de Empresas da FEUC

ANEXO – CRITÉRIOS PARA APLICAÇÃO DO QUESTIONÁRIO

CRITÉRIOS GERAIS PARA O PLANO DE TRABALHO

Público-alvo:	Passageiros a embarcar em voos regulares e que tenham realizado check-in no aeroporto.
Amostra Necessária:	n=384 (considerando a média de embarque mensal no ano de 2014, erro amostral de 5% e 95% de Nível de Confiança)
Critério de Amostragem:	Probabilístico, com abordagem aleatória.
Horário de Doleta dos dados:	Períodos de maior fluxo no aeroporto, conforme informações sobre hora-pico disponíveis.
Local de Coleta dos Dados:	Sala de embarque.
Forma de Âplicação do Questionário:	Auto-preenchimento pelo passageiro.

PROPOSTA DE ITENS A COMPOR O QUESTIONÁRIO

Caracterização do Respondente:	Gênero; Escolaridade; Motivo da Viagem; Viajando sozinho ou acompanhado; Quant. Acompanhantes; Pessoa com mobilidade reduzida; Quant. de viagens realizadas partindo do aeroporto; Frequência de viagens, Antecedência da chegada ao aeroporto antes da partida do voo.
Avaliação da Qualidade do Serviço:	Tempo total para chegar ao aeroporto; Facilidade para chegar ao aeroporto; Transporte público para o aeroporto; Custo total para chegar ao aeroporto; Tempo de espera em fila no check-in; Eficiência dos funcionários no check-in; Atendimento e cortesia dos funcionários no check-in; Disponibilidade de carrinhos de bagagem; Atendimento e cortesia dos funcionários da inspeção de segurança; Rigor na inspeção de segurança; Tempo de espera na fila da inspeção de segurança; Sensação de estar protegido e seguro; Facilidade de encontrar o seu caminho dentro do aeroporto; Disponibilidade de painéis de informação de voos; Distância percorrida a pé dentro do terminal; Facilidade de fazer conexões com outros voos; Atendimento e cortesia dos funcionários do aeroporto (exceto check-in, e inspeção de segurança); Quantidade e qualidade das instalações para alimentação; Valor cobrado pelos restaurantes/instalações para alimentação; Disponibilidade de bancos, caixas eletrônicos e casas de cambio; Lojas/estabelecimentos comerciais; Valor cobrado pelas lojas/estabelecimentos comerciais; Disponibilidade de banheiros; Limpeza dos banheiros; Conforto das áreas de espera/embarque; Limpeza geral das edificações do aeroporto; Conforto térmico no aeroporto; Conforto acústico no aeroporto.
Antecedentes e Consequentes da Satisfação:	Minha expectativa sobre os serviços do aeroporto era ALTA; Esperava que o aeroporto atendesse completamente às minhas necessidades; Esperava que NÃO houvesse falhas na prestação do serviço; O preço da Tarifa de Embarque é JUSTO, dada a qualidade dos serviços do aeroporto; Considerando o preço da Tarifa de Embarque, a qualidade dos serviços do aeroporto é ALTA; Os preços praticados no comércio são JUSTOS, dada a qualidade dos produtos/serviços; Considerando os preços praticados, a qualidade dos produtos/serviços vendidos no comércio é ALTA; A empresa que administra o aeroporto é confiável; A empresa que administra o aeroporto se preocupa com os passageiros; O aeroporto tem uma boa imagem perantes seus clientes; Este aeroporto é inovador e está preparado para o futuro; Os serviços do aeroporto atenderam plenamente às minhas expectativas; Estou muito satisfeito com os serviços do aeroporto; Este aeroporto representa o que entendo por um aeroporto ideal; Fiz uma reclamação formal sobre o aeroporto; Tenho ou tive vontade de fazer uma reclamação formal sobre o aeroporto; Já reclamei ou posso vir a reclamar do aeroporto para familiares ou amigos; Creio que

	pessoas que reclamam do aeroporto estejam sendo justas; NÃO creio que reclamações são adequadamente resolvidas pelo aeroporto; Para mim, seria mais caro utilizar outro aeroporto nesta mesma cidade; Eu perderia muito tempo para usar outro aeroporto nesta mesma cidade; Exigiria muito esforço de minha parte usar outro aeroporto nesta mesma cidade; Seria muito INCONVENIENTE utilizar outro aeroporto nesta mesma cidade; Não me resta outra alternativa a não ser usar sempre este aeroporto para embarque nesta mesma cidade; No meu próximo voo saindo de São Paulo tenho intenção de voltar a utilizar este aeroporto; Mesmo se outro aeroporto na mesma cidade cobrar uma tarifa de emabarque mais barata, é muito provável que eu continuasse a preferir este aeroporto; Mesmo se outro aeroporto na mesma cidade tiver um voo equivalente e mais barato, é muito provável que eu continuasse a preferir este aeroporto; Eu recomendarei este aeroporto para familiares e amigos partindo de São Paulo; Se pudesse usaria outro aeroporto para embarque nesta cidade.

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QUALIDADE DE SERVIÇO EM AEROPORTOS

INSTRUÇÕES DE PREENCHIMENTO

Este questionário é utilizado exclusivamente no âmbito de pesquisa acadêmica. Seu preenchimento é anônimo e destina-se a evidenciar sua percepção sobre a qualidade do serviço prestado pelo Aeroporto e sua atitude perante o Aeroporto.

Por favor, responda a todas as questões com base na sua experiência como cliente. Não há respostas "certas" ou "erradas", o importante é que as respostas demonstrem o mais fielmente possível a sua opinião.

Agradecemos pela participação!

PARTE I – ATITUDE PERANTE O AEROPORTO

Com base numa escala de 7 itens, em que 1 significa "Discordo Totalmente" e 7 "Concordo Totalmente", por favor, classifique a sua **opinião** acerca dos seguintes itens (use livremente todos os valores da escala):

	Discordo Totalmente ↓			Nem discordo Nem concordo ↓			Concordo Totalmente ↓
Eu tinha muita expectativa sobre a qualidade do Aeroporto	1	2	3	4	5	6	7
Esperava que o Aeroporto fosse capaz de satisfazer plenamente minhas necessidades enquanto passageiro	1	2	3	4	5	6	7
Esperava que **NÃO** houvesse falhas na prestação dos serviços	1	2	3	4	5	6	7
Esperava que os serviços fossem rápidos e eficientes	1	2	3	4	5	6	7
Esperava me sentir confortável e seguro(a) no Aeroporto	1	2	3	4	5	6	7
Considerando a Qualidade Geral do Aeroporto, o preço da Tarifa de Embarque é **JUSTO**	1	2	3	4	5	6	7
Considerando o preço da Tarifa de Embarque, os serviços do aeroporto são **Muito Bons**	1	2	3	4	5	6	7
Considerando o preço da Tarifa de Embarque, o conforto proporcionado é **Muito Bom**	1	2	3	4	5	6	7
Considerando a Qualidade dos produtos/serviços vendidos, os preços nos estabelecimentos comerciais são **JUSTOS**	1	2	3	4	5	6	7
Considerando os preços nos estabelecimentos comerciais, a qualidade dos produtos/serviços é **Muito Boa**	1	2	3	4	5	6	7
A empresa que administra o Aeroporto é confiável	1	2	3	4	5	6	7
A empresa que administra o Aeroporto se preocupa com seus clientes	1	2	3	4	5	6	7
A empresa que administra o Aeroporto contribui positivamente para a sociedade	1	2	3	4	5	6	7
O Aeroporto tem uma boa imagem perante seus clientes	1	2	3	4	5	6	7
O Aeroporto é moderno e está preparado para o futuro	1	2	3	4	5	6	7
Em geral, estou muito satisfeito com o aeroporto	1	2	3	4	5	6	7
O Aeroporto supera minhas expectativas	1	2	3	4	5	6	7
Este Aeroporto representa o que eu entendo por um aeroporto ideal	1	2	3	4	5	6	7
Sinto que tomei a decisão certa ao escolher utilizar este aeroporto	1	2	3	4	5	6	7
Em geral, minha experiência com o aeroporto está sendo muito agradável	1	2	3	4	5	6	7
Já fiz uma reclamação formal sobre o Aeroporto	1	2	3	4	5	6	7
Tenho ou tive vontade de fazer uma reclamação formal sobre o Aeroporto	1	2	3	4	5	6	7
Já reclamei ou posso vir a reclamar do Aeroporto para familiares ou amigos	1	2	3	4	5	6	7
Passageiros que fizeram reclamação sobre o Aeroporto estão muito provavelmente sendo justos	1	2	3	4	5	6	7
Eu **NÃO** acredito que as reclamações sejam adequadamente resolvidas pelo Aeroporto	1	2	3	4	5	6	7
Para mim, seria mais caro utilizar um outro aeroporto nesta cidade	1	2	3	4	5	6	7
Exigiria mais esforço de minha parte utilizar outro aeroporto nesta cidade	1	2	3	4	5	6	7
Eu perderia mais tempo se optasse por utilizar outro aeroporto nesta cidade	1	2	3	4	5	6	7
Para mim, seria muito INCONVENIENTE utilizar outro aeroporto nesta cidade	1	2	3	4	5	6	7
Por conveniência, me sinto praticamente obrigado(a) a usar este aeroporto para voos domésticos em São Paulo	1	2	3	4	5	6	7
No próximo voo doméstico partindo de São Paulo voltarei a utilizar ESTE aeroporto	1	2	3	4	5	6	7
Mesmo se outro aeroporto na cidade cobrar uma Tarifa de Embarque bem **mais barata**, prefiro utilizar ESTE Aeroporto	1	2	3	4	5	6	7
Mesmo se outro aeroporto na cidade tiver um voo equivalente bem **mais barato**, prefiro utilizar ESTE Aeroporto	1	2	3	4	5	6	7
Eu recomendarei este Aeroporto para familiares e amigos partindo de São Paulo	1	2	3	4	5	6	7
Eu prefiro sempre utilizar este Aeroporto para voos domésticos partindo de São Paulo	1	2	3	4	5	6	7

PARTE II – QUALIDADE DO SERVIÇO

Com base numa escala de 7 itens, em que 1 significa “Muito Ruim” e 7 “Muito Bom”, por favor, classifique a sua opinião acerca dos seguintes itens (use livremente todos os valores da escala):

	Muito Ruim ↓			Regular ↓			Muito Bom ↓
Tempo de espera em fila no check-in	1	2	3	4	5	6	7
Eficiência dos funcionários no check-in	1	2	3	4	5	6	7
Atendimento e cortesia dos funcionários no check-in	1	2	3	4	5	6	7
Tempo de espera na fila da inspeção de segurança	1	2	3	4	5	6	7
Rigor na inspeção de segurança	1	2	3	4	5	6	7
Atendimento e cortesia dos funcionários da inspeção de segurança	1	2	3	4	5	6	7
Sensação de estar protegido e seguro	1	2	3	4	5	6	7
Facilidade de encontrar o seu caminho dentro do terminal	1	2	3	4	5	6	7
Disponibilidade de painéis de informação de voos	1	2	3	4	5	6	7
Distância percorrida a pé dentro do terminal	1	2	3	4	5	6	7
Restaurantes/instalações para alimentação	1	2	3	4	5	6	7
Atendimento e cortesia dos funcionários dos restaurantes/instalações para alimentação	1	2	3	4	5	6	7
Lojas/estabelecimentos comerciais	1	2	3	4	5	6	7
Atendimento e cortesia dos funcionários das lojas/estabelecimentos comerciais	1	2	3	4	5	6	7
Disponibilidade de bancos, caixas eletrônicos e casas de câmbio	1	2	3	4	5	6	7
Internet/Wi Fi	1	2	3	4	5	6	7
Opções de lazer e entretenimento no Aeroporto	1	2	3	4	5	6	7
Atendimento e cortesia dos funcionários do aeroporto (**exceto check-in, segurança e área comercial**)	1	2	3	4	5	6	7
Disponibilidade de banheiros	1	2	3	4	5	6	7
Limpeza dos banheiros	1	2	3	4	5	6	7
Conforto das áreas de espera/embarque	1	2	3	4	5	6	7
Limpeza geral do Aeroporto	1	2	3	4	5	6	7
Conforto térmico no Aeroporto	1	2	3	4	5	6	7
Conforto acústico no Aeroporto	1	2	3	4	5	6	7

Por último, solicitamos algumas informações para efetuarmos o tratamento global dos dados:

Forma de realização do Check-in:
☐ Balcão de atendimento ☐ Totem de autoatendimento ☐ Internet ☐ Estou em conexão

Motivo para esta viagem:
☐ Lazer ☐ Negócios ☐ Familiar ☐ Estudos ☐ Outro

Quantas vezes já embarcou neste Aeroporto nos últimos 12 meses:
☐ 1ª vez ☐ 2 a 3 vezes ☐ 4 a 5 vezes ☐ 6 a 10 vezes

Quantas viagens aéreas nos últimos 12 meses, incluindo esta:
☐ Até 2 viagens ☐ De 3 a 5 viagens ☐ Mais de 5 viagens

Tempo de antecedência da chegada ao aeroporto antes do horário previsto para partida do voo:
☐ Até 30min ☐ De 30min até 1h ☐ De 1h até 1h30 ☐ De 1h31 até 2h ☐ Mais de 2h

Gênero:
☐ Feminino ☐ Masculino

Reside na Grande São Paulo:
☐ Sim ☐ Não

Muito obrigado pela sua participação!

Horário do preenchimento:_____hs:_____min
Companhia aérea: (   ) TAM (   ) Gol (   ) Azul (   ) Avianca (   ) TRIP (   )Outra:______________

APPENDIX VII – DESCRIPTIVE FOR PERFORMANCE MEASURES - STUDY 1.

Measure Code	N	Min	Max	Mean	Std. Error	Std. Deviation	Skewness	Kurtosis
OPE11	31	1	5	3,84	,192	1,068	-,712	,121
OPE12	31	1	5	2,84	,213	1,186	,204	-,720
OPE13	31	1	5	3,94	,196	1,093	-1,173	1,460
OPE14	30	1	5	2,70	,210	1,149	,202	-,565
OPE15	31	1	5	3,71	,223	1,243	-,516	-,992
OPE16	31	1	5	4,00	,197	1,095	-1,138	,747
OPE17	30	2	5	3,63	,162	,890	-,118	-,590
OPE18	31	1	5	3,32	,238	1,326	-,002	-1,287
OPE21	31	2	5	3,87	,152	,846	-,448	-,156
OPE22	31	1	5	3,13	,184	1,024	-,472	,232
OPE23	31	1	5	4,10	,176	,978	-1,346	2,236
OPE24	30	1	5	3,13	,213	1,167	-,276	-,174
OPE25	31	1	5	3,90	,209	1,165	-,883	-,150
OPE26	31	2	5	4,10	,156	,870	-,845	,354
OPE27	31	2	5	3,81	,157	,873	,080	-1,079
OPE28	31	1	5	3,94	,173	,964	-,820	1,109
OPE31	31	2	5	4,13	,178	,991	-,932	-,113
OPE32	31	1	5	3,35	,215	1,199	-,254	-,812
OPE33	31	2	5	3,90	,209	1,165	-,612	-1,109
OPE34	31	1	5	2,65	,205	1,142	,192	-,440
OPE35	31	1	5	3,84	,228	1,267	-,727	-,822
OPE36	31	2	5	4,29	,187	1,039	-1,397	,779
OPE37	31	2	5	3,81	,182	1,014	-,201	-1,148
OPE38	31	2	5	3,84	,186	1,036	-,234	-1,230
SEC11	30	1	5	2,90	,277	1,517	,117	-1,353
SEC12	30	1	5	3,10	,251	1,373	-,021	-1,283
SEC13	29	1	5	3,52	,251	1,353	-,504	-,893
SEC14	29	1	5	3,62	,265	1,425	-,541	-1,056
SEC21	30	1	5	3,57	,257	1,406	-,584	-,811
SEC22	30	1	5	3,70	,236	1,291	-,631	-,698
SEC23	29	1	5	3,97	,246	1,322	-1,027	-,165
SEC24	29	1	5	4,03	,240	1,295	-1,445	1,148
SEC31	30	1	5	3,37	,217	1,189	-,386	-,762
SEC32	30	1	5	3,70	,231	1,264	-,596	-,995
SEC33	30	1	5	3,63	,217	1,189	-,406	-,864
SEC34	30	1	5	3,83	,215	1,177	-1,151	,652
SAF11	30	1	5	3,50	,295	1,614	-,422	-1,511
SAF12	30	1	5	3,57	,257	1,406	-,504	-1,088
SAF13	30	1	5	3,70	,226	1,236	-,319	-1,097
SAF14	30	2	5	4,03	,169	,928	-,902	,293
SAF15	30	1	5	3,67	,232	1,269	-,619	-,636
SAF16	30	1	5	3,20	,277	1,518	-,172	-1,379
SAF17	30	1	5	3,20	,269	1,472	-,231	-1,231
SAF18	30	2	5	3,67	,232	1,269	-,294	-1,619
SAF19	29	2	5	3,86	,163	,875	-,403	-,359
SAF21	30	1	5	4,17	,220	1,206	-1,480	1,453
SAF22	30	1	5	4,13	,196	1,074	-1,355	1,462
SAF23	29	2	5	4,28	,156	,841	-1,355	1,960
SAF24	30	2	5	4,30	,145	,794	-1,052	,925

SAF25	30	2	5	4,40	,156	,855	-1,617	2,430
SAF26	30	1	5	4,10	,200	1,094	-1,565	2,561
SAF27	30	1	5	4,17	,225	1,234	-1,518	1,365
SAF28	30	2	5	4,10	,175	,960	-,964	,196
SAF29	30	3	5	4,43	,124	,679	-,805	-,402
SAF31	30	1	5	3,93	,253	1,388	-1,034	-,199
SAF32	30	1	5	3,73	,209	1,143	-,622	-,429
SAF33	30	1	5	3,60	,223	1,221	-,371	-1,032
SAF34	29	2	5	4,10	,188	1,012	-,885	-,270
SAF35	30	2	5	4,07	,197	1,081	-1,018	-,153
SAF36	30	1	5	3,87	,238	1,306	-,832	-,451
SAF37	30	1	5	3,83	,254	1,392	-,751	-,905
SAF38	30	2	5	3,93	,185	1,015	-,708	-,463
SAF39	30	1	5	3,90	,216	1,185	-,861	-,257
LOS11	28	1	5	3,46	,227	1,201	-,186	-1,047
LOS12	28	1	5	3,54	,244	1,290	-,586	-,480
LOS13	28	1	5	3,32	,200	1,056	-,507	,106
LOS14	28	1	5	3,21	,188	,995	-,464	,341
LOS15	28	1	5	2,57	,244	1,289	,445	-,673
LOS16	28	1	5	3,39	,201	1,066	-,489	-,596
LOS17	28	1	5	3,25	,265	1,404	-,481	-,839
LOS21	28	1	5	3,89	,208	1,100	-1,032	,551
LOS22	28	1	5	4,14	,216	1,145	-1,413	1,206
LOS23	28	2	5	3,96	,189	,999	-,884	-,041
LOS24	28	2	5	3,93	,170	,900	-,510	-,352
LOS25	28	1	5	3,04	,202	1,071	-,075	-,582
LOS26	28	2	5	4,00	,154	,816	-,879	1,008
LOS27	28	1	5	3,86	,197	1,044	-,957	,794
LOS31	28	1	5	3,29	,211	1,117	,070	-,738
LOS32	28	2	5	3,89	,201	1,066	-,563	-,872
LOS33	28	1	5	3,39	,220	1,166	-,099	-,944
LOS34	28	1	5	3,36	,213	1,129	-,115	-,828
LOS35	28	1	5	2,89	,238	1,257	,457	-,665
LOS36	28	1	5	3,32	,212	1,124	-,192	-,920
LOS37	28	2	5	3,93	,199	1,052	-,672	-,660
ASQ11	27	1	5	3,04	,217	1,126	-,427	-,881
ASQ12	27	1	5	3,63	,201	1,043	-,702	,211
ASQ13	27	1	5	3,04	,259	1,344	-,072	-1,252
ASQ14	27	1	5	4,00	,214	1,109	-1,095	,715
ASQ15	27	1	5	2,52	,216	1,122	,391	-,641
ASQ16	27	1	5	2,59	,222	1,152	,245	-,890
ASQ17	27	1	5	3,30	,225	1,171	-,010	-1,020
ASQ18	26	2	5	3,42	,209	1,065	-,106	-1,232
ASQ21	27	1	5	3,52	,216	1,122	-,491	-,573
ASQ22	27	2	5	3,93	,184	,958	-,694	-,221
ASQ23	27	1	5	3,59	,209	1,083	-,649	-,162
ASQ24	27	2	5	4,22	,187	,974	-1,022	,003
ASQ25	27	1	5	3,44	,229	1,188	-,081	-,961
ASQ26	27	1	5	3,59	,222	1,152	-,407	-,645
ASQ27	27	2	5	3,96	,196	1,018	-,393	-1,159
ASQ28	26	1	5	4,12	,217	1,107	-1,393	1,499
ASQ31	27	1	5	3,30	,219	1,137	-,130	-,961
ASQ32	27	1	5	3,48	,222	1,156	-,274	-,805
ASQ33	27	1	5	3,30	,260	1,353	-,285	-1,172

ASQ34	27	2	5	3,74	,204	1,059	-,483	-,889
ASQ35	27	1	5	2,67	,207	1,074	,536	,042
ASQ36	27	1	5	2,70	,212	1,103	,273	-,119
ASQ37	27	2	5	3,22	,216	1,121	,411	-1,173
ASQ38	26	1	5	3,31	,240	1,225	-,080	-,720
COM11	27	2	5	3,78	,216	1,121	-,411	-1,173
COM12	26	2	5	3,81	,184	,939	-,215	-,849
COM13	24	1	5	2,79	,313	1,532	,065	-1,496
COM14	21	1	5	2,95	,288	1,322	-,048	-,896
COM15	27	1	5	3,11	,235	1,219	,185	-,826
COM16	27	2	5	3,89	,222	1,155	-,578	-1,120
COM21	27	2	5	4,11	,195	1,013	-,717	-,755
COM22	26	2	5	3,85	,190	,967	-,245	-,983
COM23	24	1	5	2,87	,320	1,569	,077	-1,583
COM24	20	1	5	3,20	,313	1,399	-,394	-,904
COM25	27	1	5	3,41	,228	1,185	-,286	-,468
COM26	26	2	5	4,00	,229	1,166	-,656	-1,141
COM31	27	2	5	4,04	,229	1,192	-,811	-,944
COM32	26	1	5	3,85	,258	1,317	-,718	-,922
COM33	24	1	5	2,92	,340	1,666	,143	-1,720
COM34	21	1	5	3,24	,330	1,513	-,255	-1,364
COM35	27	1	5	3,15	,231	1,199	,127	-,713
COM36	26	1	5	3,88	,244	1,243	-,847	-,448
EFF11	25	1	5	3,08	,208	1,038	-,171	,018
EFF12	24	1	5	3,04	,237	1,160	-,269	-,563
EFF13	24	1	5	2,92	,216	1,060	,178	-,104
EFF14	25	1	5	3,44	,224	1,121	-,030	-,545
EFF15	25	1	5	3,16	,206	1,028	,155	-,169
EFF16	24	2	5	3,71	,237	1,160	-,283	-1,373
EFF21	25	3	5	3,60	,173	,866	,920	-1,017
EFF22	24	1	5	3,46	,233	1,141	-,463	,118
EFF23	24	2	5	3,50	,190	,933	,526	-,709
EFF24	25	2	5	3,76	,185	,926	,180	-1,239
EFF25	25	1	5	3,64	,190	,952	-,437	,990
EFF26	24	2	5	4,00	,190	,933	-,351	-1,045
EFF31	25	2	5	3,60	,216	1,080	,043	-1,276
EFF32	24	2	5	3,83	,206	1,007	-,196	-1,170
EFF33	24	1	5	3,46	,282	1,382	-,498	-,909
EFF34	25	1	5	3,48	,259	1,295	-,390	-,883
EFF35	25	1	5	3,52	,239	1,194	-,211	-,887
EFF36	24	1	5	3,75	,243	1,189	-,657	-,424
COP11	25	1	5	2,72	,255	1,275	,182	-1,072
COP12	25	1	5	2,76	,210	1,052	,291	,339
COP13	24	2	5	3,21	,159	,779	,207	-,123
COP14	25	1	5	2,76	,210	1,052	,757	-,206
COP21	25	2	5	3,28	,227	1,137	,504	-1,114
COP22	25	1	5	3,24	,185	,926	-,180	,511
COP23	24	2	5	3,63	,179	,875	,007	-,570
COP24	25	1	5	3,40	,231	1,155	-,176	-,819
COP31	25	1	5	2,96	,261	1,306	-,042	-1,131
COP32	25	1	5	3,00	,231	1,155	,000	-,284
COP33	24	2	5	3,50	,200	,978	,000	-,874
COP34	25	1	5	2,96	,234	1,172	,590	-,690
FIN11	25	2	5	3,84	,221	1,106	-,462	-1,103

FIN12	25	2	5	4,08	,215	1,077	-,823	-,623
FIN13	25	1	5	3,68	,222	1,108	-,697	-,040
FIN14	25	1	5	3,20	,245	1,225	-,266	-,538
FIN15	23	1	5	3,17	,286	1,370	-,110	-1,179
FIN16	25	1	5	3,24	,284	1,422	-,084	-1,346
FIN17	25	1	5	3,80	,245	1,225	-,621	-,652
FIN18	25	1	5	3,56	,259	1,294	-,332	-1,245
FIN19	25	2	5	3,96	,241	1,207	-,690	-1,135
FIN110	24	1	5	2,88	,265	1,296	,382	-,870
FIN111	25	1	5	2,88	,240	1,201	,562	-,478
FIN21	25	3	5	4,20	,191	,957	-,433	-1,861
FIN22	25	2	5	4,24	,185	,926	-,865	-,399
FIN23	25	3	5	4,16	,160	,800	-,307	-1,344
FIN24	25	1	5	3,80	,208	1,041	-,530	,332
FIN25	22	1	5	3,64	,268	1,255	-,340	-,962
FIN26	25	1	5	3,88	,226	1,130	-,688	-,071
FIN27	25	2	5	4,16	,197	,987	-,911	-,208
FIN28	25	2	5	4,08	,191	,954	-,483	-1,080
FIN29	25	2	5	4,24	,185	,926	-,865	-,399
FIN210	24	2	5	3,71	,204	,999	,080	-1,221
FIN211	25	2	5	3,52	,224	1,122	,138	-1,354
FIN31	25	1	5	3,60	,271	1,354	-,504	-,979
FIN32	25	1	5	3,84	,263	1,313	-,762	-,833
FIN33	25	1	5	3,56	,271	1,356	-,519	-1,036
FIN34	25	1	5	3,40	,283	1,414	-,307	-1,167
FIN35	23	1	5	3,43	,307	1,472	-,376	-1,280
FIN36	25	1	5	3,36	,305	1,524	-,286	-1,398
FIN37	25	1	5	3,64	,288	1,440	-,669	-,895
FIN38	25	1	5	3,68	,275	1,376	-,827	-,445
FIN39	24	1	5	3,83	,274	1,341	-,733	-,948
FIN310	24	1	5	3,13	,291	1,424	,057	-1,389
FIN311	25	1	5	3,00	,294	1,472	,085	-1,317
ENV11	23	2	5	3,65	,205	,982	-,152	-,873
ENV12	23	2	5	3,74	,211	1,010	-,292	-,904
ENV13	22	1	5	2,50	,261	1,225	,599	-,258
ENV14	22	1	5	2,68	,290	1,359	,266	-,851
ENV15	21	1	5	2,57	,289	1,326	,328	-,899
ENV16	22	1	5	3,14	,257	1,207	,251	-1,002
ENV17	21	1	5	3,00	,258	1,183	,200	-,476
ENV18	22	2	5	3,73	,281	1,316	-,271	-1,773
ENV21	23	2	5	4,13	,202	,968	-,940	,071
ENV22	23	2	5	4,09	,208	,996	-,791	-,394
ENV23	22	1	5	3,36	,203	,953	-,476	,657
ENV24	22	1	5	3,59	,215	1,008	-,273	,595
ENV25	21	1	5	3,33	,242	1,111	-,502	,349
ENV26	22	1	5	3,32	,258	1,211	-,150	-,394
ENV27	21	1	5	3,67	,270	1,238	-,511	-,725
ENV28	22	2	5	4,00	,237	1,113	-,684	-,917
ENV31	23	1	5	3,78	,259	1,242	-,641	-,644
ENV32	23	1	5	3,78	,266	1,278	-,557	-,891
ENV33	22	1	5	2,32	,266	1,249	,457	-,846
ENV34	22	1	5	2,45	,269	1,262	,581	-,408
ENV35	21	1	5	2,52	,264	1,209	,126	-,828
ENV36	22	1	5	3,18	,292	1,368	,132	-1,243

ENV37	21	1	5	3,05	,280	1,284	,217	-,947
ENV38	22	2	5	3,77	,237	1,110	-,426	-1,106
SOC11	23	1	5	2,70	,239	1,146	,464	-,272
SOC12	23	1	5	3,30	,263	1,259	-,187	-,829
SOC13	23	1	5	1,87	,221	1,058	1,291	1,818
SOC14	23	1	5	2,74	,276	1,322	,140	-,737
SOC15	22	1	5	3,09	,262	1,231	-,019	-,977
SOC16	22	2	5	3,82	,204	,958	,038	-1,327
SOC21	23	1	5	3,04	,213	1,022	-,093	,443
SOC22	23	1	5	3,57	,258	1,237	-,479	-,308
SOC23	23	1	5	2,57	,273	1,308	,245	-,895
SOC24	23	1	5	3,09	,266	1,276	-,320	-,686
SOC25	22	1	5	3,64	,214	1,002	-,725	,957
SOC26	22	3	5	4,05	,192	,899	-,095	-1,825
SOC31	23	1	5	2,96	,263	1,261	,238	-,611
SOC32	23	1	5	3,35	,278	1,335	-,332	-,763
SOC33	23	1	5	2,57	,287	1,376	,425	-,848
SOC34	23	1	5	2,96	,277	1,331	,086	-,880
SOC35	22	1	5	3,45	,235	1,101	-,345	-,311
SOC36	22	1	5	3,82	,276	1,296	-,641	-,838

Notes:

a. Measure code identifies the performance dimension based on its code, as explained in section 4.2.

b. The first numeral after the code refers to the information category, as follow: 1 – Frequency of Use (FU); 2 – Perceived Relevance (PR); 3 – Ease of Acquisition (EA).

c. The second numeral after the code refers to the performance measure.

APPENDIX VIII – TESTING LINEAR REGRESSION ASSUMPTIONS - STUDY 1.

In this appendix, the results of the linear regression assumptions tests related to study 1 are presented[43]. Basically, there are four main assumptions which justify the use of linear regression models for the purposes of statistical inference or prediction (Webster, 2006):

i. Normality of the error distribution;
ii. Homoscedasticity or constant variance for the independent variable;
iii. Statistical independence of the errors (i.e. no correlation between errors);
iv. Linearity of the relationship between the dependent and the independent variables.

As regards the first assumption, Table VIII.1 summarizes the descriptive of the standardized residuals. The values for skewness and kurtosis for the residuals are indicative of a minor deviation for normal distribution (Hair *et al.*, 2014).

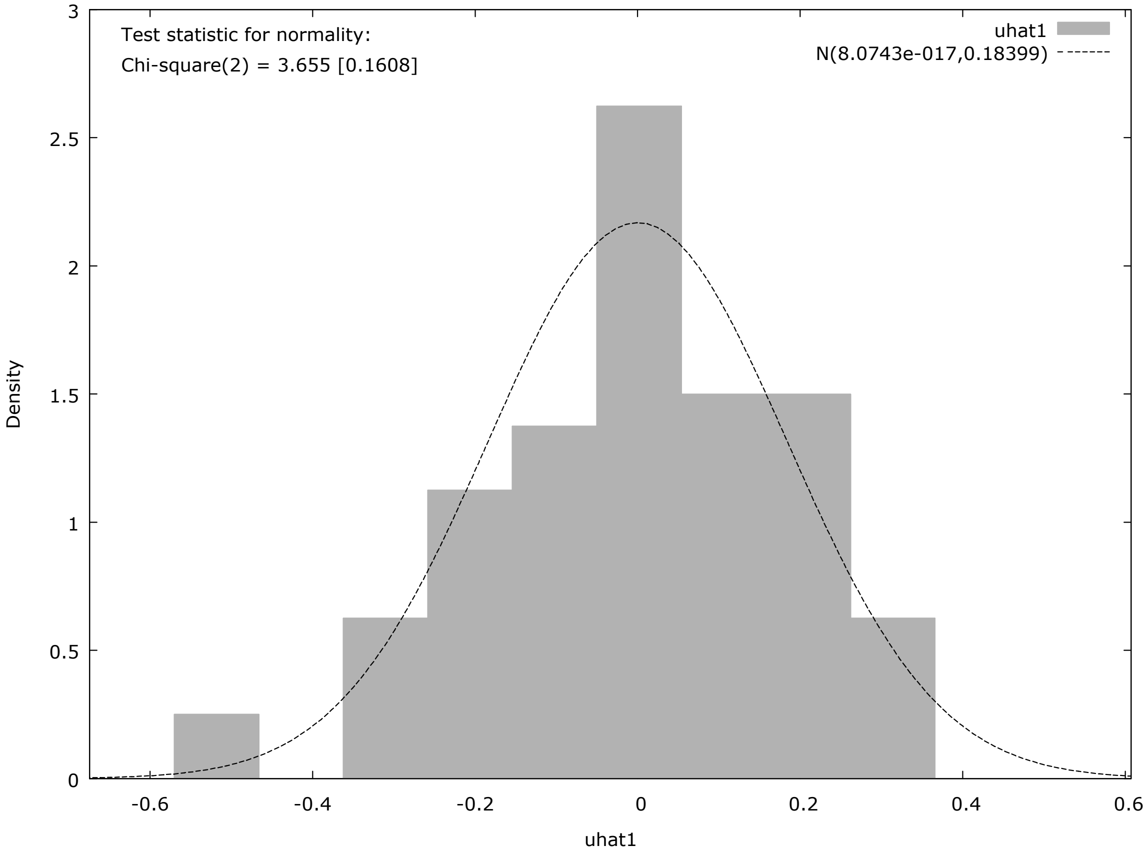
Table VIII.1. Descriptives of the standardized residuals.

			Statistic	Std. Error
Standardized Residual	Mean		0,0000000	0,112451
	95% Confidence Interval for Mean	Lower Bound	-0,2239658	
		Upper Bound	0,2239658	
	5% Trimmed Mean		0,0346600	
	Median		-0,0167624	
	Variance		0,974	
	Std. Deviation		0,98675438	
	Minimum		-2,81601	
	Maximum		1,70549	
	Range		4,52150	
	Interquartile Range		1,22959	
	Skewness		-0,505	0,274
	Kurtosis		0,127	0,541

In figure VIII.1, distribution of the residuals is compared with the normal curve.

[43] IBM SPSS Statistics, version 22, and GNU Regression Econometrics and Time-series library – Gretl software, version 2015d, were used.

Figure VIII.1. Distribution of the residuals.



The test for residual normality using the Gretl software provided the following frequency distribution for the estimated residuals (Table VIII.2). These results are related to the Doornik-Hansen test for residual normality, based on the chi-square distribution.

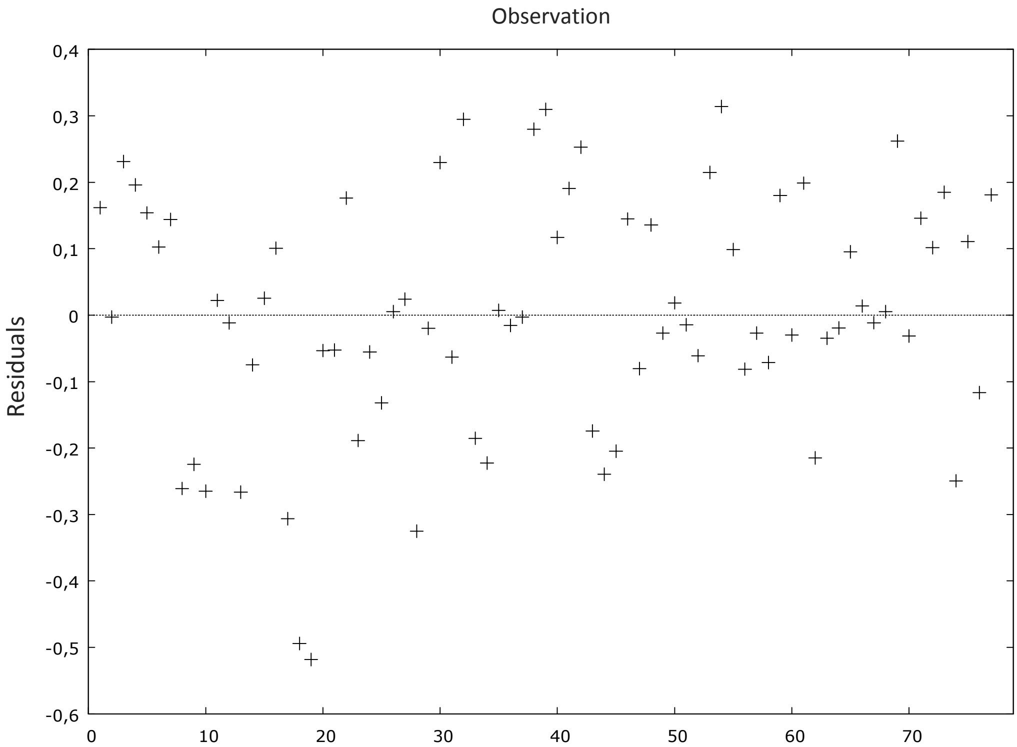
Table VIII.2. Test for residual normality.

interval	midpoint	frequency	relative	cumulative
< -0.46612	-0.51812	2	2.60%	2.60%
-0.46612 - -0.36213	-0.41413	0	0.00%	2.60%
-0.36213 - -0.25814	-0.31014	5	6.49%	9.09% **
-0.25814 - -0.15416	-0.20615	9	11.69%	20.78% ****
-0.15416 - -0.050168	-0.10216	11	14.29%	35.06% *****
-0.050168 - 0.053821	0.0018266	21	27.27%	62.34% *********
0.053821 - 0.15781	0.10582	12	15.58%	77.92% *****
0.15781 - 0.26180	0.20980	12	15.58%	93.51% *****
>= 0.26180	0.31379	5	6.49%	100% **

Number of bins = 9, mean = 8,07435e-017, standard deviation = 0,183989, Test for null hypothesis of normal distribution: chi-square(2) = 3,655 with p-value 0,16

Concerning homoscedasticity (i.e. constant variance for the dependent variable), figure VIII.2 depicts the residuals of the estimated model for each observation.

Figure VIII.2. Regression residuals for each observation.



Figures VIII.3 and VIII.4 show the residuals of the estimated model for different levels of the independent variables perceived relevance (PR) and ease of acquisition (EA), respectively.

Figure VIII.3. Regression residuals for different levels of perceived relevance (PR).

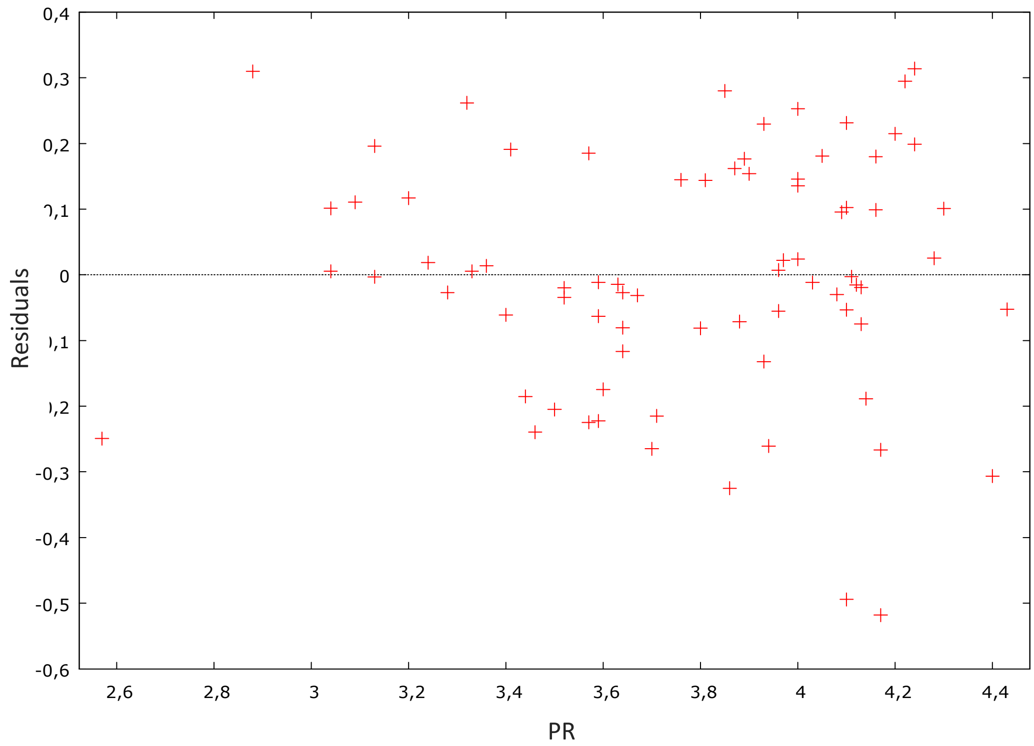
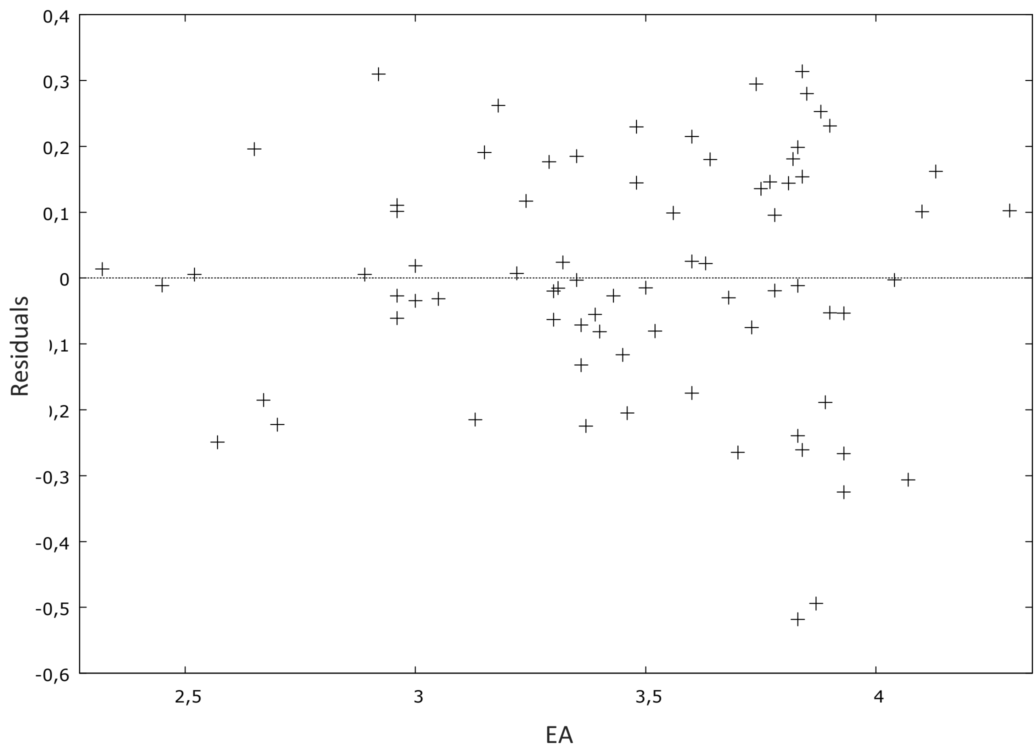


Figure VIII.4. Regression residuals for different levels of ease of acquisition (EA).



The Breusch-Pagan test of heteroscedasticity was processed in Gretl software. This test assumes that the heteroscedasticity process is a linear function of all the independent variables in the model, according to the following equation.

$$\hat{\varepsilon}_i^2 = \alpha_0 + \alpha_1 PR_i + \alpha_2 EA_i + e_i$$

Where:

$\hat{\varepsilon}_i^2$ – The square of the estimated residuals of the original model [FU=*f*(PR,EA)].

PR_i – The mean score for perceived relevance on the ith measure.

EA_i – The mean score for ease of acquisition on the ith measure.

e_i – the residuals of this auxiliary regression model.

α_0, α_1 and α_2 – the linear parameters.

The Lagrange Multiplier is used to determine whether the coefficient of determination of this auxiliary regression model is evidence of heteroscedasticity. If the statistic is non-significant, it is the case of not rejecting the null hypothesis of homoscedasticity. The results suggest that homoscedasticity cannot be rejected, as show in Table VIII.3.

Table VIII.3. Results of the Breush-Pagan test for heteroscedasticity.

	Coefficient	Std. Error	t-ratio	p-value
Const	-1,26368	1,57158	-0,8041	0,4239
PR	-0,372883	0,635500	-0,5868	0,5592
EA	1,05996	0,567503	1,868	0,0658

Dependent variable: $\hat{\varepsilon}_i^2$; Explained sum of squares = 10,206; Test statistic: LM = 5,103, with p-value = P(Chi-square(2) > 5,103) = 0,078.

The third assumption to be tested is the statistical independence of the errors (i.e. no correlation between errors). The residual plots presented in figures VIII.3. and VIII.4. can be used as a first approach to examine the independence of the errors. The existence of patterns for the residuals when compared to the independent variables may be an indicative of correlation between errors. In this case, there is no evidence of a clear pattern for both variables.

The Durbin-Watson statistic was used for testing for the statistical independence of the errors (i.e. no correlation between errors). This statistic takes values between 0 and 4.

Values approaching 0 indicate positive autocorrelation and values toward 4 indicate negative autocorrelation (Webster, 2006).

The Durbin-Watson (DW) test uses the following statistic:

$$d = \frac{\sum_{i=2}^{n}(e_i - e_{i-1})^2}{\sum_{i=1}^{n} e_i^2}$$

Where:

$e_i = yi - \hat{y}_i$ are the residuals.

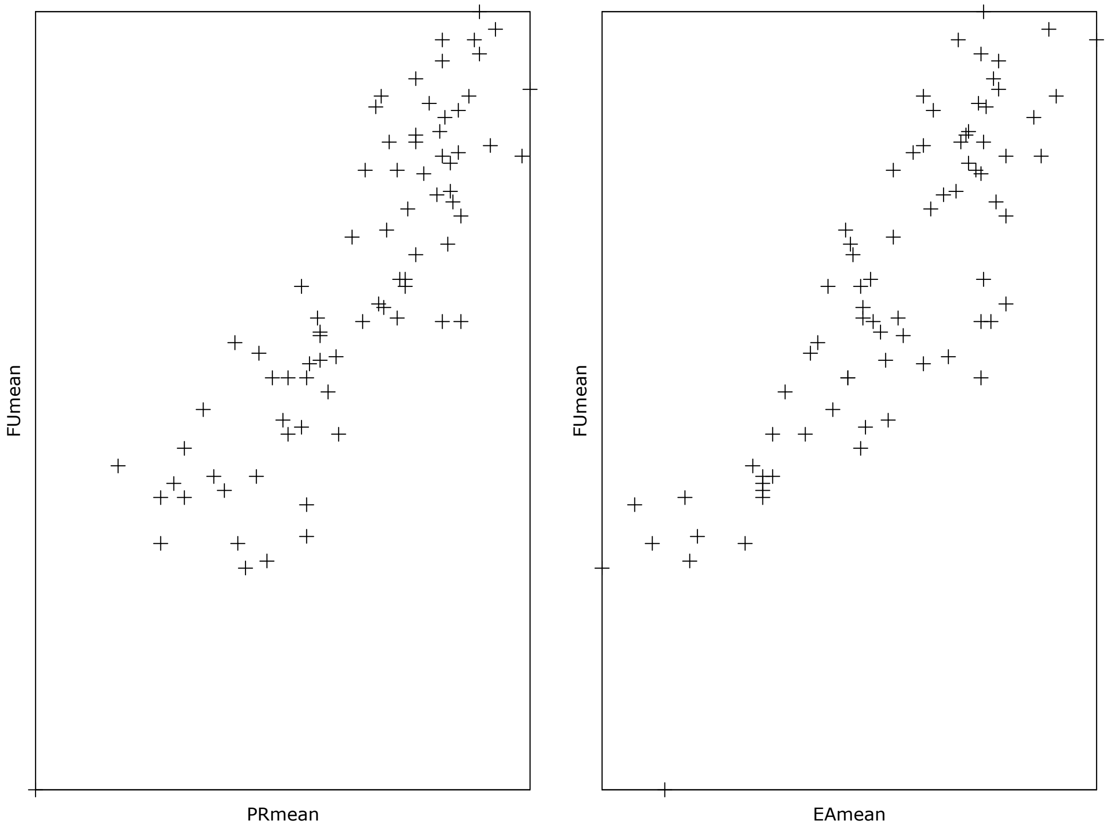
n = The number of elements in the sample.

k = the number of independent variables.

The significance of this DW statistic can also be tested based on the values of alpha provided by a standardized DW table. For combinations of significance level, sample size n and number of independent variables *k*, the table contains a lower and upper critical value (d_L and d_U). In this study, the DW statistic value of 1,47 suggest significance for the test at significance level (p-value < 0,01). Accordingly, the hypothesis of statistical independence of the errors cannot be rejected.

As for the assumption of linearity of the relationship between the dependent and independent variables, figure VIII.5 outlines the partial regression plot for FU *versus* PR and FU *versus* EA, respectively.

Figure VIII.5. Partial regression plot (FU *versus* PR and FU *versus* EA).



These scatter plot graphics may visually suggest a linear positive relationship between each pair of variables. In addition to this, the test of non-linearity with suggests that the null hypothesis of linearity cannot be rejected based on the results (Table VIII.4).

Table VIII.4. Results of the test for non-linearity.

	Coefficient	Std. Error	t-ratio	p-value
Const	0.0784387	1.65455	0.04741	0.9623
PR	−0.449889	0.869955	−0.5171	0.6066
EA	0.445263	0.664071	0.6705	0.5047
Sq_PR	0.0627238	0.119903	0.5231	0.6025
Sq_EA	−0.0677516	0.0999375	−0.6779	0.5000

Dependent variable: $\hat{\varepsilon}_i^2$; unadjusted R-squared = 0,008; Test statistic: TR^2 = 0,615, with p-value = P(Chi-square(2) > 0,615) = 0,735.

In the case of multiple linear regression, another usual concern is the presence of multicollinearity, which refers to the situation where the independent variables in a multiple regression model are highly correlated. In this situation, it is very unlike to obtain valid results for individual predictor variables (Webster, 2006).

A preliminary approach to the problem of multicollinearity is verifying the correlations between variables. The Pearson's coefficient of correlation for the independent variables are presented in Table VIII.5. Correlation is significant and reasonably high, but this result is inconclusive as regards the presence of multicollinearity.

Table VIII.5. Pearson´s coefficient of correlation for PR and EA.

Variable		PR	EA
Perceived Relevance (PR)	Pearson Correlation	1	0,761***
	Sig. (2-tailed)		0,000
	N	77	77
Ease of Acquisition (EA)	Pearson Correlation	0,761***	1
	Sig. (2-tailed)	0,000	
	N	77	77

***. Correlation is significant at the 0,01 level (2-tailed).

A formal approach for detection and decision-making regarding multicollinearity is the variance inflation factor (VIF). Its calculation is based on the idea of tolerance, which is defined as:

$$tolerance = 1 - R_j^2$$

Where R_j^2 is the coefficient of determination of a linear regression of an independent variable *j* on all other independent variables considered in the original model.

The variance inflation factor (VIF) is then calculated as the inverse of the tolerance, such as:

$$\mathrm{VIF} = \frac{1}{tolerance}$$

Accordingly, a tolerance value of less than 0,2 or 0,1 or, conversely, a VIF above 5 or 10 indicates a multicollinearity problem.

In the case of this study, the tolerance and VIF calculated for the independent variables used in the original regression were not indicative of the presence of multicollinearity as demonstrated in Table VIII.6.

Table VIII.6. Collinearity Statistics.

Variables	Partial correlations	Collinearity Statistics	
		Tolerance	VIF
Perceived Relevance	0,655	0,422	2,372
Ease of Acquisition	0,605	0,422	2,372

Note: Partial correlations coefficients describe the linear relationship between the two variables while controlling for the effects of the dependent variable Frequency of Use.

APPENDIX IX – SAMPLING CRITERIA FOR SBSP SURVEY

Regarding the survey applied to departing passengers at SBSP airport, the following general criteria were considered (Table IX.1):

Table IX.1 – Sampling criteria

Criteria	Description
Target population	Passengers departing in commercial regular flights
Places of data collection	Departure lounges (after security inspection area). The survey team covered all the gates during the time of application.
Sampling criteria	Approach one passenger at every 5 passengers starting from the passenger closer to the gate. In the case of refusing, ask the next passenger in sequence.
Application	Self-report.
Sample size	Based on Cochran (1977), with 5% of margin of error and 95% of confidence level.

Concerning the approach to the passengers, five researchers worked for data collection. Each researcher was provided with a set of four clipboards and several forms. According to the sampling criteria, the passengers were approached with a standard speech and invited to participate in the survey.

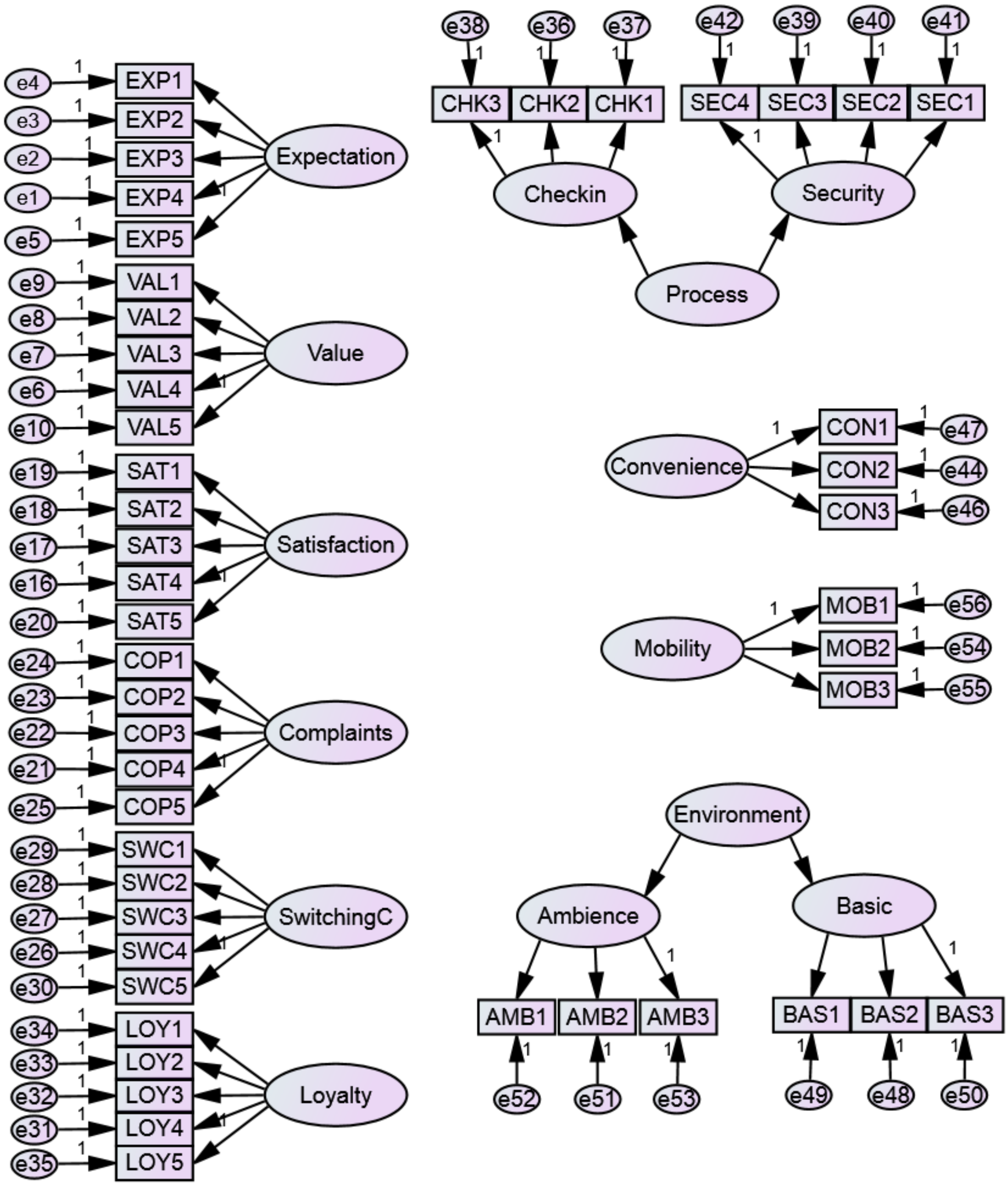
Regarding the sample size, the usual references relative to acceptable margins of error in social science research was considered. Accordingly, a sample size planned to provide a 5% margin of error and a confidence level of 95% was judged acceptable (Bartlett, Kotrlik and Higgins, 2001; Cochran, 1977). In this sense, for a selected alpha level of 0,05 (0,025 in each tail), a z-score of 1,96 was used. The z-score is the number of standard deviations a given proportion is away from the mean and may be obtained in statistic tables.

Given these figures, based on the Cochran´s references for sample size, the planned sample size was calculated to be 384 passengers. This sample size is also sufficient for the EFA and SEM analysis. However, as missing values are common in survey research, the researchers were asked to obtain 500 responses.

APPENDIX X – UNIVARIATY NORMALITY ASSESSMENT – STUDY 3

Variable	Min.	Max,	Skewness	C.R.	Kurtosis	C.R.
MOB3_1	1,000	7,000	-,388	-3,335	-,445	-1,910
MOB1_1	1,000	7,000	-,540	-4,638	-,504	-2,165
MOB2_1	1,000	7,000	-,662	-5,690	-,319	-1,369
AMB3_1	1,000	7,000	-,416	-3,572	-,652	-2,803
AMB1_1	1,000	7,000	-,494	-4,249	-,234	-1,005
AMB2_1	1,000	7,000	-,407	-3,498	-,565	-2,426
BAS3_1	1,000	7,000	-,149	-1,285	-,532	-2,287
BAS1_1	1,000	7,000	-,359	-3,086	-,294	-1,261
BAS2_1	1,000	7,000	-,319	-2,743	-,694	-2,983
CON3_1	1,000	7,000	-,105	-,901	-,597	-2,563
CON1_1	1,000	7,000	-,040	-,345	-,778	-3,343
CON2_1	1,000	7,000	-,223	-1,913	-,361	-1,549
SEC4_1	1,000	7,000	-,467	-4,012	-,313	-1,344
SEC1_1	1,000	7,000	-,550	-4,725	-,209	-,900
SEC2_1	1,000	7,000	-,605	-5,199	-,194	-,833
SEC3_1	1,000	7,000	-,593	-5,094	-,131	-,564
CHK3_1	1,000	7,000	-,474	-4,072	-,222	-,953
CHK1_1	1,000	7,000	-,267	-2,293	-,288	-1,237
CHK2_1	1,000	7,000	-,269	-2,316	-,519	-2,231
LOY5_1	1,000	7,000	-,513	-4,406	-,417	-1,793
LOY1_1	1,000	7,000	-,524	-4,503	-,458	-1,968
LOY2_1	1,000	7,000	-,162	-1,388	-1,000	-4,296
LOY3_1	1,000	7,000	,202	1,734	-1,044	-4,487
LOY4_1	1,000	7,000	-,155	-1,333	-,138	-,593
SWC5_1	1,000	7,000	-,704	-6,045	-,766	-3,293
SWC1_1	1,000	7,000	-,398	-3,422	-,719	-3,090
SWC2_1	1,000	7,000	-,770	-6,617	-,338	-1,453
SWC3_1	1,000	7,000	-,887	-7,621	-,245	-1,054
SWC4_1	1,000	7,000	-,631	-5,423	-,624	-2,681
COP5_1	1,000	7,000	-,340	-2,924	-,589	-2,529
COP1_1	1,000	7,000	1,175	10,093	,151	,649
COP2_1	1,000	7,000	,434	3,726	-1,088	-4,673
COP3_1	1,000	7,000	,260	2,230	-1,254	-5,386
COP4_1	1,000	7,000	-,280	-2,407	-,534	-2,296
SAT5_1	1,000	7,000	-,167	-1,437	-,417	-1,794
SAT1_1	1,000	7,000	,007	,062	-,666	-2,861
SAT2_1	1,000	7,000	,238	2,044	-,850	-3,653
SAT3_1	1,000	7,000	,518	4,452	-,569	-2,444
SAT4_1	1,000	7,000	-,263	-2,261	-,147	-,631
VAL5_1	1,000	7,000	,287	2,465	-,919	-3,950
VAL1_1	1,000	7,000	,135	1,158	-,876	-3,766
VAL2_1	1,000	7,000	,202	1,733	-,772	-3,318
VAL3_1	1,000	7,000	-,001	-,007	-,816	-3,505
VAL4_1	1,000	7,000	,913	7,843	-,249	-1,068
EXP5_1	1,000	7,000	-1,193	-10,254	,725	3,116
EXP1_1	1,000	7,000	-,208	-1,786	-,113	-,484
EXP2_1	1,000	7,000	-,723	-6,210	,163	,699
EXP3_1	1,000	7,000	-,878	-7,543	,056	,240
EXP4_1	1,000	7,000	-,913	-7,842	,080	,344
Multivariate					437,481	65,123

APPENDIX XI – MEASUREMENT MODEL - STUDY 3



Note: For the sake of clarity, double-headed arrows representing correlations among the independent latent variables in the model are not included in this figure.

APPENDIX XII – STRUCTURAL MODEL RESULTS - STUDY 3

Table XII.1 – Regression weights.

Paths			Estimate	S.E.	C.R.	p-value	Stand. Estimate
ASQ	<---	Expectation	0,131	0,055	2,390	0,017	0,141
Value	<---	ASQ	0,874	0,079	11,102	***	0,643
Value	<---	Expectation	0,055	0,061	0,909	0,363	0,044
Satisfaction	<---	ASQ	0,555	0,069	8,066	***	0,506
Satisfaction	<---	Value	0,362	0,048	7,590	***	0,450
Satisfaction	<---	Expectation	-0,001	0,038	-0,032	0,974	-0,001
Complaints	<---	Satisfaction	-0,563	0,082	-6,865	***	-0,413
Environment	<---	ASQ	0,981	0,075	13,039	***	0,824
Process	<---	ASQ	0,706	0,066	10,685	***	0,727
Loyalty	<---	Satisfaction	0,401	0,068	5,896	***	0,314
Mobility	<---	ASQ	0,646	0,069	9,334	***	0,652
Loyalty	<---	SwitchingCosts	0,684	0,057	12,073	***	0,707
Ambience	<---	Environm	1				0,931
Basic	<---	Environm	0,894	0,078	11,460	***	0,916
Convenience	<---	ASQ	0,978	0,073	13,471	***	0,789
Checkin	<---	Process	0,939	0,098	9,572	***	0,794
Security	<---	Process	1				0,947
Loyalty	<---	Complaints	-0,061	0,048	-1,267	0,205	-0,065
AMB1_1	<---	Ambience	0,912	0,053	17,091	***	0,842
AMB2_1	<---	Ambience	1,000	0,058	17,225	***	0,790
AMB3_1	<---	Ambience	1				0,774
BAS1_1	<---	Basic	0,998	0,065	15,439	***	0,789
BAS2_1	<---	Basic	1,191	0,074	16,194	***	0,831
BAS3_1	<---	Basic	1				0,766
CHK1_1	<---	Checkin	0,971	0,062	15,776	***	0,731
CHK2_1	<---	Checkin	1,107	0,057	19,548	***	0,887
CHK3_1	<---	Checkin	1				0,817
CON1_1	<---	Convenience	1				0,786
CON2_1	<---	Convenience	0,941	0,060	15,585	***	0,795
CON3_1	<---	Convenience	0,755	0,064	11,801	***	0,622
COP2_1	<---	Complaints	1				0,736
COP3_1	<---	Complaints	1,181	0,091	13,048	***	0,851
COP4_1	<---	Complaints	0,723	0,061	11,789	***	0,635
EXP3_1	<---	Expectation	1				0,655
EXP4_1	<---	Expectation	1,326	0,122	10,871	***	0,918
EXP5_1	<---	Expectation	0,929	0,081	11,426	***	0,630
LOY1_1	<---	Loyalty	0,874	0,067	12,989	***	0,781
LOY2_1	<---	Loyalty	0,914	0,076	11,965	***	0,643
LOY5_1	<---	Loyalty	1				0,777
MOB1_1	<---	Mobility	1,250	0,107	11,645	***	0,767
MOB2_1	<---	Mobility	1,301	0,111	11,697	***	0,804
MOB3_1	<---	Mobility	1				0,620
SAT1_1	<---	Satisfaction	1,146	0,072	15,886	***	0,792
SAT2_1	<---	Satisfaction	1,224	0,075	16,251	***	0,824
SAT3_1	<---	Satisfaction	1,143	0,074	15,422	***	0,777
SAT5_1	<---	Satisfaction	1				0,722
SEC1_1	<---	Security	1,123	0,085	13,222	***	0,755
SEC2_1	<---	Security	1,143	0,085	13,422	***	0,757
SEC3_1	<---	Security	1,111	0,079	14,115	***	0,778
SEC4_1	<---	Security	1				0,675
SWC1_1	<---	SwitchingCosts	0,782	0,059	13,239	***	0,616
SWC2_1	<---	SwitchingCosts	1				0,794
SWC3_1	<---	SwitchingCosts	1,128	0,057	19,970	***	0,881
SWC4_1	<---	SwitchingCosts	1,056	0,061	17,441	***	0,800
VAL1_1	<---	Value	0,930	0,060	15,571	***	0,716
VAL2_1	<---	Value	1,062	0,054	19,582	***	0,869
VAL3_1	<---	Value	1				0,839

Table XII.2 – Squared multiple correlations.

Variable	Estimate
ASQ	0,020
Value	0,423
Satisfaction	0,754
Complaints	0,170
Loyalty	0,619
Process	0,528
Environment	0,680
Mobility	0,425
Convenience	0,622
Basic	0,840
Ambience	0,868
Security	0,898
Checkin	0,630
AMB1_1	0,710
AMB2_1	0,624
AMB3_1	0,599
BAS1_1	0,623
BAS2_1	0,690
BAS3_1	0,587
CHK1_1	0,534
CHK2_1	0,786
CHK3_1	0,667
CON1_1	0,617
CON2_1	0,631
CON3_1	0,387
COP2_1	0,541
COP3_1	0,724
COP4_1	0,404
EXP3_1	0,429
EXP4_1	0,843
EXP5_1	0,397
LOY1_1	0,610
LOY2_1	0,413
LOY5_1	0,604
MOB1_1	0,588
MOB2_1	0,647
MOB3_1	0,385
SAT1_1	0,628
SAT2_1	0,680
SAT3_1	0,604
SAT5_1	0,521
SEC1_1	0,570
SEC2_1	0,573
SEC3_1	0,605
SEC4_1	0,456
SWC1_1	0,379
SWC2_1	0,631
SWC3_1	0,775
SWC4_1	0,640
VAL1_1	0,512
VAL2_1	0,755
VAL3_1	0,704

APPENDIX XIII – MATRIX OF THE STANDARDIZED INDIRECT EFFECTS

Construct	Expectation	ASQ	Perceived Value	Satisfaction
Airport Service Quality - ASQ	0	0	0	0
Process	0,103	0	0	0
Environm	0,116	0	0	0
Convenience	0,111	0	0	0
Mobility	0,092	0	0	0
Security	0,097	0,689	0	0
Check-in	0,081	0,577	0	0
Basic Facilities	0,107	0,755	0	0
Ambience	0,108	0,768	0	0
Perceived Value	0,091	0	0	0
Satisfaction	0,132	0,289	0	0
Complaints	-0,054	-0,328	-0,186	0
Loyalty	0,044	0,271	0,153	0,027

Notes: a. The indirect effect of each column variable on each row variable after standardizing all variables; b. Only the latent variables are presented; c. effects are statistically significant based on the bootstrapping results (p-value < 0,05).