QUALITY AND SAFETY IN THE AIRLINE INDUSTRY AND THEIR INFLUENCE ON COMPANY PROFITABILITY

Nicole Kalemba

UNIVERSITAT ROVIRA i VIRGILI

QUALITY AND SAFETY IN THE AIRLINE INDUSTRY AND THEIR INFLUENCE ON COMPANY PROFITABILITY

NICOLE KALEMBA

DOCTORAL THESIS
2017

UNIVERSITAT ROVIRA I VIRGILI
QUALITY AND SAFETY IN THE AIRLINE INDUSTRY AND THEIR INFLUENCE ON COMPANY PROFITABILITY
Nicole Kalemba

UNIVERSITAT ROVIRA I VIRGILI
QUALITY AND SAFETY IN THE AIRLINE INDUSTRY AND THEIR INFLUENCE ON COMPANY PROFITABILITY
Nicole Kalemba

NICOLE KALEMBA

QUALITY AND SAFETY IN THE AIRLINE INDUSTRY AND THEIR INFLUENCE ON COMPANY PROFITABILITY

DOCTORAL THESIS

IN BUSINESS AND ECONOMICS

PhD Supervisor

Dr. Fernando Campa-Planas

Department of Business Management

UNIVERSITAT ROVIRA i VIRGILI

Reus, 2017

UNIVERSITAT ROVIRA I VIRGILI
QUALITY AND SAFETY IN THE AIRLINE INDUSTRY AND THEIR INFLUENCE ON COMPANY PROFITABILITY
Nicole Kalemba

UNIVERSITAT ROVIRA i VIRGILI

FAIG CONSTAR que aquest treball, titulat "Quality and Safety in the Airline Industry and their influence on Company Profitability", que presenta Nicole Kalemba per a l'obtenció del títol de Doctor, ha estat realitzat sota la meva direcció al Departament Gestió d'Empreses d'aquesta universitat.

HAGO CONSTAR que el presente trabajo, titulado "Quality and Safety in the Airline Industry and their influence on Company Profitability", que presenta Nicole Kalemba para la obtención del título de Doctor, ha sido realizado bajo mi dirección en el Departamento de Gestión de Empresas de esta universidad.

I STATE that the present study, entitled "Quality and Safety in the Airline Industry and their influence on Company Profitability", presented by Nicole Kalemba for the award of the degree of Doctor, has been carried out under my supervision at the Department of Business Administration of this university.

Reus, 31 d'Agost de 2017 / Reus, 31 de Agosto de 2017 / Reus, August 31st, 2017

El/s director/s de la tesi doctoral
El/los director/es de la tesis doctoral
Doctoral Thesis Supervisor/s

Dr. Fernando Campa Planas

UNIVERSITAT ROVIRA I VIRGILI
QUALITY AND SAFETY IN THE AIRLINE INDUSTRY AND THEIR INFLUENCE ON COMPANY PROFITABILITY
Nicole Kalemba

"Roads were made for Journeys,

not Destinations."

(Confucius)

UNIVERSITAT ROVIRA I VIRGILI
QUALITY AND SAFETY IN THE AIRLINE INDUSTRY AND THEIR INFLUENCE ON COMPANY PROFITABILITY
Nicole Kalemba

ACKNOWLEDGEMENTS

I would like to say thank you to several persons that made that this path during those three years has been possible, that this personal objective could become reality. The elaboration of this Doctoral Thesis would not have been possible without the support of all of you, THANK YOU.

GRACIAS…

…Al Dr. Fernando Campa, por su tiempo dedicado, sus consejos y críticas constructivas que me han hecho aprender, crecer y mejorar, tanto a nivel profesional como a nivel personal durante el proceso de elaboración de esta tesis. Gracias por todo, por los contactos brindados, por haberme guiado siempre, por las alegrías compartidas y también por el apoyo en momentos menos agradables. Gracias también a Fátima, por tantos momentos bonitos compartidos con los cuales me quedo.

…A todos mis compañeros de Doctorado del Departamento de Gestión de Empresas, los del principio y los de ahora, habiendo compartido muchas alegrías y momentos de estrés. Sin vosotros no hubiera sido lo mismo.

…A mis amigos, los que siempre me han apoyado en mis proyectos, los que siempre me han motivado para seguir este camino y que me han acompañado en los momentos buenos y no tan buenos.

GRÀCIES…

...A la Universitat Rovira i Virgili i a la Facultat d'Economia i Empresa, especialment al Departament de Gestió d'Empreses per haver-me concedit la beca pre-doctoral que m'ha permès realitzar aquest doctorat. Gràcies a la Dra. Maria Victoria Sánchez per haver-me obert la porta a aquesta Facultat. Gràcies també a Cristina, Montse y Ramon per tot l'ajut; sense vosaltres hagués estat impossible fer totes les tràmits necessaris durant aquest tres anys.

...A la Associació Catalana de Comptabilitat i Direcció (ACCID) pels premis concedits durant aquests anys de doctorat i per la confiança brindada. Especialment moltes gràcies a Oriol Amat, Ana Quesada i Elena Campreciós.

... Als coordinadors de Doctorat d'Economia i Empresa, els Dr. Antonio Terceño i Dr. Juan Antonio Duro per la seva confiança.

...A la Facultat de Geografia i Turisme, per haver-me ajudat en el començament del meu camí acadèmic, per haver cregut en mi i per tot el suport durant els anys d'estudi.

... Al Dr. Antonio Rodríguez, el qual s'ha interessat sempre per la meva tesi, el qual sempre m'ha animat a seguir, començant amb el Màster de Finances i Gestió Bancària.

... Als professors de la Universitat Rovira i Virgili, que m'han acompanyat durant els meus estudis i recerca, gràcies pel suport.

... Al CESDA i a l'UOC per la oportunitat de fer docència durant aquest camí.

DANKE...

... An die Universität Bayreuth und den DLM Lehrstuhl, vor allem an Herrn Prof. Dr. Woratschek und Carmen Back, die mich bei meinem Aufenthalt an der Uni Bayreuth von Anfang an unterstützt haben. Ein herzliches Dankeschön auch an die „Doktorspiele", die mir meinen Aufenthalt an der UBT sportlich versüßt haben.

... An meine Freunde, die mich immer zum Lachen gebracht haben und mich in aussichtslosen Momenten immer wieder zurück auf die Bahn gebracht haben.

... An meine Familie, ohne die ich jetzt nicht da stehen würde, wo ich heute bin. Vor allem aber DANKE an Mum und Ingo, ohne eure Unterstützung, eure Lebensfreude, eure Aufmunterungen und all eure Liebe wäre dieser Kraftakt nicht möglich gewesen. Danke, dass ihr immer an mich glaubt.

THANK YOU – GRACIAS – GRÀCIES - DANKE

ABSTRACT

This Doctoral Thesis aimed to contribute to an understanding of the consequences and impact of quality and safety on profitability of airline companies, as well as to emphasize the importance and need for management accounting and its Key Performance Indicators (KPIs) in the airline industry. In order to cover this goal, a compendium of six academic papers were developed to answer to the research questions introduced and deal with existing gaps in the literature.

The main findings and results revealed a positive and significant influence of service quality on the profitability measured as Economic return (ROI, or *return on investment*) of US airline companies; and a non-significant effect for quality on airline passenger revenues. While the effect of safety was vice versa. Thus, a non-significant effect for safety on profitability of airlines was confirmed, whereas the effect of safety on airline passenger revenues was significant.

RESUMEN

El objetivo de la presente tesis era contribuir al conocimiento de las consecuencias e impacto de la calidad y seguridad operacional en la rentabilidad de las compañías aéreas, así como destacar la importancia y necesidad de la contabilidad de gestión y sus indicadores clave de gestión (KPIs, o *Key Performance Indicators*) en la industria aérea. Con el fin de lograr este objetivo, se desarrolló un compendio de seis artículos académicos para responder a las preguntas de investigación planteadas y resolver los *gaps* existentes en la literatura.

Las principales conclusiones y resultados revelaron una influencia positiva y significativa de la calidad de servicio en la rentabilidad medida como rentabilidad económica (ROI, o *return on investment*) de las compañías aéreas estadounidenses; y un efecto no significativo de la calidad sobre los ingresos de pasaje de las aerolíneas. Al mismo tiempo, se comprobó que el efecto de la seguridad operacional era en sentido contrario. Por lo tanto, se confirmó un efecto no significativo para la seguridad operacional en la rentabilidad de las aerolíneas, mientras que el efecto de la seguridad operacional sobre los ingresos de pasaje de las aerolíneas fue significativo.

RESUM

L'objectiu de la present tesi era contribuir al coneixement de les conseqüències i l'impacte de la qualitat i seguretat operacional en la rendibilitat de les companyies aèries, així com destacar la importància i necessitat de la comptabilitat de gestió i els seus indicadors clau de gestió (KPIs, o *Key Performance Indicators*) a la industria aèria. Per tal de cobrir aquest objectiu, es va desenvolupar un compendi de sis articles acadèmics per respondre a les preguntes de recerca plantejades i resoldre els *gaps* existents a la literatura.

Les principals conclusions i resultats van revelar una influencia positiva i significativa de la qualitat de servei en la rendibilitat mesurada com rendibilitat econòmica (ROI, o *return on investment*) de les companyies aèries nord-americanes; i un efecte no significatiu per a la qualitat sobre els ingressos de passatge de les aerolínies. Per un altre banda, l'efecte de la seguretat operacional era el contrari. Per tant, es va confirmar un efecte no significatiu per a la seguretat operacional en la rendibilitat de les aerolínies, mentre que l'efecte de la seguretat operacional sobre els ingressos de passatge de les aerolínies va ser significatiu.

ZUSAMMENFASSUNG

Das Ziel dieser Doktorarbeit war es sowohl dazu beizutragen, die Konsequenzen und Auswirkungen von Qualität und Sicherheit auf die Rentabilität von Fluggesellschaften zu verstehen, als auch die Bedeutung und Notwendigkeit der Kosten- und Leistungsrechnung und deren Key Performance Indicators (KPIs) in der Airline-Branche zu unterstreichen. Um diesem Ziel nachzugehen, wurde ein Kompendium von sechs akademischen Artikeln entworfen, um Antworten auf die vorgelegten Forschungsfragen zu geben und sich somit mit den bestehenden *gaps* der Literatur auseinanderzusetzen.

Die wichtigsten Ergebnisse zeigten einen positiven und signifikanten Einfluss der Servicequalität auf die Rentabilität, gemessen als Kapitalrentabilität (ROI, oder *return on investment*) der US-Fluggesellschaften; und ein nicht signifikanter Effekt für Qualität auf die Fluggast-Einnahmen. Die Auswirkung der Sicherheit war konträr. So wurde ein nicht signifikanter Effekt für die Sicherheit auf die Rentabilität der Fluggesellschaften bestätigt, während andererseits die Auswirkung der Sicherheit auf die Fluggast-Einnahmen erheblich war.

QUALITY AND SAFETY IN THE AIRLINE INDUSTRY AND THEIR INFLUENCE ON COMPANY PROFITABILITY

CONTENTS

LIST OF FIGURES

UNIVERSITAT ROVIRA I VIRGILI
QUALITY AND SAFETY IN THE AIRLINE INDUSTRY AND THEIR INFLUENCE ON COMPANY PROFITABILITY
Nicole Kalemba

LIST OF TABLES

UNIVERSITAT ROVIRA I VIRGILI
QUALITY AND SAFETY IN THE AIRLINE INDUSTRY AND THEIR INFLUENCE ON COMPANY PROFITABILITY
Nicole Kalemba

OVERVIEW OF ACADEMIC PAPERS

UNIVERSITAT ROVIRA I VIRGILI
QUALITY AND SAFETY IN THE AIRLINE INDUSTRY AND THEIR INFLUENCE ON COMPANY PROFITABILITY
Nicole Kalemba

LIST OF ABBREVIATIONS

ACSI	Airline Customer Satisfaction Index
ADP	Airline Data Project
AECA	Asociación Española de Contabilidad y Administración de Empresas
AQR	Airline Quality Rating
ASK	Available Seat Kilometers
ASM	Available Seat Miles
ATAG	Air Transport Action Group
ATK	Available Ton Kilometer
ATM	Available Ton Mile
BH	Block Hours
BSC	Balanced Scorecard
CAGR	Compound Annual Growth Rate
CHC	Charter Carrier
CC	Customer Complaints
CRM	Customer Relationship Management
DB	Denied Boarding
DLR	Deutsches Zentrum für Luft- und Raumfahrt
EBITDAR	Earnings Before Interests Taxes Depreciations Amortizations and Renting
EBITDA	Earnings Before Interests Taxes Depreciations and Amortizations
FAA	Federal Aviation Authority
FFP	Frequent Flyer Program
FSNC	Full Service Network Carrier
FTK	Freight Ton Kilometer
GDP	Gross Domestic Product
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
IOSA	IATA Operational Safety Audit
JACDEC	Jet Airliner Crash Data Evolution Centre
JCR	Journal Citation Reports
KPI	Key Performance Indicator
KSF	Key Success Factor
LCC	Low Cost Carrier
MB	Mishandled Baggage
MIT	Massachusetts Institute of Technology
NPS	Net Promoter Score

OLS	Ordinary Least Squares
OT	On-Time Performance by flight
PAX	Number of Passengers
RC	Regional Carrier
ROCE	Return on Capital Employed
ROE	Return on Equity
ROI	Return on Investment
RPK	Revenue Passenger Kilometers
RPM	Revenue Passenger Miles
SERVQUAL	Service Quality
SLR	Systematic Literature Review
US	United States
USD	United States Dollar

1

CHAPTER ONE

INTRODUCTION AND OVERVIEW OF THE AIRLINE INDUSTRY

UNIVERSITAT ROVIRA I VIRGILI
QUALITY AND SAFETY IN THE AIRLINE INDUSTRY AND THEIR INFLUENCE ON COMPANY PROFITABILITY
Nicole Kalemba

1.1. Overview on the Airline Industry and Justification of the Study

In recent decades, the global airline industry, being one of the world's most important industries, has undergone a fundamental structural change, and its performance is therefore of considerable interest to analysts and policymakers (Morrison and Winston, 1995; IATA, 2014). The main reason for this change was, and still is, advancing globalization and it can be assumed that international air traffic will continue to develop dynamically in coming years because of a continued growth in demand (Doganis, 2010; Rürup and Reichart, 2014).

The airline industry provides a service to almost every country in the world and contributes to both the economic and social development of the countries it operates in (ATAG, 2005, Belobaba et al., 2009, IATA, 2014).

As far as the economic effects are concerned, air transport provides a multitude of benefits, such as the creation of jobs, and it is also a highly efficient investor and user of infrastructures and resources (ATAG, 2005). However, to consider the benefits, it is necessary to distinguish between three categories: the direct, indirect and induced impact of the airline industry (ATAG, 2005 and 2014; Vasigh et al., 2013). The direct impact is related to everything that happens within the industry, considering airline and airport personnel salaries, as well as other areas such as landing fees and fuel purchased, among others. The indirect benefits on this economy are generated through services provided by companies in the air transportation supply chain and are linked to all the related airport and airline activity benefits produced through hotels, restaurants, rental car companies, etc. The induced impact is a multiplier effect of both the direct and indirect economic impacts (ATAG, 2005; Vasigh et al., 2013). As a consequence, the influence of the global airline industry is equivalent to 3.5% (2.7 trillion USD) of the world's gross domestic product (GDP) (ATAG, 2016).

Regarding the social benefits, an improvement in the quality of life can be highlighted due to the cultural and leisure experiences people can enjoy, as well as an increase in living standards, both through trade and tourism, since the airline industry is one of the main drivers of economic growth.

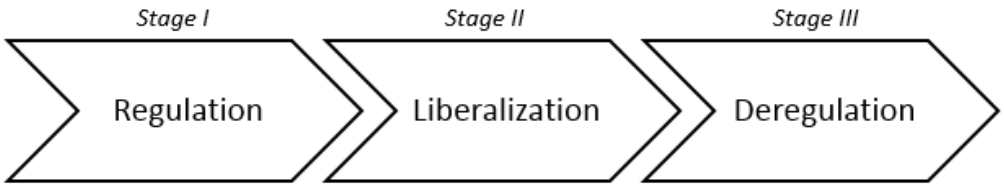
Another advantage is its contribution to sustainable development and the simplification of air transport network creation (ATAG, 2005; IATA, 2014).

Important Stages in the Development of the Airline Industry

The modern airline industry has experienced several important stages during its development, as Figure 1-1 illustrates (Wensveen, 2015). In the middle of the 20th century, it was a completely regulated sector due to government powers, including market entry controls, high and regulated air fares for airline passengers that restricted general access to this form of transport, ownership control of airlines, and the prohibition of competition on chosen routes because of specific air laws, among others (Olson and Trapani, 1981; Wensveen, 2015). However, the airline sector then went through economic liberalization that at the same time was part of the resulting deregulation movement at the end of the 1970s.

The deregulation act of 1978 in the United States changed the global airline sector into an open and competitive industry. These changes rapidly affected the international airline industry, resulting in decreased air fares, and essential aspects, such as the quality of service, started to increase and air transportation safety improved (Morrison and Winston, 1995; Doganis, 2010; Wensveen, 2015). Terms such as profitability, competition and cost efficiency became the focal points for discussion (Belobaba et al., 2009), since airlines were, for instance, suddenly able to fly between two (or several) destinations with open access, which meant that limits on flight frequencies and the seat capacities offered were removed and airline pricing was liberated (Ben-Yosef, 2005; Doganis, 2010).

Figure 1-1



Stages in the development of the airline industry (Author's own work).

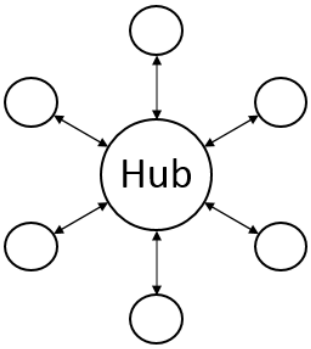
These movements were followed by the open skies policies in Europe in 1992 that included open route accesses, free code-sharing and no pricing controls, as well as the right to operate charter and bilateral flights (Belobaba et al., 2009; Doganis, 2010).

Important Players in the Air Transportation Industry

Depending on the business model and the network strategy of each airline company, the main players of the passenger airline industry can be divided into the following categories (DLR, 2008; Campa-Planas and Campa-Lewkowycz, 2009; Keynes, 2009; Rürup and Reichart, 2014):

- **Full Service Network Carriers (FSNC):** Often referred to as Hub-and-Spoke airlines, they provide a multitude of services in different classes with dedicated services in business and first class, as well as offering connecting flights. The Hub-and-Spoke arrangement is a network system that allows airlines to provide services to a wide range of geographic areas and destinations (Cook and Goodwin, 2008). The core element is represented by the hubs that serve as a central traffic point for redistributing and networking shuttle flights from domestic or international airports (spokes) to other connected airports (see Figure 1-2). Other important elements of the FSNCs are that they are global players, covering short- to long-haul flights, they additionally develop alliances, and consider that vertical product differentiation and customer relationship management (CRM) also play an important role. Other key aspects are the planning and optimization of routes, as well as maximizing the roundabout and block hours (BH). Furthermore, they can be differentiated through their yield management and pricing structure, as well as their multi-channel sales and distribution system.

Figure 1-2

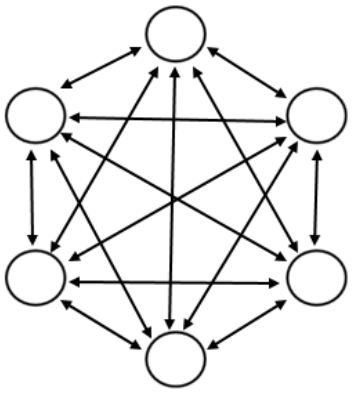


Hub-and Spoke network (Author's own work)

- **Low Cost Carriers (LCCs):** They focus mainly on price leadership strategies to reduce costs; offering short- and medium-haul point-to-point flights that are mainly connected with secondary airports, therefore allowing the airlines to maximize the daily block hours and the utilization of aircraft. Reservation costs and sales are minimized. Additionally, ancillaries[1] play an important role, and they earn revenues, for instance, through selling onboard services and products.

  In a point-to-point structure, the main interest of the airlines lies in carrying the passengers directly from the origin (bases) to the destination, without connecting through a hub (see Figure 1-3).

Figure 1-3



Point-to-Point structure (Author's own work)

[1] Revenues obtained from non-ticket services

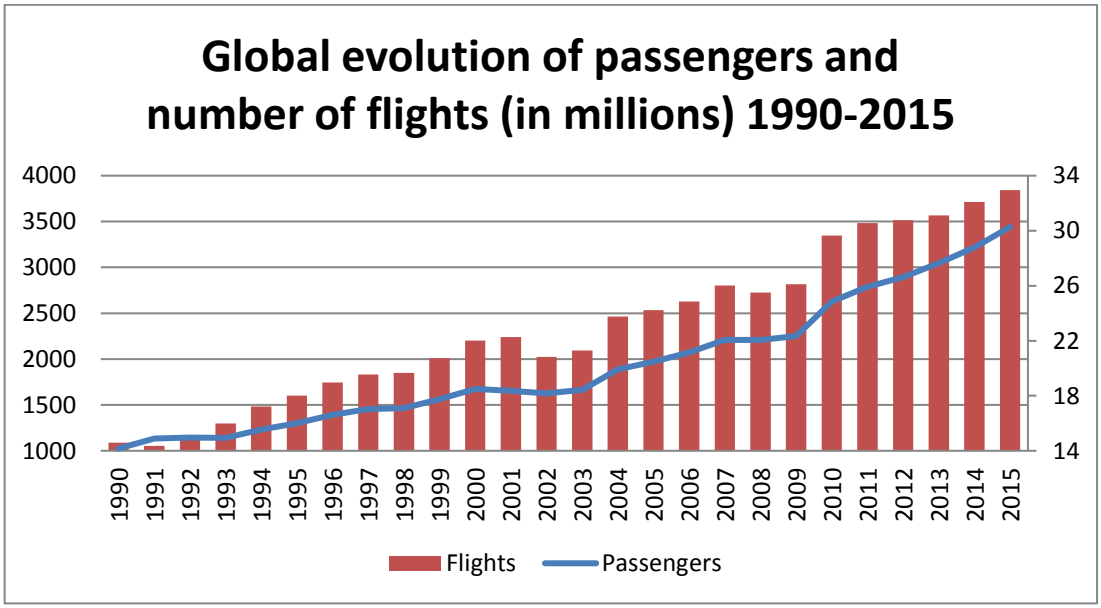
- **Charter Carriers (CHC):** They especially offer leisure flights operating outside normal schedules and are included in charter packages provided by tour operators, focusing, in a similar way to the LCCs, on point-to-point flights.
- **Regional Carriers (RC):** They generally use smaller aircraft with a capacity of 20-100 seats, and offer flights between small decentralized airports. In many cases, they cover the service needs of, for instance, interisland or peninsular traffic, and they sometimes have some type of public subsidy.

Nevertheless, since the competitiveness of companies has increased, it is now without doubt much more difficult to distinguish between each of the business models, as well as classify them clearly. Therefore, only the FSNCs and LCCs are included in this thesis.

Development of Passenger Airline Traffic

The evolution of the global number of passengers and the corresponding number of flights (see Figure 1-4) has been increasing in recent years, with only three exceptions due to recession, and a CAGR of 4.96% and 3.32%, respectively, during the period from 1990-2015.

Figure 1-4



Global evolution of the number of passengers and number of flights (1990-2015)
(Author's own work based on data.worldbank.org, 2015)

On the one hand, there was a decrease both in the evolution of takeoffs and passengers in 1991 and 1993, respectively, which was related to the Gulf War that took place in 1991, followed by the consequent oil crisis and first economic recession considered in the timeframe represented by the figure.

The second recession occurred during the period 2001-2002 as a consequence and effect of the events of September 2001 in the United States, which, in turn, caused greater uncertainty and a change of the paradigm in security issues, and furthermore generated an increase in the operating costs of airlines. Likewise, it produced greater inconvenience for passengers due to increased security measures, especially in relation to alternative means of transport.

Finally, the third recession both in number of passengers and flights in 2008 and 2009, respectively, was due to the reaction at the beginning of the economic financial crisis that occurred during this period of time.

Justification of the Study

Due to steadily growing airline demand and the constant need to influence customers' satisfaction positively, this doctoral thesis therefore focuses on two key aspects of the business that are addressed by the following questions:

- What are the factors that can positively or negatively affect airline customer satisfaction?
- What could be the potential consequences for airline companies of having satisfied customers?

As section 1.2. describes, the international academic literature has explained and analyzed the importance of relevant key aspects, such as quality and safety in the airline industry, as well as their influence on customer satisfaction and, consequently, on the firms' success.

The air transportation sector is a highly competitive environment; therefore, it is crucial to consider both these factors. Since airlines need to improve service quality constantly on the one hand, it is essential to understand and identify the expectations and requirements of their customers (Basfirinci and Mitra, 2015;

Norazah, 2014) in order to deliver a high-quality service to the passengers. This fact is essential for an airline's survival as well as for achieving profitability and growth (Norazah, 2014; Messner, 2016; Sandada and Matibiri, 2016; Sultan and Simpson, Jr., 2000). On the other hand, airlines must provide their passengers with operations that have a high safety standard (ICAO, 2015), and constantly try to identify the causes and potential consequences of hazards and risks. Thus, both quality and safety are fundamental elements, not only for the customers, but also for ground support, manufacturers, airlines and organizations (Brong, 2002).

This is especially true since airline deregulation in 1978 meant that service quality and safety became key topics. However, public perception is that service quality has decreased significantly (Rhoades and Waguespack, 1999; De Jager, 1993) and safety has suffered reduced expenditure due to the competitive pressures that have been generated between airlines (Moses and Savage, 1990).

Consumers are much more capable of valuing the service quality of airline companies rather than safety (Rhoades and Waguespack, 1999). Also, in terms of measuring both aspects, it is much easier to measure and analyse service quality than safety. In the airline business, several indexes exist for measuring quality, such as the Net Promoter Score (NPS), the American Customer Satisfaction Index (ACSI), the J.D. Power Airline Satisfaction Index, the Wichita's Airline Quality Rating (AQR) and SKYTRAX Airline Review and Rating; whereas for safety the existing measurement indexes are very scarce, and are represented mainly by the JACDEC safety index and the Airline and Safety Ratings index. Of the two, the most known index is the JACDEC safety index that establishes a yearly overall ranking of the 60 safest airlines worldwide, showing the relationship between the accident rate and the flight performance of each airline (JACDEC, 2014). Since safety is an attribute of quality, both elements should therefore be included in any management process of an airline, considering as a basis an understanding of the main Key Performance Indicators (KPIs) of the airline business.

Furthermore, it is clear that reductions in service quality are much more visible and hard-hitting than no reductions in safety spending (Rhoades and Waguespack, 1999).

Obviously, safety is the same for all customers, while quality depends on the perception of each passenger. However, safety should be the top priority of the airline business (Jeeradist et al., 2016).

For this reason, several studies have been conducted and put together as a compendium of academic publications for this thesis.

Since service quality and safety are essential and vital aspects for the airline business and, as they are related to each other, the main interest of this thesis lies in analyzing what has been published concerning safety and quality in the air transportation sector and assessing the impact that these elements could have on the profitability or success of the airline companies.

1.2. Theoretical Framework of the Study

For gaining further insights into the relevance of the previously mentioned key aspects studied in this doctoral thesis, a theoretical framework is provided.

The importance of especially quality, but also safety, in the air transportation industry has been extensively dealt with in the academic literature. The result shows above all the significance that both concepts have on customer satisfaction (Messner, 2016; Rajaguru, 2016; Hunter and Lambert 2016; Sandada and Matibiri, 2016; Sukati et al. 2015; Etemad-Sajadi et al., 2015; Basfirinci and Mitra, 2015; Norazah, 2014; Hussain et al., 2015; Kim and Lee 2011; Babbar and Koufteros, 2008; Vázquez-Casielles et al., 2007), which in turn leads to loyalty and product purchase intention (Jeeradist et al., 2016; Messner, 2016; Sandada and Matibiri, 2016; Etemad-Sajadi et al. 2015; Hussain, 2016; Kim, 2015; Akamavi et al., 2015), as well as, consequently, to the achievement of higher profitability (Messner, 2016; Sandada and Matibiri, 2016; Sultan and Simpson, 2000) and a firm's success (Rajaguru, 2016; Sandada and Matibiri, 2016).

The literature summary in Figure 1-5 shows the three main aspects considered in this thesis and their relationship with other elements, namely, the KPIs, service quality and safety. Figure 1-5 indicates that service quality directly influences loyalty and product purchase intention (Osaki and Kubota, 2016; Etemad-Sajadi et al., 2015; Hussain, 2016; Akamavi et al., 2015; Hussain et al., 2015) that, in turn, also depends on determinants such as customer value (Sajitos et al., 2010; Hussain, 2016) and incentives, especially in air transport, as represented by for instance the frequent flyer program (FFP) (Sandada and Matibiri, 2016).

Service quality, including pre-flight, in-flight and post-flight services, can be divided into process quality and outcome quality (Osaki and Kubota, 2016). Outcome quality refers to terms such as punctuality, while process quality is related to staff correspondence as a general factor, and to premium services, such as check-in service, lounge access, deplaning, etc. (Osaki and Kubota, 2016).

Customer expectations depend on the service quality offered by an airline (Jeeradist et al., 2016) and they consequently have an influence on customer

perceptions and the perceived value or performance (Jeeradist et al., 2016; Norazah, 2014; Sultan and Simpson Jr., 2000; Kim, 2015; Hussain et al., 2015; Liou et al., 2011; Kim and Lee, 2011; Chen and Chang, 2005; Park et al., 2004).

According to the literature reviewed, both service quality and safety have an influence on customer perceptions (Jeeradist et al., 2016). Positive customer perceptions, meaning a higher service perception than expectation, will have an effective outcome on customer satisfaction (Jeeradist et al., 2016; Norazah, 2014; Chen, 2008; Kim, 2015) and this, besides generating loyalty and product purchase intention, likewise creates positive word of mouth (Norazah, 2014; Liu and Lee, 2016; Kim and Lee, 2011) and behavioural intention (Chen, 2008; Kim and Lee, 2011; Park et al., 2004).

Another factor that should be considered is value for money, which is defined as the price perception of service quality in general, both in monetary and behaviour terms (Liu and Lee, 2016), and specifically the impact that perceived price fairness and the customers' willingness to pay has on customer expectations and customer satisfaction (Osaki and Kubota, 2016; Rajaguru, 2016; Etemad-Sajadi et al, 2015; Sajitos et al., 2010; Liu and Lee, 2016; Akamavi et al., 2015).

Evidently, service quality, high perceptions and perceived value or performance, as well as airline safety, can have a crucial impact on the image of an airline company and *vice versa* (Jeeradist et al., 2016; Sandada and Matibiri, 2016; Park et al., 2004). The better the airline image, the higher should be the customers' perception of the service offered (Jeeradist et al., 2016). Subsequently, a favourable airline image positively influences customer satisfaction (Hussain, 2016; Akamavi et al., 2015; Park et al., 2004), as well as loyalty and product purchase intention (Messner, 2016; Akamavi et al., 2015).

The reviewed literature also showed that only a few authors considered the relationship between safety and quality as an important link (Hunter and Lambert, 2016), therefore creating a gap that should be analysed with further research.

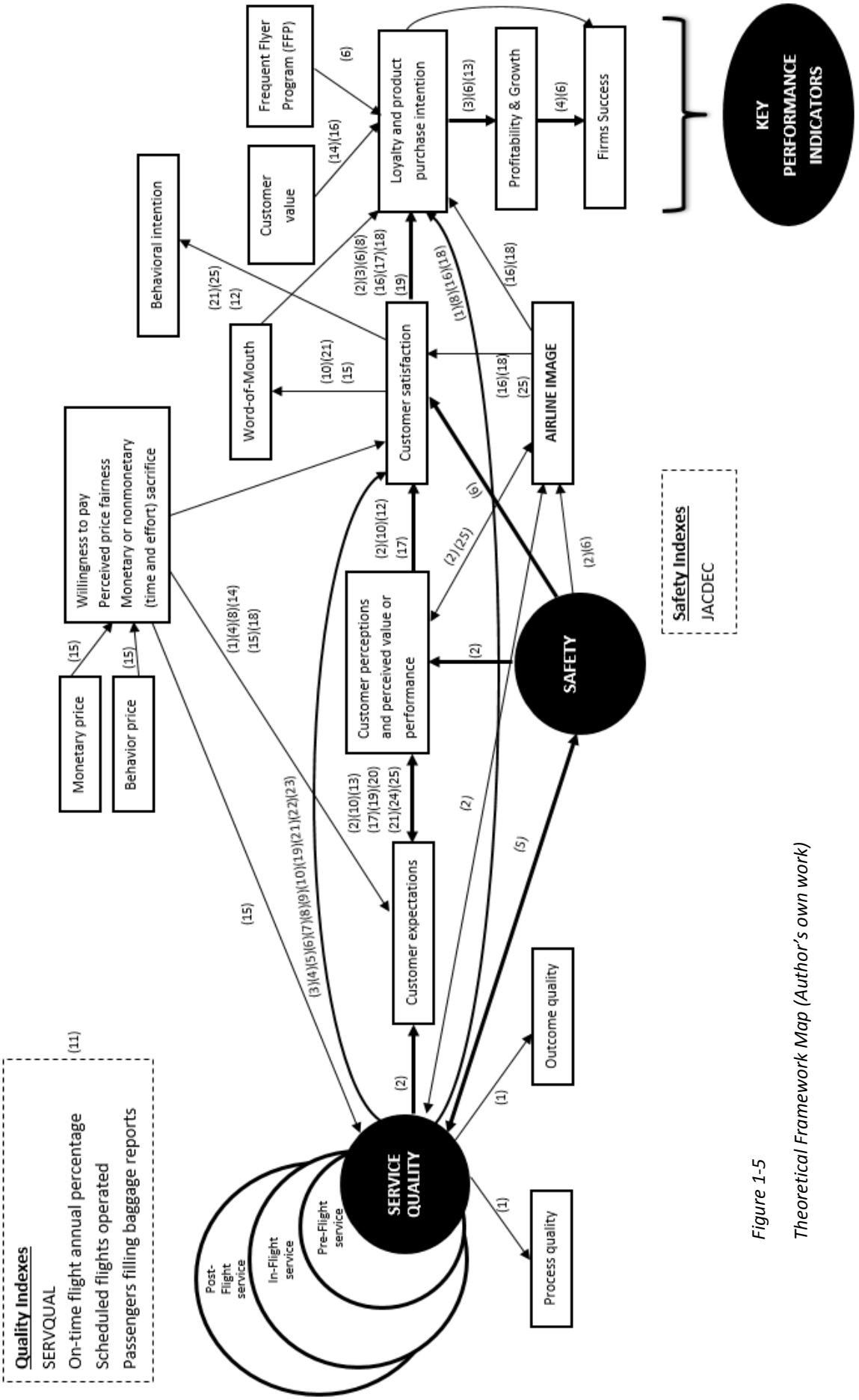


Figure 1-5

Theoretical Framework Map (Author's own work)

Chapter I

Table 1-1

1	Osaki, T. and Kubota, Y. (2016)	**14**	Sajtos, L., Brodie, R. and Whittome, J. (2010)
2	Jeeradist, T. Thawesaengskulthai, N. and Sangsuwan, T. (2016)	**15**	Liu C-H. and Lee, T. (2016)
3	Messner, W. (2016)	**16**	Hussain, R. (2016)
4	Rajaguru, R. (2016)	**17**	Kim, Y. (2015)
5	Hunter, J.A. and Lambert, J.R. (2016)	**18**	Akamavi, R., Mohamed, E., Pellmann, K. and Xu, Y. (2015)
6	Sandada, M. and Matibiri, B. (2016)	**19**	Hussain, R., Al Nasser, A. and Hussain, Y. (2015)
7	Sukati, I., Khiang, T.B. and Isnurhadi (2015)	**20**	Liou, J., Hsu, C.C. and Lin, R.H. (2011)
8	Etemad-Sajadi, R., Way, S.A. and Bohrer, L. (2015)	**21**	Kim, Y. and Lee, H. (2011)
9	Basfirinci, C. and Mitra, A. (2015)	**22**	Babbar, S. and Koufteros, X. (2008)
10	Norazah Mohd Suki (2014)	**23**	Vázquez-Casielles, R., del Río-Lanza, A.B. and Díaz-Martín, A.M. (2007)
11	Tiernan, S., Rhoades, D. and Waguespack Jr, B. (2008)	**24**	Chen, F.Y. and Chang, Y.H. (2005)
12	Chen, C.F. (2008)	**25**	Park, J.W., Robertson, R. and Wu, C.L. (2004)
13	Sultan, F. and Simpson Jr., M. (2000)		

Authors included in the Theoretical Framework Map in Figure 1-5 (Author's own work)

1.3. Research Questions and Objectives

Considering the background described, the main objective of this doctoral thesis was to contribute to an understanding of the consequences and impact of quality and safety on the profitability of airline companies, as well as to emphasize the importance of and need for management accounting and its Key Performance Indicators in the airline industry. Therefore, the focus was based on several research questions, which were derived from the research gaps in the reviewed literature, by considering different methodologies and objectives for each one as described in their relevant chapter. The thesis structure is designed in the form of a compendium of six publications.

First, related to the importance of management accounting with the aim of providing an overview of the most important KPIs used in the airline sector, the research question was as follows:

1) What are the most applied and relevant Key Performance Indicators used in the Air Transportation Industry?

Second, and considering the need to implicate quality in the airline industry, the research questions were:

2) What has been published about Quality in the Airline Industry?
3) How does Quality correlate with an Airline's Profitability?

Third, and finally, regarding the second key management aspect in the airline industry dealt with in this thesis, safety, the following research questions were addressed:

4) What has been published about Safety in the Airline Industry?
5) How does Safety impact the Profitability of the Airline Companies?

To answer these questions, the six studies included in this doctoral thesis (papers A-F) were carried out in order to achieve the established objectives.

1.4. Thesis Structure

As previously mentioned, the main objective of this doctoral thesis was to focus on the important key aspects quality and safety in the air transportation industry.

In order to be able to discuss the research questions as best as possible, the thesis structure is divided into five chapters. Table 1-2 provides a summary of the most essential aspects considered, outlining the research questions, the content of each chapter and the main research results.

Chapter One provides the reader with an overview of the airline industry and explains the development of past trends. In addition, a theoretical framework and the scope of the doctoral thesis are provided, and the research questions and thesis structure are presented.

Chapter Two introduces the reader to the main Key Performance Indicators and the importance of management accounting and information in the airline industry. In addition to the literature review carried out, the results are presented in Section 2.3. as a paper entitled *"Management information used by Spanish Airlines for the financial decision making process: an exploratory study",* which has been published in the *Journal of Investment Management and Financial Innovations* (Vol. 13, Issue 2, 2016) indexed in the database Scopus.

Chapter Three corresponds to quality in the airline industry. First, a literature review concerning the quality concept is provided as a paper entitled *"An Overview of the Quality Concept in the Air Transportation Business: A Systematic Literature Review"*, which has been published in the *International Journal for Quality Research*, (Vol. 11, Issue 1, 2017) indexed in the database Scopus.

Furthermore, a study was conducted to determine the impact that quality has, or not, on the profitability of US airlines, and the results are provided through an additional paper, entitled *"The Quality Effect on the Profitability of US Airline Companies",* which has been published in Online First in the Journal *Tourism Economics*, 2017, indexed in the database Journal Citations Reports (JCR).

Likewise, based on the outcome of these papers and considering the attention paid to quality indexes used in the airline industry, a study was carried out and the results are presented in the paper entitled *"The Quality-Profitability Link in the US Airline Business: A Study based on the Airline Quality Rating Index"*, which has been published in the Journal *Procedia Engineering* (Vol. 187, 2017) indexed in the database Scopus.

Chapter Four contains an overview related to the safety concept in the airline business, providing results through an additional paper in this doctoral thesis entitled *"Safety as a management concept in the air transport sector: A systematic literature review",* which has been published in the Journal *Intangible Capital* (Vol. 13, Issue 1, 2017) indexed in the database Scopus.

Additionally, the relationships between safety and airline profitability and performance were studied, where the results are given through the paper entitled *"The Potential Relationship between Safety and Performance in the Airline Industry",* which is currently under review in a JCR indexed Journal.

Chapter Five provides the conclusions and findings drawn from this doctoral thesis through the compendium of publications, as well as detailing the implications, limitations and further research lines.

It should also be mentioned that all references cited are contained in the reference list in the penultimate section of this thesis, even though each paper already has its own bibliography with its own formatting style depending on the guidelines required by each Journal publishing the studies.

Furthermore, an appendix has been added as the final part of this thesis that shows the questionnaire used for the online survey for paper A presented in Chapter Two.

Table 1-2

CHAPTER	RESEARCH QUESTIONS	CONTENTS	MAIN RESULTS
2 **Key Performance Indicators in the Airline Industry**	1) What are the most applied and relevant key performance indicators (KPIs) used in the air transportation industry?	2.1. Introduction 2.2. Literature Review on Key Performance Indicators 2.3. **Research Study → Paper A "Management Information used by Spanish Airlines for the Financial Decision Making Process: an Exploratory Study"**: Published in the *Journal of Investment Management and Financial Innovations, Vol. 13, Issue 3, pp. 341-352, 2016* (indexed in the database Scopus)	High level of implementation and utility of management accounting in the Spanish Airline Industry.
3 **Quality and Profitability in the Airline Business**	2) What has been published about quality in the Airline Industry? 3) How does quality correlate with an airline's profitability?	3.1. Introduction 3.2. Literature Review → **Paper B "An Overview of the Quality Concept in the Air Transportation Business: A Systematic Literature Review"**: Published in the *International Journal for Quality Research, Vol. 11, Issue 1, pp. 51-70, 2017* (indexed in the database Scopus) 3.3. **Research Study (a) → Paper C "The Quality Effect on the Profitability of US Airline Companies":** Published in Online First in the Journal *Tourism Economics, 2017* (indexed in the database JCR) **Research Study (b) → Paper D "The Quality-Profitability Link in the US Airline Business: A Study based on the Airline Quality Rating Index":** Published in *Procedia Engineering, Vol. 187, pp. 308-316, 2017* (indexed in the database Scopus)	Growing interest in this research field during recent years. Positive and significant influence of service quality on the ROI of Airline Companies, non-significant effect for quality on airline passenger revenues.
4 **Safety and Profitability in the Airline Business**	4) What has been published about safety in the Airline Industry? 5) How does safety impact the profitability of the airline companies?	4.1. Introduction 4.2. Literature Review → **Paper E "Safety as a Management Concept in the Air Transport Sector: A Systematic Literature Review"**: Published in *Intangible Capital, Vol. 13, Issue 1, pp. 71-93, 2017* (indexed in the database Scopus) 4.3. **Research Study → Paper F "The potential Relationship between Safety and Economic and Financial Performance in the Airline Industry":** Currently under review in a JCR Journal	Considerable increase of academic literature in recent years. Non-significant effect for safety on the profitability of airlines, but a significant effect of safety on airline revenues

Summary of the Doctoral Thesis with its Main Sections (Authors' own work)

2

CHAPTER TWO
KEY PERFORMANCE INDICATORS IN THE AIRLINE INDUSTRY

UNIVERSITAT ROVIRA I VIRGILI
QUALITY AND SAFETY IN THE AIRLINE INDUSTRY AND THEIR INFLUENCE ON COMPANY PROFITABILITY
Nicole Kalemba

In the current chapter, after the general overview of the airline industry given in Chapter One, the main objective of Chapter Two lies in explaining the importance of management accounting and the need for Key Performance Indicators (KPIs) in the airline business.

2.1. Introduction

The concept of KPIs in recent years has become one of the most commonly used terms in business management, since KPIs are important tools for measuring the performance of companies and for the decision-making process. Due to the growing competition in the airline industry (Pakdil and Aydin, 2007; Belobaba et al., 2009; Keynes, 2009) and the uncertainty related to technological, political and sociological changes, there is a consequent need to use Key Management Indicators for the optimization of operational and business decision making activities.

Therefore, this second chapter of the thesis aims to provide an overview of the importance of the use of KPIs in the airline business. Nevertheless, considering they are the same for the whole airline business, the research was limited especially to the Spanish airline industry.

For this reason, a quantitative exploratory study has been carried out with the main aim of analyzing the management information used by the leading Spanish airline companies.

Quantitative studies allowed data to be provided for the trends, attitudes and opinions in a numeric and descriptive form. In this case, after considering different data collection techniques, an online questionnaire was designed and used, since it is a method that can cover large samples of a population (Lim, 1995; Creswell, 2009).

This chapter is divided into the following different parts. First, after a small introduction, a literature review of KPIs is provided in section 2.2, whereas section 2.3 subsequently presents the research study (paper A) with its associated methodology and the results derived from the study, which are represented by subsections 2.3.1 and 2.3.2, respectively.

Paper A, entitled "*Management information used by Spanish airlines for the financial decision making process: an exploratory study"* was published in 2016 in the *Journal of Investment Management and Financial Innovations* indexed in the Scopus database.

2.2. Literature Review on Key Performance Indicators (KPIs)

KPIs are essential for a company's future success (Parmenter 2007; Campa-Planas et al., 2016), as they can determine future initiatives, analysis and test results (Arhall and Cox, 2013). Furthermore, KPIs play a crucial role since they provide essential and accurate information to the companies related to aspects they need to control and measure (AECA, 2002). They allow managers to benchmark their current performance with other companies, as well as with the target and established objectives of the business, for subsequent analysis and identification of any possible deviations (Maté et al., 2017; Peral et al., 2017).

Parmenter (2007) states that KPIs have a wide range of beneficial characteristics. Thus, for a useful outcome, they are measured frequently to determine their evolution and thus make appropriate decisions. Naturally, the KPIs must be understood by the whole staff as they are the result of cooperation between a multitude of managers.

According to AECA (2002), there are several additional aspects that must be taken into account when defining an indicator, such as, among others, the following:

- It must be able to explain what it is measuring through its denomination.
- Every indicator must be related to a Key Success Factor (KSF).
- It must have an explicit character, explaining in a clear and decisive way what it wants to achieve together with the determination of a time horizon.
- The indicator's measurement method should not create any doubt when compared with other objectives or indicators.
- The indicator must be reliable and comparable for different periods of time.

In contemplation of analyzing the operational and financial performance of airline companies, the airline business proposes its own KPIs, as every business does (Belobaba et al., 2009; Barnett, 2009; AECA, 2011; Massachusetts Institute of Technology, 2014).

For this reason, the current section intends to provide an overview of the management indicators usually used in the airline industry that have been identified through the reviewed academic literature. Figure 2-1 shows a summary of the main indicators for each of the KSFs. Thus, a distinction is generally made between market indicators (exchange rate, type of interest, GDP, etc.) and the economic indicators derived from the business operation (passengers, freight, maintenance), as well as economic and financial indicators (EBITDAR, EBITDA, ROI, ROE, etc.), based on the annual accounts, and non-economic indicators (AECA, 2011).

In this case, the KPIs are related to seven defined KSFs, namely, the economic and financial performance, traffic, production, productivity, costs, quality and freight.

The literature also shows that it is essential subsequently to synthesize the management information with the help of the Balanced Scorecard (BSC) developed by Kaplan and Norton (1992), as pointed out by Amat and Campa (2011), Banchieri et al. (2011) and Sainaghi et al. (2013).

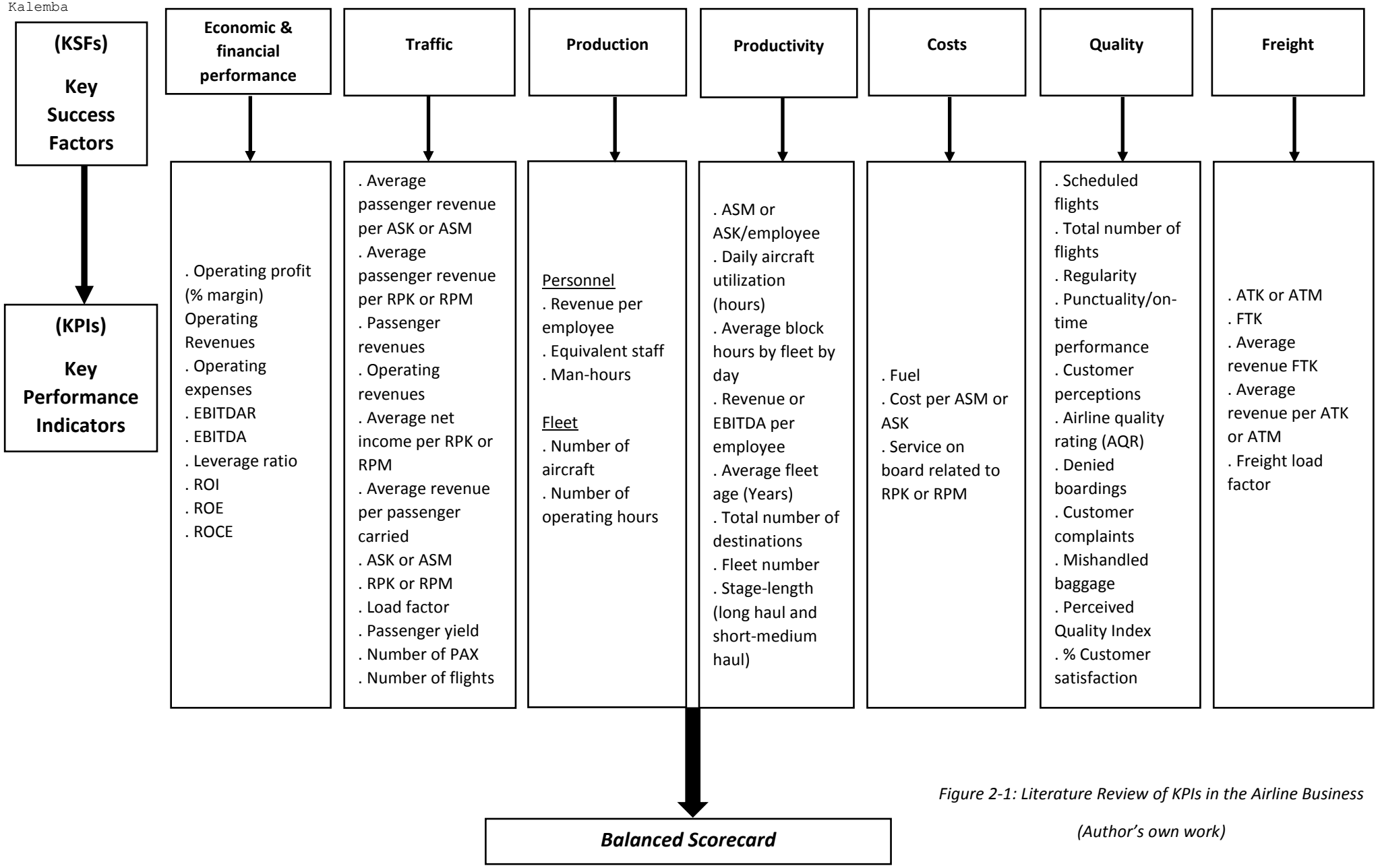


Figure 2-1: Literature Review of KPIs in the Airline Business

(Author's own work)

A brief introduction to the main KPIs shown in Figure 2-1 that were used for the study carried out (see Section 2.3) and that formed part of the questionnaire are as follows, among others (Morell, 2007; AECA, 2011; Demydyuk, 2011; IATA, 2013; Vasigh et al., 2016; Bureau of Transportation Statistics, 2017; Massachusetts Institute of Technology, 2017):

1) Related to the Economic Performance
    - **EBITDAR:** Earnings Before Interests Taxes Depreciations Amortizations and Renting
    - **EBITDA:** Earnings Before Interests Taxes Depreciations and Amortizations

Both EBITDAR and EBITDA are operating measurements for a company's performance, with the difference being that EBITDAR allows benchmarking with the aim of determining the operating result excluding in this case fleet renting from the expenses.

2) Related to Traffic
    - **ASK or ASM:** Available Seat Kilometers/Miles is a supply indicator that refers to the available capacity, defined as one aircraft seat flown one mile/kilometer, whether occupied or not by a passenger.
    - **RPK or RPM:** Revenue Passenger Kilometers/Miles is a demand indicator that measures the number of airline seats sold. Therefore, the number of revenue-paying passengers onboard has to be multiplied by the distance traveled.
    - **Revenues per ASK or ASM:** An indicator measured by dividing the passenger revenue of an airline by Available Seat Kilometers/Miles.
    - **Revenues per RPK or RPM:** An indicator measured by dividing the passenger revenue of an airline by RPK/RPM.
    - **Passenger Load Factor:** The passenger occupancy factor calculated as the ratio of RPK/ASK or its equivalent RPM/ASM.

3) Related to Productivity
    - **Daily aircraft utilization (hours):** A productivity related measurement, calculated typically in block hours per day.
    - **Average Block Hours by fleet by day:** Measured as flight duration, from the moment the aircraft pushes back from the gate at the departing airport until arrival at the gate at the destination airport.
4) Related to Quality
    - **Punctuality/On-time performance (OT):** Quality indicator related to the on-time arrival, travel time, turnaround time and delay of an airline. Punctuality in the airline business is generally measured in a time period delay of less than 3, 15 or 60 minutes, depending on the flight length.
    - **Regularity:** Percentage relationship between flights undertaken and scheduled flights.
    - **Customer Complaints (CC):** Number of complaints by passengers due to aspects such as flight or reservation problems, ticketing, among others.
    - **Mishandled Baggage (MB):** Customer claims concerning lost, delayed or damaged baggage.
    - **Perceived Quality Index:** Quality related indicator, providing information (through surveys) concerning the customer perception of the service quality received, especially related to areas such as handling and passenger transport.
5) Related to Freight
    - **ATK or ATM:** The available Tonne Kilometer/Mile is a freight indicator related to the weight capacity carried multiplied by the kilometers/miles travelled.
    - **Weight Load Factor:** The ratio between Revenue Tonne Kilometers/Miles and ATK or ATM.

2.3. Research Study

This section of Chapter Two presents the methodology used and the outcome obtained through the study carried out regarding the KPIs in the airline business.

2.3.1. Methodology

The main aim of this research was to examine the degree of practical application for management accounting in Spanish airline companies, as well as to determine the budgeting methods, procedures used to present deviations between planned and real results and, finally, the key performance indicators and their frequency.

To achieve the established objectives and to provide information concerning the degree of practical application for management accounting in the Spanish airline industry, an online questionnaire was elaborated (see *Appendix I*) and administered to the persons in charge of management accounting in the main Spanish airline companies: Air Europa, Air Nostrum, Grupo Binter, Iberia, Volotea and Vueling Airlines.

The questionnaire was drawn up based on the results of the literature review and it was structured in several sections. First, after a small introduction, the general classification characteristics were asked for (i.e. name and identification of the company). Second, questions concerning the resources applied to developing management accounting and the importance given to it were requested. Third, the use of traditional management accounting tools was considered, which was followed by questions concerning the use of planning and budgeting systems. Subsequently, the responsible person for management accounting had to answer questions dealing with the specific management and performance indicators of the air transportation sector used in the budgeting process. The final section concerned the information included in the reporting systems of the company, as well as how it was synthetized in a company BSC. A total of 100% of the six Spanish airline companies answered the questionnaire.

2.3.2. Results

The final results are presented in Paper A that has been published in an internationally indexed journal:

- Paper A: *"Management information used by Spanish Airlines for the financial decision making process: an exploratory study"* was published in the *Journal of Investment Management and Financial Innovations*, vol. 13, issue 3, 2016, indexed in the database Scopus and made available at: *http://dx.doi.org/10.21511/imfi.13(3-2).2016.06*

Investment Management and Financial Innovations, Volume 13, Issue 3, 2016

Fernando Campa-Planas (Spain), Nicole Kalemba (Spain), Lucía-Clara Banchieri (Argentina), Juan Magaz-Pérez (Spain)

Management information used by Spanish Airlines for the financial decision making process: an exploratory study

Abstract

The main objective of this research was to examine the degree of practical application of management accounting in Spanish airline companies as far as management accounting is a crucial tool for the financial decision making process. In particular, the goal was to get to know the degree of strategic planning, the utilized methods of budgeting, procedures used to present the comparison between planned and actual results, and the reported key performance indicators, as well as their frequency. Quantitative methodology has been used through the creation of an on-line questionnaire. The results showed that the level of implementation, and utility granted to the different techniques of management accounting in the analyzed companies that are corresponding to the six most important airlines in Spain, is pretty high, helping airline companies to make operations and financial decisions.

Keywords: strategic planning, airline companies, financial decision making, key performance indicators, management accounting.
JEL Classification: M41, L93.

Introduction

The international air transport industry is essential for any global economy as it provides a great value and service to operate in a completely globalized environment (Belobaba et al., 2009). Numerous studies have shown that air transport contributes significantly to the economy of a country, being an important motor for the economic development of the nations (Button et al., 1998; Reynolds-Feighan, 2001; Daley, 2009; Ginieis et al., 2012), as well as for the social development (ATAG, 2014; IATA, 2014).

The growth of the air transportation industry during much of the twentieth century was made possible by major technological innovations, such as the introduction of aircrafts for commercial use in the 50s, followed by the development of wide-body aircrafts in the 70s (Belobaba et al., 2009), among other actions. To emphasize the importance of the sector by volume, currently the airline industry consists of 1,397 airline companies, operating 25,332 aircrafts, and providing service to 3,864 airports worldwide (ATAG, 2014).

Air transport differs from other types of transportation due to characteristics such as speed, safety and security, flexibility and cost (ATAG, 2014). One of the most widely used indexes to measure the efficiency of air transport is its passenger load factor, which was 80.2% worldwide in 2015 (IATA, 2016). The air traffic passenger demand is steadily growing and it is expected that the airline sector will maintain a positive compound annual growth rate (CAGR) of 5.4% until 2017 and afterwards a slight increase will be maintained until 2030 (IATA, 2015; Statista, 2015).

According to the Air Transport Action Group (ATAG, 2014), the rapid growth of air transport in recent decades has been motivated mainly by the following factors:

- Increase of GDP, disposable income and quality of life, which has led to an increase in the demand for traveling, with a consequent impact on the sector.
- Reduced airfares, as a result of improved efficiency in the sector and higher competition, increasing, therefore, the demand by offering a higher and easier accessibility to the purchase of flight tickets.
- Globalization of the sector, through the increase of long-distance trips offered, consequently, providing a better infrastructure and better equipped aircrafts for long haul flights.
- Deregulation of the sector, by making possible the entry of new companies in the sector, additionally to the traditional flag carriers. Starting in 1978 in the United States, the economic deregulation was a key event for the industry, concepts such as cost efficiency, operational profitability and competitive behavior became dominant issues that the airline management (Belobaba et al., 2009).

As a result of the mentioned continuous development of the airline industry, its growing complexity and the highly competitive environment, it is essential to consider management accounting as it helps managers to make decisions, to solve problems, to plan related activities, as well as it

Fernando Campa-Planas, Ph.D., Full Professor, Universitat Rovira i Virgili (Reus), Spain.
Nicole Kalemba, Ph.D. Student, Universitat Rovira i Virgili (Reus), Spain.
Lucía-Clara Banchieri, Ph.D., Associate Professor, Universidad Nacional del Sur (Bahía Blanca), Argentina.
Juan Magáz-Pérez, Specialist Consultant in Air Transport, Spain.

Investment Management and Financial Innovations, Volume 13, Issue 3, 2016

helps to follow up and control them. And certainly, it is necessary to know, in which way airlines are managing their resources and how they run their operations. The existing global competition in the market of firms has increased steadily the number of challenges the managers are confronted with (Pérez-Méndez and Machado-Cabezas, 2015).

Objective of the study

As literature on the relevance of management accounting in the airline industry is scanty, the objective of this research was to analyze management information used by Spanish Airlines, carrying out an exploratory study.

Spain is the second ranked tourist destination in Europe and the third in the world in numbers of international tourist arrivals (UNWTO, 2016) and, obviously, the air transport plays an indispensable role as intermediary industry in the tourism sector, so that in 2014, a 79.7% of the international tourists used the airplane as means of transport for arriving to Spain. Also the fact that Spain provides about 3.88 billion seat kilometers weekly (Statista, 2015), made that all those mentioned aspects have been seen as potential factors to put an emphasis on the main regular Spanish airline companies in this research.

Structure of the paper

Therefore, the paper gives initially an overview on the airline industry, both in a general way, as well as specifically in the case of Spain. Section 2 describes the need of management accounting in general terms, as well as in the air transport sector. Section 3 presents the goals and methodology applied, section 4 exposes the results of the exploratory study, while the last section explains the concluding remarks.

1. An overview on the airline industry

1.1. Relationship between the air transportation and economic activity. Air transport generates employment in the airline sector and creates wider socioeconomic benefits thanks to its potential of combining various types of activities in a local economy, consequence of the increasingly globalized world economy, facilitating the growth of international trade, tourism, and, consequently, international investment (ATAG, 2014).

This economic impact of the airline industry varies from its direct effects on employment and profitability of the companies, to the less direct, but important effects on aircraft manufacturing, construction of infrastructures and airport management. The air transportation industry has also an important impact on the tourism industry and contributes significantly to the development of other industries or activities (Belobaba et al., 2009; AECA, 2011).

Economic activity generates the need of transportation of passengers and goods and, therefore, urges a high demand on air transport services. This relationship results in a significant correlation between the amount of air travelers and the global GDP (Ishutkina and Hansman, 2008).

Consequently, the air transportation industry is a global driver of the economy and, as an outcome thereof, more than 58 million jobs have been created, contributing a 3.4% of the global GDP (ATAG, 2014).

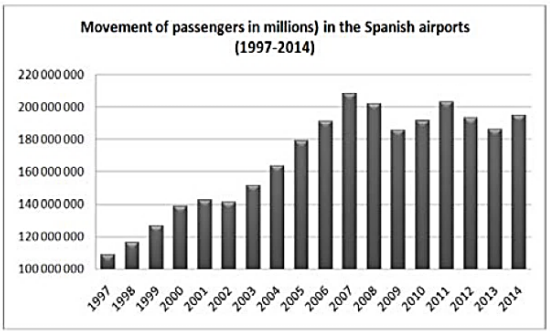
1.2. The air transportation sector in Spain. Spain, whose economy is significantly oriented to the service and tourism sector, companies involved in the air transportation industry are essential for the performance of the country's economy, being a basic pillar of its development (CEOE, 2009).

It is one of the activities that shows a greater contribution to the GDP of the country, 6% (INE, 2011), and plays an important role as an intermediary industry (AECA, 2011). There is an important link between air transportation and international trade of goods and generation of services, promoting specially the tourism (AECA, 2011).

As previously mentioned, Spain is the third country in the world and second in Europe by international tourist arrivals in 2015 (UNWTO, 2016).

As it is shown in Figure 1, during the years 1997-2014, the movement of passengers (arrivals and departures) in Spanish airports has had an upward trend, with exceptions in the years 2002, 2008/2009 and 2012/2013, periods which coincide with the cycle of the worldwide recession, before mentioned.

The year 2007 stands out with an historic record of 210.5 million passengers, followed by two consecutive years of declines with annual variations of a -3.2% and -8%, respectively, caused by the increase in fuel price and the beginning of the global financial crisis having a significant impact on the Spanish economy (Hosteltur, 2013).

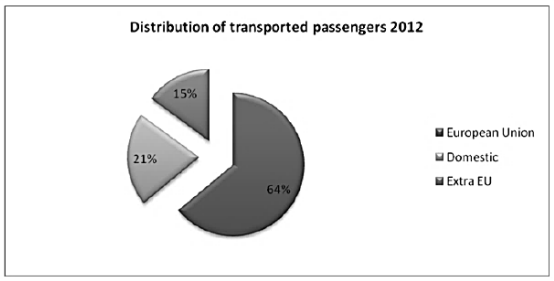


Source: created by the authors from the data of the Ministry of Public Works and Transport, 2015.

Fig. 1. Movement of passengers (in millions) in the Spanish airports (1997-2014)

Investment Management and Financial Innovations, Volume 13, Issue 3, 2016

The main flow of passengers from Spain is related to the traffic it has with the European Union (see Figure 2), which represents approximately 64% of the total movement, followed by 21% of the domestic market, whereas the extra European market represents 15% (Hosteltur, 2013).



Source: created by the authors from the data of the Ministry of Public Works and Transport, 2013.

Fig. 2. Distribution of transported passengers from Spain, 2012

Additionally, it is important to mention that, apart from the deregulation in the air transportation sector, there were other factors that have had a significant impact on the airline industry, including the construction of new road infrastructure, new market participants, such as Low Cost Carriers (henceforth LCCs), and the competence of the high speed train (being called AVE in Spain). The latter has led to a major shift in the air traffic demand to the train, especially the domestic one (Albalete et al., 2014), since it is a clear alternative to air and road transport. The high speed train services can replace the air transport services and they are more competitive, especially on short-haul routes (Givoni and Banister, 2006).

An example in Spain is the high speed train route between Madrid and Barcelona, which was launched in February 2008 and reached, in 2015, a traffic volume of more than 3.7 million of passengers (City Council Barcelona, 2015), being market leader on this route (Hosteltur, 2013).

1.3. Main national and international airline companies in Spain. Table 1 shows a ranking of the major domestic and international airlines that operate in Spain along with their numerical evolution of the number of passengers carried during the years 2004, 2008 and 2014.

Table 1. Evolution of the number of passengers by each airline company

	2004		2008		2014	
Vueling	609.077	0,4%	7.747.831	3,8%	26.913.436	13,8%
Air Europa	13.160.608	8.0%	15.652.406	7.7%	14.844.608	7.6%
Iberia	41.307.515	25.2%	33.647.618	16.6%	13.348.083	6.8%
Air Nostrum	6.677.152	4.1%	9.595.041	4.7%	6.648.928	3.4%
Iberia Express					6.130.541	3.1%
Binter Canarias	4.876.146	3.0%	4.663.981	2.3%	453.785	0.2%
Volotea					306.845	0.2%
Pullmantur Air S.A.	94.547	0.1%	281.533	0.1%	183.429	0.1%
Swiftair S.A.	25.658	0.0%	245.545	0.1%	16.337	0.0%
Flightline (Flight-Avia)	6.354	0.0%	11.724	0.0%	1.048	0.0%
Rest of Spanish companies	35.198	0.0%	444.590	0.2%	2.822.099	1.4%
Subtotal Spanish companies	66.792.255	40.8%	72.290.269	35.7%	71.669.139	36.8%
Ryan Air	3.765.229	2.3%	14.871.089	7.4%	31.698.195	16.3%
Easy Jet	5.645.087	3.4%	10.999.798	5.4%	10.679.112	5.5%
Air Berlin	6.975.791	4.3%	11.604.998	5.7%	9.506.757	4.9%
Norwegian Air	59.182	0.0%	405.924	0.2%	4.690.874	2.4%
Thomson Airways	173.413	0.1%	4.324.592	2.1%	4.180.404	2.1%
Rest of foreign companies	80.477.560	49.1%	87.726.534	43.4%	62.553.729	32.1%
Subtotal foreign companies	97.096.262	59.2%	129.932.935	64.3%	123.309.071	63.2%
Total traffic Spanish airports	163.888.517	100.0%	202.223.204	100.0%	194.978.210	100.0%

Source: created by the authors from the data of AENA, 2015.

Of the six major regular Spanish airlines, Vueling is the one with the highest number of passengers transported in 2014, followed by Air Europe and Iberia. In the case of the international airline companies, the evolution of Ryanair stands out during the years 2004-2014 as, in the last year, it was the company with the highest number of transported passengers in Spain. Although the total number of traffic at Spanish airports has had an evolution with a positive tendency, we observed a change in the market share obtained by the Spanish and international airlines over the total of transported passengers during the analyzed period. In 2004, 40.8% of all the passengers were transported by the Spanish airlines, whereas this percentage was reduced in 2014 to 36.8%, while foreign companies had an increase in the opposite direction in the market share they obtained.

Investment Management and Financial Innovations, Volume 13, Issue 3, 2016

2. The need of management accounting

2.1. Management accounting as a financial tool. The term management accounting started to be used in Spain in the decade of the 80s to define new fields of action which arise within the discipline of cost accounting, and, given its scope and relevance it contributes in an outstanding way with a new terminology to the countable disciplines, causing a new approach of objectives and methodology.

Already in 1969, the Institute of Management Accounting (IMA, 2016) defined the targets of these accounting fields in the United States as follows:

- Managing functions that are critical to business performance.
- Supporting organizational management and strategic development.
- Providing accurate and insightful information for better decisions.
- Ensuring that organizations operate with integrity and proper governance.
- Planning for the long-term and helping to ensure sustainability.
- Safeguarding the interests of the organization and its key stakeholder.

AECA [1] (AECA, 1990) defines management accounting as a branch of accounting that aims to capture, measure and assess, as well as to rationalize and control the internal data, in order to provide information to the organization that is relevant for making decisions in the business. Therefore, the aim of management accounting is to give answers to multiple needs formulated in organizations, in order to optimize cost efficiency and, therefore, to be more competitive from the strategic and financial point of view.

The expected information from management accounting should allow adopting decisions rationally, so that the risk that emerges from this decision can be as small as possible. This information is expected to be used as a guide or baseline for all types of internal company decisions. According to Lebas (1993), management accounting avoids all kinds of submission to any regulation since it is inserted closer to the ambiguous and imprecise future, than to the past.

Therefore, management accounting is one of the basic instruments for the process of decision making in business organizations and the control they require (Sáez et al., 1993), having experienced a spectacular evolution in the last decades. The transformation processes of organizations, the interaction with the environment, both economic and social, the new competitive context and the incorporation of new technologies have greatly influenced this development (Fernández, 1994).

In this context, Porter (1996) says that a company that wants to be competitive and sustainable in the long term should achieve operational efficiency and have a clear strategy. As explained in the previous section, deregulation in the airline industry increased even more the importance of the exposed issues for the airline companies (Belobaba et al., 2009).

Management accounting contributes to operational efficiency through monitoring and controlling costs. From a strategical and financial perspective, it provides the link between the budget and the strategic plan that ensures that the financial resources are related and oriented to the achievement of the final goals of the organization.

With this in mind, special features of tools and management accounting models used by the airline companies will be presented.

2.2. Management accounting in the air transportation sector. Decision making and planning is a crucial task within the management accounting and especially in the airline industry as this sector is highly competitive. Through an effective organizational structure, one company can have an advantage over another one (Wensveen, 2015).

The airline business involves a multitude of other businesses as passenger and cargo transportation and handling, airport infrastructures, information systems, catering, ancillaries (O'Connell and Warnock, Smith, 2013), between others (Campa-Planas and Campa-Lewkowycz, 2009; AECA, 2011), fact that makes management accounting indispensable in such a complex industry as aviation is. Furthermore, it provides information especially to managers and employees about financial and operating data of organization's activities.

The air transportation sector has a number of characteristics different to other businesses and related to their management that should be known and considered (AECA, 2011):

- Operates in a global market with no significant entry barriers.
- There exist (more or less visible) state aids that distort supply conditions of the companies of the sector.
- High structure of fixed costs, forcing them to maximize the total revenues per flight.
- Important power of negotiation of the suppliers of goods and specific services.
- The economic results of the airlines are low; seldom do they offer positive results and, in any case, they do not reach to compensate the cost of capital.

[1] Spanish Association of Accounting and Business Administration (www.aeca.org).

Investment Management and Financial Innovations, Volume 13, Issue 3, 2016

2.2.1. Costs in air transportation. The most practical classification of costs for decision making and analysis is based on the concepts of operating and non-operating costs, direct and indirect costs, and finally fixed and variable costs (AECA, 2011). Table 2 shows the structure followed by most of the airline companies operating in the market.

Table 2. Classification of costs used by the airline companies

Total costs	Non-operating costs		
	Operating costs	Direct operating costs	Fixed
			Variables
		Indirect operating costs	Fixed
			Variables

Source: AECA (2011).

1. Non-operating costs: costs that are not related to the operations of air transport, for example, financial costs.
2. Operating costs: those that are caused by the activity of air transport. These costs are divided into direct and indirect costs.

   2.1 Direct costs are those that can be linked unequivocally to passengers or to the aircraft. These costs, in turn, are divided into fixed and variable costs.

      2.1.1 Direct and fixed costs: costs of the aircraft, fixed costs of maintenance, handling structure to passengers in the airport, fixed costs of the crews, fixed commercial costs, among others.

      2.1.2 Direct and variable costs: fuel, airport taxes, ramp handling, variable costs of maintenance, variable costs of the crews, compensation for passengers, compensation for the loss of luggage, service on board, among others.

   2.2 The indirect costs are fixed or variable depending mainly on the time domain. Among indirect operating costs are: cost of the maintenance engineering area, cost of the area of technical flight direction and the cost of the overall structure.

From another perspective, the costs in the air transportation industry can also be classified as requested by the ICAO (International Civil Aviation). This institution requires periodically the costs of all the airline companies in each of the markets with the objective that the companies carry out benchmarking. The collected information is, then, supplied to each company for its analysis.

The classification is as follows:

1. Costs by type of aircraft and type of route.
2. Costs by geographic area.
3. Other operating expenses.
4. Other non-operating expenses.

2.2.2. Strategy and budget. Porter (1985) identifies generic strategies for any industrial sector: differentiation, cost leader and segmentation. In the air transportation sector, the big companies with the core business of passenger transport (without forgetting the important involved businesses) are divided in the following classifications, adapting the denominations of network, low cost and charter airlines, respectively. It should be noted that both, LCCs and network airlines, have, in general terms, the same need of using management accounting as a tool for the decision making process, but using different key performance indicators (KPIs) as far as the strategic points of their businesses are different.

Upon this, Table 3 presents distinctive characteristics, on the one hand. of an airline that has a differentiation strategy and. on the other hand. an airline leading in costs.

Table 3. Distinctive characteristics of strategy used by network airline and LCC

Characteristics	Low cost carrier	Network airline
Image to transmit	Price	Price and quality
Price	Simple price structure	Complex price structure
Distribution	Internet, direct purchase	Internet, direct purchase, travel agency
Checking in	No ticket	No ticket, IATA ticket contract
Airports	Mostly secondary airports	Main airports
Business	Point-to-point	Hub-and-spoke
Class	Only one class	Multiple classes
During the trip	Paying for services	Free services
Use of aircrafts	Very intensive	Moderate-intensive
Type of aircraft	One type and few diversity of models and brands	Multiple types
Turnaround	25 minutes average	Higher period of time
Product	A single product: cheap tickets	Multiple integrated products
Complementary product	Sales during the flight	Focus on the main product
Seat	Little legroom (high density of seats), no reservations accepted	Extensive space between the seats, reservations accepted
Customer service	Generally poor service	Complete and reliable service
Operating activities	Focus on business of passengers	Extensions: maintenance, cargo

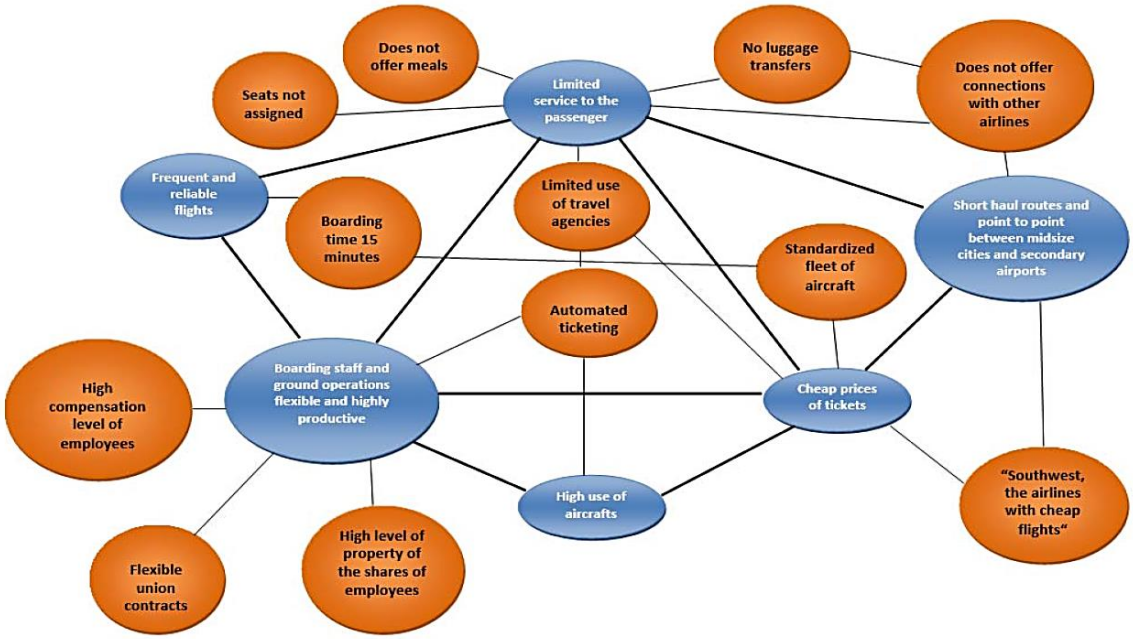
Source: O'Connell and Williams (2005).

Subsequently, Porter (1996) states explicitly that the strategic positions should have a temporal horizon higher than one decade and not only a single planning cycle.

Investment Management and Financial Innovations, Volume 13, Issue 3, 2016

The achievement of the strategy requires the company to develop and try complying with a strategic plan, which is the tool that contains goals that should be achieved by the organization and the actions and policies that should be implemented to achieve them.

For a better understanding, Figure 3 provides as an example the system of activities of Southwest Airlines. This figure defines the actions chosen by the company and how they are related between each other to achieve the objectives that the organization has established in relation to their low-cost strategy.



Source: created by the authors based in Porter (1996).

Fig. 3. System of activities of Southwest Airlines

The budget is a central tool in the planning process, being the quantification in monetary units of the expected evolution for a given period. Due to the changing context, companies not only carry out the budget but, on many occasions, they analyze different stages through forecasts. Likewise, once the budget has been drafted, they carry out *rollings* to update and adapt them to the reality. For example, Table 4 shows variables which Southwest Airlines controls to adapt its budget.

Table 4. Measures and periods Southwest Airlines uses for performing rolling forecast

	Economic relevance	Variability	Speed of response	Refresh rate	Forecasted horizon
Revenues	High	High	High	Daily	Quarterly
Personnel costs	High	Low	Middle	Fortnightly	Biannual
Fuel cost	High	High	Middle	Weekly	Quarterly
Maintenance expenses	Middle	Middle	Middle	Fortnightly	Biannual
Advertising expenses	Middle	Middle	High	Monthly	Biannual
Costs of own fleet	Middle	Low	Low	Quarterly	Annual
Airport fees and charges	Middle	Middle	Low	Weekly	Biannual
Other operating costs	Middle	Middle	Middle	Fortnightly	Fortnightly

Source: Zeller and Metzger (2013).

The monitoring of these measures makes it easier for the company to make decisions and to achieve their goals in this dynamic and changing environment as it is the airline sector, as well as it helps the management to guide the future of the company.

3. Goals and methodology used

As the research goal is to get to know the degree of practical implementation of management accounting (planning, management indicators and their follow-up) in Spanish airline companies, thus, quantitative methodology has been used through the creation of an on-line questionnaire.

This questionnaire included dichotomous, poly-tomous, categorized and open questions, as well as intensity scales in some questions following the Likert scale. The questionnaire has been developed by the authors, based on a literature review, their

own professional experience and reviewed by an expert panel. The units of analysis were the six main regular Spanish airline companies, which, in alphabetical order, are the following: Air Europa, Air Nostrum, Grupo Binter, Iberia, Volotea, Vueling Airlines.

The questionnaire was sent by e-mail through a web link to the persons in charge of management accounting of the different airline companies as they are the key managers for giving services that can lead to an improvement of decision making especially over the long term.

It was obtained 100% of answers from the companies of the selected sample, according to the criteria mentioned before.

The questionnaire was structured in different sections as follows:

a) Name and identification of the company.
b) Resources used to develop management accounting and the importance given to it.
c) Use of traditional tools of management accounting.
d) Use of planning and budgeting systems.
e) Specific management and performance indicators of the air transportation sector used in the budgeting process.
f) Information included in the reporting systems of the company and, where appropriate, included in the BSC of the company. This section pretends to analyze if the previously mentioned variables are included in the support systems for the decision making process and the level of use of the BSC.

4. Results of the exploratory study

In this section, the results that have been obtained from the empirical research are presented; the analysis of this research has been divided into five different parts, following the questionnaire structure.

4.1. Resources used to develop the management accounting and the importance given to it. In this first set of questions, the approach was to observe if the airline personnel in charge of management accounting consider necessary the use of it in the companies, as well as the importance and utility they give to this tool. Moreover, the level of academic qualifications of the persons in charge and the existence of professional consultants in these fields can provide us information about the importance and relevance of management accounting in the sector from another point of view.

In response to the question "Does any person on your team develop any type of management accounting?", 100% of respondents answered affirmatively, so that all entities consider that they have implemented, in a greater or lesser degree, management accounting.

With regard to the question "Which level of academic degree does the manager have?", 5 companies indicated a degree in Business Administration or Economics, while the sixth company indicated a degree closed to these branches of study. Therefore, it can be said that a high level of university education is given in relation to the responsible persons of management accounting.

In the following questions, the goal was to get to know if the company received any external support in management accounting, and, if so, where from. Half of the companies (3) indicated that they receive external advice, and, in two of them, this advice comes from the external auditor, while in one case it comes from a specialized consulting firm in the air transportation sector.

The next question was about getting to know the goals of management accounting for the different responsible parties.

In this case, the answers did not show any homogeneity among the companies, as seen in Table 5. Some possible answers were given to the respondents, and Table 5 shows the frequency of each answer (maximum potential would be 6).

Table 5. Answer to the question: utility of management accounting

	Number of answers
Information for decision making	6
Information for planning and control	5
Information for the company	5
Information for Shareholders	3
Calculation of costs and results through responsibility areas	3
Cost saving projects	1

It is seen that there is unanimity in relation to the usefulness of management accounting for facilitating the decision-making process, and almost unanimity in using management accounting as a tool for planning and control and internal information for the company's management.

In the last question of this section, as indicated before, it is shown the importance given to management accounting by the different persons in charge. At this point, it should be emphasized that the questionnaire provided five possible answers (none, low, medium, high and very high), and 100% of the answers were in the category "very high", a fact that confirms the importance of management accounting in the airline companies from the point of view of the people responsible for the management control system.

Investment Management and Financial Innovations, Volume 13, Issue 3, 2016

4.2. Use of traditional tools of management accounting. This section analyzes the results obtained related to the degree of use of traditional management accounting tools, such as cost accounting, and the orgatization structured by centers of responsibility.

In a newly formulated question, the management accounting managers were asked if the company had implemented any system of cost accounting and the answer was positive in 100% of the cases.

Afterwards, it was asked what major departments the company was divided into. The results obtained are shown in Table 6. Likewise, it was asked if the analytical orgatization, on the level of management accounting, matched the al structure, and the answer was affirmative in 5 out of 6 companies.

As shown, only two companies are distinguishing the business of passenger and cargo transportation. In the remaining areas, there is total unanimity (only one company has specified that it has a "corporate" area instead of an "administration" area; so being a non-significant difference).

Table 6. Answer to the question: organization of the airline company

	Number of answers
Handling	6
Maintenance	6
Cargo	2
Systems	6
Airline	2
Commercial	6
Operations	6
Administration	5

Given the fact that the companies are divided into different areas, as previously seen, it was formulated the question about the existence of internal charges between these areas, requesting, where appropriate, the criterion of charging used for these services. In 4 of the 6 surveyed companies, they had established a system in which transfer pricing was the criterion for charging indicated in Table 7.

Table 7. Answer to the question: criteria in determining transfer prices

	Number of answers
Market price	2
Combination of market price and standard price	1
Depending on the volume of assets	1

Finally, the answers to the last question of this section about the age of the currently valid cost system of the company are shown in Table 8. As hypothesis for the answer options, it was assumed that the calendar year coincides with the fiscal year.

Table 8. Answer to the question: age of the currently valid cost system

	Number of answers
Less than 2 years	1
Between 2 and 5 years	0
Between 5 and 10 years	4
More than 10 years	1

4.3. Use of planning and budgeting systems. In the previous sections, the importance granted to management accounting and the use of cost accounting has been verified. In this third section of the survey, the objective was to see to which degree the use of planning and budgeting systems is important, aspects analyzed through 3 questions.

All companies answered affirmatively to the question as to whether they had established a strategic plan, and the duration of the plan in all the cases was between 3 and 5 years. There is also unanimity in the revision period of this plan; of the 6 companies, 5 indicated that they review the plan annually (and the 6th one does it every two years).

Also, in 5 of the 6 airlines, they have approved in writing the annual business goals, objectives used as a base for the preparation of annual budgets. In the later question, we asked when the annual budgets were carried out and approved; results are shown in Table 9.

Reading the table, one can see that all the budgets are carried out and approved before the beginning of the fiscal year monitored, inclusively in 5 of 6 of the cases before December. It is noticed as well that there is anticipation when the budget is about to be prepared, given the fact that, in 5 of 6 cases, the process starts during the third quarter of the year, in September, and, in one case, in July, during the summer season.

Table 9. Answer to the question: time of year X for the preparation and approval of the budget of the year X + 1 (calendar year = fiscal year)

	Budgets made	Budgets approved
July - September	2	
September - November	1	
September - November	1	
September - December	1	
October - November		1
November		1
November - December		1
December	1	3

Table 10 shows the answers in regards to the starting point of the budget preparation.

Investment Management and Financial Innovations, Volume 13, Issue 3, 2016

Table 10. Answer to the question: starting point of the budget preparation

	Number of answers
From the reality of the previous year (incremental budget)	2
Zero based budgeting	2
Zero based budgeting for certain activities and/or services. For structural costs the incremental budget is used, depending on the outcome of the previous year	3
From the reality of the previous year plus the fixed goals in the multiannual budget for this year	3

The responses sum up more frequencies (10) than analyzed companies (6), due to the fact that more options were allowed due to the possibility of combining the criterion of budgeting based on each item in question. The frequencies are quite divided; unanimity does not exist in the base of budgeting, combining in very similar frequency the zero-based criterion and the incremental budget, with or without multi-year targets of reduction/increase.

In another question, we asked about the revision of budgets during the financial year in regard to the performance of the company. In this case, 100% of the companies responded affirmatively. And, finally, the following questions were proposed:

- Do you calculate the deviations between budget and actual results?
- Do you analyze the reasons that have generated these deviations in order to propose corrective measures, where appropriate?
- Do you carry out an analysis of deviations by price, volume and mix effect?

All the companies have answered affirmatively to all the three questions regarding the analysis of deviations.

4.4. Specific management and performance indicators of the air transportation sector used in the budgeting process. This first set of questions in this section are intended to detect the main management indicators used by the responsible persons in control of the airline companies, as well as the frequency in obtaining and analyzing them. Table 11 details the management indicators and their frequency of carrying out annual operating budgets of the companies.

Table 11. Management indicators and detail in the operational budgeting

	Number of answers					
	Not calculated	Daily	Weekly	Fortnightly	Monthly	Other
ASK's		2			4	
RPK's		2			4	
PAX load factor		3			3	
Revenues per RPK		2			4	
Revenue per ASK		2			4	
Revenue per ESK (equivalent seat Km)	1	1			3	1
TKT's	1				3	2
Cargo load factor	2	1			2	1
Number PAX		3			3	
Average stage length		3			3	
Block hours per fleet per day		2	1		3	
Punctuality		2	1		2	1
Regularity		2	1		2	1
Number of complaints	1			1	3	1
Number of lost luggage					5	1
Perceived quality index	1				4	1
EBITDAR					6	
EBITDA					6	

One of the first analyses we can accomplish is that all the proposed indicators in the survey are used, although with different frequencies; there is none which is not included by any airline company when preparing the budget.

Table 11 shows as well that there exist operating indicators that are budgeted monthly, by 4 of the 6 companies of the sample (for example, ASKs, RPKs, revenues per RPK and per ASK), as well as on a daily basis (in this case, 2 of 4 companies). It should be also highlighted the daily budgeting level for other important management variables, such as the number of passengers or the average stage length (fundamental for analyzing the evolution of revenues per RPK and per ASK).

Regarding economic indicators, there is unanimity when budgeting (monthly), both EBITDAR (very common and helpful in the airline business) and EBITDA. Therefore, we understand that the level of detail when budgeting is very important. With this

Investment Management and Financial Innovations, Volume 13, Issue 3, 2016

in mind, the question was about which were the indicators and the frequency of obtaining them when carrying out the actual analysis of the activity. This information is given in Table 12.

Table 12. Management indicators in detail regarding the operating performance

	Number of answers					
	Not calculated	Daily	Weekly	Fortnightly	Monthly	Other
ASK'		1	2		3	
RPK's		1	2		3	
PAX load factor		2	2		2	
Revenues per RPK		2	2		2	
Revenue per ASK		2	2		2	
Revenue per ESK (equivalent seat Km)	1	2			1	2
TKT's	1				3	2
Cargo load factor		2	1		2	1
Number PAX		2	1		3	
Average stage length		1	2		3	
Block hours per fleet per day		1	1	1	3	
Punctuality		3	1		2	
Regularity		3	1		2	
Number of complaints		1			5	
Number of lost luggage					6	
Perceived quality index					6	
EBITDAR		1	1		4	
EBITDA		1	1		4	

In this case, we can see that the level of analysis is higher, especially regarding the economic result. While in all of the cases EBITDA and EBITDAR have been budgeted monthly, when reporting actual data, there are two companies that do it with a higher frequency. One daily, another weekly and the remaining four companies on a monthly basis, homogenously with the budget. Another important conclusion is that while there were barely weekly budgeted indicators (mostly, as seen in Table 11, they were either daily or monthly), in the case of the analysis of actual data, there exist several analyzed indicators on a weekly basis that, probably, arise from the existence of weekly Management Committees of the companies where their operating performance is analyzed. In any case, it is seen that there exist differences between the levels of detail when preparing the budget and when analyzing the actual operational and financial indicators. This discrepancy, which is produced neither in all the companies nor in all of the variables, supposes that it is not always possible to analyze the performance of all the variables versus the budgeted data, as the budget has been carried out with another level of detail. Probably, in any case, it is feasible to carry out analysis of actual data versus homogenized weeks of previous year.

4.5. Information included in the reporting systems of the company and, where appropriate, included in the Balanced Scorecard of the company. This section is intended to analyze the obtained results related to the degree of use and criteria of development and distribution of the surveyed airlines' BSC. In the question "Does the company have an integral Balanced Scorecard?" 5 of 6 companies answered affirmatively. Likewise, it was asked if the implementation was considered profitable. Answers are shown in Table 13.

Table 13. Answer to the question: appropriation of implementation of the BSC

	Number of answers
Entirely appropriate	2
Very suitable	2
Suitable	1
Unsuitable	0
Inadequate	0
Don't know/no reply	1

With different degrees, except in one case where the company did not answer the question, all the airlines think that the executed implementation of the BSC is appropriate and they are satisfied (5 of 6 respondents consider it totally appropriate, very appropriate or just appropriate).

Table 14 shows the obtained results about the differences of information included in the BSC developed by these airline companies.

Table 14. Answer to the question: information included in the BSC developed

	Number of affirmative answers
Executive summary	6
Analysis of the economic environment	4
Analysis of the air transportation sector	2

Table 14 (cont.). Answer to the question: information included in the BSC developed

	Number of affirmative answers
Analysis of risks and opportunities	5
Goals and qualitative indicators	5
Goals and quantitative indicators	6
Income statement	6
Cash flow statement	6
Investment tracking	5
Best estimate of the year-end	6

There is a great homogeneity in the answers. From 10 points proposed in the questionnaire, there exists unanimity in preparation in 5 of those and practical unanimity (5 of 6 surveyed companies) in the other 3. The aspects with less homogeneity are the analysis about the economic environment (still with majority, 4 of 6 companies) and, in contrast, only 2 of 6 companies included in their BSC information about the situation of the air transportation sector.

Finally, it was asked about the addressees of this management information and the results are shown in Table 15.

Table 15. Answer to the question: distribution of the BSC

	Number of answers
Management Committee	4
Chief Financial Officer	1
Chief Executive Officer/First management level	1

It is seen, with nuances, that the level of distribution is very similar; 4 of 6 companies answered that the BSC is distributed to the Management Committee, in one case it is additionally distributed to the Chief Financial Officer, and in the sixth case it is distributed to the Chief Executive Officer and the first management level, being considered equivalent to the Management Committee.

Conclusions

The goal of this study was to examine the level of introduction of management accounting in Spanish airline companies, in particular the degree of strategic planning, the methods of budgeting, the procedures used to analyze results between planned and actual results, the key performance indicators used (and their frequency), given the importance of this sector in the Spanish economy and the lack of similar studies worldwide. As far as the implementation of the management accounting tools was generally extended, we could conclude that the referred companies had the required information to help in the operating, financial and strategic decision making process.

The main remarkable conclusion coming up from this research is that the level of implementation and follow-up of the main indicators of management is relatively high between the analyzed airline companies (the top six in Spain based on passengers transported in 2014). At a more detailed level, there are some aspects which should be highlighted:

- All companies consider as the main utility of management accounting the support to the decision- making process.
- The system of management accounting that has been implemented has an age between 5 and 10 years; so, it cannot be considered as a recent implementation; especially in a business that is having fast changes in their business models.
- All the respondents carry out their annual budget before the target year of budgeting and with some advance (in general, before December of x-1 proceed to the approval of the budget).
- The criterion of budgeting is either zero-based or incremental based, depending on the type of business.
- All the companies carry out an analysis of deviations, segregating the effects of them.
- All suggested indicators in the survey are drawn up in elder or lower frequency by the airlines management when carrying out the budget.
- The common operating indicators of the sector are budgeted even on a daily level (by 4 of the 6 companies). With regard to economic indicators, there is unanimity when budgeting (monthly) both EBITDAR and EBITDA. Therefore, we understand that the level of detail in general is very important when budgeting.
- Regarding the frequency of preparation of the actual activity indicators, one fact to highlight is that, while there were barely budgeted indicators on a weekly basis, in the case of the real data analysis, there exists multiple indicators which are analyzed on a weekly basis that, probably, arise from the existence of weekly Management Committees of the companies where they analyze the operative performance of the airline. Additionally, it has been observed that there exist differences between the level of detail when preparing the budget and the level of detail when analyzing the operating indicators.
- All the airlines have implemented a Balanced Scorecard (BSC), considering it as an appropriate tool. This highlights that there exists a big homogeneity in the sections that include the companies, as well as in the addressees of the mentioned supporting information for decision making.

As a future research line, it is proposed to extend this study taking into account international airline companies in order to detect possible similarities and/or differences with this study.

Investment Management and Financial Innovations, Volume 13, Issue 3, 2016

References

1. Asociación Española de Contabilidad y Administración de Empresas (1990). *Comisión de Principios de Contabilidad de Gestión*. *Principios de contabilidad de gestión: El marco de la contabilidad de gestión.* AECA. Madrid.
2. Asociación Española de Contabilidad y Administración de Empresas (2011). *Comisión de Contabilidad de Gestión*. *La Contabilidad de Gestión en las Empresas de Transporte Aéreo*. AECA, Madrid.
3. Aeropuertos Españoles y Navegación Aérea (2015). www.aena.es (viewed day 12 April 2016).
4. Air Transport Action Group (ATAG) (2014). www.atag.org (viewed 11 April 2016).
5. Albalate, D., Bel, G. and Fageda, X. (2014). Competition and cooperation between high-speed rail and air transportation services in Europe, *Journal of Transport Geography*, 42, pp. 166-174.
6. Belobaba, P., Odoni, A. and Barnhart, C. (2009). *The Global Airline Industry*. John Wiley and Sons, Ed.
7. Button, K., Haynes, K. and Stough, R. (1998). Flying into the future: Air transport policy in the European Union. Cheltenham, UK and Northampton/Mass: Edward Elgar. In: Kiso, F. & Deljanin, A. (Eds.). Air Freight and logistic services, *Promet – Traffic & Transportation*, 21(4), pp. 291-298.
8. Campa-Planas, F. and Campa-Lewkowycz, R. (2009). Estructuras de oferta en transporte aéreo: modelos punto a punto y de red, *Harvard Deusto Business Review*, p. 179.
9. City Council Barcelona (2015). www.barcelona.cat (viewed 20 July 2016).
10. Confederación española de organizaciones empresariales (CEOE). Memorándum: El sector del transporte en España 2009. www.ceoe.es, 2009 (viewed 15 April 2016).
11. Daley, B. (2009). Is Air Transport Effective Tool for Sustainable Development? *Sustainable Development*, 17 (4), pp. 210-219.
12. Fernández, A. (1994). Situación actual y perspectivas futuras en Contabilidad de Gestión, Elementos de Contabilidad de Gestión. AECA, Madrid.
13. Ferropedia (2014). www.ferropedia.es (viewed 12 April 2016).
14. Ginieis, M., Sánchez-Rebull, M.V. and Campa-Planas, F. (2012). Los costes en el sector del transporte aéreo. Una revisión de la literatura internacional, *Revista iberoamericana de contabilidad de gestión*, 10, nº20.
15. Givoni, M. and Banister, D. (2006). Airline and Railway Integration, *Transport Policy*, 13 (5), pp. 386-397.
16. Hosteltur (2013). www.hosteltur.com, 2013 (viewed 13 April 2016).
17. Institute of Management Accounting (2016). www.imanet.org (viewed day 21 July 2016).
18. Instituto Nacional de Estadística (INE) (2011). www.ine.es (viewed day 10 April 2016).
19. International Air Transport Association (IATA). www.iata.org, 2014-2016 (viewed day 20 July 2016).
20. Ishutkina, M.A. and Hansman, R.J. (2008). Analysis of the interaction between air transportations and economic activity: A worldwide perspective. International Center for Air Transportation, MIT.
21. Lebas, M. (1993). Evolution d'un système d'information de gestion: un exemple, *Revue Française de Comptabilité*, 242, pp. 56-60.
22. Massachusetts Institute of Technology (MIT) (2014). Global Airline Industry Program, http://web.mit.edu/airlinedata/www/default.html (viewed 18 April 2016).
23. Ministry of public works and transport (2013 & 2015), www.fomento.gob.es (viewed 13 April 2016).
24. O'Connell, J.F. and Warnock-Smith, D. (2013). An investigation into traveler preferences and acceptance levels of airline ancillary revenues, *Journal of Air Transport Management*, 33, pp. 12-21.
25. O'Connell, J.F. and Williams, G. (2005). Passengers' perception of low cost airlines and full service carriers: A case study involving Ryanair, Aer Lingus, Air Asia and Malaysia Airlines, *Journal of Air Transport Management*, 11, pp. 259-272.
26. Pérez-Méndez, J.A. and Machado-Cabezas, A. (2015). Relationship between management information systems and corporate performance. Revista de Contabilidad - *Spanish Accounting Review*, 18 (1), pp. 32-43.
27. Porter, M.E. (1985). *The competitive Advantage: Creating and Sustaining Superior Performance*. NY: Free Press.
28. Porter, M.E. (1996). What is strategy? *Harvard Business Review*, 74 (6), pp. 61-78.
29. Reynolds-Feighan, A. (2001). Air freight logistics. In: Brewer, A., Button, K. & Hensher, D. (Eds.). *Handbook of Logistics and Supply-Chain Management*. Elsevier Ltd, London, UK.
30. Statista (2015). www.statista.com (viewed 20 July 2016).
31. Sáez, A., Fernández, A. and Gutiérrez, G. (1993). *Contabilidad de costes y contabilidad de gestión*. Mc.Graw-Hill, Madrid.
32. World Tourism (2016). UNWTO Tourism Highlights, Edition 2016. www.unwto.org (viewed 22 July 2016).
33. Wensveen, J.G. (2015). *Air Transportation - A Management Perspective*. Ashgate Eighth edition.
34. Zeller, T. L. and Metzger, L.M. (2013). Good bye traditional budgeting, hello rolling forecast: Has the time come? *American Journal of Business Education*, 6 (3), pp. 299-310.

3

CHAPTER THREE
QUALITY AND PROFITABILITY IN THE AIRLINE BUSINESS

UNIVERSITAT ROVIRA I VIRGILI
QUALITY AND SAFETY IN THE AIRLINE INDUSTRY AND THEIR INFLUENCE ON COMPANY PROFITABILITY
Nicole Kalemba

After the importance of the KPIs was discussed in the previous chapter, Chapter Three considers quality and its role in the airline business, as this concept is ultimately essential in terms of customer satisfaction. Furthermore, the quality-profitability link is examined.

3.1. Introduction

Within the scope of this doctoral thesis, quality in the airline sector was one of the main points dealt with.

Quality plays a significant role in the day-to-day operation of any company, but the impact that quality can have on an airline's business still needs to be addressed. In addition, what has already been published about quality in the academic literature in relation to the airline industry should be determined. These are the basic questions answered in this chapter.

Airline management has dramatically changed during recent decades in order to achieve adequate airline profitability and survive due to the highly competitive market conditions that characterize the airline industry (Pakdil & Aydin, 2007).

Worldwide, people are paying increasing attention to the service quality provided in an airline industry context, especially since liberalization and deregulation have spread throughout the international airline industry (Rhoades and Waguespack, 2008).

With the already mentioned deregulation act in the USA in 1978 and the consequent open skies policies, considerable changes have occurred in the airline industry. However, additional aspects, such as modifications in the tourism model, the introduction of revenue management policies, new infrastructures, the presence of low cost carriers (LCCs) as new players, and high-speed train competition (Albalate et al., 2014; Massachusetts Institute of Technology, 2015), have also been matters that have subsequently been taken into consideration.

As a result of the constant growth of passenger demand, IATA (2016) is forecasting an increase of 3.7% CAGR (compound annual growth rate) for the next 20 years, with a projection of almost double the number of 3.8 billion passengers between

2016 and 2035. In this scenario, advances in efficiency and technical processes will be necessary in the same way as they have been in the recent past.

However, this will only be possible if the airline companies achieve their primary business goal, namely profitability, thus enabling the airlines to survive in the long term.

In addition, quality has also been significant, especially since airline deregulation, as far as it has allowed passengers to choose between the different airline companies they prefer to fly with. Therefore, quality remains an important day-to-day matter for airline management.

The relationship between quality and company profitability has been the subject of considerable interest during the last few years (Caruana, 2002; Mellat-Parast and Fini, 2010; Steven et al., 2012; Mellat-Parast et al., 2015).

Therefore, this chapter is divided into three sections that, after an introduction, provide an overview of the quality concept in the airline business through a literature review presented as paper B, entitled *"An Overview of the Quality Concept in the Air Transportation Business: A Systematic Literature Review"*.

The final section of Chapter Three presents two quantitative research studies that analyzed the effect of quality on company profitability. Paper C, entitled *"The Quality Effect on the Profitability of US Airline Companies",* which has been published in 2017 in the JCR indexed Journal (Journal Citation Reports, Thomson Reuters) *Tourism Economics* in Online First and paper D, entitled *"The Quality-Profitability Link in the US Airline Business: A Study based on the Airline Quality Rating Index"*, which has been published in 2017 in the Journal *Procedia Engineering,* vol. 187, and is indexed in the Scopus database.

3.2. Literature Review of Quality in the Airline Business

Service quality is in general terms defined as "the degree of discrepancy between customers' expectations about a service and their perceptions of service performance" (Parasuraman et al., 1985; Park et al., 2005; Gazzera and Lombardo, 2007).

Grönroos (1983) identified two dimensions of quality: functional and technical quality. Functional quality defines the perceptions of the interactions of customers during the service delivery (how the service was delivered), while technical quality places the focus on the outcome of the service and what customers receive from the interactions with service providers to satisfy their basic needs (Chaipoopirutana, 2008).

The easiest and most common way to measure service quality is through the SERVQUAL (acronym of SERViceQUALity) model developed by Parasuraman, Zeithaml and Berry (1988) that considers five dimensions: reliability, assurance, responsiveness, empathy and tangibility (Parasuraman et al., 1988; Park et al., 2005; Ladhari, 2009; Basfirinci & Mitra, 2015). Parasuraman et al. (1985) argued that, with small modifications, SERVQUAL can be adapted to any service organization.

Consequently, the SERVQUAL model has been proposed in several studies focused on exploring quality in the airline industry (Gilbert & Wong, 2003; Park, 2007; Park et al., 2005; Gazzera & Lombardo, 2007). The main findings of these studies reflect SERVQUAL as a useful model due to its ability to extract information easily.

The term "service quality" is not only the service provided to the passengers on board aircraft because it represents much more than in-flight service or seat quality. It is the combination of interactions between the customers and airline employees that try to influence customer perceptions in order consequently to achieve satisfaction and thus, in turn, obtain a positive airline image and behavioral intentions (Gursoy et al., 2005).

Chapter III

A deeper insight from the literature and answers to the first research question of Chapter Three, "What has been published about quality in the airline industry?", are provided by the results presented in paper B, entitled *"An Overview of the Quality Concept in the Air Transportation Business: A Systematic Literature Review"*, that was published in the *International Journal for Quality Research,* vol. 11, issue 1, 2017, indexed in the Scopus database and made available at *https://doi.org/10.18421/IJQR11.01-04.*

The main objective of this section, and in particular paper B, was to provide an overview of the importance of quality in the airline business and the aspects that play a significant role in the quality phenomena of this industry, since no similar research exists in this field.

Hence, paper B represents an analysis of the evolution of publications in this research field, as well as the relationship between variables related to the quality concept represented by a network analysis.

Therefore, a systematic literature review (SLR) was carried out to identify the core papers and elements used in previous research studies. First, keywords were identified and relevant papers were sampled. Second, variables were coded and sixteen quality-related main variables were subsequently created. Third, the literature review in the paper was carried out based on these sixteen established variables, with the descriptive results being given and co-occurrence and network analyses considered.

International Journal for Quality Research 11(1) 51–70
ISSN 1800-6450

Nicole Kalemba [1]
Fernando Campa-Planas

Article info:
Received 10.08.2016
Accepted 10.10.2016

UDC – [005.6+658.6](656.7)
DOI – 10.18421/IJQR11.01-04

AN OVERVIEW OF THE QUALITY CONCEPT IN THE AIR TRANSPORTATION BUSINESS: A SYSTEMATIC LITERATURE REVIEW

Abstract: *The main purpose of this research is to provide a comprehensive overview of literature related to the quality phenomena in the air transportation business over the last decades, to assess if there is some relationship between variables related to the quality concept in this business and how they have been developed during this period.*
To obtain this goal, a systematic literature review (SRL) has been carried out, based on international academic literature of Scopus and ISI Web of Science databases simultaneously, identifying the corresponding main papers on the research question, as well as carrying out a network analysis resulting from this review.
The number of papers related to the quality concept have considerably increased during the last decades, showing, therefore, the dynamism, higher importance and interest that this topic has gained. Findings show, as well, a detailed overview of the most cited articles and productive journals on this research topic and the importance of co-occurrence between the established variables.
This study promotes the growing interest that the research topic is receiving, as well as it provides a broad understanding on the variables that frame the development of this concept in the air transportation business, giving, therefore, a general overview and helping researchers and practitioners.

Keywords: *quality, service quality, service experience, airline companies, air transport, systematic literature review*

1. Introduction

International air transport is a prodigiously growing industry that is an important driver for economic development. However, due to its volatile behavior to worldwide events, the industry had to face a variety of challenges, overcoming trends, both economic and social, as well as technological advances (OECD, 1997).

Since the Airline Deregulation Act of 1978 in the United States (U.S.), and the open skies approach, concepts of competition in the airline transportation business have become an essential theme, and issues such as price management, innovation, efficiency and service options have started being necessary (Wensveen, 2011).

[1] Corresponding author: Nicole Kalemba
email: nicole.kalemba@urv.cat

International Journal for Quality Research

Therefore, the airline industry has gone through major transformations and changes linked to the fact that governments worldwide commenced to modify their economies, implementing new policies (Werner and Stoner, 1999); due to deregulation, the airline industry was converted from being a closely regulated sector to a market-oriented sector, so that a competitive environment was created in the commercial aviation industry (Ben-Yosef, 2005; Dempsey and Goetz, 1992).

Another key factor for the increase of competition and the arisen need to provide quality to the customers is the introduction of the Low Cost Carriers (LCCs) in the last decade of the past century, which started to confront the hitherto dominance of Full Service Carriers (FSCs), generating more competition to the domestic and international air transportation market (Belobaba, 2011).

As a result of the mentioned aspects, there has been considerably more attention, both professionally and academically, given to the quality provided to the customers in the airline business. Consequently, this made it necessary for the airline companies to provide quality to their passengers and improve the service level for attracting demand (Mazzeo, 2003), being quality an essential factor that contributes to service differentiation and adds value to the positioning of a company in the market (Prayag, 2007; Nejati et al., 2009). Also it helps to strengthen the loyalty of customers, to reduce negative word of mouth, as well as it contributes consequently to increase the turnover of the company.

Therefore, quality is on the one hand a challenge that the companies have to face, but at the same time an opportunity of competitive advantage.

That's just why it is so important to study the quality concept and to see the evolution it has had during the last decades. This study has been conducted based on an initial literature review previously performed by the authors concerning the quality concept in the airline industry. Through that, sixteen variables were established for being used in this study to frame the concept of quality.

The previous review was based on research primarily using the database Scopus, taking into account the years 1990 (just when the open skies policy came along) to 2014. Five keywords were used for carrying out this previous literature review: quality, service quality, air transportation, airlines and aviation, where the outcome was a total of 32 concepts being included in 11 published studies.

The main purpose of this study is to get a broader idea of the quality concept and, therefore, to examine, identify and collect the existing literature for showing the trend of the quality concept in the air transportation industry making use of two databases, *Scopus* and *ISI Web of Science* (WOS). In consequence, the number of authors that now have analyzed the relationship between the airline business and the approach of quality is much higher than the one used in the previous research.

To cover this goal, a systematic literature review (SLR) has been considered in order to determine items included by different authors within the framework of quality in previous studies, referring always to the passenger transport, and helping therefore to classify, evaluate and interpret existing and relevant research papers about the present topic.

Other additional objectives are as follows, always based on the quality subject targeted in this paper:

- See the evolution of papers published during the years 1978-2015 (note: the year 2015 in this paper is always referring to a review done up to the 31st of December 2015).
- Identify the most frequently cited papers.
- Identify the main journals in relation to the studied research field.

International Journal for Quality Research

- See the evolution of the total number of variables identified and related with quality during the covered period from 1978-2015.
- Show the co-occurrence between the identified keywords through a network analysis of variables.

Therefore, the main contribution of this article is to reveal and outline the attention paid to the concept of quality in the airline business and its evolution during this period; the study promotes the importance of the quality phenomena in published academic articles during recent years.

The paper is structured as follows. The first part introduces and explains the field of interest, airline quality; the second section describes the methodology used for the research. Section 3 gives an overview on the existing international literature in this research field; section 4 displays the results and findings of the study; while the last section points out the conclusions drawn from this research.

This paper can encourage researchers and practitioners to focus more on the importance of quality in the airline sector, helping them in their day-to-day management and to carry out new approaches and impacts in the future.

2. Methodology

A systematic literature review (SLR) has been carried out using two relevant bibliographic databases, *ISI Web of Science* and *Scopus* (Downloads before 31st of December 2015), to identify core papers and items used in previous studies considering a specific period of time.

The purpose of the SLR was to identify the research need, evaluate and summarize "the findings of all relevant individual studies, thereby making the available evidence more accessible to decision-makers" (CRD, 2009).

Therefore, the SLR methodology is an essential feature of any academic project and helps to increase the researcher's knowledge about the topic (Webster and Watson, 2002). The advantages of the SRL are that it provides reliable information, it is replicable and reduces bias. The SRL was originally used in the area of health issues (CRD, 2009), however, it has already been used in regard to air transport (Ginieis, et al., 2012), demonstrating that SLR is a helpful tool for analyzing and interpreting information available to answer the research question. In relation to the two databases used, on the one hand, Web of Science (WOS) is recognized as the most important database offering a scientific citation indexing service maintained by Thomson Reuters (2015). On the other hand, Scopus permits a wide overview of global research, offering a large abstract and citation database of not only scientific journals but also books and conference proceedings (Elsevier, 2015).

The SLR covers the period from 1978, when legal deregulation of airlines started in the U.S., through 2015. This provides a wide ranging period for producing an overview on the evolution of the concept of quality in the airline industry during previous decades.

2.1. Identification of Keywords and Sampling of Papers

For the identification of publications related to the research, 24 combinations of specific keywords (four primary keywords and six secondary keywords) have been used. These keywords have been chosen due to their relation to the air transportation industry and to the research question, as the objective is to see what has been said about quality in this business. The keywords are as follows:

- Service Quality **OR** Quality **OR** Service **OR** Service Experience **AND** Airline
- Service Quality **OR** Quality **OR** Service **OR** Service Experience **AND** Airline
- Transportation
- Service Quality **OR** Quality **OR** Service **OR** Service Experience AND Aviation

International Journal for Quality Research

- Service Quality **OR** Quality **OR** Service **OR** Service Experience **AND** Airline Companies
- Service Quality **OR** Quality **OR** Service **OR** Service Experience **AND** Air Transport
- Service Quality **OR** Quality **OR** Service **OR** Service Experience **AND** Air Travel

In Table 1, the total search findings for each database are listed. The number of papers found in the WOS is 3,890, while in Scopus the number is 1,898, although it is important to mention that the total number of papers is not the sum of both, as several papers are presented in both of the databases.

Table 1. Total search results WOS and Scopus (Source: Created by the authors)

	WOS		**SCOPUS**
Service Quality AND Airline	309		113
Service Quality AND Air Transportation	28		43
Service Quality AND Aviation	46		30
Service Quality AND Airline Companies	51		2
Service Quality AND Air Transport	18		8
Service Quality AND Air Travel	23		0
Subtotal Service Quality	**475**		**196**
Quality AND Airline	415		163
Quality AND Air Transportation	35		66
Quality AND Aviation	120		144
Quality AND Airline Companies	64		2
Quality AND Air Transport	28		17
Quality AND Air Travel	28		3
Subtotal Quality	**690**		**395**
Service AND Airline	934		379
Service AND Air Transportation	102		175
Service AND Aviation	215		252
Service AND Airline Companies	164		4
Service AND Air Transport	161		49
Service AND Air Travel	74		25
Subtotal Service	**1,650**		**884**
Service Experience AND Airline	327		162
Service Experience AND Air Transportation	147		70
Service Experience AND Aviation	207		65
Service Experience AND Airline Companies	72		34
Service Experience AND Air Transport	228		54
Service Experience AND Air Travel	94		38
Subtotal Service Experience	**1,075**		**423**
TOTAL Articles	**3,890**		**1,898**

International Journal for Quality Research

The sampling and selection process of papers has been carried out taking into account the following steps, as seen in Table 2. First, duplicates were removed in order to ensure unbiased results, secondly papers were removed focusing on the title of the article, seeing if it was relevant or not for the study and if it had any relation with the research topic. For instance, papers talking about the quality of air in the airline industry were not included in the review; so, the articles that didn´t meet the inclusion criteria were rejected straightaway. And, finally, abstracts and available papers were read to ensure that there is any relationship with the search field.

Table 2. Sample of publications WOS and SCOPUS (Source: Created by the authors)

	WOS and SCOPUS	
Concept	**Eliminated**	**Number of considered papers for the literature review**
Total search results		(3,890 + 1,898 : 5,788)
Removal of duplicates	(1,233)	4,555
Removal of "non-applicable" papers by each combination (title)	(4,206)	349
Removal of "non-applicable" papers (abstract)	(231)	**118**

The final set of relevant articles considered for the literature review and included in the analysis to work with were 118, assembling both of the databases, WOS and Scopus. In this research were included only articles that have been published in journals, therefore conference proceedings were rejected.

As already mentioned, a multitude of articles were repeated in both of the databases, so that doubled papers were counted as one in terms of the number of articles.

2.2. Codification of Variables related to Quality in the Air Transportation Business

According to the literature review carried out and a previous study of the authors (Kalemba et al., 2016), sixteen variables were created after doing an expert panel. Therefore, results were given previously in order to reduce the total number of keywords used in relation to the quality concept to a smaller set (Table 3).

Table 3. Definition of different variables related to quality based on a previous study (Source: Created by the authors)

1)	Pre-flight service: Needs of passengers before the flight, such as ticketing, check-in service/process, reservation related service, accessibility and facilities dimensions.
2)	In-flight service: Needs of passengers during the flight, such as food and beverage quality/service, in-flight entertainment service.
3)	Post-flight service: Needs of passengers after the flight, such as baggage handling or mishandled baggage.
4)	Courtesy and image of the company: General image of the airline company, as well as of airline employees, appearance of the flight crew and reliability of service.
5)	Handling passenger: Handling of customer complaints, service failure, ground service, and airport service.

International Journal for Quality Research

Table 3. Definition of different variables related to quality based on a previous study (Source: Created by the authors) (continued)

6)	Features aircraft: On board comfort, seat comfort, cleanliness, aircraft interior, aircraft size, variety and type of airplane.
7)	Flight schedule: Flight availability, flight frequency, flight cancellation, denied boarding.
8)	Punctuality: On-time performance, on-time arrival, travel time, turnaround time, delay.
9)	Safety: Perceived by the passengers, assurance.
10)	Pricing: Ticket price, price transparency.
11)	Service quality: Overall concept, including the service dimensions.
12)	Total quality management: Overall concept, seeing quality in general.
13)	Customer satisfaction: Satisfaction, behavioral intentions.
14)	Customer perception and expectation: Expectations, perceptions, needs, loyalty, personal comfort, service experience
15)	Airline Alliances: Arrangement between two or more airlines
16)	Others: Frequent Flyer Program, Web pages, and e-services.

These variables were needed for the literature review as well as for carrying out a network analysis between the different items related to the quality concept and therefore, to show its evolution during the years 1978-2015, as well as to identify the relationship between each of the items.

Following the SRL methodology, a tool for analyzing the structure and relation of papers in a specific field of study is to examine the correlation of keywords or, as in this case, established variables, through a network analysis.

The network analysis has a large and complex history and was used in different fields of study, especially in relation with health issues and social networks (e.g. Freeman, 2004; Luke and Harris, 2007). In the 1970s, it started to be included in fields of sociology, psychology, anthropology, mathematics and others (Luke and Harris, 2007).

The key aim of the network and visualization analysis is to see the interconnections between the sixteen created variables according to the literature review carried out in this SRL, as well as to illustrate the importance of each established variable and to discover their tendencies during the evolution of time.

3. Literature review

First of all, it is important to define what is understood as quality in the air transportation industry. Talking about this concept in the airline business, it mostly refers to the service quality offered to the customers.

Therefore, quality is seen as an all-around concept being a composite of various variables which contribute significantly to an improvement in the passengers' perceptions during their lived service experience, as well as to their satisfaction and loyalty (An and Noh, 2009; Baker, 2013; Fageda et al., 2014).

That means, the higher the perception of quality is during the travel experience, the higher gets the satisfaction of the customer and at the same time also its airline loyalty (see Figure 1).

International Journal for Quality Research

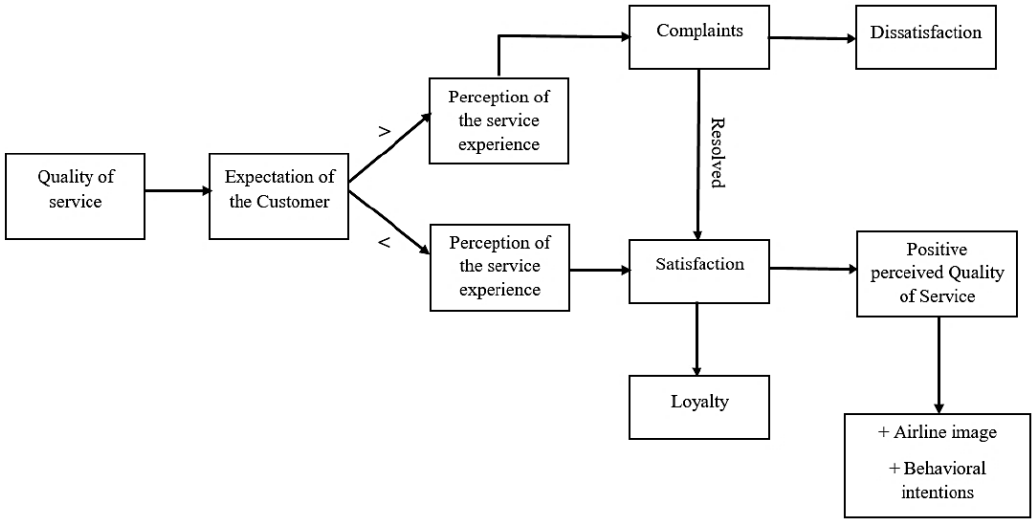


Figure 1. Conceptual model of quality in the airline business (Source: Created by the authors)

Figure 1 shows that in case that the perception of service experience of the customer is lower than the expectation he had, it leads to complaints and a resulting dissatisfaction. Dissatisfaction has been an important aspect related to the customer satisfaction (Fonseca et al., 2010). Otherwise, in case of resolving complaints or if the perceptions of the service experience is higher than the expectation the customer had, than he gets satisfied and this results in loyalty, being an important key indicator of competitive advantage (Akamavi et al., 2014), as well as it leads to a positive perceived quality of service that causes though a positive airline image and good behavioral intentions, etc.

3.1. LCCs vs. FSCs

Another important and necessary fact when analyzing the quality phenomena is to distinguish between the determinants of quality across the different airline groups for being able to evaluate the impact of quality measure on each of those groups. Thus, the differentiation between the expectations of customers of Full Cost Carriers (FSCs) and Low Cost Carriers (LCCs) is required, as the competitiveness of the airlines in the market is steadily increasing. The LCC market segment has been grown significantly during the last years and can be found nowadays in every market (Vasigh, et al., 2016). LLCs had their origin in the U.S. with Pacific Southwest, just after the deregulation in 1978; in Europe the introduction of LCCs succeeded in 1995 with easy Jet and Ryanair (Francis et al., 2006).

Especially in Asia-Pacific, the LCCs market is representing a high percentage, being around a 25% (Pearson, 2016).

It is known, that LCC customers are prepared to sacrifice quality for cost benefits, but the LCCs stand out as well due to other characteristics, as lower labor costs per block hour, point-to-point services (Campa-Planas and Campa-Lewkowycz, 2009), lower ticket distribution costs, between others (Vasigh et al., 2016).

Obviously, when flying with a FSC it is not the same to travel in economy or business class. Therefore, the focus in this part has been put more on the two big business models as it is the low cost airline and the network carrier.

Both of them have their own peculiarities that can affect the quality of service provided to the passengers. For instance, in the LCC

International Journal for Quality Research

market, the general service level in pre-flight, in-flight and post-flight services is much lower than in the FSC market. Moreover, seat density is much higher for LCCs than FSCs, as well as LCCs are following the point-to point system, while in the FSC market it is the hub-and spoke system, between other aspects (Acar and Karabulak, 2015).

But, nowadays the LCC companies are offering their own classifications and possibilities as priority boarding or seat reservation against payments. Concepts of quality, that some years ago were unthinkable.

3.2. Literature review overview on quality in the airline business

This section is meant to point out an overview of the 16 established variables in relation to what has been said by the authors in the set of the 118 articles that have been included in this study (Table 4). Therefore, only the first author's name is given, as well as the year of publication.

Table 4. Literature review: combination of variables, authors and year (Source: Created by the authors based on the WOS and SCOPUS database)

Name of variables	Authors (year)
1) Pre-flight service	Gilbert D. (2003); Leong C.C. (2007); 이용일 (2011); Han S. (2012); Etemad-Sajadi R. (2015)
2) In-flight service	Laws E. (2005); Leong C.C. (2007); An M. (2009); 김순희 (2009); Moufakkir O. (2010); Chen, Y.H. (2011); Han S. (2012); Han H. (2014); Pappachan J. (2014); Etemad-Sajadi R. (2015)
3) Post-flight service	Suzuki Y. (2004); Gardner E. (2004); Gursoy D. (2005); Rhoades D.L. (2008); Phillips (2013)
4) Courtesy and image of the company	Park J.-W. (2004); Park J.-W. (2006); Babbar S. (2008); Rhoades D.L. (2008); An M. (2009); Nejati M. (2009); Park J.-W. (2010); Elgin A. (2012); Han S. (2012); Yang K.-C. (2012); Choi H. (2013); Pappachan J. (2014); Hwang S.-Y. (2015)
5) Handling passenger	Suzuki Y. (2004); Chen F.-Y. (2005); Gursoy D. (2005); Rhoades D.L. (2005); Chiou W.B. (2007); Tiernan S. (2008); Forbes S. (2008); Metwally D. (2013); Wittman M.D. (2014); Chow C.K.W. (2015)
6) Features aircraft	Russon M.G. (1989); Ghobrial A. (1995); Ardakani S.S. (2015)
7) Flight schedule	Ghobrial A. (1995); Rietveld P. (2001); Wojahn O.W. (2002); Gardner E. (2004); Gursoy D. (2005); Rupp N.G. (2006); Rhoades D.L. (2008); Tiernan S. (2008); Sim K.L. (2010); Deshpande V. (2012); Ater I. (2015)
8) Punctuality	Ghobrial A. (1995); Wojahn O.W. (2002); Mazzeo M.J. (2003); Suzuki, Y. (2004); Gardner E. (2004); Gursoy D. (2005); Rhoades D.L. (2008); Tiernan S. (2008); Shipley M.F. (2009); Anderson S.W. (2009); Prince J. (2009); Sim K.L. (2010); Deshpande V. (2012); Phillips (2013); Ardakani S.S. (2015); Bubalo B. (2015); Chow C.K.W. (2015); Ater I. (2015); Fobres S.J. (2015)

International Journal for Quality Research QUALITY RESEARCH

Table 4. Literature review: combination of variables, authors and year (Source: Created by the authors based on the WOS and SCOPUS database) (continued)

Name of variables	Authors (year)
9) Safety	Brong J. (2002); Gilbert D. (2003); Rhoades D.L. (2005); Chiou W.B. (2007); Jou R.-C. (2008); Nejati M. (2009); Martin J.C. (2010); Ardakani S.S. (2015)
10) Pricing	Trapani J. (1982); Schwieterman J. (1995); Leong C.C. (2007); Espino R. (2008); Jou R.-C. (2008); Martin J.C. (2008); Park J.-W. (2010); Phillips (2013); Wittman M.D. (2014); Soelasih Y. (2015)
11) Service quality	Anderson J. (1981); Trapani J. (1982); Abrahams M. (1983); Ostrowski, P.L. (1994); Truitt L. (1994); Ghobrial A. (1995); Schwieterman J. (1995); Lee M. (1996); Chen, K.J. (1997); Frost F.A. (2001); Suzuki Y. (2001); Chang Y.-H. (2002); Tsaur S.-H. (2002); Wojahn O.W. (2002); Gilbert D. (2003); Kozak N. (2003); Rhoades D.L. (2005); Le Bel J.L. (2005); Hill R. (2006); Park J.-W. (2006); Abdlla G. (2007); Liou J.J.H. (2007); Pakdil F. (2007); Prayag G. (2007); Gemmel P. (2007); Babbar S. (2008); Chen C.-F. (2008); Chou C. (2008); Jou R.-C. (2008); Rhoades D.L. (2008); Tiernan S. (2008); Brueckner J. (2008); Nejati M. (2009); Saha G.C. (2009); Prince J. (2009); Saha G.C. (2009); Martin J.C. (2010); Park J.-W. (2010); Sim K.L. (2010); Kim Y.K. (2011); Lau T.-C. (2011); Tsai W.-H. (2011); Kuo M.S. (2011); Chiou Y.-C. (2012); Curry N. (2012); Yang K.-C. (2012); Ahmed H.S. (2013); Llach J. (2013); Namukasa J. (2013); Wu H.-C. (2013); Chen P.T. (2013); Choi H. (2013); Fageda X. (2014); Han H. (2014); Wittman M.D. (2014); Bae E.-S. (2014), Kuo C.W. (2014); Strombeck S. (2014); Ali F. (2015); Hwang S.-Y. (2015); Choi K. (2015); Merkert R. (2015)
12) Total quality management	Gourdin KN. (1991); Brong J. (2002); Rhoades D.L. (2005); Ahmed A.M. (2006); Cheng J.-H. (2008); Salmador M.P. (2008); Parast M.M. (2010); Llach J. (2013);
13) Customer satisfaction	Kozak N. (2003); Park J.-W. (2004); Laws E. (2005); Hill R. (2006); Park J.-W. (2006); Babbar S. (2008); Chen C.-F. (2008); An M. (2009); Saha G.C. (2009); Anderson S.W. (2009); Saha (2009); 김순희 (2009); Park J.-W. (2010); Ahn T.-H. (2011); Kim Y.K. (2011); Lau T.-C. (2011); Curry N. (2012); Yang K.-C. (2012); Namukasa J. (2013); Choi H. (2013); Han H. (2014); Ali F. (2015); Chow C.K.W. (2015); Elias, N.F. (2015); Etemad-Sajadi, R. (2015); Merkert R. (2015)
14) Customer perception and expectation	Kloppenburg Timothy J. (1992); Lee M. (1996); Chen, K.J. (1997); Gustafsson, A. (1999); Frost F.A. (2001); Rietveld P. (2001); Gilbert D. (2003); Park J.-W. (2004); Chen F.-Y. (2005); Le Bel J.L. (2005); Laws E. (2005); Park J.-W. (2006); Abdlla G. (2007); Pakdil F. (2007); Prayag G. (2007); Chen C.-F. (2008); Cheng J.-H. (2008); Tiernan S. (2008); Forbes S. (2008); Moufakkir O. (2010); Ahn T.-H. (2011); Kim Y.K. (2011); Tsai W.-H. (2011); Lambert A. (2011); Curry N. (2012); Ahmed H.S. (2013); Llach J. (2013); Metwally D. (2013); Namukasa J. (2013); Chen P.T. (2013); Laming, C. (2014); Strombeck S. (2014); Chow C.K.W. (2015); Etemad-Sajadi, R. (2015); Choi K. (2015); Merkert R. (2015)

International Journal for Quality Research

Table 4. Literature review: combination of variables, authors and year (Source: Created by the authors based on the WOS and SCOPUS database) (continued)

Name of variables	Authors (year)
15) Airline Alliances	Tiernan S. (2008); Tsantoulis M. (2008)
16) Others	오지경 (2007); Xie Z.C. (2008); 홍외성 (2009); Park J.-W. (2010); 박종기 (2010); Dominic P.D.D. (2011); Elgin A. (2012); Llach J. (2013); Elkhani N. (2014); Elias, N.F. (2015); Araujo L. (2015); Ater I. (2015);

Obviously, some articles took into account more than one variable in its study, so that authors are appearing repeatedly in some cases.

4. Descriptive results

4.1. Evolution of published papers

Figure 2 shows the evolution of papers that met the requirements of this study, as well as the total accumulative. The relevant set considers the period from 1981-2015, as for the previous years 1978-1980 no papers were found.

Therefore, Figure 2 displays the evolution of the 118 identified papers during the ranged period (1978-2015). It shows that 63.6% of the total papers were published in the last eight years (2008-2015), a result which determines the dynamism of this field of study in recent years and the importance that the concept quality is assuming during the mentioned span of time.

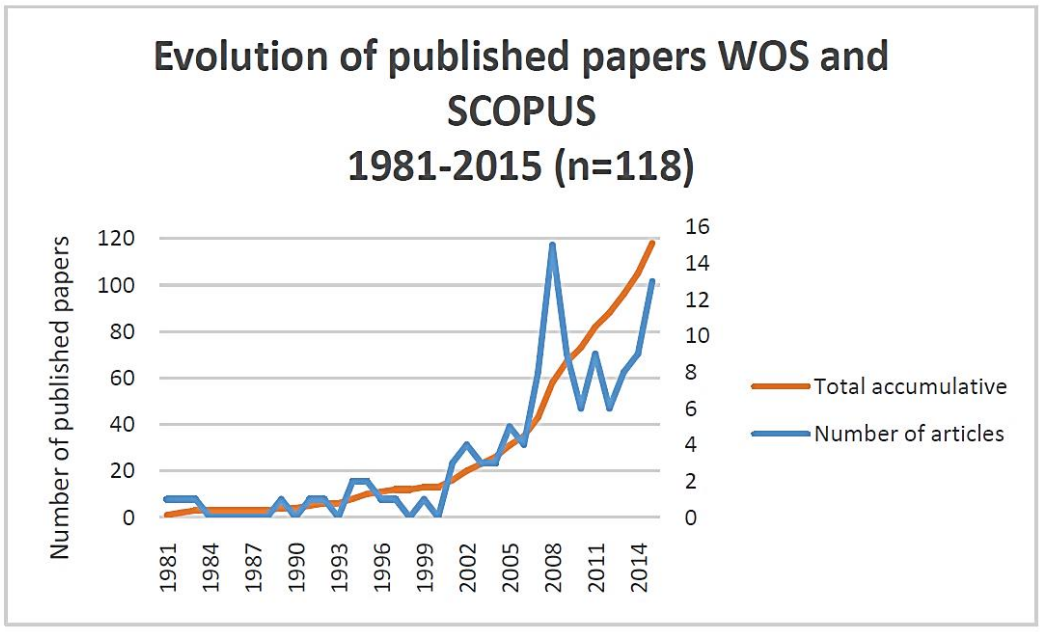


Figure 2. Evolution of published papers by year and accumulative 1981-2015 (Source: Created by the authors)

International Journal for Quality Research

Especially after challenges to the industry, such as the attacks of 9/11 in 2001, as well as the mentioned introduction of LCCs in Europe in 1995, changes occurred in both demand and supply for air travel and the phenomena quality got essential in this business. Consequently, researchers started to explore this field of study in a much higher frequency during the last years.

4.2. Most frequently cited papers in WOS and SCOPUS

The following Table 5 shows the ranking of the most cited papers in both databases used. The most cited article is published by Tsaur et al. (2002), with a total of 591 citations (the paper was available in both of the databases, WOS and Scopus, so the sum of the citations has been taken), while the second ranked paper is written by Chang and Yeh (2002), which obtained 232 citations (same criteria).

Table 5. Ranking of the most cited papers (Source: Created by the authors)

	AUTHORS	TITLE	YEAR OF PUBLICATION	TOTAL CITATIONS
1	Tsaur S.-H., Chang T.-Y., Yen C.-H.	The evaluation of airline service quality by fuzzy MCDM	2002	591
2	Chang Y.-H., Yeh C.-H.	A survey analysis of service quality for domestic airlines	2002	232
3	Gilbert D., Wong R.K.C.	Passenger expectations and airline services: a Hong Kong based study	2003	148
4	Chen C.-F.	Investigating structural relationships between service quality, perceived value, satisfaction, and behavioral intentions for air passengers: Evidence from Taiwan	2008	134
5	Mazzeo M.-J.	Competition and service quality in the US airline industry	2003	102
6	Gursoy D., Chen M.-H., Kim H.-J.	The US airlines relative positioning based on attributes of service quality	2005	80
7	Park J.-W., Robertson R., Wu C.-L.,	The effect of airline service quality on passengers' behavioral intentions: A Korean case study	2004	76
8	Chen F.-Y., Chang Y.-H.,	Examining airline service quality from a process perspective	2005	63
9	Liou J.J.H., Tzeng G.-H.,	A non-additive model for evaluating airline service quality	2007	52
10	Pakdil F., Aydin O.,	Expectations and perceptions in airline services: An analysis using weighted SERVQUAL scores	2007	50

As seen, a set of authors demonstrated the importance of the quality concept and its strait connection with the airline industry. In relation to the first five most frequently cited papers, basically they are taking into account the following ideas:

- In the paper with the title "The evaluation of airline service quality

International Journal for Quality Research

by fuzzy MCDM" by Tsaur et al. (2002), being the most cited article (591 citations), a fuzzy set theory was conducted to be able to measure different attributes that compose the term of service quality, relating them with the 5 service dimensions included in the SERVQUAL model, as tangibility, reliability, responsiveness, assurance and empathy.

- In the same manner, Chang and Yeh (2002) evaluated the service quality concept of domestic airlines through a fuzzy multicriteria analysis and customer surveys.
- Gilbert and Wong (2003) analyzed in their paper expectations that air passengers can have in terms of being decision maker or non-decision maker in regard with aspects as customization, responsiveness, employees, reliability, assurance, flight related issues and facilities; trying therefore to identify the aspects that matter most to the airline passengers.
- Chen C.-F. (2008) wants to identify in his paper the relationship that exists between the aspects service quality, perceived value, satisfaction and the behavioral intentions that passengers can have.
- Meanwhile Mazzeo (2003) takes into consideration the variable of "punctuality", talking about on-time performance and delays and its mutual connection.

4.3. Most productive and cited journals

The 118 papers which are included in both databases for this study appear in a total of 68 different journals. Table 6 shows the 6 most productive journals with 4 or more articles included in this study, the total citations and its correspondent indexing in WOS or SCOPUS database. The criteria of taking into account journals with 4 articles or more has been established by the authors for reducing the table size.

Table 6. Most productive journals and citations during the research in WOS and Scopus

RANKING	JOURNAL NAME	Number of articles in this study	Number of citations	5-years impact factor	WOS	SCOPUS
1	Tourism Management	6	852	3.762	**O**	**O**
2	Journal of Air Transport Management	11	274	1.328	**O**	**O**
3	Transportation Research Part A - Policy and Practice	5	237	3.563	**O**	**O**
4	Managing Service Quality	9	106	1.477		**O**
5	International Journal of Quality and Reliability Management	4	70	NA		**O**
6	Total Quality Management and Business Excellence	4	22	1.482	**O**	**O**

International Journal for Quality Research

The first 6 journals in the ranking already represent 33% (39 of 118 papers) of the total set of papers included in this study, which means that the research topic is gathered together and focused in a concentrated group of journals. The three most productive journals in terms of citations are Journal of Tourism Management (n=852), the Journal of Air Transport Management (n=274) and the Journal Transportation Research Part A – Policy and Practice (n=237). In terms of the number of articles included in this study, it is the Journal of Air Transport Management that stands out with almost 10% of the total of published articles included in this research (n=11).

Analyzing the relation between the total citations by papers for each journal and the corresponding 5-years impact factor, results of this study achieve unanimity at least in the first placed journal in regard to the total citations. The Journal of Tourism Management shows a total of 852 citations and at the same time it has the highest 5-years impact factor with 3.762.

The high number of citations is related to the fact that the most cited article in this study (Tsaur et al., 2002) is published through this journal.

The journal of Air Transport Management for instance, which in this study has been ranked first in relation to its productiveness in terms of articles (n=11), and the second placed journal in regard to its number of citations, shows that although having 11 articles included for this study, the number of citations for each article is very low and, therefore, its 5-years impact factor is only 1.328.

4.4. Evolution of established variables

In this part of the results, the evolution of the number of the 16 established variables has been analyzed, first for the databases, and afterwards for each of the established variables, grouping together different periods of time.

Figure 3 shows the evolution of the total variables used during the period 1978-2015, although this analysis starts in 1981, as no articles were published related to this research topic prior to these years.

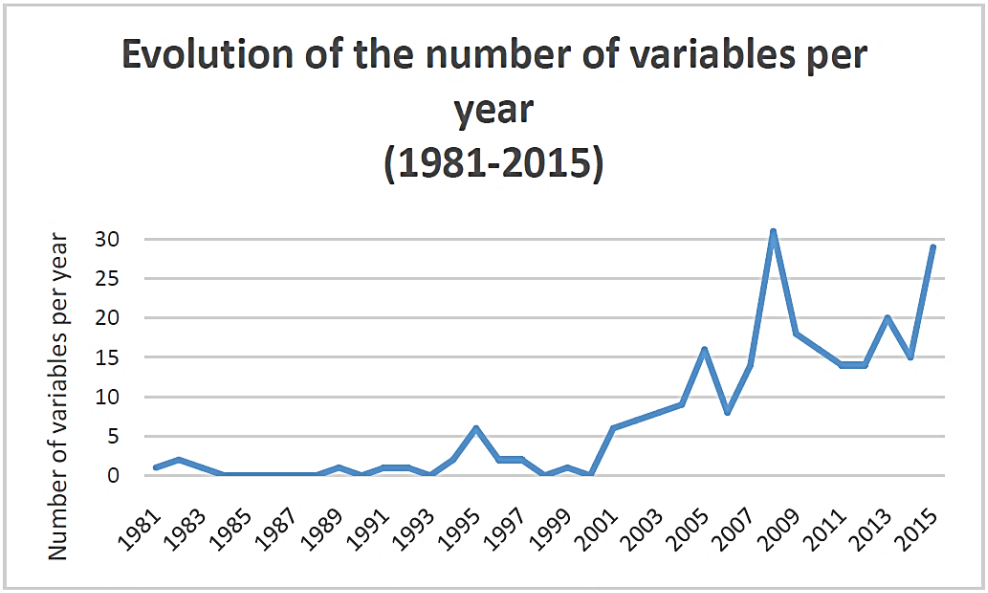


Figure 3. Evolution of the number of variables per database 1981-2015 (Source: Created by the authors)

International Journal for Quality Research

The graphic displays the first increment in 1995 (n=6), growing the number of variables from 2001 on with a positive tendency, although showing fluctuations during the whole period. It reaches its highest point of number of variables in 2008 (n=31).

Table 7 presents an evolution of variables for 4 different periods, starting the analysis in 1978.

Table 7. Evolution of variables per periods of time (Source: Created by the authors)

	1978-1987	1988-1997	1998-2007	2008-2015	
					TOTAL
Service quality	3	6	17	37	**63**
Customer perception and expectation	0	3	11	22	**36**
Customer satisfaction	0	0	5	22	**27**
Punctuality	0	1	6	13	**20**
Courtesy and image of the company	0	0	2	11	**13**
Others	0	0	1	11	**12**
Flight schedule	0	1	5	5	**11**
In-flight service	0	0	3	8	**11**
Handling passenger	0	0	5	5	**10**
Pricing	1	1	1	7	**10**
Total quality management	**0**	**1**	**4**	**4**	**9**
Safety	0	0	4	4	**8**
Post-flight service	0	0	3	2	**5**
Pre-flight service	0	0	2	3	**5**
Features aircraft	0	2	0	1	**3**
Airline Alliances	0	0	0	2	**2**
TOTAL	**4**	**15**	**69**	**157**	**245**

The variable with the highest weight of importance related to what has been said about quality in the airline business is "service quality". The total number of times it was mentioned in the chosen papers for this study was 63.

The period where most variables have been used, showing a parallel evolution to the number of published articles, has been the period of 2008-2015 with 157 mentions.

The periods 1978-1987 and 1988-1997 show only a low number of variables used during

International Journal for Quality Research

these years, being the total number of mentions 4 and 15, respectively for the mentioned periods. During the period 1998-2007, the academic published articles started putting more focus on this concept, although it is, as mentioned, especially the period 2008-2015 which stands out with a total of 157 variables used in 75 papers that are included in this study during this period.

4.5. Co-occurrence and Network Analysis of Variables through Keywords and Titles

For the unit of both databases, WOS and Scopus, a graphic has been created, making use of the sixteen previously established variables; this graphic analyzes the relationships between the keywords which have been identified by the authors of each paper, seeing therefore in both cases the interaction and association between the variables.

The graphic has been represented through the program NodeXL (NodeXL, 2013), using the Fruchterman and Reingold (1991) algorithm graph layout; the matrix has been created based on the size of the edges, which represents the importance and frequency of relation and co-occurrence between one and a second variable, while the volume of vertexes represents the relevance of each variable itself based on the literature reviewed for this research.

As Figure 4 shows, the most important identified links between the variables exist between "service quality", "customer satisfaction", and "customer perception and expectation".

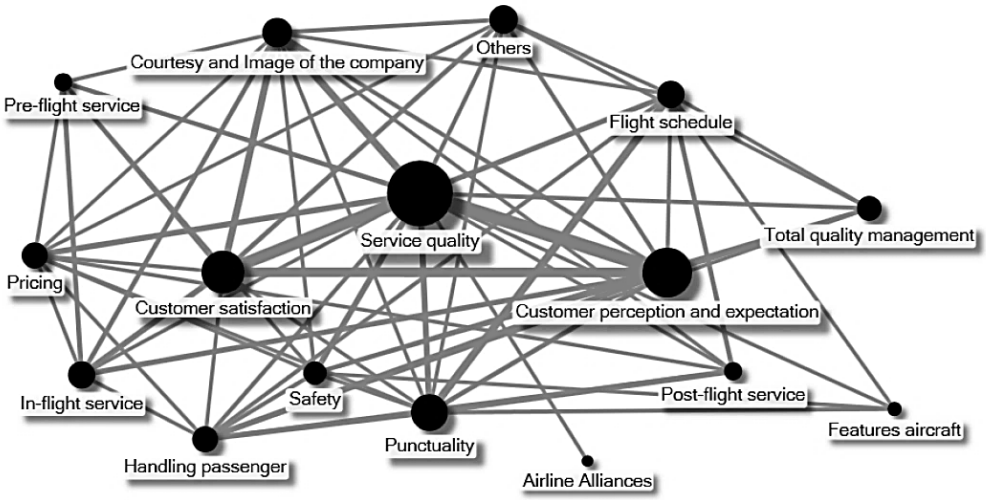


Figure 4. Network analysis of variables (Source: Created by the authors)

The vertexes with the highest relevance are the variables "service quality" (n=63), "customer perception and expectation" (n=36) and "customer satisfaction" (n=27).

5. Discussion and conclusions

Although the general interest on quality in this business is steadily growing, it is necessary to emphasize that there does not exist any specific literature review on what has been said about the quality concept in the airline industry during the previous decades.

Therefore, existing literature about this subject has been revised, covering the period 1978-2015. This paper identified and analyzed papers related to this research topic through a systematic literature review in order to define and frame this concept and to

International Journal for Quality Research

see a general overview on the evolution that quality has taken in this business.

Furthermore, the aim of this research was to give firstly an overview on the quality concept and what has been said about quality in previous studies. And, secondly, also to determine the weight of correlation between each of the established quality variables in this study and to figure out the strength of each, through a network variable analysis, which helps significantly to understand in a better and easier way the relationship and co-occurrence between the variables included in the framework of quality in regard to the air transportation industry.

Papers have been classified and sorted out through the academic community's two most recognized databases, WOS and Scopus, using a total sample of 118 papers.

One of the first conclusions drawn from this study is that the topic has received a growing interest during recent years maintaining positive tendencies.

With no doubt, the aviation industry has undergone a fundamental structural change in recent decades, a fact which is associated with the progressive globalization, the liberalization and deregulation progress in the international aviation market, the introduction of LCCs, as well as the changing demands and expectations of the customers (Ali et al., 2015); as a result, a lot of new airline companies were created, and competition and quality became essential concepts both for the customers and companies.

Resulting from this study it can be seen that the number of published articles in this research field has developed in a constant way. The most cited article has been published by Tsaur et al. (2002) and Chang and Yeh (2002), with 591 and 232 citations, respectively.

A multitude of journals distributed articles related to the research topic, but only a few really focused on it.

The most productive journal in this study, measured in number of citations, has been the Journal of Tourism Management (n=852), while the journal with the highest number of articles included in this study has been the Journal of Air Transport Management (n=11).

Regarding the analysis of the evolution of each of the established variables in this study, the most mentioned item has been "service quality", with a total of 63 mentions during the period 1978-2015.

Through a network variable analysis, it has been possible to analyze the co-occurrence between the variables created for this study. The strongest ties exist between "service quality", "customer satisfaction" and "customer perception and expectation".

Finally, given these results, and seeing what has been said about quality, another conclusion is that "service quality" is the element that most contributes to the satisfaction, loyalty and therefore to a positive perceived service quality for the customers, that helps them to get a positive image of the airline company as well as positive behavioral intentions. Service quality was the variable with the highest frequency used as it is the concept that is adopted normally when talking about quality in the airline business.

Further research following the findings of this study could firstly carry out a research about the influential aspects of quality for each of the business models, LCC and FSC market, as there does not exist any relevant literature about the several quality concepts that really show the differences in terms of quality between both of the models.

Especially due to the high importance that the low-cost market has received during the last years, this would be a necessary and needed research.

Secondly, further research could address and analyse if the companies that are focused on quality, under the different ways of defining and measuring it, are employing their resources and strategies correctly in order to achieve their financial performance goals.

International Journal for Quality Research

References:

Acar, A. Z., & Karabulak, S. (2015). *Competition between Full Service Network Carriers and Low Cost Carriers in Turkish Airline Market.* Paper presented at the 11th International Strategic Management Conference 2015.

Akamavi, R. K., Mohamed, E., Pellmann, K., & Xu, Y. (2014). Key determinants of passenger loyalty in the low-cost airline business. *Tourism Management*, *46*, 528-545. http://dx.doi.org/10.1016/j.tourman.2014.07.010

Ali, F., Dey, B. L., & Filieri, R. (2015). An assessment of service quality and resulting customer satisfaction in Pakistan International Airlines. *International Journal of Quality and Reliability Management*, *32*(5), 486-502. http://dx.doi.org/10.1108/IJQRM-07-2013-0110

An, M., & Noh, Y. (2009). Airline customer satisfaction and loyalty: impact of in-flight service quality. *Journal of Service Business*, *3*(3), 293-307. doi: 10.1007/s11628-009-0068-4

Baker, D. (2013). Service quality and customer satisfaction in the Airline Industry: A comparison between legacy Airlines and low cost Airlines. *American Journal of Tourism Research*, *2*(1), 67-77.

Belobaba, P. (2011). In search of sustained profitability 30 years after deregulation. In J.F. O`Conell & G. Williams (Eds.). *Air Transport in the 21st century-Key strategic developments.* Ashgate.

Ben-Yosef, E. (2005). *The Evolution of the US Airline Industry. Theory, Strategy and Policy*. Springer Science & Business Media

Campa-Planas, F., & Campa-Lewkowycz, R. (2009). Estructuras de oferta en transporte aéreo: modelos punto a punto y de red. *Harvard Deusto Business Review*, *179*, 42-50.

Chang, Y. H., & Yeh, C.-H. (2002). A survey analysis of service quality for domestic airlines. *European Journal of Operational Research*, *139*(1), 166-177. http://dx.doi.org/10.1016/S0377-2217(01)00148-5

Chen, C. F. (2008). Investigating structural relationships between service quality, perceived value, satisfaction, and behavioral intentions for air passengers: Evidence from Taiwan. *Transportation Research Part A – Policy and Practice*, *42*(4), 709-717. http://dx.doi.org/10.1016/j.tra.2008.01.007

Chen, F. Y., & Chang, Y. H. (2005). Examining airline service quality from a process perspective. *Journal of Air Transport Management*, *11*(2), 79-87. http://dx.doi.org/10.1016/j.jairtraman.2004.09.002

CRD. Centre for Reviews and Dissemination. (2009). *Systematic Reviews: CRD´s guidance for undertaking reviews in health care*. CRD, University of York.

Dempsey, P., & Goetz, A. (1992). *Airline deregulation and laissez-faire mythology*. Quorum Books.

Elsevier (2015). www.elsevier.com, (accessed 20 February 2016).

Fageda, X., Jimenez, J. L., & Suarez-Aleman, A. (2014). Assessing airlines: Quality as a competitive variable. *International Journal of Transportation Economics*, *41*(3), 425-440.

Fonseca, F., Pinto, S., & Brito, C. (2010). Service quality and customer satisfaction in public transports. *International Journal for Quality Research, 4*(2), 125-130.

Francis, G., Humphreys, I., Ison, S., & Aicken, M. (2006). Where next for low cost airlines? A spatial and temporal comparative study. *Journal of Transport Geography*, *14*, 83-94. http://dx.doi.org/10.1016/j.jtrangeo.2005.05.005

International Journal for Quality Research

Freeman, L.C. (2004). *The Development of Social Network Analysis. A Study in the Sociology of Science*. Vancouver, BC Canada: Empirical Press.

Fruchterman, T., & Reingold, E. (1991). Graph Drawing by Force-directed Placement. *Software-practice and experience*, *21*, 1129-1164.

Gilbert, D., & Wong, R. K. C. (2003). Passenger expectations and airline services: A Hong Kong based study. *Tourism Management*, *24*(5), 519-532. http://dx.doi.org/10.1016/S0261-5177(03)00002-5

Ginieis, M., Sánchez-Rebull, M.-V., & Campa-Planas, F. (2012). The academic journal literature on air transport: Analysis using systematic literature review methodology. *Journal of Air Transport Management*, 19, 31-35. http://dx.doi.org/10.1016/j.jairtraman.2011.12.005

Gursoy, D., Chen, M. H., & Kim, H. J. (2005). The US airlines relative positioning based on attributes of service quality. *Tourism Management*, *26*(1), 57-67. http://dx.doi.org/10.1016/j.tourman.2003.08.019

Kalemba, N., Campa-Planas, F., Hernández-Lara, A.-B. & Sánchez-Rebull, M.-V. (2016). *US Airlines Performance and Its Connection with Service Quality.* 18th International Conference on Air Transport Management 2016, London.

Liou, J. J. H., & Tzeng, G.H. (2007). A non-additive model for evaluating airline service quality. *Journal of Air Transport Management*, *13*(3), 131-138. http://dx.doi.org/10.1016/j.jairtraman.2006.12.002

Luke, D. A., & Harris, J. K. (2007). Network Analysis in Public Health: History, Methods, and Applications. *Annual Review of Public Health*, *28*, 69-93. doi: 10.1146/annurev.publhealth.28.021406.144132

Mazzeo, M. J. (2003). Competition and Service Quality in the U.S. Airline Industry. *Review of Industrial Organization*, *22*, 275-296. doi:10.1023/A:1025565122721

Nejati, M., Nejati, M., & Shafaei, A. (2009). Ranking airlines' service quality factors using a fuzzy approach: study of the Iranian society. *International Journal of Quality and Reliability Management*, *26*(3), 247-260. http://dx.doi.org/10.1108/02656710910936726

NodeXL (2013), www.nodexl.codeplex.com, (accessed 04 August 2016).

OECD (1997), The future of international air transport policy: Responding to global change. Report.

Pakdil, F., & Ayding, O. (2007). Expectations and perceptions in airline services: An analysis using weighted SERVQUAL scores. *Journal of Air Transport Management*, *13*(4), 229-237. http://dx.doi.org/10.1016/j.jairtraman.2007.04.001

Park, J. W., Robertson, R., & Wu, C. L. (2004). The effect of airline service quality on passengers´ behavioral intentions: A Korean case study. *Journal of Air Transport Management*, *10*(6), 435-439. http://dx.doi.org/10.1016/j.jairtraman.2004.06.001

Pearson, J. (2016). *Relative performance: a product and organizational architecture analysis of Asian low-cost subsidiaries.* Paper presented at the 20th ATRS World Conference 2016, Rhodes.

Prayag, G. (2007). Assessing international tourists' perceptions of service quality at Air Mauritius. *International Journal of Quality and Reliability Management*, *24*(5), 492-514. http://dx.doi.org/10.1108/02656710710748367

Scopus (2015). www.scopus.com, (accessed 4 August 2016).

Suzuki, Y., Tyworth, J. E., & Novack, R. A. (2001). Airline market share and customer service quality: a reference-dependent model. *Transportation Research Part A – Policy and Practice*, *35*(9), 773-788. http://dx.doi.org/10.1016/S0965-8564(00)00016-1

Thomson Reuters (2015). www.thomsonreuters.com, (accessed 11April, 2016).

Tsaur, S.-H., Chang, T.-Y., & Yen, C.-H. (2002). The evaluation of airline service quality by fuzzy MCDM. *Tourism Management*, *23*(2), 107-115. http://dx.doi.org/10.1016/S0261-5177(01)00050-4

Vasigh, B., Fleming, K., & Tacker, T. (2016). *Introduction to Air Transport Economics – From Theory to Applications*, Second Edition. Routledge.

Web of Science (2015). www.webofknowledge.com, (accessed 5 August 2016).

Webster, J., & Watson, R. (2002). Analyzing the past to prepare for the future: Writing a literature review. *MIS Quarterly*, *26*(2), 13-23.

Wensveen, J. G. (2011). *Air Transportation: A Management Perspective*, 7th edition. Ashgate Publishing Company

Werner, F. M., & Stoner, J. F. A. (1999). Bringing Quality into Airline Financial Management. In G. Butler & M. Keller (Eds.), *Handbook of Airline Finance*. New York: McGraw-Hill.

Nicole Kalemba
Universitat Rovira i Virgili,
Department of Economics
and Business
Avinguda Universitat 1,
43204 Reus
Spain
nicole.kalemba@urv.cat

Fernando Campa-Planas
Universitat Rovira i Virgili,
Department of Economics
and Business
Avinguda Universitat 1,
43204 Reus
Spain
fernando.campa@urv.cat

3.3. Research Study

After the literature review in the previous section, this part of Chapter Three corresponds to the methodology and academic results obtained through two quantitative research studies.

3.3.1. Methodology

The main objective of this chapter and its associated research papers was to determine and analyze how service quality affected the economic performance of US airlines. While paper C considered four quality indexes, namely the American Customer Satisfaction Index (ACSI), Wichita's Airline Quality Rating (AQR), J.D. Power's Airline Satisfaction Index and the Net Promoter Score (NPS); paper D focused exclusively on the AQR. Moreover, both studies were based on the US airline industry and they made use of available secondary data for measuring profitability. Thus, financial ratios and airline KPIs were extracted from the Airline Data Project (ADP) built by the Massachusetts Institute of Technology (MIT, 2016). For both studies, the sample consisted of a total of fifteen and thirteen US airline companies, respectively, including data from the 2006-2015 period for paper C, and 2000-2015 for paper D.

To determine if there was any significant impact of quality on airline profitability, both studies used a panel data methodology with longitudinal time series data during the estimation process. The estimation models consisted of three variables: dependent, independent and control.

Paper C considered two dependent variables. First, Return on Investment (ROI) to measure the effect quality had on airline profitability, and second, passenger revenues (REVENUES), for measuring if there was any significant impact, or not, of quality on the companies' activities. Therefore, to address the proposed hypotheses it was necessary to run two regression analyses.

Paper D made exclusive use of the ROI for measuring the return on an airline's investment in relation to the investment costs, thus, only one regression estimation model was required.

The quality index for the airlines was included as an independent variable. In the first case, paper C, it was measured through an average of the before mentioned standardized quality indicators, while paper D included the total AQR index first and then the disassembled AQR was considered separately using the elements of on-time performance (OT), mishandled baggage (MB), denied boardings (DB) and customer complaints (CC).

Finally, control variables were included as they allowed the effects of variables not directly related to quality to be considered, since they can also affect airline performance. Thus, the models included the passenger load factor and number of employees in both studies, since this variable had already been considered in several research studies as a general measurement of company size (Le et al., 2006; Wu, 2008). Additionally, paper C included robustness checks on the results, where the PAX number was used as a control variable.

In addition, F tests and Hausman-type tests were conducted in both research papers to determine the choice of the most appropriate estimation method. The election between pooled OLS (ordinary least squares), and fixed or random effects models depends on their properties, as well as the individual and idiosyncratic errors (Croissant & Millo, 2008).

Moreover, for both studies, the effect of $Quality_{it-1}$ was considered, since the quality of one year does not have a direct effect on airline company profitability in the same year.

3.3.2. Results

This final section of Chapter Three aimed to respond to the second research question "How does Quality correlate with an airline's profitability?"

The results are presented in two papers (C and D). Paper C considered four quality indexes used in the airline industry and showed the impact that quality can have both on the economic performance and the airline's activity, whereas paper D was exclusively related to the AQR index and analyzed the influence of quality on the airlines' ROI.

- Paper C: *"The Quality Effect on the Profitability of US Airline Companies"* was published in the Journal *Tourism Economics*, 2017 in Online First, indexed in the JCR database and is available at: *https://doi.org/10.1177/1354816617731193*

- Paper D: *"The Quality-Profitability Link in the US Airline Business: A Study based on the Airline Quality Rating Index"* was published in the Journal *Procedia Engineering*, vol. 187, 2017, indexed in the Scopus database and is available at: *https://doi.org/10.1016/j.proeng.2017.04.380*

Research Article

TOURISM ECONOMICS
The Business and Finance of Tourism and Recreation

Tourism Economics
1–19

DOI: 10.1177/1354816617731193
journals.sagepub.com/home/teu
SAGE

The quality effect on the profitability of US airline companies

Nicole Kalemba
University Rovira and Virgili, Spain

Fernando Campa-Planas
University Rovira and Virgili, Spain

Abstract
This study was conducted to determine if quality had any effects on US airline economic performance. Therefore, four service quality indexes used in the US air transportation industry were included together with two economic performance indicators, passenger revenues and return on investment (ROI). Longitudinal data from the US airline companies from 2006 to 2015 were used to determine if airline activity or profitability increased when service quality improved. The results of this research demonstrated and confirmed the positive and significant influence of service quality on the ROI of US airline companies. Meanwhile, a non-significant effect was found for quality on airline passenger revenues. As none of the previous research studies have considered the four quality indexes altogether, the findings of this work could encourage airline companies to invest in quality, since this policy can have a positive consequence for their profitability.

Keywords
airlines, air transportation, economic performance, key performance indicators, quality

Introduction

Why do airlines focus on the quality they offer to the passengers (PAXs)? Is quality an influencing factor that ensures the profitability and a higher performance of airline companies? Which are the variables that play an important role when analysing this correlation? These questions, in various combinations, have led to carry out the present study.

Corresponding author:
Nicole Kalemba, Department of Business Administration, University Rovira and Virgili, Avinguda Universitat 1, 43204 Reus, Spain.
Email: nicole.kalemba@urv.cat

Several empirical studies have been conducted during the last few years to explore the potential relationship between quality and profitability in the airline industry (Caruana, 2002; Mellat-Parast et al., 2015; Steven et al., 2012).

It is in the airlines' best interest to offer a high standard of service quality, first, to reach a high level of customer satisfaction; but airlines are focused likewise on improving the quality provided to PAXs (and perceived by them) to differentiate themselves from competitors; not only by pricing (Gursoy et al., 2005). Achieving a high passenger satisfaction is one of the greatest assets (Akamavi et al., 2015; Archana and Subha, 2012). A passenger who is not satisfied with the services offered by the airline will most likely become less reliable to continue its relationship with that airline, as far as the airline industry is a global business operating in an open and liberal market.

These arguments justify the objective of this article, which is to determine and analyse the effect that service quality exerts on airline economic performance. To do so, we consider four service quality indexes applied in the US airline industry for determining their influence on passenger revenues and return on investment (ROI) of a sample of US airline companies. According to International Air Transport Association (2016), North American Airlines are leading the performance of this industry, and since 2013, they have been generating more than the half of the total profits of the global airline industry, being in 2016, 19.2 billion dollars over the global number of 36.3 billion dollars. Even though, it is essential to mention, that precisely in relation to the quality of service offered to the customers, the US airlines were underperforming through several years (Yu, 2007). This statement can be confirmed, as the US consumer satisfaction was ranked below the tax authority Internal Revenue Service (IRS), for instance, throughout several years. It is since 2012 that the US airline companies started slowly to rank ahead the IRS in customer satisfaction-related terms (Jones, 2014).

The structure of the article is organized as follows. It first offers a conceptual approach on how quality and performance are measured in the airline business. Thereafter, it describes the academic literature on what has been said about quality and the potential relationship between quality and profitability; besides it offers the hypotheses that have been built for this study. Subsequently, 'Methodology' section describes the methodology applied, how data has been collected and variables measured to test the established hypotheses. 'Results' section outlines the results that have been obtained from this research. The final section presents the conclusions that can be drawn from this study with a discussion on key findings, as well as limitations of the current study and proposed further research.

Based on the findings of this study and considering that the airline business affects several sectors in the economy related to, among others, transportation, infrastructure and tourism, this article can be useful for managers, shareholders, stakeholders, as well as for researchers in this field of interest.

Conceptual approach

How to measure quality in the airline industry?

From the airline business point of view, it is fundamental to provide a high level of service quality to PAXs to retain customer patronage, market share and profitability (Doppelt and Nadeau, 2013; Hussain et al., 2015; Morash and Ozment, 1994; Park et al., 2005). In the transportation field, the importance of aspects as passenger satisfaction and the measurement of service quality are

increasingly recognized (Shen et al., 2016). A relevant method for analysing airline service quality in the airline industry is the use of publicly available, secondary data and indexes. Even if the purpose of this article is not to detail an exhaustive list of available sources, the most relevant indexes in the United States, and used in this study, are shown in Table 1 with the aim of giving an overview about the most important quality-related indexes applied in the US airline industry.

How to measure performance in the airline industry?

Beside the common indicators that can be used in all industries (financial, non-financial, etc.), the airline business, as every business does, has its own specific key performance indicators (KPIs) that should be calculated and understood in order to analyse the performance of airline companies (Amat et al., 2011; Belobaba et al., 2009; Katz and Garrow, 2014; Massachusetts Institute of Technology (MIT), 2015–2016). The most important KPIs of this business, and used for this article, are as follows:

- Load factor: The load factor is one of the most useful KPIs that was analysed in several studies to identify its impact on the average operating costs per flight (Bilotkach et al., 2014; Zuidberg, 2014). According to the MIT (2015–2016), the load factor refers to 'the number of revenue passenger miles (RPMs)[1] expressed as a percentage of available seat miles (ASMs)'[2]. It was widely accepted by the airline industry as the principal measure of commercial performance (Brenner, 1982), as it shows the maximization of a route due to economies of traffic density (Bilotkach et al., 2014).
- In line with Zuidberg (2014), airlines can reduce their operating unit costs per passenger by maximizing their load factor, as this does not lead to relevant higher operation costs per aircraft movement. Thus, airlines are able to increment their profit if they do so with their load factor, without any need to raise significantly operating costs. However, there are cost increases in fuel, catering, handling, among others, that could represent an increase per seat, approximately a 10–15% of the marginal revenue derived from this new occupied seat (Doganis, 2009). Nevertheless, due to the enormous changes in the pricing policy over the last two decades, the KPI revenue per ASM replaced latterly in some way this KPI.
- Company size refers to the company size of the airline measured through the total number of employees, as flight personnel (i.e. technical flight crew) and ground personnel (handling, maintenance, etc.). Thus, this KPI is used as a size variable of the airline companies, measured as full-time equivalent employees by year.
- PAX refers to the total number of PAXs that fly and, that are generating, in general terms (except free tickets), passenger revenues. This KPI is also necessary for calculating other operating metrics as, for instance, the RPM, that measures the average of each flown mile paid by each passenger, as well as the revenue per passenger, that stands for the generated average income per passenger.

Although the variables load factor and PAX are related, it is very important to point out that those two variables do not need to have necessarily the same tendency. Companies with wide body fleet can reflect an increase in the number of PAXs carried, but being the load factor lower than for instance for a company using narrow fleet, with less PAXs on board than the wide body company.

Table 1. Summary of quality-related indexes applied in the US airline industry.

Index name	Approach	Measurement
ACSI (2016)	With its origin in 1994, the index measures customer satisfaction across the US economy offers information of benchmarks of a multitude of industries. In the case of the airline industry, ACSI analyses passengers' satisfaction of US Airlines' customers. It includes nine major airlines and several small carriers; data are updated once a year.	Summarizes opinions of customers about elements are as follows: – Flight schedule options – Check-in – Reservations – On-time arrival – Baggage handling – Loyalty programs – Flight crew courtesy and helpfulness – In-flight services – Seat comfort – Call centre – Website
AQR (2016)	Developed in 1991, the AQR index provides a summary of quality ratings taken month by month, reflecting US airlines that show at least 1% of domestic passenger volume. This rating system allows comparing the performance between the different domestic airlines.	Based on consumer surveys and subjective opinions, the index takes into account a weighted average of several elements and is calculated as follows: $AQR = \frac{(+8.36\times OT)+(-8.03\times DB)+(-7.92\times MB)+(-7.17\times CC)}{(8.63+8.03+7.92+7.17)}$
JD Power Airline Satisfaction Index	The index measures the satisfaction of airline passengers, considering LCCs and network carriers. Besides, it compares airline performance and provides benchmark information of those two market segments.	Summarizes the satisfaction of customers of their air travel experiences, considering – Cost and fees – In-flight service – Boarding/deplaning/baggage – Flight crew – Aircraft – Check-in – Reservation
NPS (2016)	Developed in 2003, the NPS measures the tendency or possibility of a customer to confirm and recommend a good service to a close person.	Calculated as the average according to the answers of customers, they have to give with a score between 0 and 10 (being 10 most likely) on the question: 'How likely are you recommend (this company), to your friends, family or business associates?'

Source: Created by the authors based on the webpage information of each index.
Note: ACSI: American Customer Satisfaction Index; AQR: Airline Quality Rating; NPS: Net Promoter Score; LCC: low cost carriers.

In addition to these specific KPIs of the airline business, we will use for the purpose of measuring profitability, the ROI that is applied as the most common ratio by different financial analysts to ascertain the best investment plans (Bhunia et al., 2011), as far as higher levels of assets imply

higher capital needs and financial costs (debt plus equity) to be balanced (González et al., 2000). In this study, we will not make use of financial profitability, as we are focused on performance that is not influenced by the financial structure; and return on equity considers how to finance firm's assets, depending on the capital structure that affects the ratio. For instance, a positive financial leverage would imply that the financial profitability would be higher than the economic profitability (Yoon and Jang, 2005).

Literature review on quality and performance in the airline industry and research hypotheses

Literature review

What has been said about quality in the airline industry?. To find a response to this question, a literature review has been carried out using primarily the database (*Web of Science*, 2016) that permits us to find out and obtain academic journals and papers related to the topic. The period considered for this literature review started on 1993, approximately when the open skies policy came into force, and finished on September 2016. The keywords used for carrying out the literature review have been as follows:

– quality, service quality, air transportation and airlines.

These keywords have been introduced in the database *Web of Science* with the following combinations through the topic search:

- quality or service quality and
- air transportation or airlines.

Based on a previous literature review carried out by Kalemba and Campa-Planas (2017), 16 concepts related to quality have been used to classify the findings of the literature reviewed (see Table 2).

This literature review related to the quality context in the airline business takes into consideration several authors' definitions of parameters corresponding to service quality and shows that the most important concepts have been punctuality and postflight service. Meanwhile, the punctuality concept considers on-time performance, on-time arrival, travel time, turnaround time and delay; the postflight service concept includes aspects as needs of PAXs after the flight, such as baggage handling or mishandled baggage (Kalemba and Campa-Planas, 2017). Like Table 2 in structure, Table 3 has been developed to show a summary of the attributes used for measuring quality through the four selected quality indexes, which were explained previously.

While Table 2 shows that the most important parameters in previous researches have been punctuality and postflight service, Table 3 shows that the most important parameters the indexes are based on are customer satisfaction just as postflight service. Therefore, there are no significant differences between the parameters that the quality indexes consider and the academic literature that has been reviewed.

The quality–profitability link in the airline business. The relationship between quality and performance of a company has been identified and extensively discussed in the academic literature.

Table 2. Literature review on quality of parameters used.

	Total	Sandada and Matibiri (2016)	Delbari et al. (2016)	Merkert and Assaf (2015)	Chow (2014)	Choi et al. (2015)	Steven et al. (2012)	Mellat-Parast and Fini (2010)	Rhoades and Waguespack (2008)	Association of European Airlines (2008)	Park (2007)	Liou and Tzeng (2007)	Chen and Chang (2005)	Gilbert and Wong (2003)	Chang and Yeh (2002)	Bowen and Headley (2000)	Truitt and Haynes (1994)	Elliot and Roach (1993)
Attributes used for measuring service quality																		
1 Preflight service	5								X		X			X			X	X
2 In-flight service	6								X		X	X	X				X	X
3 Postflight service	7				X				X	X		X				X	X	X
4 Courtesy and image of the company	5								X		X	X		X	X			
5 Handling passenger	6										X	X	X		X	X	X	
6 Features aircraft	5								X			X			X		X	X
7 Flight schedule	5								X	X	X	X				X		
8 Punctuality	8				X			X	X	X		X				X	X	X
9 Safety	3											X		X		X		
10 Pricing	1										X							
11 Service quality	3			X		X					X							
12 Total quality management	1							X										
13 Customer satisfaction	5	X		X		X	X				X							
14 Customer perception and expectation	2	X		X														
15 Airline alliances	1		X															
16 Others	3	X							X			X						
Total parameters used by each author	66	3	1	3	2	2	1	2	8	3	8	9	2	3	3	5	6	5

Source: Created by the authors from the literature reviewed and mentioned.

Table 3. Parameters mentioned by the literature and used by the four selected quality indexes.

		Total number of literature review	Total number of quality indexes	ACSI	Wichita	JD Power Airline Satisfaction Index	NPS
Attributes used for measuring service quality							
1	Preflight service	5	2	X		X	
2	In-flight service	6	2	X		X	
3	Postflight service	7	3	X	X	X	
4	Courtesy and image of the company	5	2	X		X	
5	Handling passenger	6	1		X		
6	Features aircraft	5	1	X			
7	Flight schedule	5	2	X	X		
8	Punctuality	8	2	X	X		
9	Safety	3	-				
10	Pricing	1	-				
11	Service quality	3	-				
12	Total quality management	1	-				
13	Customer satisfaction	5	4	X	X	X	X
14	Customer perception and expectation	2	-				
15	Airline alliances	1	-				
16	Others	3	1	X			
	Total parameters used by each index		20	9	5	5	1

Source: Created by the authors from the literature reviewed and mentioned and information coming from airlines quality indexes.
Note: ACSI: American Customer Satisfaction Index; NPS: Net Promoter Score.

Several studies based on management examined the link between both concepts, being either positive (Clemes et al., 2011; Nicolau and Sellers, 2010; Sun and Kim, 2013) or negative (Bounds et al., 1994; Easton, 1993; Reger et al., 1994). However, the focus of this study laid primarily on the quality–profitability link in the airline industry, where the results have been shown in Figure 1.

Figure 1 shows, therefore, that quality does not have a direct influence on profitability, as there are several factors in-between that play an important role and are significant for the relationship; therefore, our findings of Figure 1, based on the literature reviewed, confirm the theory of the service profit chain that outlines the importance of people – both employees and customers – for establishing a relationship between quality and profitability through components as satisfaction and loyalty, among others.

Thus, based on the literature reviewed, the starting point of the chain is the customer service that according to Merkert and Assaf's (2015) leads, in case of being positive, to an increased level of perceived service quality and helps afterwards to improve the relationship between the airline company and the customers. This, in turn, creates customer satisfaction and increments the willingness to pay for the service. Others emphasize a direct influence of customer service

Paper C

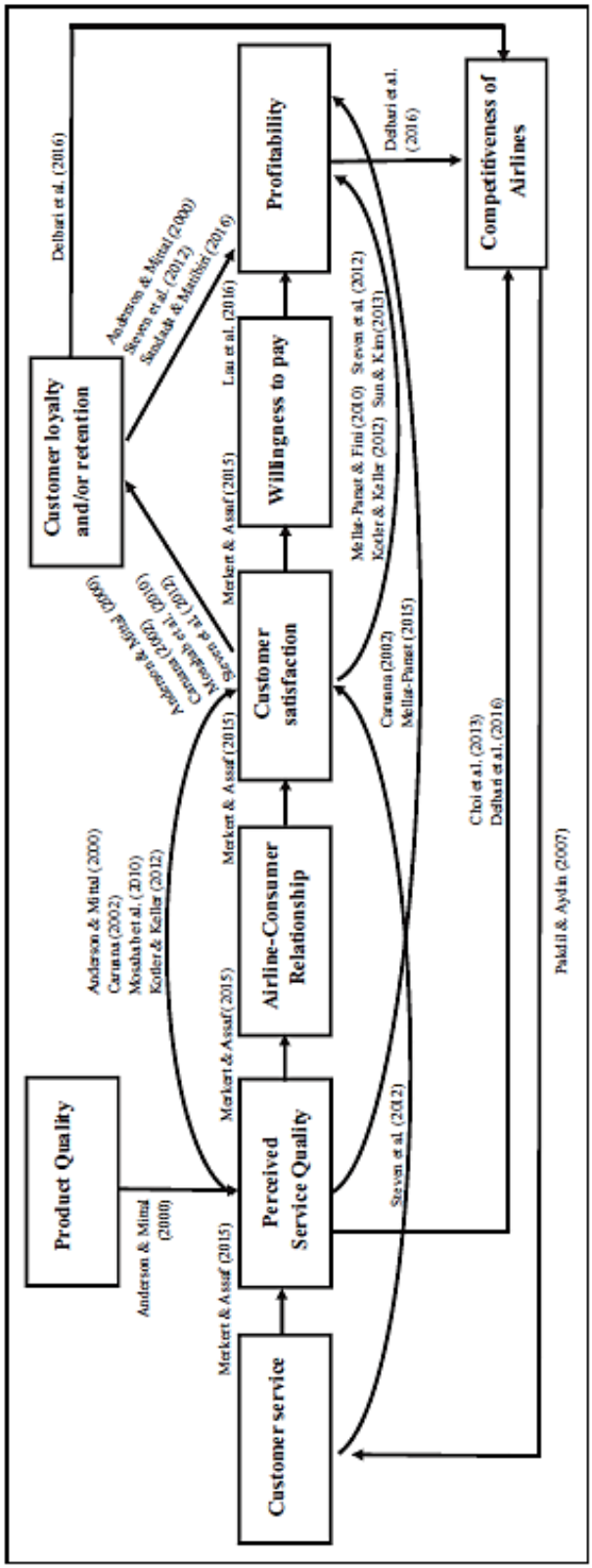


Figure 1. Concept map literature review. *Source*: Created by the authors based on the literature reviewed.

8

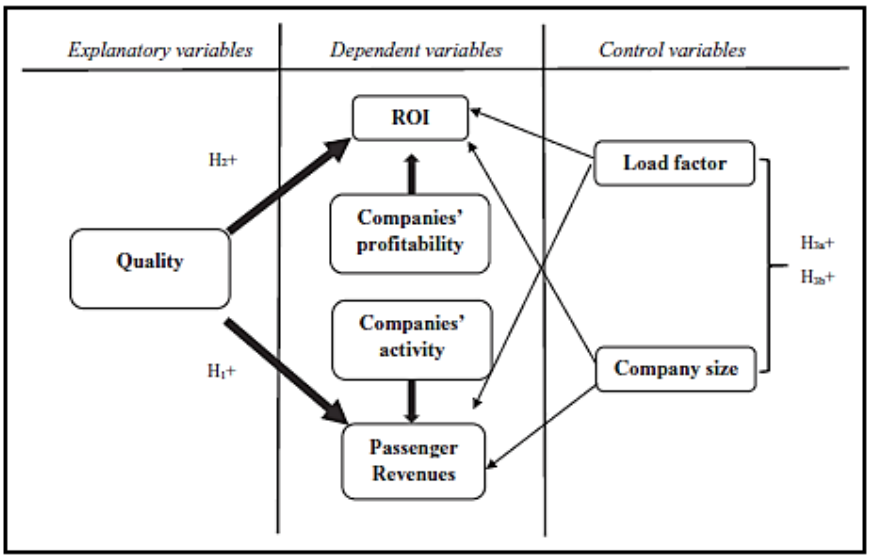


Figure 2. Conceptual model and hypotheses. *Source*: Created by the authors.

(Steven et al., 2012) and perceived quality (Anderson and Mittal, 2000; Caruana, 2002; Kotler and Keller, 2012; Mosahab et al., 2010) on the level of customer satisfaction.

Hence, when perceptions are higher than expectations, the customer will be satisfied and that, consequently, results in customer loyalty and/or retention (Anderson and Mittal, 2000; Caruana, 2002; Mosahab et al., 2010; Steven et al., 2012). In consequence, a high degree of customer loyalty drives to an increase of the profitability of the airline companies. That means, the more loyal customers an airline company has, the easier it will outperform competitors. This high level of performance and profitability, in turn, leads to a higher competitiveness of the airlines (Delbari et al., 2016). It is also important to mention the feedback of the chain that shows that customer service is the consequence of the highly competitive pressure existing in the airline industry (Pakdil and Aydin, 2007).

It is true that airlines that can understand PAXs' needs, wishes and behaviours have a better position to aspire an improvement of their performance that maximizes sales and drives profitability through positive passenger experiences and loyalty (Power, 2016).

Research hypotheses

Once considered the literature reviewed and the objectives of this research, our conceptual model, illustrated in Figure 2, shows a relationship model between quality, defined through the four quality indexes, and financial indicators, as well as between airline KPIs and the financial ratios.

Based on the model in Figure 2, our hypotheses development is as follows.

The relationship between quality and the firm's performance and especially profitability has received considerable interest among authors (Caruana, 2002; Mellat-Parast, 2015; Steven et al., 2012). However, most of the empirical works considered only one quality index, and none of the

studies quality has been considered as the average of a mix of four quality indexes. We therefore propose our first two hypotheses as follows:

Hypothesis 1: The better the service quality offered by the airlines, the higher their activity measured through passenger revenues.

Hypothesis 2: The better the service quality offered by the airlines, the higher their profitability measured through ROI.

Furthermore, there are additional variables that may affect the airlines' performance and profitability. One of those variables that should be considered and that are essential in the airline business is size variables (Steven et al., 2012). In this study, we make use of the number of PAXs and the company size, measured through the number of employees. This relationship has not been studied in any previous study. Thus, our third hypotheses (3a and 3b) are as follows:

Hypothesis 3a: The higher the value of size variables (company size, PAX), the higher the profitability of the airlines measured through ROI.

Hypothesis 3b: The higher the value of size variables (company size, PAX), the higher the activity of the airlines measured through passenger revenues.

Methodology

Sources of information

Two different typologies of information sources have been used. Firstly, for the financial ratios and airline KPIs, it has been used the Airline Data Project (ADP) built by the MIT in the context of their Global Airline Industry Program. The ADP is developed based on reliable information provided by the US Department of Transportation giving the users an overview about data on the aircraft and employee productivity (MIT, 2015–2016). Secondly, for the quality indexes, we have used their respective scoring gained by the airlines that are included in the ADP. Data were taken from the index own public websites.

Sample collection

The period considered for both sources was longitudinal time-series data from 2006 to 2015. The airline companies and years considered that form the sample included in this study are as follows:

- American Airlines;
- Continental, until 2011; from 2012, merged with United Airlines;
- Delta Air Lines;
- Northwest Airlines, until 2009; from 2010, merged with Delta Air;
- Lines;
- United Airlines;
- US Airways;
- America West Airlines, until 2007, merged with US Airways;
- Southwest Airlines;
- JetBlue Airways;

- AirTran Airways, until 2013; from 2014 ,merged with Southwest;
- Airlines;
- Frontier Airlines;
- Virgin America, operating since 2007;
- Alaska Airlines;
- Hawaiian Airlines; and
- Allegiant Air.

In relation to quality, the indexes considered during the period 2006–2015 for this study are as follows:

- American Customer Satisfaction Index (ACSI);
- Wichita's Airline Quality Rating;
- JD Power's Airline Satisfaction Index; and
- Net Promoter Score (NPS).

Measurement of variables

The established statistical model consists of three variables: dependent, explanatory and control variables (see also Figure 2).

Dependent variables. This study includes two dependent variables: passenger revenues to measure the airlines' activity and ROI to measure the firm's profitability. Passenger revenues show the total coming from airline operations (scheduled and non-scheduled flights), including PAXs, excess baggage and other transport-related items. Therefore, this variable shows the income related to the number of PAXs that have flown in a certain period. The second variable, ROI, measures the return on an airline's investment in relation to the investment's costs. This KPI is very useful to benchmark an airline's profitability, as it measures the relationship between earnings before interest and taxes and total assets.

Explanatory variables. In our models, we have included only one explanatory variable, namely, the quality index of the airlines. This variable has been measured through the average of the standardized quality indicators: ACSI, Wichita AQR, JD Power Airline Satisfaction Index and NPS.

Control variables. We have used three control variables that allow us considering the effects of other variables not related to quality that can also affect an airlines' performance

- Firstly, the load factor that measures the occupancy of the plane, as the ratio of RPM between ASM. As already explained previously (Belobaba et al., 2009; MIT, 2015–2016), higher occupancy should assume higher profitability and activity, as this business has a high component of fixed costs and a low component of variable costs. Therefore, an additional passenger generates, in most of the cases, a marginal profit, as far as the marginal revenue is higher than the variable cost.
- Secondly, the variable SIZE that has been considered as company size, being the annual total number of employees (FTS). A higher number of employees should imply a higher number of flights. Until these flights are sold at the right prices, a higher number of employees should imply likewise higher revenue (MIT, 2015–2016).

Table 4. Descriptive statistics.

Variables	Minimum	Maximum	Mean	SD
R	0.020	41.08	10.939	11.305
ROI	−0.275	0.245	0.050	0.080
Q	−3.337	1.671	−0.098	0.898
lf	0.621	0.909	0.823	0.040
lPAX	5.950	11.897	10.216	1.164
lSIZE	6.735	11.502	9.572	1.318

Note: SD: standard deviation; R: revenues; ROI: return on investment; Q: quality; lf: load factor; lPAX: log PAX; PAX: passenger lSIZE: log composition size.

Table 5. Correlation matrix.

Variables	R	ROI	Q	lf	lPAX	lSIZE
R	1					
ROI	−0.096	1				
Q	−0.380	0.440	1			
lf	0.228	0.130	0.046	1		
lPAX	0.819	−0.162	−0.244	−0.075	1	
lSIZE	0.893	−0.227	−0.422	0.027	0.956	1

Note: R: revenues; ROI: return on investment; Q: quality; lf: load factor; lPAX: log PAX; PAX: passenger; lSIZE: log composition size.

– And, finally, the number of PAXs for carrying out the robustness checks, reflecting the total number of people moved. Before the open skies policies, an increase of PAXs implied a proportional increase of revenues, as far as fixed pricing policies were established. Since the implementation of RM policies, new pricing policies have been applied (Butler and Keller, 1999; Eldad, 2005), and a higher number of PAXs should imply higher profitability too, when a good relationship between occupancy and price is achieved. This relationship is measured through the ASM ratio.

Both variables, the number of PAXs and company size, have been used as a logarithmic transformation of the original number.

Results

The descriptive statistics and the correlation matrix, respectively, of the dependent, explanatory and control variables included in the estimation models are shown in Tables 4 and 5, based on the statistical analyses carried out using the program R, version 3.3.2 (R Development Core Team, 2016).

Table 4 reports that the correlation between both company size variables, namely PAX and SIZE is very high, suggesting therefore the suitability of including only one company size variable in the statistical model to avoid problems of multicollinearity between explanatory variables (Kalemba et al., 2016).

Table 6. Estimation models.

	Model 1 (fixed effects)		Model 2 (pooling)	
	Dependent variable: R		Dependent variable: ROI	
Variables	β	t	β	t
Intercept	–	–	−0.218	−0.899
Q_{it-1}	−1.101	−1.197	0.045***	4.278
lf_{it}	61.773***	4.139	0.357	1.297
$ISIZE_{it}$	23.602***	13.104	−0.003	−0.345
Hausman test (fixed vs. random)	55.356***		7.793^{+}	
Adjusted R^2	0.605		0.237	
F	70.176***		8.739***	

Note: R: revenues; ROI: return on investment; Q: quality; lf: load factor; ISIZE: log composition size. All coefficients are standardized β weights and t-values are also given.
***$p < 0.001$; **$p < 0.01$; *$p < 0.05$; $^{+}p < 0.1$.

As mentioned before, the logarithmic transformation of the control variable SIZE, measured through the number of employees, has been considered as a general measure of the company size (Le et al., 2006; Wu, 2008).

Panel data methodology has been applied during the estimation process, due to the unobservable firm-specific effects that could affect the dependent variables. For the response to our proposed hypotheses, we determined to run two regressions for REVENUES and ROI, respectively. The specification models were as follows:

$$\text{REVENUES}_{it} = \beta 11\text{Quality}_{it-1} + \beta 12\text{Load factor}_{it} + \beta 13\text{Size}_{it} + \varepsilon_{it}$$

$$\text{ROI}_{it} = \beta 21\text{Quality}_{it-1} + \beta 22\text{Load factor}_{it} + \beta 23\text{Size}_{it} + \varepsilon_{it}$$

As seen in both models, we decided to consider the effect of Quality_{it-1} as the quality of 1 year does not have such a fast effect on the profitability of the airlines of the same year. Results for both specification models are reported in Table 6. F tests and Hausman-type tests have been conducted to determine the choice between pooled OLS, fixed or random effects models. The most appropriate estimation method for the models depends on the properties of both the individual as well as the idiosyncratic errors (Croissant and Millo, 2008).

In this case, the most appropriate model for model 1 was the fixed effects model, which means that the individual error is correlated with the regressors. On the contrary, pooled OLS was proven to be the most efficient estimator for β because the individual component of error was missing altogether.

The results of the fixed effects estimation of model 1 are provided in column 1 of Table 6. As the table shows, a non-significant effect was found for quality on airlines' activity measured through passenger revenues ($\beta 11 = -1.101$), reason why hypothesis 1 is not supported. Therefore, the findings of this study do not confirm the positive influence of service quality on airlines' revenues. On the contrary, the effects of the control variables load factor and size show a positive sign of the coefficient, that is, $\beta 12$ is positive ($\beta 12 = 61.773$; $p < 0.001$) and $\beta 13$ is also positive ($\beta 13 = 23.602$; $p < 0.001$), which demonstrates the positive influence of the load factor and company size on the airlines' revenues (hypothesis 3b supported). In conclusion, the incomes that

Table 7. Estimation models: robustness checks.

	Model 1 (fixed effects)		Model 2 (pooling)	
	Dependent variable: R		Dependent variable: ROI	
Variables	β	t	β	t
Intercept	–	–	−0.195	−0.757
Q_{it-1}	−1.065	−1.1765	0.046***	4.651
lf_{it}	6.732	0.453	0.344	1.245
$lPAX_{it}$	26.436***	13.386	−0.004	−0.430
Hausman test (fixed vs. random)	53.341***		8.708*	
Adjusted R^2	0.612		0.238	
F	73.056***		8.768***	

Note: R: revenues; ROI: return on investment; Q: quality; lf: load factor; lPAX: log PAX; PAX: passenger. All coefficients are standardized β weights and t-values are also given.
***$p < 0.001$; **$p < 0.01$; *$p < 0.05$; $^{+}p < 0.1$.

airlines receive from their normal business activities are higher in big companies with a higher number of employees and also when their production is higher in comparison to their capacity. On the contrary, better service quality does not seem to directly affect airlines' incomes.

Table 6 also reports a pooled OLS estimation of model 2. Column 2 shows that airline's profitability is positively influenced by service quality ($\beta 21 = 0.045$; $p < 0.001$), as it was hypothesized (hypothesis 2 is supported), confirming that a better service quality may not affect airlines' revenues but, at the end, it improves the economic profitability of the airline companies. However, despite the confirmation of this result, the limited value of the adjusted R^2 (0.237) suggests that there are some other relevant variables that are not included in our model and that are affecting the airlines' ROI. The variable SIZE and the load factor do not have a significant effect on the airlines' economic profitability ($\beta 22 = 0.357$; $\beta 23 = -0.003$), therefore hypothesis 3a is not supported. Additionally, some robustness checks have been carried out to confirm whether our findings regarding the influence of quality on economic performance are robust to alternative specifications of the models. Results are reported in Table 7, which takes into consideration the logarithmic transformation of the number of PAX as the company size variable, substituting the logarithmic transformation of the company size (variable SIZE).

Table 7 indicates, contrary to our established hypothesis 1, a non-significant effect for quality on airlines' revenues ($\beta 11 = -1.065$). At the same time, a positive and significant influence was proven for company size, measured as the logarithmic transformation of the number of PAXs ($\beta 13 = 26.436$; $p < 0.001$) on revenues, supporting therefore our hypothesis 3b. Moreover, the results confirm the positive and significant effect of service quality on airlines profitability, measured through the ROI of the companies' sample of this study ($\beta 21 = 0.046$; $p < 0.001$), supporting our hypothesis 2.

Conclusions

Discussion and contribution

The purpose of this article is to provide a contribution explaining the quality–profitability link in the airline business.

Airline companies have been modifying their business model in the last decades in order to adapt to the new situation of competition, legal regulations, tourism changes, world globalization, among other facts. Due to these changes, the airlines have been focused on different new strategies and one of them has been the quality provided as a way to differentiate from their competitors (Chen and Hu, 2013; Gursoy et al., 2005), having a specific customer-oriented attitude. It is fundamental to determine the quality concept in this business, due to the variety of needs of PAXs. There are some who could appreciate the service provided on the ground or in-flight, while other PAXs could prefer a lower fare or a better flight connection, for instance, over any other consideration. In addition, finance plays a crucial role in any business. Therefore, we have considered the airline's success (Butler and Keller, 1999), addressed in this study through the analysis of the effects of quality on economic performance.

The main objective of this research is to focus on testing the outcomes of service quality on US airlines' performance. For the analysis, four service quality indexes that are well-known and recognized in the US airline business and two economic performance indicators have been considered. That implied to figure out, firstly, two main research approaches, considering, on one hand, the effects of service quality on economic profitability and, on the other hand, the quality effect on airline passenger revenues. And, secondly, a third research approach, analysing the effect of size on airlines' profitability. Consistent with our hypothesis, and considering the effects on airlines' profitability, the results confirm the positive and significant influence of service quality on the ROI of the analysed US airlines. However, contrary to our assumption, there is a non-significant effect of quality on airline passenger revenues. At the same, this does not mean that airlines with a higher activity loose therefore quality and profits.

Additionally, a positive and significant influence was proven for company size on airlines' revenues for both estimation models, the general and the robustness check, measured as the company size and number of PAXs, respectively.

Even though this results in relation to business profitability are consistent and similar to previous studies related to hospitality and tourism management (i.e. Sun and Kim, 2013), this research has been developed exclusively for airline companies, with several appropriate quality indexes, following a different research method. A positive relationship between quality and firms' performance has been confirmed in research studies related to different businesses (i.e. hospitality business), but not in case of the airline industry, where no exclusive study for this industry has been previously developed. Furthermore, none of the studies included four quality indexes, fact that reaffirms the importance and the effect that quality has on the profitability the airline companies.

Therefore, we consider that the statistical outcome, the positive relationship between service quality and profitability, can encourage the airline management to continue improving service quality in their companies; this would be a core competitive advantage for the development of any airline company. Airline managers should enforce this opportunity to contribute to the airline company's benefits and, therefore, respond to the political and economic transformations of recent years. This research also provides an important contribution to the academic community, especially for researchers in the airline sector.

Limitations and further research

However, this study is limited due to the restriction to a certain number of US airline companies where data have been available. Despite the explored results and the evidence for the positive relationship between quality and ROI in the US airline industry, there are several issues that still

require a more detailed examination and analysis. In particular, in a further research, quality and economic factors of non-US companies have yet to be analysed, as this could enrich the given results of this study. By the same token, research could be extended to other rating systems such as Skytrax (2016) and Airline Ratings (2016) that consider different sources to build their quality-related indexes.

Furthermore, differentiating the relationship between the quality concept and profitability by passenger segments could strengthen our research results. That is to say, separating business travellers from leisure travellers and seeing their contribution and effects of quality for each segment on airline's profits. Moreover, an analysis taking into account the contrast between low cost carriers and full cost carriers could be realized as both consider different determinants of quality.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Notes

1. RPM reflects how many available seats of an airline were occupied.
2. ASM refers to one aircraft total seat flown one mile, whether occupied or not.

References

Airline Ratings (2016) Available at: http://www.airlineratings.com (accessed 29 February 2017).

Akamavi R, Mohamed E, Pellmann K, et al. (2015) Key determinants of passenger loyalty in the low-cost airline business. *Tourism Management* 46: 528–545.

Amat O, Campa-Planas F and Magaz J (2011) La contabilidad de gestión en las empresas de transporte aéreo. *Asociación Española de Contabilidad de Empresas AECA* 37.

American Customer Satisfaction Index (2016) Available at: http://www.theacsi.org (accessed 12 March 2017).

Anderson EW and Mittal V (2000) Strengthening the satisfaction-profit chain. *Journal of Service Research* 3(2): 107–120.

Archana R and Subha MV (2012) A study on service quality and passenger satisfaction on Indian Airlines. *International Journal of Multidisciplinary Research* 2(2): 50–63.

Association of European Airlines (2008) Available at: http://www.aea.be (accessed 14 April 2017).

Belobaba P, Odoni A and Barnhart C (2009) *The Global Airline Industry*. Chichester, UK: John Wiley and Sons.

Bhunia A, Mukhuti S and Roy S (2011) Financial performance analysis – a case study. *Current Research Journal of Social Sciences* 3(3): 269–275.

Bilotkach V, Gaggero A and Piga C (2014) Airline pricing under different market conditions: Evidence from European low-cost carriers. *Tourism Management* 47: 152–163.

Bounds G, York L, Adams M, et al. (1994) *Beyond Total Quality Management Toward the Emerging Paradigm*. New York: McGraw-Hill.

Bowen B and Headley D (2000) Air travel consumer report: The airline quality rating 2000. Washington: US Department of Transportation.

Brenner MA (1982) *The Significance of Airline Passenger Load Factors*. Lexington: Airline Economics, Lexington Books.

Butler GF and Keller MR (1999) *Handbook of Airline Finance*. McGraw-Hill.
Caruana A (2002) Service loyalty. The effects of service quality and the mediating role of customer satisfaction. *European Journal of Marketing* 36(7/8): 811–828.
Chang YH and Yeh CH (2002) A survey analysis of service quality for domestic airlines. *European Journal of Operational Research* 139(1): 166–177.
Chen FY and Chang YH (2005) Examining airline service quality from a process perspective. *Journal of Air Transport Management* 11(2): 79–87.
Chen PT and Hu HH (2013) The mediating role of relational benefit between service quality and customer loyalty in airline industry. *Total Quality Management and Business Excellence* 24: 9–10.
Choi K, Lee D and Olson D (2015) Service quality and productivity in the U.S. airline industry: A service quality-adjusted DEA model. *Service Business* 9(1): 137–160.
Chow CK (2014) Customer satisfaction and service quality in the Chinese airline industry. *Journal of Air Transport Management* 35: 102–107.
Clemes M, Gan C and Ren M (2011) Synthesizing the effect of service quality, value, and customer satisfaction on behavioral intentions in the motel industry: An empirical analysis. *Journal of Hospitality and Tourism Research* 35(4): 530–568.
Croissant Y and Millo G (2008) Panel data econometrics in R: The PLM package. *Journal of Statistical Software* 27(2).
Delbari S, Ng S, Aziz Y, et al. (2016) An investigation of key competitiveness indicators and drivers of full-service airlines using Delphi and AHP techniques. *Journal of Air Transport Management* 52: 23–34.
Doganis R (2009) *Flying Off Course IV: Airline Economics and Marketing*. New York, US.
Doppelt L and Nadeau MC (2013) *Making Loyalty Pay: Lessons from the Innovators*. San Francisco, CA: McKinsey on payments.
Easton G (1993) The 1993 State of U.S. total quality management: A Baldrige examiner's perspective. *California Management Review* 35(3): 32–54.
Eldad BY (2005) *The Evolution of the US Airline Industry – Theory, Strategy and Policy*. Dordrecht, The Netherlands: Springer.
Elliott KM and Roach DW (1993) Service quality in the airline industry: Are carriers getting an unbiased evaluation from consumers? *Journal of Professional Services Marketing* 9: 71–82.
Gilbert D and Wong RK (2003) Passenger expectations and airline services: a Hong Kong based study. *Tourism Management* 24(5): 519–532.
González JI, Hernández MC and Rodríguez T (2000) Contribución del tamaño y el sector en la explicación de la rentabilidad empresarial. *Revista Española de Financiación y Contabilidad* 29(106): 903–930.
Gursoy D, Chen MH and Kim H (2005) The US airlines relative positioning based on attributes of service quality. *Tourism Management* 26: 57–67.
Hussain R, Nasser A and Hussain Y (2015) Service quality and customer satisfaction of a UAE-based airline: An empirical investigation. *Journal of Air Transport Management* 42: 167–175.
International Air Transport Association (IATA) (2016) *2016* Mid-year report. IATA Economic performance of the airline industry.
Jones C (2014) Airline rank ahead of IRS in customer satisfaction. *USA Today*. Available at: http://www.usatoday.com. (accessed 1 August 2017).
Kalemba N and Campa-Planas (2017) An overview of the quality concept in the air transportation business: A systematic literature review. *International Journal of Quality Research* 11(1): 51–70.
Kalemba N, Campa-Planas F, Hernández-Lara AB, et al. (2016) US airlines performance and its connection with service quality. In: *18th international conference on air transport management (ICATM)*, 25–26 February, London, UK.
Katz DS and Garrow LA (2014) Revenue and operational impact of depeaking at U.S. hub airports. *Journal of Air Transport Management* 34: 57–64.
Kotler P and Keller K (2012) *Marketing Management*, 14th ed. One Lake Street, New Jersey: Pearson Education, Inc.

Le SA, Walters B and Kroll M (2006) The moderating effects of external monitors on the relationship between R&D spending and firm performance. *Journal of Business Research* 59(2): 278–287.
Liou JJH and Tzeng GH (2007) A non-additive model for evaluating airline service quality. *Journal of Air Transport Management* 13(3): 131–138.
Massachusetts Institute of Technology (MIT) (2015–2016) Global Airline Industry Program. Available at: http://www.airlinedataproject.mit.edu. (accessed 15 June 2017).
Mellat Parast M and Fini E (2010) The effect of productivity and quality on profitability in US airline industry. An empirical investigation. *Managing Service Quality* 20(5): 458–474.
Mellat-Parast M, Golmohammadi D, McFadden KL, et al. (2015) Linking business strategy to service failures and financial performance: Empirical evidence from the U.S. domestic airline industry. *Journal of Operations Management* 38: 14–24.
Merkert R and Assaf AG (2015) Using DEA models to jointly estimate service quality perception and profitability – Evidence from international airports. *Transportation Research Part A* 75: 42–50.
Morash EA and Ozment J (1994) The augmented service offering for perceived and actual service quality. *Journal of the Academy of Marketing Science* 22(4): 352–363.
Mosahab R, Mahamad O and Ramayah T (2010) Service quality, customer satisfaction and loyalty: A test of mediation. *International Business Research* 3(4): 72–80.
Nicolau JL and Sellers R (2010) The quality of quality awards: Diminishing information asymmetries in a hotel chain. *Journal of Business Research* 63(8): 832–839.
Pakdil F and Aydın Õ (2007) Expectations and perceptions in airline services: An analysis using weighted SERVQUAL scores. *Journal of Air Transport Management* 134: 229–237.
Park JW (2007) Passenger perceptions of service quality: Korean and Australian case studies. *Journal of Air Transport Management* 13(4): 238–242.
Park JW, Robertson R and Wu CL (2005) Investigating the effects of airline service quality on airline image and passengers' future behavioral intentions: Findings from Australian international air passengers. *The Journal of Tourism Studies* 16(1): 2–11.
Power JD (2016) Available at: http://www.jdpower.com. (accessed 17 May 2017).
R Development Core Team (2016) R: The R project for statistical computing. Available at https://www.r-project.org/
Reger RK, Gustafson LT, Demarie SM, et al. (1994) Reframing the organization: why implementing total quality is easier said than done. *Academy of Management Review* 19(3): 565–584.
Rhoades DL and Waguespack B (2008) Twenty years of service quality performance in the US airline industry. *Managing Service Quality: An International Journal* 18(1): 20–33.
Sandada M and Matibiri B (2016) An investigation into the impact of service quality, frequent flier programs and safety perception on satisfaction and customer loyalty in the airline industry in Southern Africa. *South East European Journal of Economics and Business* 11(1): 41–53.
Satmetrix Data Product (2016) Available at: http://www.satmetrix.com. (accessed 5 April 2017).
Shen W, Xiao W and Wang X (2016) Passenger satisfaction evaluation model for Urban rail transit: A structural equation modeling based on partial least squares. *Transport Policy* 46: 20–31.
Skytrax (2016) Available at: http://www.airlinequality.com. (accessed 28 May 2017).
Steven AB, Don Y and Dresner M (2012) Linkages between customer service, customer satisfaction and performance in the airline industry: Investigation of non-linearities and moderating effects. *Journal of Transportation Research Part E* 48: 743–754.
Sun KA and Kim DY (2013) Does customer satisfaction increase firm performance? An application of American Customer Satisfaction Index. *International Journal of Hospitality Management* 35: 68–77.
Truitt LJ and Haynes R (1994) Evaluating service quality and productivity in the regional airline industry. *Transportation Journal* 33: 21–32.
Web of Science (2016) Available at: http://www.webofknowledge.com. (accessed 5 March 2017).
Witchita's Airline Quality Rating (2016) Available at: http://www.airlinequalityrating.com. (accessed 16 June, 2017).

Wu HL (2008) When does internal governance make firms innovative? *Journal of Business Research* 61: 141–153.
Yoon E and Jang SC (2005) The effect of financial leverage on profitability and risk of restaurant firms. *Journal of Hospitality Financial Management* 13(1): 1–18, Article 24.
Yu R (2007) Airlines score lower than IRS in customer satisfaction. *USA Today*. 1st August 2017.
Zuidberg J (2014) Identifying airline cost economies: An econometric analysis of the factors affecting aircraft operating costs. *Journal of Air Transport Management* 40: 86–95.

UNIVERSITAT ROVIRA I VIRGILI
QUALITY AND SAFETY IN THE AIRLINE INDUSTRY AND THEIR INFLUENCE ON COMPANY PROFITABILITY
Nicole Kalemba

Available online at www.sciencedirect.com

ScienceDirect

Procedia Engineering 187 (2017) 308 – 316

Procedia Engineering

www.elsevier.com/locate/procedia

10th International Scientific Conference Transbaltica 2017:
Transportation Science and Technology

The Quality – Profitability Link in the US Airline Business: A Study Based on the Airline Quality Rating Index

Nicole Kalemba*, Fernando Campa-Planas

University Rovira and Virgili, Reus, Spain

Abstract

One of the key tasks of an airline company and management is to ensure a high standard of service quality to the customers. Therefore, the paper deals with the importance of the quality-profitability link in the air transportation business. Although there are several quality indexes in the airline business, we are focusing exclusively on the Airline Quality Rating Index (AQR). The AQR includes four main aspects in the measurement, namely on-time performance (OT), denied boardings (DB), mishandled baggage (MB) and customer complaints (CC). The results of this study show a significant effect of the AQR on the US airlines' profitability. On time performance, mishandled baggage and customers complaints also affect the profitability significantly, while a non-significant effect on profitability is given by the AQR component denied boardings. None of the previous researches took into account the link between the AQR index and the profitability of the US airlines. Therefore, this identified gap could encourage airline managers to invest more in quality and its related aspects, as far as the results confirm a significant impact on the airlines' profit.

Peer-review under responsibility of the organizing committee of the 10th International Scientific Conference Transbaltica 2017

Keywords: quality, air transportation, Airline Quality Rating (AQR), US airlines, profitability

* Corresponding author.
E-mail address: nicole.kalemba@urv.cat

Peer-review under responsibility of the organizing committee of the 10th International Scientific Conference Transbaltica 2017
doi:10.1016/j.proeng.2017.04.380

1. Introduction

The transportation industry and especially air transportation is one of the sectors that significantly contributes to the socio-economic development as well as to the growth and improvement of living standards [14]. The day-to-day challenge for airline companies is, among many other factors, to provide a high service quality to the customers and users of the airlines as well as to respond to the customers' requirements, what, in turn, leads to a higher passengers' satisfaction and has consequently an impact on their decision-making process [5, 12]. Starting with the deregulation in 1978 in the United States, major structural and management changes have been conducted and the issue of quality in this business got fundamental for reaching business excellence and a competitive advantage [1]. Another fundamental aspect is that customer perceptions and consequently service quality are influencing the positioning of the airlines [18]. As every interaction between airline and customer can have an impact on the image that the traveler can have in its mind, a successful market positioning strategy is necessary, contributing consequently to an increase of the companies' profitability [19]. Therefore, it is an interlinking of several factors that leads from service quality to profitability.

Obviously, it is imperative to take into consideration that service quality is mostly one of the main reasons and metrics by which the airline customers are judging the overall quality of an airline company [8]. But the question is, does this effort of trying to attract and retain customers through offering an adequate service quality really help to increment the profitability of the airline companies?

There has been already quite some focus from several researchers on the quality-profitability link in the airline business. Most of the results of previous studies set out that quality has a positive influence on profitability [10, 22] [17]. While the study carried out by Campa-Planas et al. [9] included 4 quality indexes applied in the US airline industry, namely the American Customer Satisfaction Index (ACSI), Airline Quality Rating (AQR), JD Power Airline Satisfaction Index and the Net Promoter Score (NPS); the current study aims to focus exclusively on the AQR, as it is the index with the most public detailed and precise methodology. Therefore, the present article contributes to previous works. First, because it generally offers an overview on how quality can be measured in the airline industry, and secondly, it analyzes a possible relationship between quality and profitability in the US airline industry, based on the Airline Quality Rating index.

The structure of this paper is as follows: We first describe the Airline Quality Rating (AQR) index with its methodology and origins, treating separately the factors the index is composed of. Secondly, we review the academic literature on researches that included the AQR index in their study. Subsequently, the method applied for this study is described and thereafter, results are shown. The final section gives an overview on the conclusions drawn from this study and discusses the potential limitations and further research.

2. The AQR rating – methodology and origins

The Airline Quality Rating (AQR) is a joint research project funded as part of faculty research activities at the Wichita State University and Embry-Riddle Aeronautical University since 2014. The Airline Quality Rating Reports were published through a joint research project between Purdue University and Wichita State University [24]. It is an index that is domestically and internationally accepted and acknowledged by the airline industry. It summarizes the quality ratings and permits to compare the performance of the domestic US airlines included in this ranking [3] [8] due to the focus on quantitative factors for providing a more certain result [5]. Being published annually and founded by Bowen and Headley, the ranking included in the first years since its creation in 1991 until 1998 a weighted average of 19 quality related factors. In 1999, Bowen and Headley simplified the index and focused exclusively on only 4 quality related aspects: on-time arrivals (OT), involuntary denied boardings (DB), mishandled baggage (MB) and customer complaints (CC) [3, 13].

The formula calculating the results for the AQR [24] score is as follows:

$$\mathrm{AQR}=\frac{(+8.63\cdot OT)+(-8.03\cdot DB)+(-7.92\cdot MB)+(-7.17\cdot CC)}{(8.63+8.03+7.92+7.17)}. \quad (1)$$

The closer to zero the result of the AQR, the better is the overall performance of an airline. Three of the four variables are weighted negatively, as those elements have a negative impact on the customers' overall satisfaction. On one hand, the positive or negative sign of the formula for calculating the AQR depends on the impact and the perception the consumer gives to that element. Therefore, only on-time arrival is seen as a positive repercussion on airline quality, while denied boardings, mishandled baggage and customer complaints have a negative impact on the through customers perceived airline quality. On the other hand, the weighting shows the significance of each element in the customers' decision making process, where on-time performance is weighted as the most important factor. Table 1 offers an overview on the 4 elements the AQR index is composed of, together with its weight and impact.

Table 1. Components of the AQR index: explanation, weight and impact.

Element	Explanation	Weight and impact
On-time performance (OT)	Referring to the flights that are within 15 minutes of the estimated time.	8.63 (+)
Involuntary denied boardings (DB)	Referring to the total number of passengers that have an involuntary denied boarding due to an overbooked flight. Reports are done per 10,000 passengers by carrier.	8.03 (−)
Mishandled baggage (MB)	Includes all the customer claims about damaged, delayed or lost baggage; reports are done per 1,000 passengers by carrier.	7.92 (−)
Customer complaints (CC)	Referring to 12 aspects, as for instance, terms as oversales, flight problems, reservation related complaints, ticketing, among others. Reports are done per 100,000 passengers by carrier.	7.17 (−)

Figure 1 shows the AQR US industry average performance during the years 1999–2015 calculated through the current applied formula. During the years 2000–2003 a slight improvement of the AQR index is given, decreasing afterwards until 2007, where the AQR index reaches its worst result (−2.16), consequence of the poor performance across the industry at that time. From 2008–2013 the industry performance increased significantly and reached in 2013 the best industry score of the history of the AQR (−1.07). Especially taking into account the difficult economic situation, this improvement shows the positive evolution of the airline industry. 2014 and 2015 show a slight decrease regarding 2013, but displaying a positive evolution.

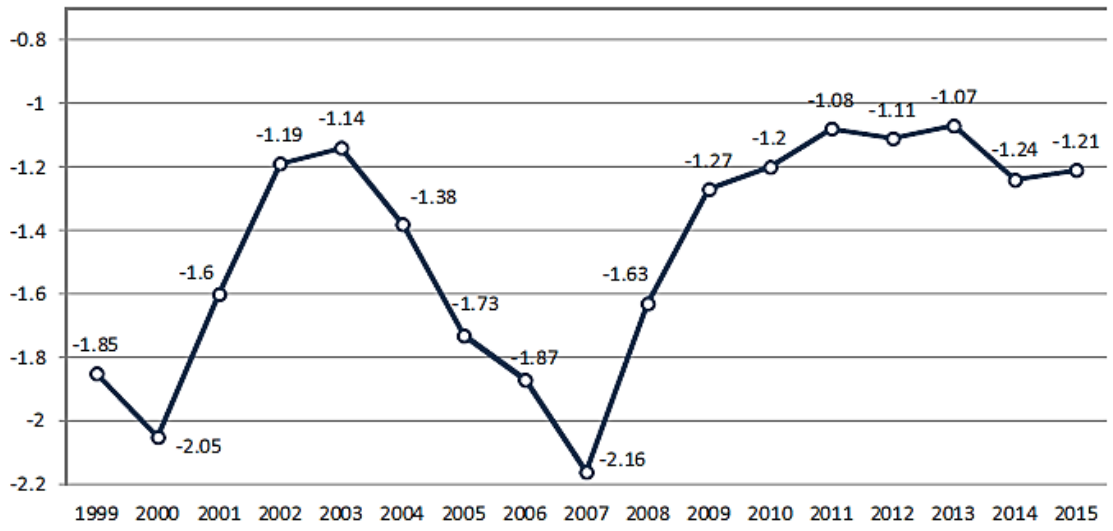


Fig. 1. AQR Industry Average Performance 1999–2015.

3. Literature review

A small number of authors considered the Airline Quality Rating index in their studies. A search has been carried out using two academic databases Web of Science [23] and Scopus [21] to detect published academic research studies – from 1991–2016 – that took into consideration the AQR. The aim of this review was identifying preliminary studies on the importance of the AQR as a quality measure in the airline business and its profitability link. Through the search, a total of 6 papers that met the mentioned conditions, were found. 2 of them were repeated in both databases Web of Science and Scopus. 4 of the 6 papers are written by the same authors, namely Bowen and Headley [5–8], founders of the AQR rating. Table 2 shows a summary of the 6 papers that have been found in the literature review.

Table 2. Literature review on the AQR index.

Authors (year)	Paper title (journal)	Issue
Bowen, Headley, Luedtke (1992)	A Quantitative Methodology for Measuring Airline Quality (Journal of Aviation/Aerospace Education & Research)	Importance of providing service quality to the consumers; first approach and application of the AQR index, taking considering 19 quality related factors.
Gradner (2004)	Dimensional Analysis of Airline Quality (Interfaces)	Dimensional analysis for ranking the airlines in their overall quality, giving a broad overview on the AQR index.
Bowen, Headley, Lu (2004)	Developing a Standardized Mechanism for Measuring Airline Service Performance: A Preparation for Airlines and the Flying Public (International Journal of Applied Aviation Studies)	Explains the development and measurement of the AQR index and outlines the importance of benchmarking procedures.
Bowen, Scarpellini-Metz, Headley (2005)	Understanding Consumer Preference-Findings from the Airline Survey (International Journal of Applied Aviation Studies)	Study about consumer preferences of frequent fliers and their perceptions, taking into account the AQR index. Additionally, price and schedule are seen as essential airline service elements.
Gursoy, Chen, Kim (2005)	The US Airlines relative positioning based on attributes of service quality (Tourism Management)	Study about the importance of the positioning of different US airline companies, referring to aspects that are related and included in the AQR.
Bowen, Bowen, Headley, Küçükönal, Wildt (2013)	An innovative leadership effectiveness measure: Applied analytic indicators of high-consequence industry performance (Procedia-Social and Behavioral Sciences)	The authors created an airline performance formula to see that the applied methodology of the AQR provides an important tool for assessing organizational leadership.

All of the studies include the AQR index as an important tool, explaining its development and measurement, but in none of the papers it has been established any relationship between quality and the profitability of the airline companies. This identified gap has been used to study the relationship between the quality related components of the AQR index and the profitability of the US airlines, measured through the Return on Investment (ROI).

4. Method

This section aims to describe the method used in this study, to show the data collection and sample, as well as to explain the measures and data analysis that have been carried out.

4.1. Data collection and sample

The study considers sources of information as the Airline Data Project (ADP) developed by the Massachusetts Institute of Technology (MIT) [15] for the airline related Key Performance Indicators (KPIs) and financial data. On the other hand, publicly available data of the AQR index is extracted from the annually published reports developed by Bowen and Headley [3, 4]. Longitudinal time-series data for the years 2000–2015 has been taken into consideration; the sample collection was comprised of a total of 13 US airline companies, for the years where data

were available, namely Air Tran, Alaska, American, American West, Continental, Delta, Frontier, Hawaiian, Jet Blue, Northwest, Southwest, United and U.S. Airways.

4.2. Measures and data analysis

One generic statistical model and 4 specific sub models have been established, including in each of them dependent, explanatory and control variables. As dependent variable, we used Return on Investment (ROI); it measures the US airline companies' profitability and gives an idea on the evolution of the business performance, without considering the financial structure.

As explanatory variable, we included quality. On one hand, the total AQR index for the generic model (H1), seeing if quality, based on this index, affects significantly the profitability of the US airlines. And, on the other hand, for the four specific sub models we disassembled the AQR, creating one sub model for each of the four quality factors (H2–H5), for getting an overview on the impact that each of the factors has (or not) on the US airlines' profitability.

Therefore, the hypotheses are as follows:

- H1: Quality, measured through the AQR affects significantly the US airlines' profitability;
- H2: On-time arrival (OT) has a significant impact on US airlines' profitability;
- H3: Denied boardings (DB) have a significant influence on the profitability of the US airlines;
- H4: Mishandled baggage (MB) impacts significantly the profitability of the US airlines;
- H5: Customer complaints (CC) affect significantly the US airlines' profitability.

The conceptual model is shown in Fig. 2.

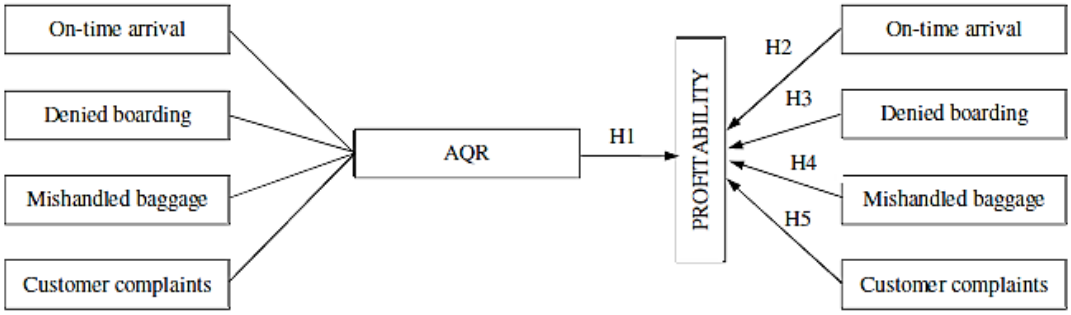


Fig. 2. Conceptual model and hypotheses.

Finally, as control variables we included in all models first the passenger load factor (LF), being the relationship between revenue per miles (RPM) and available seat miles (ASM), as well as the logarithmic number of total employees (LOGempl) of the airlines.

For this study, a panel data approach with regression models for longitudinal data [11] was used to estimate the relationship within the US airline industries' profitability and the effects of quality on those.

5. Results

Both, descriptive statistics in Table 3 and the correlation matrix (table 4) are considering the dependent, explanatory and control variables that are included in the estimation models. All the analysis for this study have been carried out using the statistical programming language R, version 3.3.2 [20].

Table 3. Descriptive statistics.

Variables	Min	Max	Mean	sd
ROI	−0.280	0.273	0.016	0.086
AQR	−3.430	−0.400	−1.252	0.542
OT	0.614	0.938	0.790	0.056
DB	0.010	2.470	0.8145	0.535
MB	1.580	9.620	3.870	1.430
CC	0.140	7.860	1.315	1.111
LOGempl	6.541	11.502	9.852	1.152
LOGpax	7.028	11.897	10.379	1.020
LF	0.579	0.907	0.787	0.060

Table 4. Correlation matrix.

Variables	ROI	AQR	OT	DB	MB	CC	LOGempl	LOGpax	LF
ROI	1								
AQR	.266	1							
OT	.230	.603	1						
DB	−.096	−.588	−.238	1					
MB	−.250	−.882	−.546	.417	1				
CC	−.190	−.667	−.403	.164	.314	1			
LOGempl	−.204	−.429	−.235	.340	.309	.340	1		
LOGpax	−.089	−.324	−.208	.298	.261	.186	.942	1	
LF	.329	.262	.243	−.156	−.250	−.124	−.076	−.051	1

The correlation matrix in Table 4 reports a high correlation between both company size variables that have been included at the beginning, LOGempl and the logarithmic number of total passengers (LOGpax) (.942). Consequently, we suggested to include only one company size variable, in this case employees, for avoiding any biased effects by the multicollinearity. For carrying out the statistical analysis, a panel data methodology has been executed with longitudinal time-series data from 2000–2015, where we established one generic estimation model for the AQR index and four estimation sub models for each of the four components of the AQR index, using the same specification model that is as follows:

$$ROI_{it} = \beta 1_x Quality_{it-1} + \beta 2_x Load\ factor_{it} + \beta 3_x Size_{it} + \varepsilon_{it}\,. \quad (2)$$

We considered to look at quality data $it - 1$ as we suggest that the service quality provided to the consumers does not affect the profitability of the same year of an airline company, but we guess that it can have a positive repercussion on profitability after at least one year. The models in Tables 5 and 6 are reporting beta weights and t-values as well as F tests and Hausman-type test that have been conducted.

The generic estimation model 1 shows a significant effect for quality on airlines' profitability measured through the AQR index ($\beta 1 = .059$; $p < 0.001$), reason why hypothesis 1 is supported.

Additionally, the effects of the control variable load factor are significant with a positive sign of the coefficient ($\beta 1 = .379$; $p < 0.01$), demonstrating the influence of the load factor on the airlines' ROI, while a non-significant effect is shown for the size variable, measured through the variable LOGempl.

Table 5. Generic estimation model 1.

Variables	Model 1 (AQR) Dependent variable: ROI	
	β1	T
Intercept	–.206*	–1.771
Quality(AQR)$_{it-1}$	.059***	5.310
Load factor$_{it}$	.379**	3.224
Size (LOGempl)$_{it}$	–.000	–.014
Hausman test (fix vs random)	156.06***	
Adjusted R^2	0.271	
F	18.971***	

All coefficients are standardized beta weights and t-values are also given.
***p< 0.001; **p < 0.01; *p < 0.05; +p < 0.1.

Table 6. Estimation sub models 1 and 2.

Variables	Sub model 1 (On-time arrival) Dependent variable: ROI			Sub Model 2 (Denied boardings) Dependent variable: ROI	
	$\beta1_1$	t		$\beta1_2$	t
Intercept	–.176	–1.472	Intercept	–.244$^+$	–1.920
Quality(OTest)$_{it-1}$	.029***	4.623	Quality(DBest)$_{it-1}$	–.002	–.310
Load factor$_{it}$	.349**	2.849	Load factor$_{it}$	.519	4.103
Size (LOGempl)$_{it}$	–.008	–1.186	Size (LOGempl)$_{it}$	–.015	–1.961
Hausman test (fix vs random)	14.404**		Hausman test (fix vs random)	14.382**	
Adjusted R^2	0.241		Adjusted R^2	0.127	
F	16.314***		F	8.025***	

All coefficients are standardized beta weights and t-values are also given.
***p< 0.001; **p < 0.01; *p < 0.05; +p < 0.1.

Table 7. Estimation sub models 3 and 4.

Variables	Sub model 3 (Mishandled baggage) Dependent variable: ROI			Sub Model 4 (Customer complaints) Dependent variable: ROI	
	$\beta1_3$	t		$\beta1_4$	t
Intercept	–.235$^+$	–1.972	Intercept	–.246*	–2.100
Quality(MBest)$_{it-1}$	–.030***	–4.395	Quality(CCest)$_{it-1}$	–.035***	–5.064
Load factor$_{it}$	.397**	3.287	Load factor$_{it}$	.387**	3.271
Size (LOGempl)$_{it}$	–.006	–.805	Size (LOGempl)$_{it}$	–.004	–.619
Hausman test (fix vs random)	18.16***		Hausman test (fix vs random)	32.298***	
Adjusted R^2	0.231		Adjusted R^2	0.260	
F	15.514***		F	17.979***	

All coefficients are standardized beta weights and t-values are also given.
***p< 0.001; **p < 0.01; *p < 0.05; +p < 0.1.

Tables 6 and 7 report the four estimation sub models, where the quality components have been used as standardized variables. The sub models 1, 3 and 4 show a similar effect on the airlines' profitability as the generic

model 1. Therefore, 3 out of the 4 quality elements that compound the AQR index, show a significant effect on profitability ($\beta 1_1 = .029$; $\beta 1_3 = -.030$; $\beta 1_4 = -.035$; $p < 0.001$), namely on-time performance, mishandled baggage and customer complaints (supporting H2, H3 and H5). On-time performance (sub model 1) is the only AQR element that positively affects the profitability of the airline companies, having therefore a positive sign.

Having a look on the AQR index, on-time performance is the most significant element on profitability, showing a positive correlation. This, in turn, matches with the researches of other authors [2, 16] that considered that on-time performance is directly linked to profitability in the US airline industry, as it helps to reduce and save costs, as well as time that is needed for rescheduling flights. Likewise, similar to the generic model of the AQR, the mentioned three sub models show a significant effect of the control variable load factor on profitability ($\beta 2_1 = .349$; $\beta 2_3 = .397$; $\beta 2_4 = .387$; $p < 0.01$), demonstrating the influence of the load factor on the airlines' ROI. A non-significant effect is shown for the size variable in all the three sub models, measured through the logarithm of employees. Contrary to this, H3 is not supported, as denied boardings do not show any significant effect on airlines' profitability.

However, it is necessary to mention the limited value of the adjusted R^2 for the sub models 1, 3 and 4 (0.242; 0.231 and 0.260, respectively) that suggests the inclusion of other variables that can affect the airlines' ROI.

6. Conclusions and discussion

The purpose of this study was to provide an idea on the quality-profitability link in the US airline industry, basing the research on the AQR index, a helpful and effective quantitative and comparable tool that offers the possibility to benchmark data between US domestic airlines.

Results show consistency with our hypotheses, where quality (AQR) affects significantly the profitability (ROI) of the airlines. At the same time, considering the components of the AQR, a positive correlation between on-time performance and profitability is shown (positive impact), as well as a significant effect of mishandled baggage and customer complaints on profitability (negative impact). While the influence of denied boardings on profitability is insignificant. This outcome can encourage airline managers to focus on an improvement of the overall quality provided to the customers, as it can lead to a higher satisfaction and loyalty, emphasizing specifically the importance and continuation of on-time performance, but also focusing on the reduction of mishandled baggage and customer complaints, as it has a negative outcome on the profitability of airline companies. Thus, in today's highly competitive airline industry environment, it is essential that the airline companies do their best effort to attract and retain their customers, as well as to differentiate themselves from the competitors through offering an adequate standard of service quality for consequently reaching a higher profitability.

This study has some restrictions and limitations, as the AQR index only includes the US airline market. Therefore, it would be interesting to study also European airline companies for being able to compare their standard of quality and the impact on profitability.

References

[1] A. T. Bon, E. M. A. Mustafa, Quality Management on Innovation in Service Organizations: Literature review and New Conceptual Framework, Procedia Engineering 53 (2013) 516–529.
[2] Booz Allen Hamilton, Punctuality: How Airlines can improve on-time performance. 2001.
[3] D. B. Bowen, D. E. Headley, The Airline Quality Rating 2001, Airline Quality Rating Report, Paper 14, Wichita. 2001.
[4] D. B. Bowen, D. E. Headley, The Airline Quality Ratings 2002–2015, Airline Quality Rating Reports, Wichita, 2002–2015.
[5] D. B. Bowen, D. E. Headley J. R. Luedtke, A quantitative methodology for measuring airline quality, Journal of Aviation/Aerospace Education and Research 2(2) (1992).
[6] B. D. Bowen, D. E. Headley, C. T. Lu, Developing a Standardized Mechanism for Measuring Airline Service Performance: A Preparation for Airlines and the Flying Public, International Journal of Applied Aviation's Studies 4(2) (2004).
[7] B. D. Bowen, N. Scarpellini-Metz, D. E. Headley, Understanding Consumer Preference-Findings from the Airline Survey, International Journal of Applied Aviation Studies 5(2) (2005).
[8] D. B. Bowen, E. E. Bowen, D. E. Headley, H. Küçükönal, C. T. Wildt, An innovative leadership effectiveness measure: Applied analytic indicators of high-consequence industry performance, Procedia – Social and Behavioral Sciences 75 (2013) 209–216.
[9] F. Campa-Planas, A. B. Hernández, M. V. Sánchez-Rebull, N. Kalemba, Does quality influence Company's performance? An analysis in the air transportation industry, European Academy of Management (EURAM) Congress, Warsaw. 2015.

[10] A. Caruana, Service Loyalty. The effects of service quality and the mediating role of customer satisfaction, European Journal of Marketing 36(5) (2002) 811–828.
[11] Y. Croissant, G. Millo, Panel Data Econometric in R: The plm Package, Journal of Statistical Software 27(2) (2008).
[12] L. Eboli, Y. Fu, G. Mazzulla, Multilevel comprehensive evaluation of the railway service quality, Procedia Engineering 137 (2016) 21–30.
[13] E. S. Gardner Jr., Dimensional analysis of airline quality, Interfaces 34(4) (2004).
[14] L. Janušová, S. Čičmancová, Improving Safety of Transportation by Using Intelligent Transport Systems, Procedia Engineering 134 (2016) 14–22.
[15] Massachusetts Institute of Technology (MIT), Global Airline Industry Program, www.airlinedataproject.mit.edu, last viewed day 10 of December, 2016.
[16] M. Mellat Parast, E. Fini, The effect of productivity and quality on profitability in US airline industry. An empirical investigation, Managing Service Quality 20(5) (2010) 458–474.
[17] M. Mellat Parast, D. Golmohammadi, K. L. McFadden, Linking business strategy to service failures and financial performance: Empirical evidence from the U.S. domestic airlines, Journal of Operations Management 38 (2015) 14–24.
[18] D. Gursoy, M.H. Chen, H.J. Kim, The US Airlines relative positioning based on attributes of service quality, Tourism Management 26 (2005) 57–67.
[19] M. E. Porter, The Competitive Advantage: Creating and sustaining superior performance, New York: Free Press. 1985.
[20] R Development Core Team, R: The R project for statistical computing. 2016.
[21] Scopus. Availablr ftom Internet: www.scopus.com, last viewed day 3 of December, 2016.
[22] A. B. Steven, Y. Don, M. Dresner, Linkages between customer service, customer satisfaction and performance in the airline industry: Investigation of non-linearities and moderating effects, Journal of Transportation Research Part E 48 (2012) 743–754.
[23] Web of Science. www.webofknowledge.com, last viewed day 12 of December, 2016.
[24] Wichita's airline quality rating (2016), www.airlinequalityrating.com, last viewed day 7 of December, 2016.

UNIVERSITAT ROVIRA I VIRGILI
QUALITY AND SAFETY IN THE AIRLINE INDUSTRY AND THEIR INFLUENCE ON COMPANY PROFITABILITY
Nicole Kalemba

4

CHAPTER FOUR
SAFETY AND PROFITABILITY IN THE AIRLINE BUSINESS

UNIVERSITAT ROVIRA I VIRGILI
QUALITY AND SAFETY IN THE AIRLINE INDUSTRY AND THEIR INFLUENCE ON COMPANY PROFITABILITY
Nicole Kalemba

The previous chapters have explained the need for KPIs and the importance of information and management accounting in the airline industry, as well as the indispensable consideration of quality in this particular business and its effect on company profitability. Chapter Four deals with the second main aspect of this doctoral thesis, safety in the airline industry. Similar to Chapter Three, it henceforth analyzes the relationship between safety and airline profitability.

4.1. Introduction

Even if aviation is among the safest means of transport, accidents and incidents still happen, although they are a rarity, which still makes the improvement of safety in this business necessary (Stolzer and Goglia, 2015). Safety in the airline industry is a service characteristic that airline customers desire, although it is related to a high production cost (Ben-Yosef, 2005).

One of the main problems regarding safety is the lack of information and the uncertainty of risk (Fleischer et al., 2015). Furthermore, the absence of clear ways to measure safety makes it a complex process, since, in most of the cases, safety is measured and defined basically through the number of accidents (Rose, 1990; Raghavan and Rhoades, 2005; Liou et al. 2007; Roelen and Klompstra 2012; Oster et al. 2013), which leads to a certain difficulty for determining the safety level of an airline. Not all accidents have the same consequences and the lack of safety does not always end in an accident. Additionally, the existence of safety indexes is very scarce, which makes it difficult to compare the safety levels between airlines (Fleischer et al., 2015).

The two most known publicly available indexes for safety in the air transportation business are the JACDEC safety index and the Airline Ratings system.

The JACDEC safety index is a rating that started in 2003 that records both total losses and serious incidents, and reaches an optimum value of 0.000 when an airline company operates without any total loss or incident during an established period (JACDEC, 2003).[1]

[1] For further information about the index see section 2.1. of paper F.

The second named index is the Airline Ratings system, which has been available since 2014. This index is based on a 7-star criteria rating for each airline, and considers the following information (Airline Ratings, 2014):

- IOSA Membership: Refers to the IATA Operational Safety Audit.
- Inclusion or not of the airline company on the blacklist of the European Union (European Commission, 2017): Refers to airlines that are excluded from flying through European air space due to safety related aspects.
- Fatality-free years: Refers to more than 10 years without any death generating accident.
- FAA endorsement: The airlines must meet the international standards established by the Federal Aviation Authority (FAA).
- ICAO safety parameters: This point is related to aspects established by the International Civil Aviation Organization (ICAO), and includes terms such as Legislation, Organization, Licensing, Operations, Airworthiness, Accident Investigation, Air Navigation Service and Aerodromes.
- Country's governing authority: If one of the fleet of the company has had to remain under guard by an authority due to safety problems, stars will be taken away.
- If the airline operates with any aircraft manufactured in Russia, the final rating will be influenced negatively.

In addition, and similar to a consideration of quality (see Chapter Three), the challenge and pressure that the airlines have had to face since the deregulation act in the US in 1978, led initially to a cutback of investments related to safety (Moses and Savage, 1990; Talley, 1992; Rhoades and Waguespack, 1999). Nevertheless, safety has improved since the act, leading to a decrease in the number of fatalities and significant safety improvements (Dempsey and Goetz, 1992; Kahn, 2002).

These statements and the importance of safety in the airline business make it necessary to analyze if any relationship exists between safety and the success of the airline companies, as measured through profitability.

Chapter Four is divided into three parts. After the introduction (4.1), section 4.2 is dedicated to the literature review on safety in the airline industry, where paper E, entitled *"Safety as a Management Concept in the Air Transport Sector: A Systematic Literature Review"*, published in the Journal *Intangible Capital*, is presented.

Section 4.3 of this chapter presents a research study through paper F, entitled *"The Potential Relationship between Safety and Economic and Financial Performance in the Airline Industry*", which is currently under review[2] in a JCR indexed Journal.

[2] July 2017

4.2. Literature Review of Safety in the Airline Business

Safety refers to circumstances related to incidents and accidents, and efforts that ensure that an airplane can be free from problems that could lead to a loss or fatality (Boeing, 2016), especially related to human performance and technical reliability (Pettersen and Bjørnskau, 2015).

Although fatal airline accidents are infrequent, the airline industry must nevertheless face a multitude of safety related challenges, such as, for example, the lack of maintenance, the reduced number of practice hours of pilots before being hired to a major carrier, or the abundance of airlines with low experience, among others (Dempsey and Goetz, 1992).

In order to respond to the first research question of Chapter Four, "What has been published about Safety in the Airline Industry?", this section examines the academic literature of previous publications related to safety in the airline business and its connected aspects through an SLR. Thus, a review for the period 1990-2016 was undertaken primarily using the databases *Web of Science* (2017) and *Scopus* (2017) that allowed international academic papers to be obtained within the research topic.

In this way, paper E, entitled "*Safety as a Management Concept in the Air Transport Sector: A Systematic Literature Review*", already published in the Journal *Intangible Capital*, vol. 13, issue 1, 2017, and indexed in the database Scopus, is available at *http://dx.doi.org/10.3926/ic.918*, and provided the results for this review.

After finalizing the SLR, co-authorship and co-citations between authors were analyzed and a co-occurrence between safety related variables was additionally carried out through a network analysis.

OmniaScience Intangible Capital

IC, 2017 – 13(1): 71-116 – Online ISSN: 1697-9818 – Print ISSN: 2014-3214
http://dx.doi.org/10.3926/ic.918

Safety as a management concept in the air transport sector: A systematic literature review

Nicole Kalemba, Fernando Campa-Planas
Universitat Rovira i Virgili (Spain)

nicole.kalemba@urv.cat, fernando.campa@urv.cat

Received October, 2016
Accepted November, 2016

Abstract

Purpose: The main purpose of the present study is to conduct a literature review of the contribution made by safety in air transport, based on the existing international academic literature in the field of the social sciences. It primarily attempts to examine and verify the relationship between safety-related concepts (co-occurrence), the link between the different authors (co-authorship) and the corresponding citations (co-citations).

Design/methodology: To achieve the established objectives, a systematic literature review (SLR) has been conducted using the Scopus database between the years 1990 and 2016, identifying international academic papers related to the research topic of the present study.

Findings: It has been verified, on the one hand, that safety in the air transport sector is a field of growing interest, as the number of papers has increased considerably in recent years, thus demonstrating the importance that this topic has acquired over time. On the other hand, however, it must be mentioned that the total quantity of papers related to the topic is low in terms of absolute numbers.

The results of the co-occurrence analysis show that the most important aspect of safety is safety management, while the strongest link is between safety management and aircraft accidents, a fact that is foreseeable a priori.

Intangible Capital – http://dx.doi.org/10.3926/ic.918

Originality/value: The approach used allows a better view of the academic contribution made in relation to safety; this serves as the link among the different elements of the concept studied, and it demonstrates the growing interest in this area.

Keywords: Safety, Air transport, Airlines, Quality, Profitability, Systematic literature review

Jel Codes: J28, L93

1. Introduction

The air transport sector is an essential provider of a wide range of services, and is a fast-growing industry faced with a large number of challenges when it comes to generating benefits, due to the numerous events and trends that influence it, both social and economic (IATA, 2014; ATAG, 2014).

Within the large variety of circumstances that have an influence on the air transport sector, a key element is offering operations with a high level of safety and efficiency to passengers on a global level (ICAO, 2015), as well as ensuring the safety and security of the people who work around the aircraft and the safety of the aircraft themselves (AERTEC, 2013).

Air transport stands out from other alternative means due to factors such as speed, cost, efficiency, comfort and flexibility (Kelemen, 2003; ATAG, 2014), in addition to its safety conditions, which are much higher than those of other types of transport, such as road, rail, etc. (Pacheco, Fernandes & Domingos, 2014).

Improved safety standards have always been one of the main priorities in the sector, if not the top priority (Liou, Yen & Tzeng, 2008). There is little doubt that it is a concept that plays an essential role and its improvement has become a topic of growing interest in the field of operation management (McFadden & Hosmane, 2001). The air transport industry is also known for its efforts and the unending challenge of always wanting to be known for its high level of safety and security, therefore reducing the number of accidents and incidents (Shappell, Detwiler, Holcomb, Hackworth, Boquet & Wiegmann, 2007; Liao, 2015).

Intangible Capital – http://dx.doi.org/10.3926/ic.918

While the number of passengers in this sector is continuously on the rise, the number of passengers who are victims of accidents is decreasing in absolute values, and therefore, to a greater extent, in relative values (Aviation Safety Network, 2016; ICAO, 2015).

However, due to the difficulty of defining the aspects that are included within the framework of operational safety, the main objective of the study is to obtain a broad view of the contributions made in the literature about safety in air transport and its evolution over time, as well as to determine the concepts that are most closely related to it (co-occurrence).

To reach said objective, the necessary information has been examined and collected through a systematic revision of the literature, using the Scopus database.

Other more specific objectives, taking into account the present research topic at all times, are the following:

- To see the evolution of the academic publications related to safety in air transport during the period 1990-2016 (understanding 2016 as the review completed prior to February 29 of this year).
- To obtain an overview of the main journals considering the research topic.
- To identify which are the most frequently cited academic articles and their corresponding researchers.
- To determine the relationship among the different researchers (co-authorship).
- To see the co-citation among the documents included in this study.
- To show and analyze the origin of the authors of the related articles.

The main contribution of this article is therefore the description and dissemination of what has been said about safety in the air transport sector in recent decades, the authors that stand out and the relationship between the established variables and the concept of safety.

The present document has been structured as follows: first, the field of interest and research topic are introduced, that is to say, safety in air transport; secondly, the methodology used to conduct the research is described; the third section presents the results obtained, while the last part discusses the main conclusions drawn.

Intangible Capital – http://dx.doi.org/10.3926/ic.918

2. The conceptual framework and evolution of operational safety

The intent of this section is to analyze the concept of operational safety, as well as to show the evolution of said concept over time.

2.1. Dual of interpretation

Before defining this concept, it is necessary to comment on the need for a correct interpretation of two concepts highly related in the air transport field: safety and security.

One concept is safety, which refers to concepts related to incidents and accidents involving air transport (AERTEC, 2013), while the other aspect is the security, related to, for example, "criminal acts and illicit interference" (AERTEC, 2013), which can affect the protection of both passengers and ground and air crews, among others. Security can thus affect, to a greater or lesser extent, safety.

Both safety and security have always been two key objectives and a great challenge in the air transport sector (Fox, 2014), and more so since the events of September 2001 in the United States. According to Barnett (2009), the two factors that passengers most commonly relate to safe travel is one, avoiding airplane accidents, and two, the prevention of criminal and terrorist incidents.

2.2. Operational safety

According to AERTEC (2013), safety works when the possibility of accidents and incidents and injuries or damage to passengers, property and staff members is reduced, thanks to the ongoing process of analysis and management of both dangers and risks.

The International Civil Aviation Organization (ICAO) defines safety in a similar manner, as a state in which the possibility of personal injury or property damage is reduced, and an attempt is made to keep it low and controlled through continuous risk analysis, among other measures.

In other words, safety refers to the act of reducing both accidents and incidents as much as possible. Per AERTEC (2013), three criteria need to be considered in order to define safety: first of all, how to evaluate and detect risks in order to keep them at an acceptable low level;

Intangible Capital – http://dx.doi.org/10.3926/ic.918

secondly, how to investigate incidents in order to make the right preventive decisions and finally, how to define safety variables and indicators that make it possible to measure and monitor the safety level.

2.3. Evolution of safety in recent years

As mentioned earlier, the number of passengers has continually increased, while the number of fatal accidents has significantly decreased in recent decades, as shown in Figure 1.

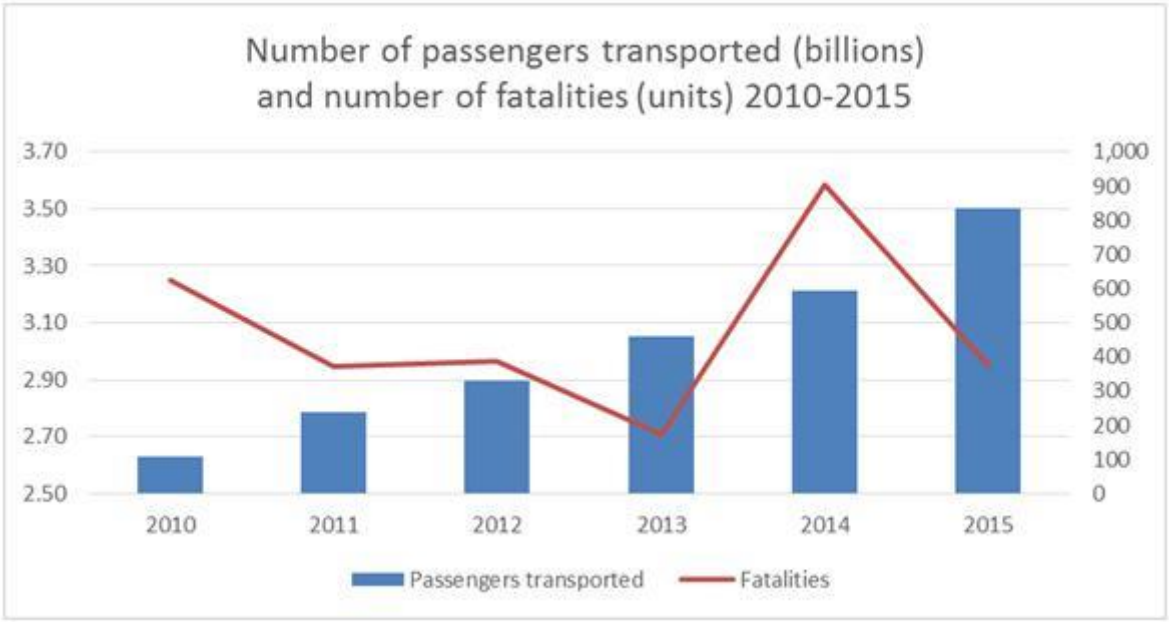


Figure 1. Number of passengers and number of fatal accidents 2010-2015 (author's own work based on data of the World Bank (2015) and ICAO (2015))

Figure 1 shows the constant growth in the number of passengers, which reached 3.5 billion in 2015, representing an increase of 8.9% over 2014.

According to the European Aviation Safety Agency (EASA, 2015), the number of fatal accidents in 2014 was below the average total for the last 10 years (2004-2013), in spite of the fact that 2014 (see Figure 1) was a year that stands out for the number of fatalities (n=904).

Intangible Capital – http://dx.doi.org/10.3926/ic.918

The year 2014 includes two unique accidents, Malaysia Airlines Flight 370 (which disappeared in March 2014; there is still no evidence as to its cause), and Flight 17 from the same company, which was attacked as it flew over Ukraine in July 2014.

3. Methodology

The methodology followed in the present study is as follows: first, a systematic review was conducted of the literature (hereinafter referred to as the systematic literature review or SLR), using the bibliographic database Scopus, which provides a broad overview of international academic articles, including a large database of summaries and citations (Elsevier, 2015).

The systematic literature review methodology is an essential tool for any project in academia, as it helps add to the knowledge researchers need about a specific topic (Webster & Watson, 2002). It also has the advantage of providing rigorous, exhaustive, reliable and unbiased information (Kitchenham, 2004).

Kitchenham (2004) also mentions two fundamental aspects that make SLR necessary, namely, the identification of gaps in order to propose future lines of research and also to present background information as a framework.

In most cases, SLR has been used in the field of health (CRD, 2009) and other disciplines, such as public policy, but it has also been applied in relation to the air transport sector (Ginieis, Sánchez-Rebull & Campa-Planas, 2012a-b).

All this shows that SLR is a very useful tool for the evaluation and analysis of the available information and its later interpretation in response to the research question to be studied (Kitchenham, 2004).

The SLR conducted for the present study covers the period between 1990 and February 2016, thus encompassing an extended period, which enables us to obtain an overview of the evolution of the concept of safety in air transport.

Secondly, for the co-authorship and co-citation analysis among the different articles, as well as to compare the variables (co-occurrence) related to safety, the program *NodeXL Template for Microsoft Excel 2007* was used to facilitate the identification of the concepts and to create a network analysis that is visualized in a way that makes it easy to see the existing relationships among the different variables (NodeXL, 2013).

Intangible Capital – http://dx.doi.org/10.3926/ic.918

3.1. Identification of key words and article sampling

To identify the publications related to the present study, different combinations of a total of nine key words (three primary and six secondary key words) were established, as shown below:

- Safety **AND** Airlines **OR** Air Transportation **AND** Profitability
- Safety **AND** Airlines **OR** Air Transportation **AND** Quality
- Safety **AND** Airlines **OR** Air Transportation **AND** Cost Maintenance
- Safety **AND** Airlines **OR** Air Transportation **AND** Management
- Safety **AND** Airlines **OR** Air Transportation **AND** Performance
- Safety **AND** Airlines **OR** Air Transportation **AND** Success

As can be seen in Table 1, considering the different combinations of primary and secondary key words, the total number of articles found in the Scopus database within the field of the social sciences after the first search was 1,021. This figure includes conference presentations and book chapters which were later eliminated for the final review.

Combination of key words	Number of articles found
Safety AND Airlines AND Profitability	17
Safety AND Air Transportation AND Profitability	9
Safety AND Airlines AND Quality	62
Safety AND Air Transportation AND Quality	126
Safety AND Airlines AND Cost Maintenance	15
Safety AND Air Transportation AND Cost Maintenance	8
Safety AND Airlines AND Management	193
Safety AND Air Transportation AND Management	299
Safety AND Airlines AND Performance	105
Safety AND Air Transportation AND Performance	147
Safety AND Airlines AND Success	23
Safety AND Air Transportation AND Success	17
Total papers	**1,021**

Table 1. Results of the search in the Scopus database

The search criterion and subsequent filtering of the articles after eliminating duplicates was based on the requirement that at least one of the key words must be used in the title, the article abstract or the keywords specified by each of the authors.

Intangible Capital – http://dx.doi.org/10.3926/ic.918

According to this procedure, the final bibliographic database consisted of 59 international academic articles, which were used as the basis for the present study, as shown in Table 2.

Article filter	Articles eliminated	Total articles considered for the SLR
Total initial main search		1,021
Elimination of duplicates	(405)	616
Elimination of articles based on the search criteria	(557)	**59**

Table 2. Final sample of articles included in the literature review

3.2. Encoding operational safety variables

After reviewing and reading the aforementioned 59 articles about operational safety and with the collaboration of a panel of experts, 11 key variables were determined that were derived from their reading. The variables detected were the following:

1. **Aircraft accidents**: Related to airplane accidents, collision, etc.; events that generate the death or serious injury of people, and in which the aircraft is substantially damaged.

2. Aircraft incidents: An event different from an operational accident, it is related to the operation and use of an aircraft that can affect safety.

3. Aircraft related issues: Aspects related to the aircraft, i.e., the type of aircraft, age of the fleet, etc.

4. Customer related issues: Includes aspects such as customer satisfaction, perception, behavior, etc.

5. Human factors: This variable covers both human errors and human resource management, among other aspects.

6. Maintenance: Aircraft maintenance is related to aspects such as the repair, inspection, general inspection, failure mechanisms, etc.

7. Safety culture: Includes everything related to the culture surrounding safety, such as the commitment and dedication to safety, the definition of obligations and the responsibilities of employees, etc.

Intangible Capital – http://dx.doi.org/10.3926/ic.918

8. Safety management: A management variable of safety that includes aspects such as safety management programs and systems, as well as risk management and analysis.

9. Safety performance: Aspects associated with financial stability, economic and financial profitability, the financial health of the airline, etc.

10. Security: Includes everything related to physical security, such as the protection of passengers, ground and flight crews, the aircraft itself, etc.

11. Technical flight crew: The technical flight crew variable includes aspects such as the communications skills of the employees, their training and the pilot's experience (i.e. total flight time), among other aspects.

All variables were necessary in order to establish and then demonstrate the relationship that exists among the different concepts included (co-occurrence) during the SLR, and thus determine which topics were dealt with most often during the analyzed period.

4. Descriptive results

This section shows the descriptive results obtained from the 59 articles from the Scopus database, along with the 134 authors included in the study and resulting of said articles, for the period 1990-February 2016 covered by the present study.

4.1. Evolution of the academic articles on operational safety

Figure 2 shows the evolution over time of the final selection of international academic articles (n=59) that have been selected following an exhaustive SLR.

In particular, during the period 2012-2015, the number of publications has increased significantly, representing 42.37% of the total analyzed. This total reflects the growing importance of the topic studied in recent years.

Intangible Capital – http://dx.doi.org/10.3926/ic.918

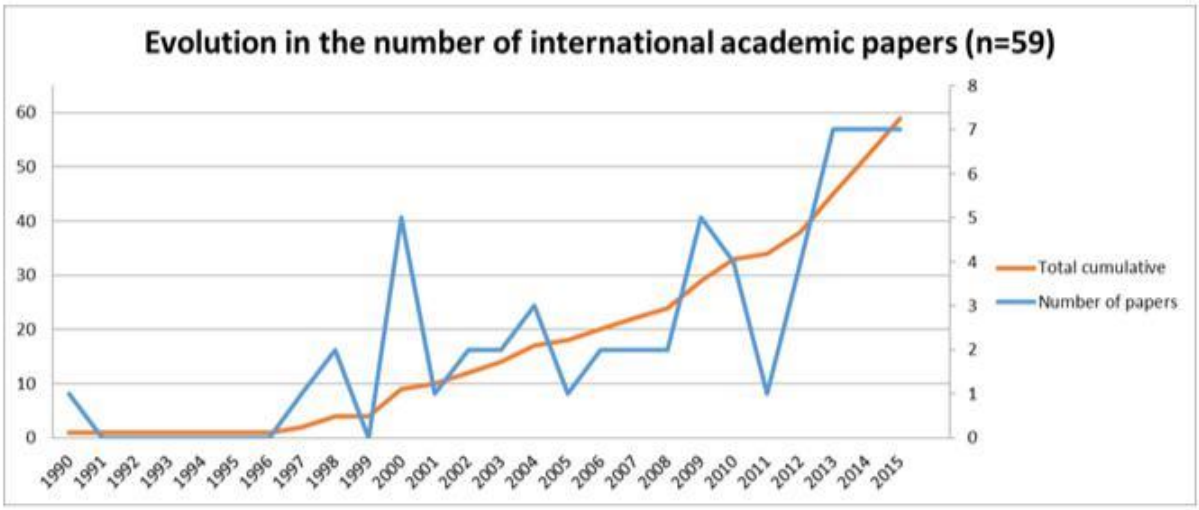


Figure 2. Evolution in the number of international academic articles during the years 1990-2015

As also can be seen, during the years 1990-1997, very few (practically no) articles were published. It is only after 2000 and especially since 2006 when the topic begins to grow as a research topic, although it must be stressed that, in general, the total number of articles in terms of absolute value is very low in relation to other studies in the field of air transport (Ginieis, Sánchez-Rebull & Campa-Planas, 2012a-b; Kalemba & Campa-Planas, 2016).

4.2. Most productive and most frequently cited journals

This section analyzes which journals are the most productive and most often cited in this study, with reference to the topic addressed in this SLR, taking into account the 59 articles obtained from the systematic literature review and their corresponding ranking.

	Journal name	No. of articles in the study	No. of citations	Impact factor at 5 years	Quartile
1	Journal of Air Transport Management	16	463	1.328	Q1/Q2
2	Safety Science	14	98	2.210	Q1
3	International Journal of Industrial Ergonomics	3	110	1.366	Q2
4	Accident Analysis & Prevention	2	27	2.699	Q1
5	Applied Ergonomics	2	2	2.143	Q1
6	Quality Progress	2	2	ND	Q4
7	Research in Transportation Economics	2	9	ND	Q1/Q2
8	Transportation Research Part E: Logistics and Transportation Review	2	28	3.513	Q1

Table 3. The most productive and most frequently cited journals according to the systematic literature review

Intangible Capital – http://dx.doi.org/10.3926/ic.918

Table 3 shows the most productive journals and those that have at least 2 or more articles included in the present study (n=8), as well as their impact factor at 5 years and the quartile to which each journal corresponds, according to its category.

The first two journals, the Journal of Air Transport Management (United Kingdom) and Safety Science (Netherlands) represent more than 50% of the publications out of the total number of articles included in the study (30 of 59 articles), thus demonstrating that the articles are concentrated in a small number of journals.

The Journal of Air Transport Management (n=16) is in first position, with 463 citations, and it is also the most specific journal in terms of air transport.

It should also be mentioned that at the same time it is the journal with the lowest impact factor at 5 years, as a journal in the first/second quartile in the subcategories of law, management and transport (SCImago Journal & Country Rank, 2014).

On the other hand, the journal Safety Science is found in the first quartile in the subcategories of health and safety (SCImago Journal & Country Rank, 2014).

4.3. Most frequently cited articles

Table 4 provides information on the articles most frequently cited, considering the authors, the title and the year of publication, as well as the total number of citations since publication.

	Authors	Title	Year	Cites
1	Liou, J.J.H., Tzeng, G.H., Chang, H.C.	Airline safety measurement using a hybrid model	2007	164
2	Liou, J.J.H., Yen, L., Tzeng, G.H.	Building an effective safety management system for airlines	2008	83
3	Janic, M.	An assessment of risk and safety in civil aviation	2000	61
4	Latorella, K.A., Prabhu, P.V.	A review of human error in aviation maintenance and inspection	2000	55
5	Chang, Y.H., Yeh, C.H.	A new airline safety index	2004	37
6	Netjasov, F., Janic, M.	A review of research on risk and safety modelling in civil aviation	2008	34
7	Rankin, W., Hibit, R., Allen, J., Sargent, R.	Development and evaluation of the Maintenance Error Decision Aid (MEDA) process	2000	33
8	Gill, G.K., Shergill, G.S.	Perceptions of safety management and safety culture in the aviation industry in New Zealand	2004	33
9	Lee, W.K.	Risk assessment modeling in aviation safety management	2006	30
10	Taylor, J.C.	The evolution and effectiveness of Maintenance Resource Management (MRM)	2000	22

Table 4. Most frequently cited academic articles base on the systematic literature review

Intangible Capital – http://dx.doi.org/10.3926/ic.918

The most cited article was that by Liou, Tzeng and Chang (2007), entitled Airline safety measurement using a hybrid model, which received a total of 164 citations. It was followed by an article by the same author, Liou et al. (2008), entitled Building an effective safety management system for airlines, which was cited a total of 83 times. Both articles were published in the aforementioned Journal of Air Transport Management.

4.4. Relationship among authors (co-authorship)

In order to demonstrate the collaboration among the different authors established by the articles selected as part of the SLR, a co-authorship map has been created.

During the evolution of the time considered in the study, the scientific works were increasingly co-authored, and following this trend, the phenomenon of co-authorship has attracted interest in recent years (Acedo, Barroso, Casanueva & Galán, 2006).

The 59 academic articles selected were written by a total of 134 authors, of whom 13 have contributed to two and even three articles. The two most productive authors have been Chen, C.F. (2012, 2014, 2014) and Chen, S.C. (2012, 2014, 2014), both of whom have collaborated on the three occasions with one another.

Figure 3 shows this information on co-authorship in graphic form.

Intangible Capital – http://dx.doi.org/10.3926/ic.918

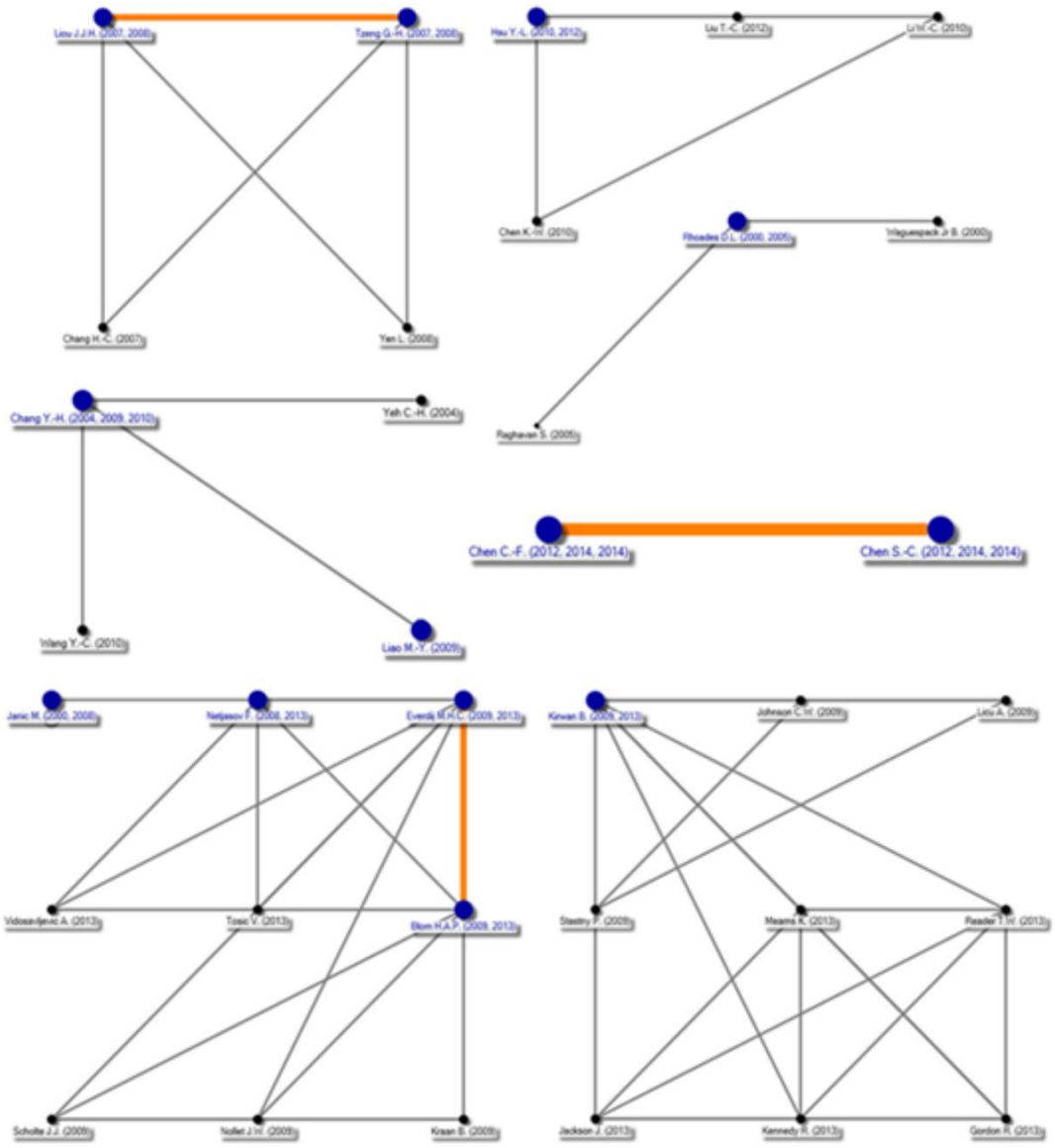


Figure 3. Co-authorship among the authors (author's own work, using NodeXL)

It should be mentioned that 32.20% of the 59 articles have been written by two authors (n=19), 30.51% by a single author and 23.73% by three authors. The remaining 13.56% were written by 4 to 6 authors.

Intangible Capital – http://dx.doi.org/10.3926/ic.918

4.5. Relationship among cited articles (co-citation)

Co-citation analysis has become a necessary and predominate method for scientific works in recent years, and it has already been applied in a number of studies (Seguí-Mas, Sarrión-Viñes, Tormo-Carbó & Oltra, 2016; Alves, Fernandes & Raposo, 2016). It is a tool that helps analyze different groups of researchers, revealing their publications and fields of application (Alves et al., 2016), as well as observing similarities in the content by the cited authors (Gmür, 2003).

Figure 4 shows a co-citation map of the authors of the articles with the largest number of citations in relation to safety, taking into account the criterion that the number of citations was greater than or equal to 50 (n=4). For all cases, only the first author of each article was included and then all authors with less than two citations were eliminated in order to obtain a better view of the co-citations among the authors.

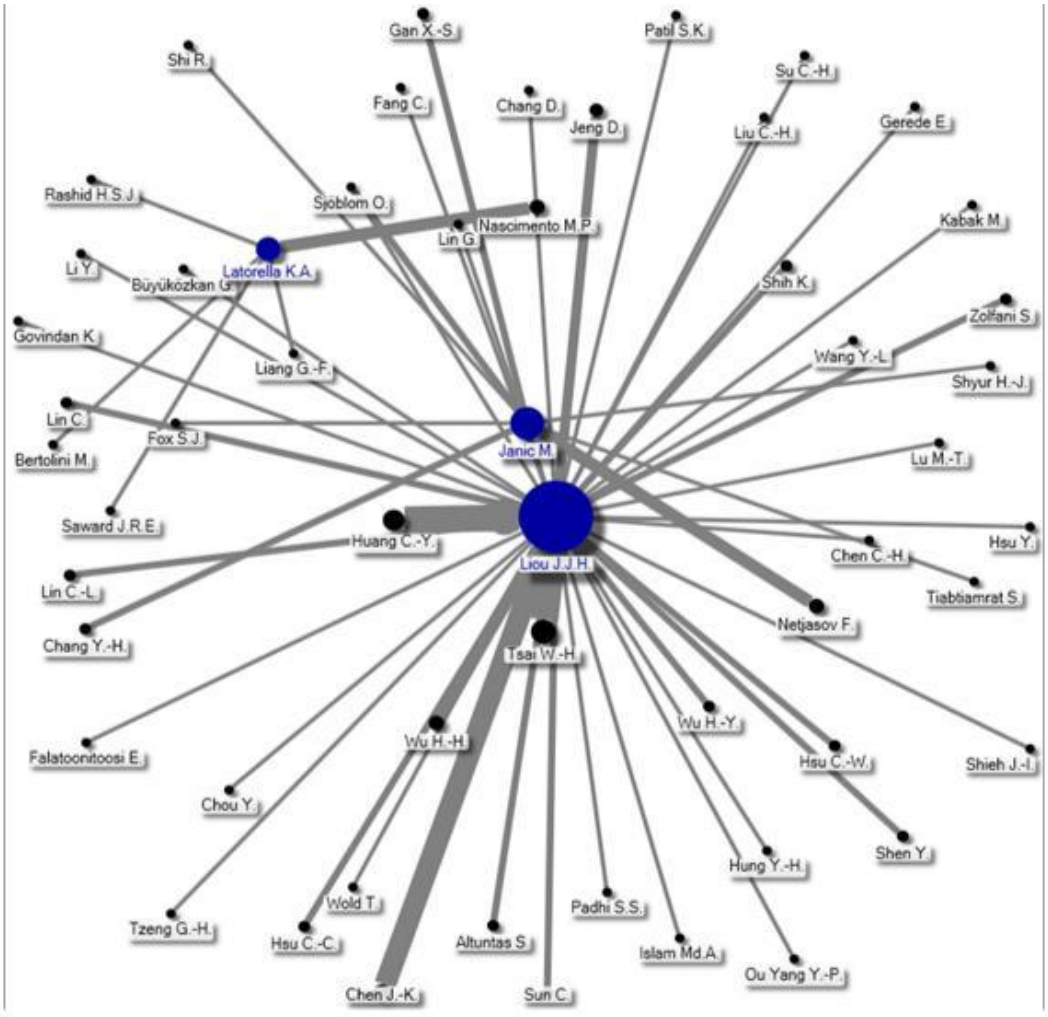


Figure 4. Co-citation among authors (author's own work, using NodeXL)

Intangible Capital – http://dx.doi.org/10.3926/ic.918

The most frequently cited authors were Liou (2007, 2008) and Janic (2000), with 116 and 24 citations, respectively. The greatest co-occurrence of citations exists between Liou & Huang (n=13) and Liou & Tsai (n=13).

4.6. Origin of the authors

In order to observe the spatial distribution and to study where else the present research topic has been given attention, the origin of each of the authors was analyzed. Figures 5 and 6 show the 17 countries in which the topic of operational safety in air transport has been studied.

Figure 5. Origin of authors by country

Among the countries included, the United States and Taiwan predominated, representing 24.6% (33 authors) and 23.95% (32 authors) of the authors, respectively, out of a total of 134 authors of the articles included in the literature review.

The countries belonging to the European Union with the largest proportion of authors are the United Kingdom (10.4%) and the Netherlands (6.0%).

Intangible Capital – http://dx.doi.org/10.3926/ic.918

Origin of the authors	Number of authors	Percentatge/total
United States	33	24.6%
Taiwan	32	23.9%
United Kingdom	14	10.4%
Australia	13	9.7%
Norway	9	6.7%
Netherlands	8	6.0%
New Zealand	5	3.7%
Italy	4	3.0%
Serbia	4	3.0%
Brazil	3	2.2%
Belgium	2	1.5%
Canada	2	1.5%
France	1	0.7%
Ireland	1	0.7%
Nigeria	1	0.7%
Sweden	1	0.7%
Turkey	1	0.7%
Total authors	**134**	

Figure 6. Origin of authors by country

4.7. Analysis of the network of variables related to safety

In order to demonstrate the relationship among the different concepts that are linked to safety, as discussed in the basic literature, a co-occurrence analysis was conducted on the keys aspects.

A map of the co-occurrences was created (see Figure 7) using the NodeXL tool (NodeXL, 2013), considering the eleven variables mentioned earlier, which were determined based on the 59 articles included in the SLR.

This figure is shown according to the design by Fruchterman and Reingold (1991), based on the one hand on edges, which show the importance and the frequency of the co-occurrence between two variables, and on the other hand, the volume of each of the nodes, which represent the relevance of each of the variables.

Intangible Capital – http://dx.doi.org/10.3926/ic.918

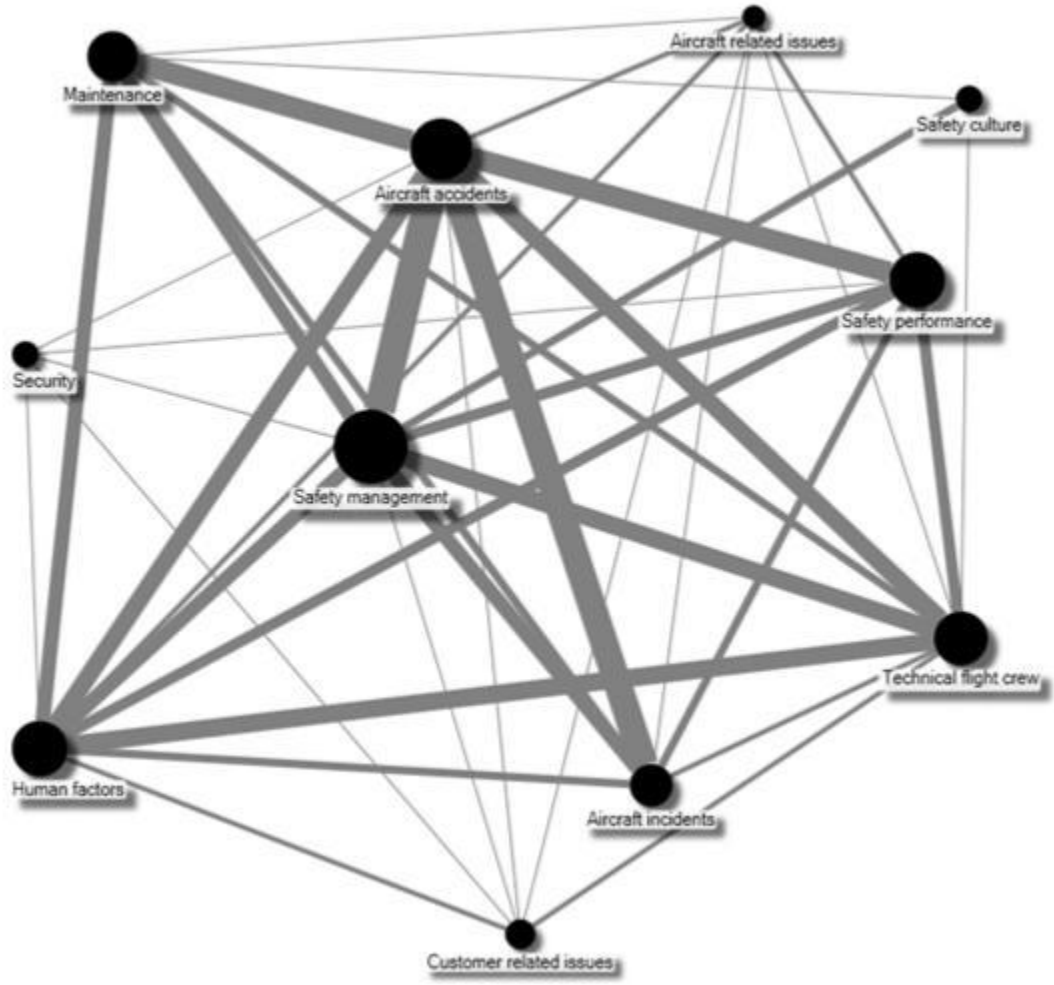


Figure 7. The relationship among the established variables in reference to safety (author's own work, using NodeXL)

As can be seen in Figure 7, the node with the greatest weight, i.e., the concept most used in relation to safety in the international academic literature is Safety management (n=30), followed by Aircraft accidents (n=22), while the strongest link is shown between the variables of Safety management and Aircraft accidents, and between Safety management and Aircraft incidents. Figure 7 also shows that the other variables most commonly used in relation to the concept of safety are Human factors, Safety performance and the Technical flight crew.

Intangible Capital – http://dx.doi.org/10.3926/ic.918

5. Conclusions

In spite of the fact that safety is a key element in the air transport sector, it must be mentioned that no specific literature review article in the sector has considered the contribution made by the concept studied in this article.

Therefore, the study has attempted to bridge this gap and conduct a systematic literature review (SLR), using the Scopus database. This review enabled us to identify international academic articles corresponding to the proposed research topic.

The most frequently cited journals and articles were examined, in addition to determining the degree of co-occurrence among the variables established by the authors in relation to safety, with the help of a panel of experts; an overview of the co-authorship and co-citations among the different authors was also provided. Starting with a total of 1,021 articles, once the selected articles were refined, a sample of 59 articles published between 1990 and February 2016 were analyzed.

The first conclusion that we can comment on is that the research topic is one of growing interest, even though the total number of articles in terms of absolute value continues to be very low. Most of the articles obtained after the preliminary search have been primarily related to the field of psychology and engineering, and only a few articles are based on management topics and relevant concepts in relation to safety.

The most productive journal in terms of both the total number of articles included (n=16) and the total number of citations (n=463) was the Journal of Air Transport Management. In second place was the journal Safety Science, in terms of the total number of articles included in the study (n=14), while the journal with the second largest number of citations was the International Journal of Industrial Ergonomics, with 110 citations.

The two most frequently cited articles were both published by Liou et al., in 2007 and 2008, and were entitled *Airline safety measurement using a hybrid model* and *Building an effective safety management system for airlines*, respectively. Through a network analysis, it was possible to obtain a co-occurrence map of the different variables established as the result of the SLR and their subsequent definition. Thanks to this, it was possible to acquire an overview of the structure of the basic literature dedicated to this research topic.

Intangible Capital – http://dx.doi.org/10.3926/ic.918

The most relevant concepts with the greatest relative weight with regard to operational safety were Safety management and Aircraft accidents, while the edges with the highest degree of interaction were found between the same variables, and between Safety management and Aircraft incidents.

Furthermore, it was revealed that collaboration among the authors in recent years has increased, with 69.5% of the aforementioned 59 articles published by two or more authors.

There are a total of 13 researchers with a minimum of two and even three published articles, among whom Chen, C.F. (2012, 2014, 2014) and Chen, S.C. (2012, 2014, 2014) stand out for having collaborated three times with one another. However, the remaining 11 authors have collaborated with a wide variety of different authors.

With regard to co-citation, the most frequently cited authors were Liou (2007, 2008) and Janic (2000), with 116 and 24 citations, respectively. The greatest co-occurrence observed was between authors Liou and Huang (n=13) and Liou and Tsai (n=13).

Finally, it is believed that the study conducted may promote the view that operational safety contributes to business management in the air transport sector. It should be stressed that the SLR carried out offers an opportunity for future lines of research with a more management-oriented focus, as the study has shown that operational safety, as an essential topic in the field of air transport, provides little academic literature related to management.

Other possible lines of future research may, therefore, include the following:

- Analyzing whether safety is profitable for the airlines. In other words, the impact of safety on the profitability of the airlines could be analyzed.

- Studying the extent to which the airlines invest in safety. In other words, what percentage of expenses and/or investment is dedicated to improving safety?

- Analyzing how safety can be measured in air transport. Some sector indicators are already available, such as the JACDEC Safety Index, for example, developed by Jan-Arwed Richter and Christian Wolf (Richter, 2014), which provides information on aircraft accidents and incidents in recent years.

Intangible Capital – http://dx.doi.org/10.3926/ic.918

References

Acedo, F.J., Barroso, C., Casanueva, C., & Galán, J.L. (2006). Co-Authorship in Management and Organizational Studies: An Empirical and Network Analysis. *Journal of Management Studies*, 43(5), 957-983.

AERTEC (2013). Seguridad aeroportuaria: Safety & Security. Por: José Antonio Poyato Moreira. Available online at: www.aerecsolutions.com. (Last access date: March, 2016).

Air Transport Action Group (ATAG) (2014). Available online at: www.atag.org. (Last access date: March, 2016).

Alves, H., Fernandes, C., & Raposo, M. (2016). Value co-creation: Concept and contexts of application and study. *Journal of Business Research*, 69(5), 1626-1633. https://doi.org/10.1016/j.jbusres.2015.10.029

Aviation Safety Network (2016). Available online at: www.aviation-safety.net. (Last access date: March, 2016).

Banco Mundial (2015). Available online at: www.datos.bancomundial.org. (Last access date: March, 2016).

Barnett, A. (2009). Aviation Safety and Security. En: P. Belobaba, A. Odoni & C. Barnhart (2009). *The Global Airline Industry*. Chichester (UK): John Wiley and Sons, Ed. https://doi.org/10.1002/9780470744734.ch11

Chang, Y.H., & Yeh, C.H. (2004). A new airline safety index. *Transportation Research Part B: Methodological*, 38(4), 369-383.

Chen, C.F., & Chen, S.C. (2012). Scale development of safety management system evaluation for the airline industry. *Accident Analysis & Prevention*, 47, 177-181. https://doi.org/10.1016/j.aap.2012.01.012

Chen, C.F., & Chen, S.C. (2014). Investigating the effects of job demands and job resources on cabin crew safety behaviors. *Tourism Management*, 41, 45-52. https://doi.org/10.1016/j.tourman.2013.08.009

Chen, C.F., & Chen, S.C. (2014). Measuring the effects of Safety Management System practices, morality leadership and self-efficacy on pilots' safety behaviors: Safety motivation as a mediator. *Safety Science*, 62, 376-385. https://doi.org/10.1016/j.ssci.2013.09.013

CRD. Centre for Reviews and Dissemination. (2009). *Systematic Reviews: CRD´s guidance for undertaking reviews in health care*. Published by CRD, University of York.

Elsevier (2015). Available online at: www.elsevier.com. (Last access date: March, 2016).

European Aviation Safety Agency (2015). *EASA Annual Safety Review 2014*. EASA.

Intangible Capital – http://dx.doi.org/10.3926/ic.918

Fox, S. (2014). Safety and Security: The influence of 9/11 to the EU framework for air carriers and aircraft operators. *Research in Transportation Economics*, 45, 24-33. https://doi.org/10.1016/j.retrec.2014.07.004

Fruchterman, T., & Reingold, E. (1991). Graph Drawing by Force-directed Placement. *Software-practice and experience*, 21, 1129-1164. https://doi.org/10.1002/spe.4380211102

Gill, G.K., & Shergill, G.S. (2004). Perceptions of safety management and safety culture in the aviation industry in New Zealand. *Journal of Air Transport Management*, 10(4), 231-237. https://doi.org/10.1016/j.jairtraman.2004.02.002

Ginieis, M., Sánchez-Rebull, M.V., & Campa-Planas, F. (2012a). The academic journal literature on air transport: Analysis using systematic literature review methodology. *Journal of Air Transport Management*, 19, 31-35. https://doi.org/10.1016/j.jairtraman.2011.12.005

Ginieis, M., Sánchez-Rebull, M.V., & Campa-Planas, F. (2012b). Los costes en el sector del transporte aéreo. Una revisión de la literatura internacional. *Revista Iberoamericana de Contabilidad de Gestión*, X(20).

Gmür, M. (2003). Co-citation analysis and the search for invisible colleges: A methodological evaluation. *Scientometrics*, 57(1), 27-57. https://doi.org/10.1023/A:1023619503005

International Air Transport Association (IATA) (2014). Available online at: www.iata.org. (Last access date: February, 2016).

International Civil Aviation Organization. ICAO. (2015). *Safety Report 2015 Edition.*

Janic, M. (2000). An assessment of risk and safety in civil aviation. *Journal of Air Transport Management,* 6 https://doi.org/10.1016/S0969-6997(99)00021-6 (1), 43-50.

Kalemba, N., & Campa-Planas, F. (2016). An overview of the Quality Concept in the Air Transportation Business: A systematic Literature Review. In press.

Kelemen, Z. (2003). Latest information technology development in the airline industry. *Periodica Polytechnica Ser. Transp. Eng.*, 31(1-2), 45-52.

Kitchenham, B. (2004). *Procedures for performing systematic reviews*. Joint Technical Report. Keele University.

Latorella, K.A., & Prabhu, P.V. (2000). A review of human error in aviation maintenance and inspection. *International Journal of Industrial Ergonomics*, 26(2), 133-161. https://doi.org/10.1016/S0169-8141(99)00063-3

Lee, W.K. (2006). Risk assessment modeling in aviation safety management. *Journal of Air Transport Management*, 12(5), 267-273. https://doi.org/10.1016/j.jairtraman.2006.07.007

Intangible Capital – http://dx.doi.org/10.3926/ic.918

Liao, M.Y. (2015). Safety Culture in commercial aviation: Differences in perspective between Chinese and Western pilots. *Safety Science*, 79, 193-205. https://doi.org/10.1016/j.ssci.2015.05.011

Liou, J.J.H., Tzeng, G.-H., & Chang, H.-C. (2007). Airline safety measurement using a hybrid model. *Journal of Air Transport Management*, 13(4), 213-220. https://doi.org/10.1016/j.jairtraman.2007.04.008

Liou, J.J.H., Yen, L., & Tzeng, G.H. (2008). Building an effective safety management system for airlines. *Journal of Air Transport Management*, 14(1), 20-26. https://doi.org/10.1016/j.jairtraman.2007.10.002

McFadden, K.L., & Hosmane, B.S. (2001). Operations safety: An assessment of a commercial aviation safety program. *Journal of Operations Management*, 19, 579-591. 6963(01)00062-6

Netjasov, F., & Janic, M. (2008). A review of research on risk and safety modelling in civil aviation. *Journal of Air Transport Management*, 14(4), 213-220. https://doi.org/10.1016/j.jairtraman.2008.04.008

NodeXL (2013). Available online at: www.nodexl.codeplex.com. (Last access date: March, 2016).

Pacheco, R.R., Fernandes, E., & Domingos, E.M. (2014). Airport airside safety index. *Journal of Air Transport Management*, 34, 86-92. https://doi.org/10.1016/j.jairtraman.2013.08.007

Rankin, W., Hibit, R., Allen J., & Sargent, R. (2000). Development and evaluation of the Maintenance Error Decision Aid (MEDA) process. *International Journal of Industrial Ergonomics*, 26(2), 261-276. https://doi.org/10.1016/S0169-8141(99)00070-0

Richter, J.A. (2014). *The JACDEC Data Base. User Guide Explanations and Definitions*. Hamburg: JACDECGbr.

SCImago Journal Rank (2014). Available online at: http://www.scimagojr.com/. (Last access date: March, 2016).

Scopus (2015). Available online at: http://www.scopus.com/. (Last access date: March, 2016).

Seguí-Mas, E., Sarrión-Viñes, F., Tormo-Carbó, G., & Oltra, V. (2016). Producció científica en el camp de les spin-off acadèmiques: Una anàlisi bibliomètrica. *Intangible Capital*, 12(1), 246-267.

Shappell, S., Detwiler, C., Holcomb, K., Hackworth, C., Boquet, A., & Wiegmann, D.A. (2007). Human error and Commercial Aviation Accidents: An Analysis Using the Human Factors Analysis and Classification System. *Human Factors*, 49(2), 227-242. https://doi.org/10.1518/001872007X312469

Taylor, J.C. (2000). The evolution and effectiveness of Maintenance Resource Management (MRM). *International Journal of Industrial Ergonomics*, 26(2), 201-215. https://doi.org/10.1016/S0169-8141(99)00066-9

Intangible Capital – http://dx.doi.org/10.3926/ic.918

Webster, J., & Watson, R. (2002). Analyzing the past to prepare for the future: Writing a literature review. *MIS Quarterly*, 26(2), 13-23.

UNIVERSITAT ROVIRA I VIRGILI
QUALITY AND SAFETY IN THE AIRLINE INDUSTRY AND THEIR INFLUENCE ON COMPANY PROFITABILITY
Nicole Kalemba

4.3. Research Study

This third part of Chapter Four presents the methodology and the results obtained through a quantitative research study related especially to the safety-profitability link.

4.3.1. Methodology

The main purpose of this chapter, and specifically paper F, was to examine the potential relationship and the effect that safety has, or not, on the economic and financial performance of the airline companies.

The study (see 4.3.2) was based on the JACDEC safety index that is currently the best tool for representing the complex topic of safety (Richter, 2014). Data for the years 2011-2015 was available from the safety index's own web page, as well as the German aviation magazine "Aero International" (Aero International, 2017). Both sources present a yearly ranking of the 60 safest airlines worldwide. Additionally, the financial data and operating metrics of the airlines were extracted from the Thomson Reuters *Eikon* (2016) database.

The study sample consisted of a total of 45 international airline companies, representing more than 70% of the companies in 2016 in terms of revenues from the total number of commercial airline companies (IATA, 2015). For testing the hypothesis, the data used was a longitudinal time-series that considered the period 2011-2015. To determine if the influence of safety on company profitability and performance was, or not, significant, a panel data methodology with two estimation models was considered, including dependent, independent and control variables.

The first model included the ROI as a dependent variable with the aim of analyzing the effect of safety on airline profitability, while the second model included REVENUES for performance measurements.

The JACDEC safety index was used exclusively as an independent variable, and the control variable was covered through the number of passengers carried by the companies.

Furthermore, robustness checks included the variable FLEET as another control variable, which referred to the number of planes an airline company owned.

4.3.2. Results

This last section aimed to respond to the second research question of Chapter Four, "How does Safety impact the Profitability of the Airline Companies?"

The results are presented in research paper F that analyzed the relationship between safety and profitability of airline companies based on the JACDEC safety index.

- Paper F: "*The potential relationship between safety and economic and financial Performance in the airline industry*", being currently under review in a JCR Journal[1].

[1] July 2017

The potential relationship between safety and economic and financial performance in the airline industry

Nicole Kalemba

University Rovira and Virgili, Spain

Fernando Campa-Planas

University Rovira and Virgili

ABSTRACT

Safety has always been a key management aspect in the airline industry. Airline companies, airport management, aviation staff and air traffic control perform the impossible to ensure the lowest possible number of accidents and incidents for minimizing the number of fatalities.

The main objective of this paper was to determine and analyze what has been published concerning safety and its relationship with other related economic and financial indicators. This study used a sample collection of international airlines included in the JACDEC safety index, considering longitudinal data for the years 2011-2015.

The results revealed a non-significant effect for safety on the profitability of the airline companies, whereas a significant effect of safety on airline revenues was shown.

Keywords: safety management; airline companies; profitability; key performance indicators; JACDEC.

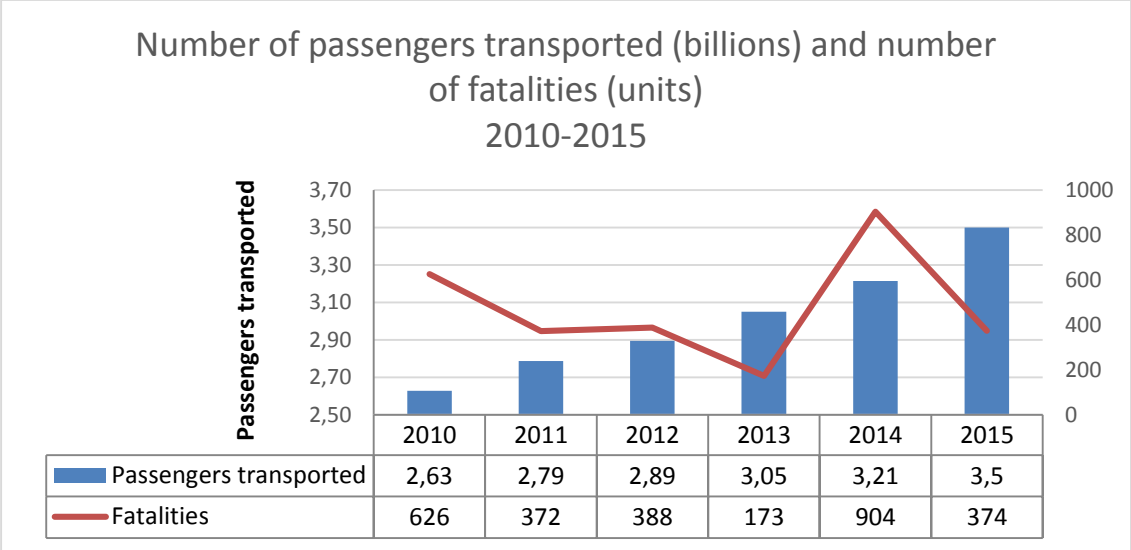
1. Introduction and objectives

Within the wide variety of factors and circumstances that affect the air transportation sector, one of the key elements is to provide operations with a high standard of safety and efficiency to the passengers (ICAO 2015), guaranteeing the safety of the persons that are operating around the aircraft, and the protection of the aircraft itself (AERTEC 2013). Likewise, security plays an important role, especially after events as 9/11. Security measures have been enhanced and improved drastically, increasing consequently the confidence of passengers, as well as their safety (Blalock et al., 2007).

Air transport, in particular commercial airlines, stand out from other alternative means of transport due to peculiar characteristics as comfort, speed, cost, efficiency and flexibility (ATAG 2014; Kelemen 2003), in addition to its safety conditions, which are much higher than rail or road transport (Miller et al., 1994; Pacheco et al., 2014; Vasigh et al. 2013; World Health Organization 2015; ICAO 2015).

In relation to the airline industry, figure 1 shows that while the number of passengers has continually increased, the number of fatal accidents has significantly decreased in recent years.

Figure 1. Number of fatal accidents and number of passengers 2010-2015



Source: Created by the authors based on data of the World Bank (2015) and ICAO (2015)

According to the EASA Annual Safety Review (2015), the number of fatal accidents in 2014 was below the total average for the last 10 years (2004-2013), although 2014 was a year that stands out for its high number of fatalities (n=904), due to two singular accidents. First, the flight MH370 of the Malaysian Airlines that crashed in the Southern Ocean (239 fatalities), and second, the flight MH17 by the same company in July 2014, that is still under investigation, having been most likely a victim of a terrorist attack while flying over Ukraine (298 fatalities) (Kalemba and Campa-Planas, 2017).

Safety and its standards have always been one of the biggest priorities of the airline sector, playing an indispensable role in the day by day of the airlines. Its improvement has become a topic of growing interest in the operation's management field (Liou et al. 2008; McFadden & Hosmane 2001), considering the main goal of the airline sector that is to guarantee the future viability of the airlines, reducing constantly the number of accidents and incidents (Shapell et al., 2007; Liao 2015). Obviously, one of the explanatory components that contributed to the improvement of safety issues were the continuous changes in technology of aircraft and engines (Dionne et al., 1997; Oster Jr. et al. 2013). But also, initiatives undertaken by the governments and the airline industry made possible the improvement of airline safety operations during the last decades, as for instance through supporting regulation systems and the investigation of accident causes in the airline industry (Stolzer and Goglia 2015).

It is especially since the deregulation in 1978 that airline companies had to deal with the increased pressure and competitiveness, fact that lead initially to the reduction of investments in safety related issues for reducing costs (Moses and Savage, 1990; Talley, 1992; Rhoades and Waguespack, 1999). Consequently, the fear was that those conditions would affect negatively the safety procedures and at the same time generate a decrease of profits inciting the airlines to scrimp and save on maintenance related matters (Morrison and Winston, 1995).

Nevertheless, and although safety in the airline sector has generally become a topic of high interest, only few authors have investigated, especially in recent years, the impact of safety issues on the airlines' profitability (Golbe 1986; Rose 1990; Dionne et al. (1997); Raghavan and Rhoades 2005; Madsen 2013; Oster et al. (2013)). Due to this fact and having found the gap of very low attention of empirical research in the reviewed literature about the relationship of safety and performance, especially at the European level, the main objectives of this paper are set. First to determine and to analyze the influence of safety on the profitability, as well as of safety on revenues volume of the airline companies, but also considering other airline related influential factors and variables.

The paper is structured as follows. Initially, a conceptual framework and literature review is given. Section 3 describes the established research hypotheses. Section 4 gives information about the methodology applied for carrying out this study, while section 5 introduces the reader to and interprets the estimation results. Finally, the last section gives an overview about the concluding remarks, key findings, and possible research limitations and suggestions for future research lines.

2. Theoretical framework and literature review

2.1. Safety definitions and measurement

Since there exist a multitude of approaches to safety, in many cases literature about aviation safety has been related to engineering and technology (Oster et al. 2013), Kalemba and Campa-Planas (2017) outlined in their study based on a safety related systematic literature review, important aspects that provide information about this concept. In most of the cases safety was put into relation with terms as safety management, aircraft accidents and incidents.

Safety has always been an important matter and has improved especially since the era of the deregulation act in 1978 in the United States (De Jager 1993). Fatality rates have decreased under deregulation (Dempsey and Goetz 1992) and per Alfred Kahn, who is known as the "father of deregulation", air safety was much higher than before deregulation; consequence of aspects as the competition between airlines, air traffic and airport controls (Kahn 2002), as well as the improved technology and advances in system infrastructures (Raghavan and Rhoades 2005).

Several authors mentioned the need of investments in new safety technologies, preventive measures of maintenance, training programs and the improvement of the work conditions of pilots to decrease possible human errors (Wang et al. 2013; Rose 1990).

Safety in the airline industry is basically defined as the number of accidents (Rose, 1990; Raghavan and Rhoades 2005). However, Rose (1990) highlights also the importance of considering other aspects as the level of maintenance expenditure, operating procedures and the training of employees.

The International Civil Aviation Organization (ICAO 2001; Huang 2009) defines safety as a situation where the possibility of harm or loss of persons or properties is reduced and maintained at a low level through a continuous analysis of risks and hazard identification.

Conforming AERTEC (2013), three criteria should be contemplated to define safety. Firstly, to evaluate and detect risks to keep them at an acceptable low level; secondly, to inquire incidents for being proactive and making preventive and accurate decisions and, finally, to define safety levels and its correspondent indicators and variables that allow to measure and follow-up the safety level.

At the moment of measuring safety, there are basically there three aspects that must be considered after reviewing the literature: Accidents, incidents and operational problems. The ICAO (2011) examines accident rates as a primary indicator of total safety in the global air transport sector.

Roelen and Klompstra (2012) state that the measurement of safety has been a highly-discussed topic during the last decades. Although safety is a "good business" (Madsen, 2013), literature (Amalberti 2001; Lofquist 2010) points out that measuring safety is a very complex process as mostly only accident rates are used as a proxy of measurement (Rose 1990; Roelen and Klompstra 2012; Liou et al. 2007; Oster et al. 2013), being those related to everything that has to do with aircraft accidents, collisions, events that cause deaths or serious incidents of persons and where the aircraft receives essential damage. Incident rates are only used as an alternative of measuring safety performance (Rose 1990).

This excessive focus on accidents makes it certainly difficult to determine if an airline company is safe or not, as in these cases neither any weighting of the cause of accident is included nor any other criteria is considered. Obviously, the fact that, in general exists a very high safety level in the air transportation industry, and consequently a low number of incidents and accidents occur (Lofquist 2010), makes it so complicated to measure safety as an objective and measurable indicator. This, in turn, leads to a low advice of future trends (Liou et al. 2007).

Another problem is that each organization defines and reports safety differently. (Vasigh et al. 2013). And, moreover, Rose (1990), for instance, states that the direct driver of safety performance is airlines' input into safety related activities. Firstly, maintenance, that should be scheduled more frequently for reducing the probability of failures. Secondly, the implementation of training programs to make sure the decrease of human failures, and, thirdly, more advanced technology for improving safety over time.

So, there exist basically two main problems related to the question how to measure safety. The first one, how is it possible to add up the number of accidents and incidents? Secondly, the lack of transparency of the maintenance expenditures by the airlines makes it difficult to get an insight into that aspect. On one hand because the airline companies itself do not offer data and, on the other hand, because the maintenance costs are included in the wet lease agreement, making it difficult to disassemble the expenditures in the companies that use this kind of fleet policy.

The number of indexes showing how to measure safety in the air transportation business is very scanty. Basically, there are two publicly available indexes, namely the JACDEC safety index and the Airline Ratings system (Airline Ratings 2014).

In this study, we will make exclusively use of the JACDEC safety index, as it is the only publicly available index that considers different elements that are weighted and aggregated into one final number.

This database, standing for *Jet Airliner Crash Data Evaluation Center* and developed by Jan-Arwed Richter and Christian Wolf, provides an overview of the following three main sections (Richter 2014):

- Hull loss accidents: When an aircraft is damaged beyond economical repair or completely missed.
- Serious incidents: High probability of an accident (ICAO 2014).
- Significant incidents: Being on the brink of a serious incident.

The JACDEC index rating started in 2003, records both, total losses and serious incidents, although according to Richter (2014), obviously, a total loss counts much more related to the final results than a serious incident. The available data between the years 2011-2015 have been rated in different ways, as the index and its calculation formula were gradually influenced by different criteria during the years on the search for official and valid safety calculation resources on a global level; results during the 5 years are standardized and data is therefore comparable.

The index establishes a yearly overall ranking of those 60 airlines worldwide with the best results and shows the relationship between the accident rate and the flight performance of an airline. Furthermore, it considers about 1,000 flight operators and includes the last 30 years of total losses and significant accidents. For the calculation of the index, there are eight weighted and aggregated elements that play a significant role (JACDEC 2014):

- Annual Revenue Passengers Kilometers (RPKs): Cumulative RPKs are used.
- Fatalities: Total number of fatalities.
- Number of Total Losses: Refers to the before mentioned hull loss accidents.
- Number of Serious Incidents: Event where an accident has narrowly been avoided.
- Accident-Free Years: Refers to the number of years without hull losses; the more accident free years an airline has, the better will be the result of the index.
- IOSA Membership: Refers to the IATA Operational Safety Audit, included in 2005, although this calculation has a very low impact of weight.
- The Time Factor: In 2010 it has been included an "exponential moving average", therefore, the longer ago the accident has occurred, the lower will be the impact on the index.

- Country Transparency: Factor introduced in 2013 including 3 levels of country transparency; level 1 with the highest transparency of information statements, level 3 with the lowest transparency.

In conclusion, if an airline persists during the established period without any aircraft loss or incident, and considering the before mentioned aspects, an airline company would reach the optimum value of 0.000. According to Richter (2014) it is currently the tool that best represents the so complex matter safety and therefore we decided to use the index for this study. Especially, in this highly-specialized environment, where safety does not arise only from the reliable technology, and considering that it must be developed, lived and respected consistently (Just 2014), it is a big challenge to obtain a dependable safety index.

2.2. Relationship between safety and profitability

Another approach of this study has been the safety-profitability link in the airline business. Two studies published by Madsen (2013) and Oster et al. (2013), already carried out literature reviews about what has been said in relation to the safety-profitability link in the airline industry. However, the absolute value of literature existing on this topic is very scanty and obsolete, referring to the 1990s. The authors include three different possibilities of relationships.

Possibility 1: Safety is positively linked to profitability in the airline industry.

> The authors mention Rose (1990) who examined a positive relationship between safety and profitability.

Possibility 2: Safety is negatively linked to profitability in the airline industry.

> Contrary to this, Dionne et al. (1997) and Raghavan and Rhoades (2005) showed results with a negative safety-profitability link, being in both studies stronger in the case of smaller airlines.

Possibility 3: There does not exist any relationship between safety and profitability in the airline industry.

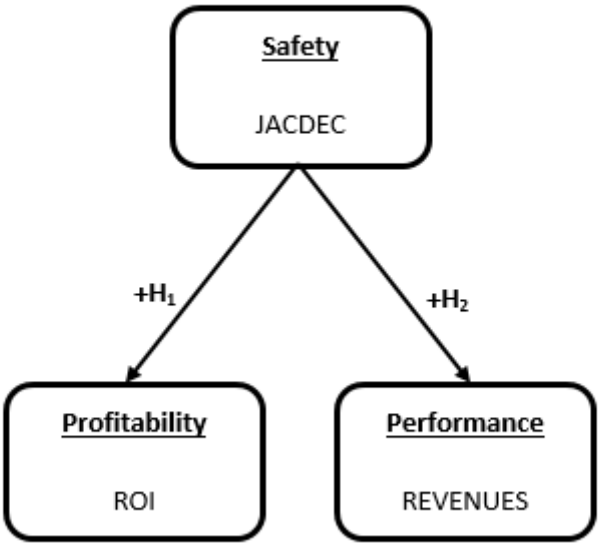
> Other analyses that demonstrated that there does not exist any relationship or statistical significance between both concepts, neither positive nor negative, were shown by Golbe (1986).

In general, only few studies (Golbe 1986; Rose 1990; Dionne et al. (1997); Raghavan and Rhoades 2005; Madsen 2013; Oster et al. (2013)) have addressed the effect that safety can have on profitability in the air transportation sector. In all of them accidents rates have been used as a proxy for the safety concept. Another existent gap of literature is the fact that all the mentioned literature has been carried out based only on the US airline sector, not at a global level, as we do in this study.

3. Research hypotheses

Different hypotheses were proposed to answer the research questions of this paper, according to the established approaches and objectives and the reviewed literature (see figure 2).

Figure 2. Conceptual model established through hypotheses



Source: Created by the authors

Hypothesis 1. Airline safety affects positively the profitability of airline companies.

As previously mentioned, several authors have already studied the effect of airline safety on the profitability of airlines, nevertheless there is not any clear statement and opinions are deeply divided on this issue and the way of measuring safety. Our hypothesis agrees with Rose (1990) who demonstrated that safety is positively linked with profitability in the airline industry. Literature on this issue is obsolete and limited.

Hypothesis 2. Airline safety affects positively the revenues of airline companies.

It does not exist any literature based on this issue. Our hypothesis is that safety can positively influence the revenues of airline companies.

4. Methodology

4.1. Sources of information

Different typologies of sources of information have been used. First, for the JACDEC safety index, it has been used secondary publicly available data from the

safety own web page, as well as the German aviation magazine Aero International that offers once a year the final ranking of the 60 airlines with the best safety related results.

Second, for the financial data and operating metrics of the airline companies, source data were taken from the Thomson Reuters *Eikon* (2016) database, enabling to reflect therefore a 5-year time series. *Eikon* offers a real-time market data and was launched in 2010.

4.2. Sample collection

For both sources, we considered longitudinal time-series data from 2011 to 2015. The hypotheses developed previously were tested on a sample of international airline companies where only those airlines, where the JACDEC index was available at least for 4 out of 5 years, were considered. The final unit of analysis included in the study was n=45 airlines. Although the sample of 45 airlines could seem to be small, they represent in terms of total revenues more than the 70% over the total revenues of commercial airlines worldwide in 2016 (IATA 2015).

4.3. Measurement of variables and model description

The established statistical models include three different types of variables; dependent, independent and control variables.

- Dependent variables: The purpose of this study was to examine the influence of safety on profitability and revenues of the airline companies. Financial ratios are fundamental for analyzing the financial statement and used to determine the profitability of the companies (Stepanyan 2014). They are a key factor of contribution to the survival of the airlines (Oum and Yu 1998).

  Therefore, this study includes in the first model as main dependent variable ROI, being the acronym of Return On Investment that refers to the performance of an investment and calculated through the quotient between the earnings before interest and taxes (EBIT) and the total assets of the company. Another possibility would be to include the ROE (Return on Equity), taking therefore into consideration the financial structure of the company. As we are analyzing the operational performance, ROI covers much better our objective of measuring exclusively business performance (Jacobson, 1987). The second model includes REVENUES used as dependent variables for performance measures.

- Independent variable: Both models include as independent variable safety (JACDEC index – see explanation point 2.1.).

- Control variable: We introduced in both cases as control variable the logarithmic number of passengers, logPAX, being the number of passengers carried by the companies. This essential KPI in the airline industry is also important for the representation of others, as the Revenue per Passenger, that represents the average income per passenger, as well as the Revenue Passenger Kilometer or yield (RPK), that stands for each flown kilometer, paid by each passenger.
  For the robustness check we will consider the variable FLEET, being the number of planes per Airline Company.

A panel data methodology with an over time series of longitudinal data has been used during the estimation process. The established model gives the possibility to observe a multitude of individuals over a period; specifically, it allows including both fixed and random effects.

The introduction of random effects admits considering unobserved heterogeneity of individuals, being in this case represented through the constant variable β_{0i}.

5. Results

All statistical analyses were carried out through the program R, version 3.3.3 (R Development Core Tea 2016), for providing results to the formulated research questions at the beginning. Tables 1 and 2 provide descriptive statistics and the correlation matrix, respectively, considering the variables used in this study.

It can be observed that the correlation between safety (JACDEC) and the other variables, besides the load factor, is not very high. Also, important to mention the positive average of the ROI, fact that means that during the considered period of time the profitability of the airline companies has been beneficial.

Table 1. Descriptive statistics

Variables	Min	Max	Mean	Sd
JACDEC	0.005	1.298	0.175	0.268
PAX	5.30	144.57	44.60	31.746
ASK	4,245	427,532	107,830	86,911.61
LF	0.658	0.926	0.796	0.049
FLEET	39	1,549	276.2	244.712
ROI	-0.226	0.195	0.028	0.066
REVENUES	2.12	36.95	9.11	7.778

Table 2. Correlation matrix

Variables	JACDEC	PAX	ASK	LF	FLEET	ROI	REVENUES
JACDEC	1						
PAX	-.120	1					
ASK	-.165	.704	1				
LF	-.420	.181	.053	1			
FLEET	-.160	.816	.779	.224	1		
ROI	-.130	.194	.074	.183	.105	1	
REVENUES	-.217	.728	.765	.121	.791	.132	1

As table 2 shows, the correlation between size variables PAX, ASK and FLEET is very high, reason that has led us consequently to take the decision of using only one size variable in each of the established specification models. This allows avoiding any multicollinearity between the independent variables.

The analysis has been built on 2 models, determining the influence of safety on the profitability of the airline companies (model 1) and on the airlines' revenues (2).

The specifications for the models used, are as follows:

Model 1:

$$ROI_{it} = \beta_{0i} + \beta_{21} JACDEC_{it-1} + \beta_{22} \text{Load Factor}_{it} + \beta_{23} SIZE_{it} + \varepsilon_{it}$$

Model 2:

$$REVENUES_{it} = \beta_{0i} + \beta_{31} JACDEC_{it-1} + \beta_{32} \text{Load Factor}_{it} + \beta_{33} SIZE_{it} + \varepsilon_{it}$$

A panel data methodology has been used during the estimation process. In order to respond to our proposed hypotheses, we decided to run two regressions, one for each of the dependent variables, ROI and REVENUES, respectively. Statistics for models 1 and 2 (table 3) show a positive effect of size on both ROI and REVENUES, measured through the logarithmic number of passengers (logPAX) (β=.022; $p<0.01$ and β=7.216; $p<0.001$, respectively).

Additionally, there does not exist any significant effect of safety on profitability (ROI) of the airline companies, fact that matches with the results given by Golbe (1986) who demonstrated in her study that there does not exist any relationship or statistical significance between both concepts, neither positive nor negative.

Therefore, the established hypothesis H1 is not supported (β=-.023, $p>0.05$).

While safety does not have any significant effect on the airlines' ROI, it does so on the airlines' revenues, therefore hypothesis H2 is supported (β=-5.456, p<0.01).

It is important to mention that we made use of the JACDEC index it-1, as we guess that a positive safety performance has an outcome on the profitability or revenues of an airline at least one year later.

Furthermore, Hausman and F tests have been conducted to determine the choice between pooling, fixed or random effects models.

Table 3. Estimation models 1 and 2

	Model 1		**Model 2**	
Variables	**Dependent variable: ROI**		**Dependent variable: REVENUES**	
	β	t	β	t
Intercept	-.494**	-3.013	-107.747***	-8.439
$JACDEC_{it-1}$	-.023	-.936	-5.456**	-2.870
Load $factor_{it}$	.169	1.304	-9.198	-.910
Size $(logPAX)_{it}$	.022**	2.842	7.216***	11.803
Hausman test	4.167		1.935	
Adjusted R^2	.073		.517	
F	4.719**		51.238***	

Beta weights and t-values are given.

***p<0.001; **p<0.01; *p<0.05

Afterwards, robustness checks have been carried out to confirm whether our findings in relation to the effect of safety on the profitability and performance of the airlines are robust to alternative specifications of the established models. Results are reported in table 4, where the size variable logPAX is substituted by FLEET as a size variable.

No significant effect is seen of safety on profitability (β=-1.004e-02; p>0.05), therefore the rejection of our hypothesis H1 can be confirmed.

On the other hand, the robustness check of model 2 confirms the significant effect of safety on REVENUES (β=-17.946; p<0.05), as well as of size on REVENUES, measured through the variable FLEET (β=0.026; p<0.001).

Table 4. Estimation models 1 and 2: Robustness check

	Robustness check Model 1		**Robustness check Model 2**	
Variables	**Dependent variable: ROI**		**Dependent variable: REVENUES**	
	β	t	β	t
Intercept	-2.177e-01	-1.819	-17.326*	2.191
$JACDEC_{it-1}$	-1.004e-02	-.377	-4.146*	-2.356
Load $factor_{it}$	2.949e-01	1.988	-17.946	-1.832
Size $(FLEET)_{it}$	3.133e-05	1.285	0.026***	15.944
Hausman test	2.673		29.779***	
Adjusted R^2	.044		.664	
F	3.095*		91.340***	

Beta weights and t-values are given.

***p<0.001; **p<0.01; *p<0.05

6. Conclusions

Since the Airline Deregulation Act of 1978, safety in the commercial airline industry has become of high interest for the public and policy makers, being a highly-discussed topic (Rose 1992; Kahn 2002). As safety is a key element in the air transportation sector, and at the same time a very complex matter, the industry is faced to a multitude of challenges that are necessary to consider for being able to maintain their level of safety being essential for the future growth of the companies.

Economically, there can be consequences to the airline companies, as each accident or incident can have negative influences on the passengers which will handle flying indifferently and therefore, due to the reduction in demand, revenues of the airline industry decrease (Blalock et al. 2007).

However, after decades of significant safety improvements, it is verified that passenger fatalities have decreased significantly during the last decades, while the number of passengers has increased constantly (World Bank 2015; ICAO 2015).

The literature that has been reviewed about safety has shown a meaningful gap. Firstly, only a few number of papers have been found in relation to the effect that safety has on airline management and results. In relation to current research, there do not exist any recent papers that consider the influence of safety on the profitability or performance of the airlines.

Therefore, this study examined the interplay and outcomes between different factors, as safety, size, profitability and performance of airlines.

For the analysis carried out, the JACDEC safety index has been used, as well as the operating metrics of each of the airlines and financial key performance indicators, considering the 2011-2015 period.

The provided results show a significant effect of both, size and safety on airlines' revenues; while a non-significant effect is given by safety on the airlines' profitability.

6.1. Potential Limitations in the study

This study has some limitations to consider. As stated previously, there are some restrictions that make it so complex to find the right way of measuring airline safety and therefore to obtain a result of the true safety performance of airline companies. This is a general restriction for any study related to the measurement of safety in the airline industry, as airline safety rankings are highly criticized. Skytrax (2016) for example, being a reference regarding airline and airport reviews, states that they do not make any use of a comparative safety rating. They suggest, that there is not any correct way of measuring safety for giving reliable information to the passengers. As we could see, the JACDEC index shows also a lack of information,

as it is not 100% clear in its web how the index is built up. Even so, the JACDEC safety index is the index that nowadays better represents the safety matter (Richter 2014), and there does not exist any other safety index that could offer publicly and homogenous available information.

Another limitation in this study is given through the restriction to a certain number of airline companies and the period considered, due to the restraint of data available, as well as the fact, that in this study have been included only airline companies which are ranked among the top 60 in relation to their level of safety, fact that makes it difficult to offer a higher sample rate and therefore a better statistical outcome.

6.2. Further research

Altogether and despite the mentioned limitations, this article provides an insight for managerial implications as well as for the operations of airline companies. Nevertheless, there are still some lines of enquiry that could be established for future research.

Firstly, it would be highly recommendable to have access to a greater sample of data for offering a much more representative sample as well as consequently to include other essential KPIs related to the airline industry, as for instance the types and age of aircrafts, pilots and their workload, maintenance or training costs or operating procedures, between others.

Secondly, it could be very interesting, when analyzing safety and its possible influences on profitability and revenues, to distinguish between the safety level of the different types of airlines, as small and medium size carriers, as well as to take into consideration the difference between Low Cost and Full Cost Carriers.

Likewise, considering that safety is one of the top priorities of the airline companies additionally to the quality that should be offered to the customers, it would be interesting to study the safety-quality link. Both concepts are indispensables in the context of the airline industry. Therefore, it could be useful to see the interrelationship between both elements.

Finally, for further research lines aspects as overflown countries and number of operations by airports could be considered at the same time as putting more focus into cabin safety related issues and terms as human factors.

7. References

AERTEC: Seguridad aeroportuaria: Safety & Security. Por: José Antonio Poyato Moreira, www.aertecsolutions.com (2013). Accessed 25 June 2017.

Airline Ratings: www.airlineratings.com (2014). Accessed 2 March 2017.

Air Transport Action Group (ATAG): www.atag.org (2014). Accessed 14 March 2017.

Amalberti R.: The paradoxes of almost totally safe transportation systems. Safety Science, vol. 37, pp. 109-126 (2001),

Arhall, J. and Cox, E.: Key Performance Indicators for SAS Flights, Linköping University 2013 (2013).

Asociación Española de Contabilidad y Administración de Empresas AECA: Comisión de Contabilidad de Gestión. La Contabilidad de Gestión en las Empresas de Transporte Aéreo. AECA. Madrid (2011).

Barnett A.: Aviation Safety and Security. In: Belobaba, P., Odoni, A. and Barnhart, C. (2009). The Global Airline Industry. John Wiley and Sons, 2009 (2009).

Belobaba, P., Odoni, A. and Barnhart, C.: The Global Airline Industry. John Wiley and Sons, 2009 (2009).

Bhadra D.: Choice of Aircraft Fleets in the U.S. Domestic Scheduled Air Transportation System: Findings from a Multinomial Logit Analysis. Journal of the Transportation Research Forum, vol. 44 (3), pp. 143-162 (2005).

Blalock, G., Kadiyali, V. and Simon, D.H.: The impact of post-9/11 airport security measures on the demand for air travel. Journal of Law and Economics, Vol. 50 (4), pp. 731-755 (2007).

Boeing Mediaroom. www.boeing.mediaroom.com (2016). Accessed 12 June 2017.

Campa-Planas, F., Kalemba, N., Banchieri, L.C. and Magaz-Pérez, J.: Management information used by Spanish Airlines for the financial decision making process: an exploratory study. Journal of Investment and Financial Innovations, vol. 13 Issue 3 (2016).

De Jager W.C.: The Effects of Airline Deregulation on Airline Safety: An Econometric Analysis. Dissertations and Theses. Paper 1297 (1993).

Dempsey, P.S. and Goetz, A.R.: Airline Deregulation and Laissez-Faire Mythology. Quorum Books (1992).

Dionne, G., Gagné, R., Gagnon, F. and Vanasse, C.: Debt, moral hazard and airline safety. An empirical evidence. Journal of Econometrics, Vol. 79, pp. 379-402 (1997).

EASA Annual Safety Review 2014: European Aviation Safety Agency, 2015

(2015).

Golbe, D.: Safety and Profits in the Airline Industry. The Journal of Industrial Economics, Vol. 34 (3), pp. 305-318 (1986).

Huang J.: Aviation Safety and ICAO. Universiteit Leiden, 2009 (2009).

International Air Transport Association (IATA): www.iata.org (2014 & 2015). Accessed 21 June 2017.

ICAO International Civil Aviation Organization: Working paper: Determination of a Definition of Aviation Safety, 2001 (2001).

ICAO International Civil Aviation Organization: Situación de la seguridad operacional de la aviación mundial. Information Paper, 2011 (2011).

ICAO International Civil Aviation Organization. Second high-level safety conference 2015 (HLSC 2015) planning for global aviation safety improvement. Information Paper, 2014 (2014).

International Civil Aviation Organization. ICAO. Safety Report 2015 Edition (2015).

JACDEC: www.jacdec.de (2014). Accessed 24 June 2017.

Jacobson, R.: The validity of ROI as a measure of business performance. The American Economic Review, vol. 77 (3) pp. 470-478 (1987).

Janić, M.: Air Transport system analysis and modelling. Capacity, Quality of Services and Economics. Transportation Studies Volume 16 (2000).

Just, O.: Vorwort. In: Richter, J.A. and Wolf, C. (2014), Mayday, Feuer an Bord. Schwarze Tage der Luftfahrt, GeraMond (2014).

Kahn A.: Airline deregulation. The Concise Encyclopedia of Economics. Library Economics Liberty. www.econlib.org (2002). Accessed 15 January 2017.

Kalemba, N. and Campa-Planas, F.: Safety as a management concept in the air transport sector: A systematic literature review: Intangible Capital, vol. 13 (1), pp. 71-93 (2017).

Kelemen, Z.: Latest information technology development in the airline industry. Periodica Polytechnica Ser. Transp. Eng., Vol. 31 (1-2), pp. 45-52 (2003).

Kumar, K.B., Rajan, R.G. and Zingales, L.: What determines firm size?. NBER Working Paper No. 7208 (1999).

Le, S.A., Walters, B. and Kroll, M.: The moderating effects of external monitors on the relationship between R&D spending and firm performance. Journal of Business Research, Vol. 59 (2), pp. 278-287 (2006).

Liao, M.Y.: Safety Culture in commercial aviation: Differences in perspective between Chinese and Western pilots. Safety Science, Vol. 79, pp. 193-205 (2015).

Liou, J.J.H, Tzeng, G.H. and Chang, H.C.: Airline safety measurement using a hybrid model. Journal of Air Transport Management, Vol. 13, pp. 243-249 (2007).

Liou, J.J.H., Yen, L. and Tzeng, G.H.: Building an effective safety management system for airlines. Journal of Air Transport Management, Vol. 14 (1), pp. 20-26 (2008).

Lofquist E.A.: The art of measuring nothing: The paradox of measuring safety in a changing civil aviation industry using traditional safety metrics. Safety Science, vol. 48 (10), pp. 1520-1529 (2010).

Madsen, P.M.: Perils and Profits: A reexamination of the link between profitability and safety in U.S. Aviation. Journal of Management, Vol. 39 (3), pp. 763-791 (2013).

Massachusetts Institute of Technology Global Airline Industry Program: Airline Data Project, MIT (2014). http://web.mit.edu/airlinedata/www/default.html. Accessed 15 June 2017

McFadden, K. L. and Hosmane, B.S.: Operations safety: an assessment of a commercial aviation safety program. Journal of Operations Management, 19, 579-591 (2001).

Miller, T., Douglass, J. and Pindus, N.: Road injury: Causes, costs, and comparisons with other transport modes. Journal of Safety Research, Vol. 25 (4), pp. 183-195 (1994).

Morrison, S. A. and Winston, C. The Evolution of the Airline Industry. The Bookings Institution, Washington D.C. (1995).

Moses, L.N. and Savage, I. Aviation deregulation and safety: Theory and Evidence. Journal of Transport Economics and Policy, pp. 171-188. (1990).

Oster Jr., C.V., Strong, J.S. and Zorn, C.K.: Analyzing aviation safety: Problems, challenges, opportunities. Research in Transportation Economics, 43, pp. 148-164 (2013).

Oum, T.H. and Yu, C.: An analysis of profitability of the world's major airlines. Journal of Air Transport Management, Vol. 4, pp. 229-237 (1998).

Pacheco, R.R., Fernandes, E. and Domingos, E.M.: Airport airside safety index. Journal of Air Transport Management, Vol. 34, pp. 86-92 (2014).

Pai V.: On the factors that affect airline flight frequency and aircraft size. Journal of Air Transport Management, vol. 16 (4), pp. 169-177 (2010).

Parmenter, D.: Key Performance Indicators. John Wiley and Sons, Ed, 2007 (2007).

Pettersen, K.A. and Bjørnskau, T.: Organizational contradictions between safety and security – Perceived challenges and ways of integrating critical infrastructure protection in civil aviation. Safety Science, Vol. 71, pp. 167-177 (2015).

Pitfield, D.E., Caves, R.E. and Quddus, M.A.: Airline strategies for aircraft size and airline frequency with changing demand and competition: A simultaneous-equations approach for traffic on the north Atlantic. Journal of Air Transport Management, vol. 16 (3), pp. 151-158 (2010).

Raghavan, S. and Rhoades, D.L.: Revisiting the relationship between profitability and air carrier safety in the US airline industry. Journal of Air Transport Management, Vol. 11, pp. 283-290 (2005).

R Development Core Team R: A language and environment for statistical computing. Vienna, Austria: R Foundation for Statistical Computing, retrieved from http//:www.R-project-org (2016).

Rhoades, D. L. and Waguespack Jr, B.: Better safe than service? The relationship between service and safety quality in the US airline industry. Managing Service Quality, Vol. 9, Number 6, pp. 396-400 (1999).

Richter, J.A.: The JACDEC Data Base. User Guide Explanations and Definitions. JACDEC Gbr, 2014 (2014).

Roelen, A.L.C. and Klompstra, M.B.: The challenges in defining aviation safety performance indicators. Preprint for PSAM 11 & ESREL 2012, 25-29 June 2012, Helsinki, Finland (2012).

Rose, N.L.: Profitability and product quality: Economic determinants of airline safety performance. Journal of Political Economy, Vol. 98, pp. 944-964 (1990).

Rose, N.L.: Fear of flying? Economic Analysis of Airline Safety. Journal of Economic Perspectives, pp. 75-94 (1992).

Scopus: www.scopus.com (2016). Accessed 19 February 2017.

Shappell, S., Detwiler, C., Holcomb, K., Hackworth, C., Boquet, A. and Wiegmann, D. A.: Human error and Commercial Aviation Accidents: An Analysis Using the Human Factors Analysis and Classification System. Human Factors, Vol. 49 (2), pp. 227-242 (2007).

Skytrax: www.airlinequality.com (2016). Accessed 22 February 2017.

Stepanyan, A.: Traditional Ratio Analysis in the Airline Business: A Case Study of Leading U.S Carriers. International Journal of Advances in Management and Economics, Vol. 3 (2), pp. 175-189 (2014).

Stolzer A.J. and Goglia J.J.: Safety Management Systems in Aviation, Second Edition, Ashgate (2015).

Talley, W. K.: The Impact of Deregulation on Airline Safety: Profit-Safety and Market-Response Arguments. International Conference Series on Competition and Ownership in Land Passenger Transport (1992).

Thomson Reuters, Eikon database, retrieved from http//:customers.thomsonreuters.com/eikon/? (2016). Accessed February 2017.

Tremblay, V. J. and Tremblay C. H.: Industry and Firm Studies, 4th edition, M.E. Sharpe, Inc (2007).

Vasigh, B., Tacker, T. and Fleming, K.: Introduction to Air Transport Economics: From Theory to Applications. Burlington, VT: Ashgate. 2013 (2013).

Wang, Z., Hofer, C. and Dresner, M.: Financial condition, safety investment and accident propensity in the US airline industry: A structural analysis. Transportation Research Part E: Logistics and Transportation Review, Vol. 49 (1), pp. 24-32 (2013).

Web of Science, www.webofknowledge.com (2016). Accessed 22 February 2017.

Wei, W. and Hansen, M.: Impact of aircraft size and seat availability on airlines' demand and market share in duopoly markets. Transportation Research Part E: Logistics and Transportation Review, Vol. 41 (4), pp. 315-327 (2005).

Wei, W. and Hansen, M.: Airlines' competition in aircraft size and service frequency in duopoly markets. Transportation Research Part E: Logistics and Transportation Review, vol. 43 (4), pp. 409-424 (2007).

World Bank: www.datos.bancomundial.org (2015). Accessed 21 March 2017.

World Health Organization: Global Status Report on Road Safety, WHO 2015 (2015).

5

CHAPTER FIVE
CONCLUSIONS, IMPLICATIONS, LIMITATIONS AND FURTHER RESEARCH LINES

UNIVERSITAT ROVIRA I VIRGILI
QUALITY AND SAFETY IN THE AIRLINE INDUSTRY AND THEIR INFLUENCE ON COMPANY PROFITABILITY
Nicole Kalemba

This concluding chapter presents the results obtained from the doctoral thesis, discusses the main findings and identifies potential limitations, as well as highlighting possible additional research lines.

5.1. Discussion and Conclusions

The response to the reasons that justified the need for this thesis, namely, the requirement to understand the consequences and impact of quality and safety on airline company profitability, has been provided through a compendium of six academic papers that, furthermore, present the answers to the research questions posed and deal with existing gaps in the literature. The papers have already been published or are currently being subjected to an advanced revision process, with the main aim of providing an insight into important elements that should be considered in the management and success of the airline business. Therefore, the thesis focused especially on quality and safety in the airline industry and their influence on company profitability.

Chapter One introduces the main objectives of this thesis and provides an overview concerning the scenarios under which the airline companies are currently developing their activities.

The open skies policies and additional factors that have had an important impact on the airline industry, such as the introduction of LCCs and their competition with traditional air carriers, the construction of new infrastructures and the introduction of “new competitors” (e.g. the high-speed train), have contributed to the development of a competitive environment in this business.

Consequently, to increase the understanding in this research area, Chapter Two discusses the essential KPIs and the importance of management accounting in the airline business in order to lay the foundation for subsequent chapters, and identify the key indicators that need to be taken into account.

Therefore, Chapter Two deals with an exploratory study related to the KPIs in the airline industry (paper A) carried out to contextualize the need for KPIs in the airline business and to analyze the management information used, in this case, by

the leading Spanish airline companies. The main aim was to examine the degree of strategic planning, define the budgeting methods, explain the procedures used to compare between a budget and actuality, determine the frequency of budgeting and, in particular, to answer the first research question "What are the most applied and relevant Key Performance Indicators used in the Air Transportation Industry?".

A questionnaire based on a previous literature review was used to obtain an overview of the most important KPIs applied in this business. The results showed that the six leading Spanish airline companies, according to the number of transported passengers, had a high level of implementation and follow-up for the main management indicators. Many of the indicators, such as ASKs, RPKs, revenues per RPK and per ASK, were budgeted monthly by 4 of the 6 airline companies but the remaining two companies budgeted on a daily basis. Important management indicators, such as the number of PAX or the average stage length, were budgeted daily. In relation to the economic management indicators, the outcome presented was unanimous when budgeting for important and common indicators in the airline business, such as EBITDAR and EBITDA, which occurred on a monthly basis in the case of all six airline companies.

In conclusion, the results showed that all airlines considered management accounting as a necessary tool to support the decision-making process.

Since it is essential in the highly competitive environment of the air transportation sector for airlines to offer both high quality and high safety standards to the customers, Chapters Three and Four focus especially on these aspects within the airline business. Therefore, the studies reflected in papers B to F aimed to respond to research questions 2 to 5 and provide an insight into the importance of quality and safety in the airline business and their influence on the economic profitability of the airline companies.

Thus, in Chapter Three, based on a literature review concerning quality in the airline industry (Paper B), a gap was detected because no similar academic study existed that offered an overview of the importance of quality in this business.

Therefore, the review analyzed the evolution of publications related to this research field and the existing relationships between quality-related variables.

The main conclusions drawn from the systematic literature review concerning what had been published about quality in the airline business were as follows:

- The topic has attracted growing interest in recent years, which has resulted in an increase of published academic papers in this research field.
- Fundamental structural changes, as well as the globalization, liberalization and deregulation process in this business, have led especially to a higher competitiveness in the airline market and the consequent need for a high-quality service.
- Given the importance that quality has for some customer segments, the airline companies have been required to emphasize their quality procedures.

Based on the literature review, 16 variables related to quality were summarized as being able to group the results and carry out a network analysis. It was considered that these variables represented the quality concept correctly. The single element of the 16 coded variables that most contributed to the satisfaction and loyalty of the customers was the term “service quality”, when the airline customers’ perceptions surpassed their expectations. Furthermore, as a logical consequence, the strongest ties existed between elements such as “service quality”, “customer satisfaction” and “customer perception and expectation”.

Subsequently, it was decided to develop two research studies (Papers C and D) that provided an insight into the influence of quality on company profitability.

Therefore, the contrasting hypotheses related to the quality-profitability link in the airline business were divided into two analyses. The first analysis considered quality as the average of standardized quality indicators taking into account the ACSI, AQR, J.D. Power Airline Satisfaction index and the NPS, whereas the second analysis for quality focused exclusively on the AQR index.

Chapter V

In the first search, two main research approaches were considered, by analyzing the effects of service quality on the economic profitability on the one hand, and evaluating the quality effect on airline passenger revenues on the other hand. For measuring profitability, the ROI was employed, while passenger revenues were used to measure company activity. Both variables were considered as separate dependent variables during the statistical process. Furthermore, a third approach was established for examining any possible influence of size variables on both the airline profitability and passenger revenues variables.

In the second analysis, the aim was to determine the influence of quality exclusively on company profitability, as represented through the AQR and its four sub factors, since this quality index was the most publicly available, detailed and precise methodology.

Thus, the main conclusions that could be drawn from the research studies of papers C and D, testing the outcomes of service quality on US airline performance, were that quality significantly affected the profitability (ROI) of the airlines in both analysis (see Figure 5-1). Therefore, the established hypotheses were supported, confirming that a higher level of service quality improved the economic profitability of the airline companies.

In the second analysis, by disassembling the AQR index, it was shown that only on-time arrivals, which was one of the sub-factors of the AQR index, had a positive effect on company profitability, whereas the effect of mishandled baggage and customer complaints was significant but negative, and denied boardings had a non-significant effect on profitability.

Contrary to the assumptions and related to the first analysis, there was a non-significant effect of quality on an airline's activity, as measured through passenger revenues, meaning that the established hypothesis was not supported. Therefore, the findings of the research study did not confirm the positive influence of service quality on airline revenues.

In conclusion, the contrasting hypotheses related to the quality-profitability link showed that, although service quality did not directly affect airline incomes, it improved the economic profitability of US airline companies.

Additionally, by considering the control variables included in the research study of the first analysis, it was shown that both load factor and size variables measured as the number of passengers (PAX) and company size, respectively, had a non-significant effect on the profitability of the airline companies, but a positive influence on airline revenues, which had been the anticipated outcome.

In Chapter Four, related to safety and profitability in the airline business, first, a systematic literature review concerning what had already been published about safety in the airline industry was carried out (Paper E). The main conclusions that could be drawn from this SLR were as follows:

- Similar to the already mentioned quality concept, safety was an aspect with a growing interest in the air transportation sector, although to a much lower degree than quality.
- Since no previous literature review paper existed in the academic literature that considered safety was an essential factor in the airline business, an attempt was made to bridge this gap with a systematic literature review to demonstrate that the main concepts related to safety, not security[1], were safety management and aircraft accidents, demonstrating at the same time the highest degree of interaction between each of them.

In order to contrast the hypotheses related to the safety-profitability link in the airline industry (Paper F), the main objective was to analyze any potential relationships between safety, as well as size variables, and the economic and financial performance of the airline companies. Therefore, the research study conducted took into consideration the JACDEC safety index, which is currently the safety index with the most available data that covers a multitude of airline companies.

[1] This distinction was made in paper E due to the dual interpretation in the Spanish language

Chapter V

The results of the research study showed a significant effect of safety and size on the revenues of airline companies, while there was a non-significant effect of safety and size on airline profitability, which were confirmed after a robustness check.

Figure 5-1 presents an overview and summary of the main final results from the research studies of this doctoral thesis.

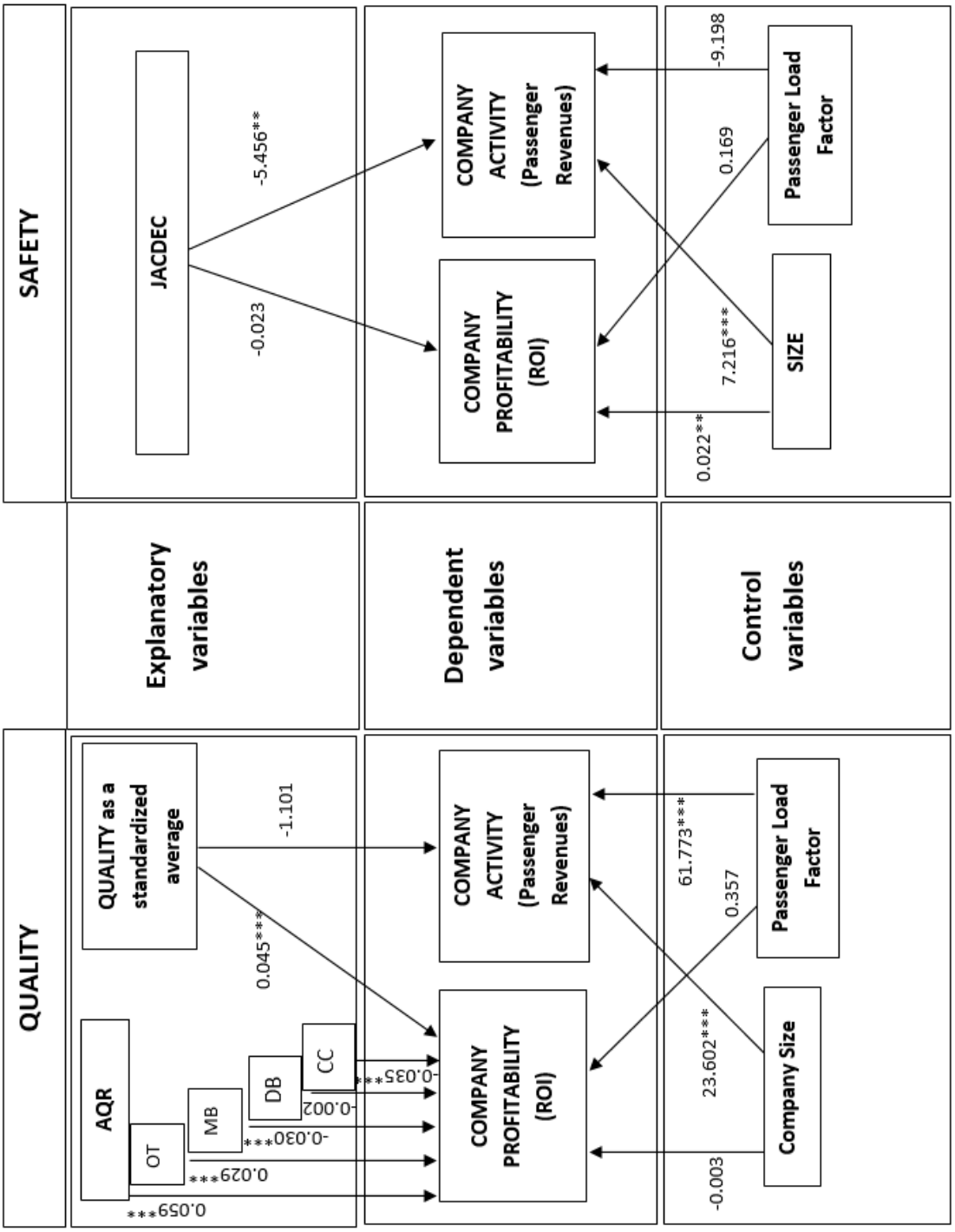


Figure 5-1 Conclusions Summary with results

5.2. Potential Implications

Quality and safety in the air transportation industry represented an important part of the research study of this business. Nevertheless, although they play an outstanding role, different gaps could be found, especially at an academic level. To date, there has been no literature review on this subject and, furthermore, the number of published academic papers concerning safety in the airline industry was even poorer than in the case of quality.

Thus, several potential implications that arose from this doctoral thesis can be highlighted.

Regarding the academic implications, this work makes a decisive contribution to a better understanding of the airline consumers' needs and behavior, since different essential and related variables were considered. Therefore, a comprehensive overview of the literature related to the quality and safety phenomena in the air transportation business was provided for this topic during the study.

This present study also provided a series of practical recommendations for airline management, which are considered in more detail below. However, in general, it can be confirmed that the research studies of the thesis showed that it was fundamental to allow for management accounting, as represented by the decision-making process and planning of crucial tasks within the highly competitive airline industry. In addition, quality and safety were vital elements for an airline company, since they were decisive factors affecting customer behavior and, consequently, success.

The results of the research clearly showed by statistical analysis that a positive relationship existed between the perceived quality and profitability of the airline companies. This, in turn, should encourage airline management to continue improving service quality in their specific companies, since this could lead consequently to a competitive advantage with regard to other airline companies.

Additionally, this thesis contributed to the academic community, especially to researchers within the airline industry, since it provided an insight into the

importance of the airline business and their KPIs, focusing particularly on quality and safety.

5.3. Limitations and Further Research

Although the current studies provide a comprehensive and useful overview of the previously mentioned essential elements in the airline business, together with the importance of management accounting in this industry, the research presented in this thesis had certain limitations, which are discussed in more detail below. Furthermore, potential future research lines are outlined.

One of the main limitations was that most of the studies were based on secondary data, which meant they were limited in some way because of the restriction of accessible data. Thus, the final number of airline companies considered in this study was reduced. By the same token, the AQR index, for example, incorporates only the US airline market in its analysis, and does not allow European airlines to be included. An additional restriction of access to data was that other indexes, for example Skytrax, which is considered a reference in relation to airline and airport reviews, did not authorize the use of their data for research studies, including this doctoral thesis.

It should also be acknowledged that safety is a complex matter to measure, which makes it difficult to compare between companies. Hence, it is complicated to find the right way to measure airline safety and, therefore, to obtain an appropriate result for the safety performance of airline companies.

As far as potential research lines based on this doctoral thesis are concerned, there are several that can be considered further.

First of all, it would be very interesting to extend this thesis by considering other non-US airline companies, especially additional European airlines, in order to expand the findings, both for the exploratory study related to the KPIs and, likewise, the analysis of the quality-profitability link for detecting possible similarities or differences between the research studies conducted, since these were exclusively based on Spanish and US airline companies, respectively.

Additionally, it could be important to distinguish between the different business models, by comparing, for instance, between LCCs and FSNC. As a consequence, it would be necessary to compare between Network companies and Point-to-Point companies using the results from further research. Furthermore, separating business from leisure travelers, as well as making the distinction between different types of airlines (e.g. small or medium size carriers) could add additional value to the research.

Second, the research could be extended to other rating systems in terms of quality, such as Skytrax or Airline Ratings, as these consider different ways for developing their indexes further, or, in the case of safety, to consider other indexes that allow safety to be measured in a more detailed way.

Finally, considering that safety and the quality offered to the customers represent one of the top priorities for airlines, it could be important to focus on the safety-quality link by analyzing their potential interrelationship.

REFERENCES

UNIVERSITAT ROVIRA I VIRGILI
QUALITY AND SAFETY IN THE AIRLINE INDUSTRY AND THEIR INFLUENCE ON COMPANY PROFITABILITY
Nicole Kalemba

References

Acar, A. Z. & Karabulak, S. (2015). Competition between Full Service Network Carriers and Low Cost Carriers in Turkish Airline Market. *11th International Strategic Management Conference 2015*.

Acedo, F. J., Barroso, C., Casanueva, C. and Galán, J.L. (2006). Co-Authorship in Management and Organizational Studies: An Empirical and Network Analysis. *Journal of Management Studies,* 43 (5).

Aero International (2017). Das Online Portal der Zivilluftfahrt. www.aerointernational.de, accessed 15 July 2017.

Aeropuertos Españoles y Navegación Aérea (2015). www.aena.es, last access 12 April 2017.

AERTEC (2013) Seguridad aeroportuaria: Safety & Security. Por: José Antonio Poyato Moreira, www.aertecsolutions.com, last access 25 June 2017.

Air Transport Action Group (2005). The economic and social benefits of air transport, ATAG June 2017.

Air Transport Action Group (2014). Aviation Benefits Beyond Borders. Powering economic growth, employment, trade links, tourism and support for sustainable development through air transport, ATAG April 2014.

Air Transport Action Group (ATAG): www.atag.org (2014), last access 14 March 2017.

Air Transport Action Group (2016). Aviation Benefits Beyond Borders. Powering economic growth, employment, trade links, tourism and support for sustainable development through air transport, ATAG July 2016.

Airline Ratings: www.airlineratings.com (2014), last access 2 March 2017.

Akamavi, R. K., Mohamed, E., Pellmann, K. and Xu, Y. (2015). Key determinants of passenger loyalty in the low-cost airline business. *Tourism Management* 46, pp. 528-545.

Albalate, D., Bel, G. and Fageda, X. (2014). Competition and cooperation between high-speed rail and air transportation services in Europe. *Journal of Transport Geography*, 42, pp. 166-174.

Ali, F., Dey, B. L. and Filieri, R. (2015). An assessment of service quality and resulting customer satisfaction in Pakistan International Airlines. *International Journal of Quality and Reliability Management,* Vol. 32 (5), pp. 486-502.

Alves, H., Fernandes, C. and Raposo, M. (2016). Value co-creation: Concept and contexts of application and study. *Journal of Business Research,* Vol. 69 (5), pp. 1626-1633.

Amalberti R. (2001). The paradoxes of almost totally safe transportation systems. *Safety Science,* Vol. 37, pp. 109-126.

Amat, O. and Campa-Planas, F. (2011). *Contabilidad, control de gestión y finanzas de hoteles*. Profit Editorial I., S.L., Barcelona, 2011.

American Customer Satisfaction Index. (2016), www.theacsi.org, last access 12 March 2017.

An, M. and Noh, Y. (2009). Airline customer satisfaction and loyalty: impact of in-flight service quality. *Journal of Service Business*, Vol. 3; (3), pp. 293-307.

Anderson, E. W. and Mittal, V. (2000). Strengthening the Satisfaction-Profit Chain. *Journal of Service Research*, Vol. 3, No. 2, pp. 107-120.

Archana, R. and Subha, M. V. (2012). A study on service quality and passenger satisfaction on Indian Airlines. *International Journal of Multidisciplinary Research*, Vol.2 Issue 2, pp. 50-63, February 2012.

Arhall, J. and Cox, E. (2013). Key Performance Indicators for SAS Flights, *Linköping University 2013.*

Asociación Española de Contabilidad y Administración de Empresas (1990). *Comisión de Principios de Contabilidad de Gestión*. *Principios de contabilidad de gestión: El marco de la contabilidad de gestión.* AECA. Madrid.

Asociación Española de Contabilidad y Administración de Empresas (2002). *Comisión de Contabilidad de Gestión. Indicadores para la Gestión Empresarial*. AECA, Madrid.

Asociación Española de Contabilidad y Administración de Empresas (2011). *Comisión de Contabilidad de Gestión*. *La Contabilidad de Gestión en las Empresas de Transporte Aéreo.* AECA, Madrid.

Association of European Airlines (2008), www.aea.be, last access 14 April 2017.

Aviation Safety Network (2016). www.aviation-safety.net, last access May 2017.

Babbar, S. and Koufteros, X. (2008). The human element in airline service quality: contact personnel and the customer. *International Journal of Operations and Production Management,* Vol. 28, pp. 804-830.

References

Baker, D. (2013). Service quality and customer satisfaction in the Airline Industry: A comparison between legacy Airlines and low cost Airlines. *American Journal of Tourism Research*, Vol. 2, (1), pp. 67-77.

Banchieri, L.C., Campa-Planas, F. and Sánchez-Rebull, M.V. (2011). What has been said, and what remains to be said about the balanced scorecard? *Journal of Economics and Business*, Vol. 29 (1), pp. 155-192.

Banco Mundial (2015). www.datos.bancomundial.org, last access June 2017.

Barnett A. (2009). *Aviation Safety and Security*. In: Belobaba, P., Odoni, A. and Barnhart, C. (2009). *The Global Airline Industry*. John Wiley and Sons, Ed. 2009.

Basfirinci, C. and Mitra, A. (2015). A cross cultural investigation of airlines service quality through integration of Servqual and the Kano Model. *Journal of Air Transport Management,* Vol. 42, pp. 239-248.

Belobaba, P., Odoni, A. and Barnhart, C. (2009). *The Global Airline Industry*. John Wiley and Sons, Ed, Chichester, UK.

Belobaba, P. (2011). *In search of sustained profitability 30 years after deregulation*. In: O`Conell, J.F. and Williams, G. (2011). *Air Transport in the 21st century-Key strategic developments*. Ashgate.

Ben-Yosef, E. (2005). *The Evolution of the US Airline Industry. Theory, Strategy and Policy*, Springer.

Bhadra D. (2005). Choice of Aircraft Fleets in the U.S. Domestic Scheduled Air Transportation System: Findings from a Multinomial Logit Analysis. *Journal of the Transportation Research Forum*, vol. 44 (3), pp. 143-162.

Bhunia, A., Mukhuti S. and Roy, S. (2011). Financial Performance Analysis – A case study. *Current Research Journal of Social Sciences* 3 (3): 269-275.

Bilotkach, V., Gaggero, A. and Piga, C. (2014). Airline pricing under different market conditions: Evidence from European Low-Cost Carriers. *Tourism Management,* Vol. 47, pp. 152–163.

Blalock, G., Kadiyali, V. and Simon, D. H. (2007). The impact of post-9/11 airport security measures on the demand for air travel. *Journal of Law and Economics*, Vol. 50 (4), pp. 731-755.

Boeing Mediaroom. www.boeing.mediaroom.com (2016), last access 12 June 2017.

Bon, A. T., and Mustafa, E. M. A. (2013). Quality Management on Innovation in Service Organizations: Literature review and New Conceptual Framework, *Procedia Engineering 53*, pp. 516-529.

Booz Allen Hamilton Inc. (2001). Punctuality: How Airlines can improve on-time performance. Booz Allen & Hamilton, 2001.

Bounds, G., York, L., Adams, M., and Ranney, G. (1994). *Beyond Total Quality Management toward the emerging paradigm*. New York: McGraw-Hill.

Bowen, B. D., Headley, D. E. and Luedtke, J. R. (1992). A quantitative methodology for measuring airline quality*, Journal of Aviation/Aerospace Education and Research,* Vol. 2, Nº 2.

Bowen, B. D. and Headley, D. E. (2000). *Air Travel Consumer Report: The Airline Quality Rating 2000*. US Department of Transportation, Washington, DC.

Bowen, B. D. and Headley, D. E. (2001). *The Airline Quality Rating 2001*, Airline Quality Rating Report, Paper 14, Wichita.

Bowen, B. D., Headley, D. E. and Lu, C.T. (2004). Developing a Standardized Mechanism for Measuring Airline Service Performance: A Preparation for Airlines and the Flying Public, *International Journal of Applied Aviation's Studies 4*, No. 2.

Bowen, B. D., Scarpellini-Metz, N. and Headley, D. E. (2005). Understanding Consumer Preference-Findings from the Airline Survey, *International Journal of Applied Aviation Studies*, Vol. 5 (2).

Bowen, B. D. and Headley, D. E. (2002-2015). *The Airline Quality Ratings 2002-2015,* Airline Quality Rating Reports, Wichita.

Bowen, B. D., Bowen, E. E., Headley, D. E., Küçükönal, H. and Wildt, C. T. (2013). An innovative leadership effectiveness measure: Applied analytic indicators of high-consequence industry performance, *Procedia – Social and Behavioral Sciences,* Vol. 75, pp. 209-216.

Brenner, M. A. (1982). *The significance of airline passenger load factors*. Airline Economics, Lexington Books, Lexington, MA.

Brong, J. (2002). Delivering Quality, Safety and Security in Aviation. *Quality Progress*, pp. 27-37.

Bureau of Transportation Statistics (2017). Glossary. United States Department of Transportation. www.transtats.bts.gov, last access day 06 July 2017.

References

Butler, G.F. and Keller M.R. (1999). *Handbook of Airline Finance*, McGraw-Hill.

Button, K., Haynes, K. and Stough, R. (1998). Flying into the future: Air transport policy in the European Union. Cheltenham, UK and Northampton/Mass: Edward Elgar. In: Kiso, F. & Deljanin, A. (Eds.). Air Freight and logistic services, *Promet – Traffic & Transportation*, 21(4), pp. 291-298.

Campa-Planas, F. and Campa-Lewkowycz, R. (2009). Estructuras de oferta en transporte aéreo: modelos punto a punto y de red. *Harvard Deusto Business Review*, nº 179, pp. 42-50.

Campa-Planas, F., Hernández, A. B., Sánchez-Rebull, M. V. and Kalemba, N. (2015). Does quality influence Company's performance? An analysis in the air transportation industry, *European Academy of Management (EURAM) Congress*, Warsaw.

Campa-Planas, F., Kalemba, N., Banchieri, L. C. and Magaz-Pérez, J. (2016). Management information used by Spanish Airlines for the financial decision making process: an exploratory study. *Journal of Investment and Financial Innovations*, Vol. 13 Issue 3.

Caruana, A. (2002). Service loyalty. The effects of service quality and the mediating role of customer satisfaction. *European Journal of Marketing*, Vol. 36 No. 5, pp. 811-828.

Chaipoopirutana, S. (2008). The development and measurement of different service quality models. *AU Journal*.

Chang, Y. H. and Yeh, C. H. (2002). A survey analysis of service quality for domestic airlines. *European Journal of Operational Research*, Vol. 139, Issue 1, pp 166-177.

Chang, Y. H. and Yeh, C. H. (2004). A new airline safety index. *Transportation Research Part B: Methodological*, Vol. 38 (4), pp. 369-383.

Chen, C. F. (2008). Investigating structural relationships between service quality, perceived value, satisfaction, and behavioral intentions for air passengers: Evidence from Taiwan. *Transportation Research Part A – Policy and Practice*, Vol. 42 (4), pp. 709-717.

Chen, C. F. and Chen, S. C. (2012). Scale development of safety management system evaluation for the airline industry. *Accident Analysis & Prevention*, Vol. 47, pp. 177-181.

Chen, C. F. and Chen, S. C. (2014). Investigating the effects of job demands and job resources on cabin crew safety behaviors. *Tourism Management,* Vol. 41, pp. 45-52.

Chen, C. F. and Chen, S. C. (2014). Measuring the effects of Safety Management System practices, morality leadership and self-efficacy on pilots' safety behaviors: Safety motivation as a mediator. *Safety Science,* Vol. 62, pp. 376-385.

Chen, F.Y. and Chang, Y.H. (2005). Examining airline service quality from a process perspective. *Journal of Air Transport Management*, Vol. 11 (2), pp. 79-87.

Chen, P.T. and Hu H. H. (2013). The mediating role of relational benefit between service quality and customer loyalty in airline industry. *Total Quality Management & Business Excellence*, Vol. 24, Issue 9-10.

Choi, K., Lee, D. and Olson, D. (2015). Service quality and productivity in the U.S. airline industry: a service quality-adjusted DEA model. *Service business*, Vol. 9, Issue 1, pp. 137-160.

Chow, C.K. (2014). Customer satisfaction and service quality in the Chinese airline industry. *Journal of Air Transport Management* 35, 102-107.

City Council Barcelona (2015). www.barcelona.cat, last access 15 March 2017.

Clemes, M., Gan, C. and Ren, M. (2011). Synthesizing the effect of service quality, value, and customer satisfaction on behavioral intentions in the motel industry: an empirical analysis. *Journal of Hospitality & Tourism Research*, Vol. 35, No. 4, November 2011, 530-568.

Confederación Española de Organizaciones Empresariales (CEOE) (2009). Memorándum: El sector del transporte en España 2009. www.ceoe.es, last access February 2017.

Cook, G. N. and Goodwin, J. (2008). Airline Networks: A Comparison of Hub-and-Spoke and Point-to-Point Systems. *Journal of Aviation/Aerospace Education & Research,* Vol. 17, Number 2 JAAER Winter.

CRD. Centre for Reviews and Dissemination (2009). Systematic Reviews: CRD´s guidance for undertaking reviews in health care. *Published by CRD*, University of York.

Creswell, J. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches*, 3rd edition, SAGE Publications, Inc.

Croissant, Y. and Millo, G. (2008). Panel Data Econometrics in R: The plm Package. *Journal of Statistical Software,* 27 (2),

References

Daley, B. (2009). Is Air Transport Effective Tool for Sustainable Development? *Sustainable Development*, 17 (4), pp. 210-219.

De Jager, W. C. (1993). *The Effects of Airline Deregulation on Airline Safety: An Econometric Analysis*. Dissertations and Theses. Paper 1297.

Delbari, S., Ng, S., Aziz, Y. and Ho, J. (2016). An investigation of key competitiveness indicators and drivers of full-service airlines using Delphi and AHP techniques. *Journal of Air Transport Management* 52, pp. 23-34.

Dempsey, P. and Goetz, A. (1992). *Airline deregulation and laissez-faire mythology*, Quorum Books.

Demydyuk, G. (2011). Choosing Financial Key Performance Indicators: the Airline Industry Case. *Conference Paper*, May 2011.

Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) (2008). *Analyses of the European air transport market.* Airline Business Models, Air Transport and Airport Research, 2008.

Dionne, G., Gagné, R., Gagnon, F. and Vanasse, C. (1997). Debt, moral hazard and airline safety. An empirical evidence. *Journal of Econometrics*, Vol. 79, pp. 379-402.

Doganis, R. (2009 and 2010). *Flying off course. Airline Economics and Marketing.* New York. Fourth Edition, Routledge.

Doppelt, L. and Nadeau, M. C. (2013). *Making loyalty pay: Lessons from the innovators*. McKinsey on payments, July 2013, San Francisco.

EASA Annual Safety Review 2014 (2015). *European Aviation Safety Agency*, 2015.

Easton, G. (1993). The 1993 State of U.S. Total Quality Management: A Baldrige Examiner´s Perspective. *California Management Review* 35 (3), pp. 32-54.

Eboli, L., Fu, Y. and Mazzulla, G. (2016). Multilevel comprehensive evaluation of the railway service quality, Procedia Engineering 137, pp. 21-30.

Eldad, B.Y. (2005). *The Evolution of the US Airline Industry – Theory, Strategy and Policy*. Dordrecht, The Netherlands. Springer.

Elliott, K.M., and Roach, D.W. (1993). Service quality in the airline industry: are carriers getting an unbiased evaluation from consumers? *Journal of Professional Services Marketing* 9, 71-82.

Elsevier (2015). www.elsevier.com, last access December 2016.

Etemad-Sajadi, R., Way, S.A. and Bohrer, L. (2015). Airline passenger loyalty: The distinct effects of airline passenger perceived pre-flight and in-flight service quality. *Cornell Hospitality Quarterly,* Vol. 52 (2), pp. 219-225.

European Aviation Safety Agency (2015). *EASA Annual Safety Review 2014*. EASA.

European Commission (2017). List of airlines banned within the EU, Mobility and Transport. https://ec.europa.eu/transport/modes/air/safety/air-ban/search_en, last access 17 July 2017.

Fageda, X., Jimenez, J. L. and Suarez-Aleman, A. (2014). Assessing airlines: Quality as a competitive variable. *International Journal of Transportation Economics,* Vol. 41, (3), pp. 425-440.

Fernández, A. (1994). *Situación actual y perspectivas futuras en Contabilidad de Gestión*. Elementos de Contabilidad de Gestión. AECA, Madrid.

Ferropedia (2014). www.ferropedia.es, last access April 2017.

Fleischer, A., Tchetchik, A. and Toledo, T. (2015). Does it pay to reveal safety information? The effect of safety information on flight choice, *Transportation Research Part C* 56, pp. 210-220.

Fonseca, F., Pinto, S. and Brito, C. (2010). Service quality and customer satisfaction in public transports. *International Journal for Quality Research,* Vol. 4 (2), pp. 125-130.

Fox, S. (2014). Safety and Security: The influence of 9/11 to the EU framework for air carriers and aircraft operators. *Research in Transportation Economics,* Vol. 45, pp. 24-33.

Francis, G., Humphreys, I., Ison, S. and Aicken, M. (2006). Where next for low cost airlines? A spatial and temporal comparative study. *Journal of Transport Geography*, Vol. 14, pp- 83.-94.

Freeman, L.C. (2004). *The Development of Social Network Analysis. A Study in the Sociology of Science*. Empirical Press. Vancouver, BC Canada.

Fruchterman, T. and Reingold, E. (1991). Graph Drawing by Force-directed Placement. *Software-practice and experience,* Vol. 21, 1129-1164.

Gardner Jr., E.S. (2004). Dimensional analysis of airline quality, *Interfaces* 34, No. 4.

Gazzera, M. and Lombardo, L. (2007). Calidad percibida en empresas de transporte aéreo. *Estudios y Perspectivas en Turismo,* Vol. 16, núm. 3, julio, 2007, pp. 361-372.

References

Gilbert, D. and Wong, R. K. C. (2003). Passenger expectations and airline services: A Hong Kong based study. *Tourism Management*, Vol. 24 (5), pp. 519-532.

Gill, G. K. and Shergill, G. S. (2004). Perceptions of safety management and safety culture in the aviation industry in New Zealand, *Journal of Air Transport Management*, Vol. 10 (4), pp. 231-237.

Ginieis, M., Sánchez-Rebull, M. V. & Campa-Planas, F. (2012). The academic journal literature on air transport: Analysis using systematic literature review methodology. *Journal of Air Transport Management*, Vol. 19, pp.31-35

Ginieis, M., Sánchez-Rebull, M. V. and Campa-Planas, F. (2012). Los costes en el sector del transporte aéreo. Una revisión de la literatura internacional, *Revista iberoamericana de contabilidad de gestión*, 10, nº20.

Givoni, M. and Banister, D. (2006). Airline and Railway Integration, *Transport Policy*, 13 (5), pp. 386-397.

Gmür, M. (2003). Co-citation analysis and the search for invisible colleges: A methodological evaluation. *Scientometrics*, Vol. 57 (1), pp. 27-57.

Golbe, D. (1986). Safety and Profits in the Airline Industry. *The Journal of Industrial Economics*, Vol. 34 (3), pp. 305-318.

González, J. I., Hernández, M. C., and Rodríguez, T. (2000). Contribución del tamaño y el sector en la explicación de la rentabilidad empresarial. *Revista Española de Financiación y Contabilidad* 29 (106), pp. 903-930.

Grönroos, C. (1983). Strategic Management and Marketing in the Service Sector, *Marketing Science Institute*. Boston, MA.

Gursoy, D., Chen, M. H. and Kim, H. J. (2005). The US airlines relative positioning based on attributes of service quality. *Tourism Management*, Vol. 26 (1), pp. 57-67.

Hosteltur (2013). www.hosteltur.com, last access 16 February 2017.

Huang J. (2009). Aviation Safety and ICAO. Universiteit Leiden, 2009.

Hunter, J.A. and Lambert, J.R. (2016). Do we feel safer today? The impact of smiling customer service on airline safety perception post 9-11. *Journal of Transportation Security 9, pp. 35-56.*

Hussain, R., Nasser, A. and Hussain, Y. (2015). Service quality and customer satisfaction of a UAE-based airline: An empirical investigation. *Journal of Air Transport Management 42*, 167-175.

Hussain, R. (2016). The mediating role of customer satisfaction: evidence from the airline industry. *Asia Pacific Journal of Marketing and Logistics,* Vol. 28 (2), pp. 234-255.

ICAO International Civil Aviation Organization (2001). *Working paper: Determination of a Definition of Aviation Safety*, 2001.

ICAO International Civil Aviation Organization (2011). *Situación de la seguridad operacional de la aviación mundial.* Information Paper, 2011.

ICAO International Civil Aviation Organization (2014). *Second high-level safety conference 2015 (HLSC 2015) planning for global aviation safety improvement*. Information Paper, 2014.

International Civil Aviation Organization. ICAO. Safety Report 2015 Edition (2015).

Institute of Management Accounting (2016). www.imanet.org, last access March 2017.

Instituto Nacional de Estadística (INE) (2011). www.ine.es, last access April 2017.

International Air Transport Association (IATA) (2014). *Airline Cost Management Group Enhanced Report*, September 2014.

International Air Transport Association (2015-2017), www.iata.org, last access June 2017.

International Air Transport Association (IATA) (2016). *2016 Mid-year report*. IATA Economic performance of the airline industry.

International Civil Aviation Organization (ICAO) (2015). *Safety Report* 2015 Edition.

Ishutkina, M.A. and Hansman, R.J. (2008). *Analysis of the interaction between air transportations and economic activity: A worldwide perspective.* International Center for Air Transportation, MIT.

JACDEC (2014). www.jacdec.de, last access July 2017.

Jacobson, R. (1987). The validity of ROI as a measure of business performance. *The American Economic Review*, Vol. 77 (3) pp. 470-478.

Janic, M. (2000). An assessment of risk and safety in civil aviation. *Journal of Air Transport Management*, Vol. 6 (1), pp. 43-50.

Janić, M. (2000). Air Transport system analysis and modelling. Capacity, Quality of Services and Economics. *Transportation Studies*, Vol 16.

Janušová, L, Čičmancová, S. (2016). Improving Safety of Transportation by Using Intelligent Transport Systems, *Procedia Engineering* 134, pp. 14-22.

References

JD Power (2016), www.jdpower.com, last access 17 May 2017.

Jeeradist, T., Thawesaengskulthai, N. and Sangsuwan, T. (2016). Using TRIZ to enhance passengers' perceptions of an airline's image through service quality and safety. *Journal of Air Transport Management, Vol. 53, pp. 131-139*.

Just, O. (2014). Vorwort. In: Richter, J.A. and Wolf, C. (2014), *Mayday, Feuer an Bord. Schwarze Tage der Luftfahrt*, GeraMond.

Kahn A. (2002). *Airline deregulation*. The Concise Encyclopedia of Economics. Library Economics Liberty. www.econlib.org, last access 15 January 2017.

Kalemba, N. and Campa-Planas, F. (2015). How quality is measured in the air transportation industry. *Tourism in Southern and Eastern Europe,* Vol. 3, pp. 115-127.

Kalemba, N., Campa-Planas, F., Hernández-Lara, A. B. and Sánchez-Rebull, M. V. (2016). US Airlines Performance and Its Connection with Service Quality. *18th International Conference on Air Transport Management 2016, February 25-26 2016*, London.

Kalemba, N. and Campa-Planas, F. (2017). Safety as a management concept in the air transport sector: A systematic literature review*: Intangible Capital*, Vol. 13 (1), pp. 71-93.

Kalemba, N. and Campa-Planas (2017). An overview of the Quality Concept in the Air Transportation Business: A systematic literature review. *International Journal of Quality Research*, Vol. 11 (1), pp. 51-70.

Kaplan, S. and Norton, D. P. (1992). The Balanced Scorecard – Measures That Drive Performance. *Harvard Business Review*, Vol. 70 (1), pp. 71-79.

Katz, D. S., and Garrow, L. A. (2014). Revenue and operational impact of depeaking at U.S. hub airports. *Journal of Air Transport Management*, Vol. 34, pp. 57-64.

Kelemen, Z. (2003). Latest information technology development in the airline industry. *Periodica Polytechnica Ser. Transp. Eng.*, Vol. 31 (1-2), pp. 45-52.

Keynes, J. M. (2009). *Characteristics of the Airline Industry*. In: The Airline Industry. Challenges in the 21st Century, Alessandro Cento, Physica-Verlag.

Kim, Y. and Lee, H. (2011). Customer satisfaction using low cost carriers. *Tourism Management,* Vol. 32, pp. 235-243.

Kim, Y. (2015). Assessing the effects of perceived value (utilitarian and hedonic) in LCCs and FSCs: Evidence from South Korea. *Journal of Air Transport Management,* Vol. 49, pp. 17-22.

Kitchenham, B. (2004) *Procedures for performing systematic reviews.* Joint Technical Report. Keele University.

Kotler, P. and Keller, K. (2012). *Marketing Management*. 14th Edition. One Lake Street, Upper Saddle River, New Jersey 07458, Pearson Education, Inc.

Kumar, K.B., Rajan, R.G. and Zingales, L. (1999). What determines firm size?. *NBER Working Paper* No. 7208.

Ladhari, R. (2009). Service quality, emotional satisfaction, and behavioural intentions. A study in the hotel industry. *Managing Service Quality: An International Journal,* Vol. 19 No. 3, 2009 pp. 308-331.

Latorella, K. A. and Prabhu, P. V. (2000). A review of human error in aviation maintenance and inspection. *International Journal of Industrial Ergonomics*, Vol. 26 (2), pp. 133-161.

Le, S.A., Walters, B. and Kroll, M. (2006). The moderating effects of external monitors on the relationship between R&D spending and firm performance. *Journal of Business Research*, Vol. 59 (2), pp. 278-287.

Lebas, M. (1993). Evolution d'un système d'information de gestion: un exemple, *Revue Française de Comptabilité*, 242, pp. 56-60.

Lee, W. K. (2006). Risk assessment modeling in aviation safety management. *Journal of Air Transport Management*, Vol. 12 (5), pp. 267-273.

Liao, M. Y. (2015). Safety Culture in commercial aviation: Differences in perspective between Chinese and Western pilots. *Safety Science*, Vol. 79, pp. 193-205.

Lim, B. (1995). Examining the organizational culture and organizational performance link. *Leadership and Organization Development Journal*, Vol. 16, Nº 5, pp. 16-21.

Liou, J. J. H. and Tzeng, G. H. (2007). A non-additive model for evaluating airline service quality. *Journal of Air Transport Management*, Vol. 13 (3), pp. 131-138.

Liou, J. J. H., Tzeng, G. H. and Chang, H. C. (2007). Airline safety measurement using a hybrid model. *Journal of Air Transport Management*, Vol. 13 (4), pp. 213-220.

Liou, J. J. H., Yen, L. and Tzeng, G. H. (2008). Building an effective safety management system for airlines. *Journal of Air Transport Management,* Vol. 14 (1), pp. 20-26.

References

Liou, J., Hsu, C. C. and Lin, R. H. (2011). Using a modified grey relation method for improving airline service quality. *Tourism Management,* Vol. 32, pp. 235-243.

Liu, C. H. and Lee, T. (2016). Service quality and price perception of service: Influence on word-of-mouth and revisit intention. *Journal of Air Transport Management,* Vol. 52, pp. 42-54.

Lofquist E. A. (2010). The art of measuring nothing: The paradox of measuring safety in a changing civil aviation industry using traditional safety metrics. *Safety Science*, vol. 48 (10), pp. 1520-1529.

Luke, D. A. and Harris, J. K. (2007). Network Analysis in Public Health: History, Methods, and Applications. *Annual Review of Public Health*, Vol. 28, pp. 69-93.

Madsen, P. M. (2013). Perils and Profits: A reexamination of the link between profitability and safety in U.S. Aviation. *Journal of Management*, Vol. 39 (3), pp. 763-791.

Massachusetts Institute of Technology (MIT) (2014 - 2017). Global Airline Industry Program, www.airlinedataproject.mit.edu, last access 15 June 2017.

Maté, A., Trujillo, J. and Myopoulos, J. (2017). Specification and derivation of key performance indicators for business analytics: A semantic approach. *Data and Knowledge Engineering*, Vol. 108, pp. 30-49.

Mazzeo, M. J. (2003). Competition and Service Quality in the U.S. Airline Industry. *Review of Industrial Organization,* Vol. 22, pp. 275-296.

McFadden, K. L. and Hosmane, B. S. (2001). Operations safety: an assessment of a commercial aviation safety program. *Journal of Operations Management,* Vol. 19, pp. 579-591.

Mellat Parast, M. and Fini, E. (2010). The effect of productivity and quality on profitability in US airline industry. An empirical investigation. *Managing Service Quality*, Vol. 20 No. 5, pp. 458-474.

Mellat Parast, M., Golmohammadi, D. and McFadden, K. L. (2015). Linking business strategy to service failures and financial performance: Empirical evidence from the U.S. domestic airlines. *Journal of Operations Management*, Vol. 38, pp. 14-24.

Merkert, R. and Assaf A.G. (2015). Using DEA models to jointly estimate service quality perception and profitability – Evidence from international airports. *Transportation Research Part A,* Vol. 75, pp. 42-50.

Messner, W. (2016). The impact of an aircraft's service environment on perceptions of in-flight food quality. *Journal of Air Transport Management,* Vol. 53, pp. 123-130.

Miller, T., Douglass, J. and Pindus, N. (1994). Road injury: Causes, costs, and comparisons with other transport modes. *Journal of Safety Research*, Vol. 25 (4), pp. 183-195.

Ministry of public works and transport (2013 & 2015), www.fomento.gob.es, last access 22 April 2017.

Morash, E. A. and Ozment, J. (1994). The augmented service offering for perceived and actual service quality. *Journal of the Academy of Marketing Science* 22 (4), pp. 352-363.

Morell, P. S. (2007). Airline Finance. Third Edition, Ashgate Publishing Limited.

Morrison, S. A. and Winston, C. (1995). *The Evolution of the Airline Industry*. The Bookings Institution, Washington D.C.

Mosahab, R., Mahamad, O., and Ramayah, T. (2010). Service Quality, Customer Satisfaction and Loyalty: A Test of Mediation. *International Business Research*, Vol. 3, No. 4, pp. 72-80.

Moses, L. N. and Savage, I. (1990). Aviation deregulation and safety: Theory and Evidence. *Journal of Transport Economics and Policy*, pp. 171-188.

Nejati, M., Nejati, M. and Shafaei, A. (2009). Ranking airlines' service quality factors using a fuzzy approach: study of the Iranian society. *International Journal of Quality and Reliability Management*, Vol. 26 (3), pp.247-260.

Netjasov, F. and Janic, M. (2008). A review of research on risk and safety modelling in civil aviation. *Journal of Air Transport Management*, Vol. 14 (4), pp. 213-220.

Nicolau J. L. and Sellers, R. (2010). The quality of quality awards: Diminishing information asymmetries in a hotel chain. *Journal of Business Research*, Vol. 63 (8), pp. 832-839.

NodeXL (2013), www.nodexl.codeplex.com, last access August 2016.

Norazah M. S. (2014). Passenger satisfaction with airline service quality in Malaysia: A structural equation modeling approach. *Research in Transportation Business and Management,* Vol. 10, pp. 26-32.

O'Connell, J. F. and Warnock-Smith, D. (2013). An investigation into traveler preferences and acceptance levels of airline ancillary revenues, *Journal of Air Transport Management*, Vol. 33, pp. 12-21.

O'Connell, J.F. and Williams, G. (2005). Passengers' perception of low cost airlines and full service carriers: A case study involving Ryanair, Aer Lingus, Air Asia and Malaysia Airlines, *Journal of Air Transport Management*, Vol. 11, pp. 259-272.

OECD (1997). *The future of international air transport policy*, Responding to global change. OECD.

Osaki, T. and Kubota, Y. (2016). Perceptions of premium service and superiority: Why do customers pay more for high-value-added domestic airline services in Japan? *Journal of Air Transport Management,* Vol. 57, pp. 196-201.

Olson, C. V. and Trapani, J. M. (1981). Who has benefited from regulation of the airline industry? *Journal of Law and Economics*, Vol. 24.

Oster Jr., C. V., Strong, J. S. and Zorn, C. K. (2013). Analyzing aviation safety: Problems, challenges, opportunities. *Research in Transportation Economics*, Vol. 43, pp. 148-164.

Oum, T. H. and Yu, C. (1998). An analysis of profitability of the world's major airlines. *Journal of Air Transport Management*, Vol. 4, pp. 229-237.

Pacheco, R. R., Fernandes, E. and Domingos, E. M. (2014). Airport airside safety index. *Journal of Air Transport Management,* Vol. 34, pp. 86-92.

Pai, V. (2010). On the factors that affect airline flight frequency and aircraft size. *Journal of Air Transport Management,* Vol. 16 (4), pp. 169-177.

Pakdil, F., and Aydın, Ö. (2007). Expectations and perceptions in airline services: An analysis using weighted SERVQUAL scores. *Journal of Air Transport Management*, Vol. 134, pp. 229–237.

Parasuraman, A., Zeithaml, V. A., and Berry, L. L. (1985). Model Service Its Quality and Implications for Future. *The Journal of Marketing,* 49(4), 41-50.

Parasuraman, A., Zeithaml, V. A., and Berry, L. L. (1988). SERVQUAL: A multiple-item scale for measuring consumer perceptions of service quality. *Journal of Retailing,* Vol. 64, Number 1, pp.12-40

Park, J.W., Robertson, R. and Wu, C.L. (2004). The effect of airline service quality on passengers´ behavioral intentions: A Korean case study. *Journal of Air Transport Management*, Vol. 10, (6), pp. 435-439.

Park, J. W., Robertson, R. and Wu, C.L. (2005). Investigating the Effects of Airline Service Quality on Airline Image and Passengers´ Future Behavioral Intentions: Findings from Australian international air passengers. *The Journal of Tourism Studies*, Vol. 16, No. 1, pp. 2-11.

Park, J.W. (2007). Passenger perceptions of service quality: Korean and Australian case studies. *Journal of Air Transport Management, 13 (4), 238-242.*

Parmenter, D. (2007). Key Performance Indicators. John Wiley and Sons, Ed, 2007.

Pearson, J. (2016). Conference paper: Relative performance: a product and organizational architecture analysis of Asian low-cost subsidiaries. *20th ATRS World Conference 2016, Rhodes.*

Peral, J., Maté, A. and Marco, M. (2017). Application of Data Mining techniques to identify relevant Key Performance Indicators, *Journal of Computer Standards & Interfaces*, Vol. 54, pp. 76-85.

Pérez-Méndez, J. A. and Machado-Cabezas, A. (2015). Relationship between management information systems and corporate performance. Revista de Contabilidad - *Spanish Accounting Review*, 18 (1), pp. 32-43.

Pettersen, K. A. and Bjørnskau, T. (2015). Organizational contradictions between safety and security – Perceived challenges and ways of integrating critical infrastructure protection in civil aviation. *Safety Science,* Vol. 71, pp. 167-177.

Pitfield, D. E., Caves, R. E. and Quddus, M. A. (2010). Airline strategies for aircraft size and airline frequency with changing demand and competition: A simultaneous-equations approach for traffic on the north Atlantic. *Journal of Air Transport Management*, Vol. 16 (3), pp. 151-158.

Porter, M. E. (1985). *The competitive Advantage: Creating and Sustaining Superior Performance*. NY: Free Press.

Porter, M. E. (1996). What is strategy? *Harvard Business Review*, 74 (6), pp. 61-78.

Prayag, G. (2007). Assessing international tourists' perceptions of service quality at Air Mauritius. *International Journal of Quality and Reliability Management,* Vol. 24 (5), pp. 492-514.

R Development Core Team R (2016). A language and environment for statistical computing. Vienna, Austria: R Foundation for Statistical Computing, retrieved from http//:www.R-project-org.

Raghavan, S. and Rhoades, D. L. (2005). Revisiting the relationship between profitability and air carrier safety in the US airline industry. Journal of Air Transport Management, Vol. 11, pp. 283-290 (2005).

Rajaguru, R. (2016). Role of value for money and service quality on behavioral intention: A study of full service and low cost airlines. *Journal of Air Transport management, Vol. 53, pp. 114-122.*

Rankin, W., Hibit, R., Allen J. and Sargent, R. (2000). Development and evaluation of the Maintenance Error Decision Aid (MEDA) process. *International Journal of Industrial Ergonomics*, Vol. 26 (2), pp. 261-276.

Reger, R. K., Gustafson, L. T., Demarie, S. M., and Mulland, J. V. (1994). Reframing the Organization: Why implementing total quality is easier said than done. *Academy of Management Review*, Vol. 19 (3), pp. 565-584.

Reynolds-Feighan, A. (2001). Air freight logistics. In: Brewer, A., Button, K. and Hensher, D. (Eds.). *Handbook of Logistics and Supply-Chain Management*. Elsevier Ltd, London, UK.

Rhoades, D. L. and Waguespack Jr, B. (1999). Better safe than service? The relationship between service and safety quality in the US airline industry. *Managing Service Quality: An International Journal*, Vol. 9, Issue 6, pp. 396-401.

Rhoades, D. L. and Waguespack, B. (2008). Twenty years of service quality performance in the US airline industry. *Managing Service Quality: An International Journal,* 18 (1), 20–33.

Richter, J.A. (2014). *The JACDEC Data Base*. User Guide Explanations and Definitions. *JACDEC* Gbr.

Roelen, A. L. C. and Klompstra, M. B. (2012). *The challenges in defining aviation safety performance indicators*. Preprint for PSAM 11 & ESREL 2012, 25-29 June 2012, Helsinki, Finland.

Rose, N. L. (1990). Profitability and product quality: Economic determinants of airline safety performance. *Journal of Political Economy*, Vol. 98, pp. 944-964.

Rose, N. L. (1992). Fear of flying? Economic Analysis of Airline Safety. *Journal of Economic Perspectives*, pp. 75-94.

Rürup, B. and Reichart, T. (2014). *Determinanten der Wettbewerbsfähigkeit im internationalen Luftverkehr*, Handelsblatt Research Institute.

Sáez, A., Fernández, A. and Gutiérrez, G. (1993). *Contabilidad de costes y contabilidad de gestión*. Mc.Graw-Hill, Madrid.

Sajitos, L., Brodie, R. and Whittome, J. (2010). Impact of Service Failure: The protective layer of customer relationships. *Journal of Service Research,* Vol. 13 (2), pp. 216-229.

Sainaghi, R., Phillips, P. and Corti, V. (2013). Measuring hotel performance: Using a balanced scorecard perspectives' approach. *International Journal of Hospitality Management,* 34, pp. 150-159.

Sandada, M., and Matibiri, B. (2016). An investigation into the impact of service quality, frequent flier programs and safety perception on satisfaction and customer loyalty in the airline industry in Southern Africa. *South East European Journal of Economics and Business*, Vol. 11 (1), pp. 41-53.

Satmetrix Data Product. 2016. www.satmetrix.com, last access 5 April 2017.

SCImago Journal Rank (2014). www.scimagojr.com, last access 17 July 2017.

Scopus (2015-2017). www.scopus.com, last access 12 July 2017.

Seguí-Mas, E., Sarrión-Viñes, F., Tormo-Carbó, G. and Oltra, V. (2016). Producció científica en el camp de les spin-off acadèmiques: Una anàlisi bibliomètrica. *Intangible Capital,* Vol. 12 (1), pp. 246-267.

Shappell, S., Detwiler, C., Holcomb, K., Hackworth, C., Boquet, A. and Wiegmann, D. A. (2007). Human error and Commercial Aviation Accidents: An Analysis Using the Human Factors Analysis and Classification System. *Human Factors*, Vol. 49 (2), pp. 227-242.

Shen, W., Xiao, W., and Wang, X. (2016). Passenger satisfaction evaluation model for Urban rail transit: A structural equation modeling based on partial least squares. *Transport Policy*, Vol. 46, pp. 20-31.

Skytrax (2016), www.airlinequality.com, last access 28 May 2017.

Statista (2015). www.statista.com, last access 20 February 2017.

Stepanyan, A. (2014). Traditional Ratio Analysis in the Airline Business: A Case Study of Leading U.S Carriers. *International Journal of Advances in Management and Economics*, Vol. 3 (2), pp. 175-189.

Steven, A. B., Don, Y., and Dresner, M. (2012). Linkages between customer service, customer satisfaction and performance in the airline industry: Investigation of

non-linearities and moderating effects. *Journal of Transportation Research Part E*, Vol. 48, pp. 743-754.

Stolzer A. J. and Goglia J. J. (2015). *Safety Management Systems in Aviation*, Second Edition, Ashgate.

Sukati, I., Khiang, T.B. and Isnurhadi (2015). Customer satisfaction level provided by air Asia. *Asian Social Sciences, Vol. 11 (13).*

Sun, K. A., and Kim, D. Y. (2013). Does customer satisfaction increase firm performance? An application of American Customer Satisfaction Index ACSI. *International Journal of Hospitality Management*, Vol. 35, pp.68-77.

Suzuki, Y., Tyworth, J. E. and Novack, R. A. (2001). Airline market share and customer service quality: a reference-dependent model. *Transportation Research Part A – Policy and Practice*, Vol. 35 (9), pp. 773-788.

Talley, W. K. (1992). The Impact of Deregulation on Airline Safety: Profit-Safety and Market-Response Arguments. *International Conference Series on Competition and Ownership in Land Passenger Transport*.

Taylor, J. C. (2000). The evolution and effectiveness of Maintenance Resource Management (MRM). *International Journal of Industrial Ergonomics*, Vol. 26 (2), pp. 201-215.

Thomson Reuters (2015). www.thomsonreuters.com, last access 14 March 2017.

Tiernan, S., Rhoades, D. L. and Waguespack Jr., B. (2008). Airline service quality: Exploratory analysis of consumer perceptions and operational performance in the USA and EU. *Managing service quality: An International Journal*, pp. 212-224.

Tremblay, V. J. and Tremblay C. H. (2007). *Industry and Firm Studies*, 4th edition, M.E. Sharpe, Inc.

Truitt. L. J., and Haynes, R. (1994). Evaluating service quality and productivity in the regional airline industry. *Transportation Journal* 33, pp. 21-32.

Tsaur, S. H., Chang, T. Y. & Yen, C. H. (2002). The evaluation of airline service quality by fuzzy MCDM. *Tourism Management*, Vol. 23 (2), pp. 107-115.

Sultan, F. and Simpson Jr, M. (2000). International service variants: airline passenger expectations and perceptions of service quality. *The Journal of Service Marketing,* Vol. 14 (3), pp. 188-216.

Vasigh, B., Tacker, T. and Fleming, K. (2013). *Introduction to Air Transport Economics: From Theory to Applications*. Burlington, VT: Ashgate. 2013.

Vasigh, B., Fleming, K. and Tacker, T. (2016). *Introduction to Air Transport Economics. From Theory to Applications*. Second Edition, published by Routledge, New York.

Vázquez-Casielles, R., del Río-Lanza, A. B. and Díaz-Martín, A. M. (2007). Quality of past performance: Impact on consumers' responses to service failure. *Marketing Letters,* Vol. 18 (4), pp. 249-264.

Wang, Z., Hofer, C. and Dresner, M. (2013). Financial condition, safety investment and accident propensity in the US airline industry: A structural analysis. *Transportation Research Part E: Logistics and Transportation Review*, Vol. 49 (1), pp. 24-32.

Web of Science (2015-2017). www.webofknowledge.com, last access 16 July 2017.

Webster, J. and Watson, R. (2002). Analyzing the past to prepare for the future: Writing a literature review. *MIS Quarterly*, Vol. 26 (2), pp. 13-23.

Wei, W. and Hansen, M. (2005). Impact of aircraft size and seat availability on airlines' demand and market share in duopoly markets. *Transportation Research Part E: Logistics and Transportation Review,* Vol. 41 (4), pp. 315-327.

Wei, W. and Hansen, M. (2007). Airlines' competition in aircraft size and service frequency in duopoly markets*. Transportation Research Part E: Logistics and Transportation Review*, Vol. 43 (4), pp. 409-424.

Wensveen, J.G. (2011). *Air Transportation: A Management Perspective*, 7th edition.

Wensveen, J. G. (2015). *Air Transportation. A Management Perspective*. Eight Edition, Ashgate Publishing Company.

Werner, F. M. and Stoner, J. F. A. (1999). *Bringing Quality into Airline Financial Management*. In: Butler, G. and Keller, M. (1999). Handbook of Airline Finance.

Wichita's Airline Quality Rating (2016), www.airlinequalityrating.com, last access 12 July 2017.

World Bank (2015). www.datos.bancomundial.org, last access 21 March 2017.

World Health Organization (2015). Global Status Report on Road Safety, WHO 2015.

World Tourism (2016). UNWTO Tourism Highlights, Edition 2016. www.unwto.org, last access December 2016.

Wu, H. L. (2008). When does internal governance make firms innovative? *Journal of Business Research*, Vol. 61, pp. 141-153.

Yoon, E., and Jang, S. C. (2005). The Effect of Financial Leverage on Profitability and Risk of Restaurant Firms. *Journal of Hospitality Financial Management*, Vol. 13 (1), Article 24, pp. 1-18.

Zeller, T. L. and Metzger, L. M. (2013). Good bye traditional budgeting, hello rolling forecast: Has the time come? *American Journal of Business Education*, 6 (3), pp. 299-310.

Zuidberg, J. (2014). Identifying airline cost economies: An econometric analysis of the factors affecting aircraft operating costs. *Journal of Air Transport Management*, Vol. 40, pp. 86-95.

UNIVERSITAT ROVIRA I VIRGILI
QUALITY AND SAFETY IN THE AIRLINE INDUSTRY AND THEIR INFLUENCE ON COMPANY PROFITABILITY
Nicole Kalemba

APPENDIX

UNIVERSITAT ROVIRA I VIRGILI
QUALITY AND SAFETY IN THE AIRLINE INDUSTRY AND THEIR INFLUENCE ON COMPANY PROFITABILITY
Nicole Kalemba

APPENDIX I

ENCUESTA SOBRE CONTABILIDAD DE GESTIÓN EN EL SECTOR DE TRANSPORTE AÉREO

En este cuestionario entendemos como contabilidad de gestión aquella que aporta información relevante, histórica o provisional, monetaria o no monetaria, segmentada o global, sobre la circulación interna de la información en la empresa para la toma de decisiones. Entre las herramientas que utiliza la contabilidad de gestión se pueden citar la contabilidad financiera, la contabilidad de costes, el control presupuestario, los cuadros de mando, los sistemas internos de *reporting*, etcétera.

*Obligatorio

P.1 ¿Desarrolla alguna persona de su equipo algún tipo de contabilidad de gestión? *
Marca solo un óvalo.

☐ Sí
☐ No

P.2 Nombre de la compañía aérea *

_____

P.3 Formación (titulación) del responsable de contabilidad de gestión *
Marca solo un óvalo.

☐ Diplomado/a en Empresariales
☐ Licenciado/a en Economía
☐ Licenciado/a en Administración y Dirección de Empresas
☐ Otra titulación vinculada a las ciencias económicas y empresariales
☐ Otra titulación vinculada a las ciencias sociales
☐ Otra titulación universitaria
☐ Sin titulación universitaria
☐ Otro: _____

P.4 ¿Recibe asesoramiento externo sobre contabilidad de gestión? *
Marca solo un óvalo.

☐ Sí
☐ No

Appendix

P.5 ¿De quién recibe este asesoramiento externo? *
Marca solo un óvalo.

☐ Empresa consultora
☐ Auditores externos
☐ Asesor externo individual
☐ Otro: _____

P.6 Objetivos de la contabilidad de gestión, independientemente de que la misma esté instaurada en su compañía. Señale las que considere más importantes. *
Selecciona todos los que correspondan.

☐ Información para la compañía
☐ Información para el accionista
☐ Cálculo de costes y resultados por centros de responsabilidad
☐ Información para planificación y control
☐ Información para la toma de decisiones
☐ No es necesario llevar contabilidad de gestión
☐ Otro: _____

P.7 Utilidad, a su juicio, de la información que suministra la contabilidad de gestión hoy en día. *
Marca solo un óvalo.

☐ Ninguna
☐ Escasa
☐ Media
☐ Alta
☐ Muy alta

P.8 ¿La compañía lleva algún tipo de contabilidad de costes? *
Marca solo un óvalo.

☐ Sí
☐ No

P.9 ¿Coincide la estructura organizativa de la compañía con los departamentos en los que está estructurada la contabilidad de gestión, de manera que sea plenamente identificable el responsable de departamento con resultados económicos?
☐ Sí
☐ No

P.10 Marque los diferentes departamentos en los cuales está dividida la compañía. *
Marca solo un óvalo por fila.

	Sí	No
Handling	☐	☐
Mantenimiento	☐	☐
Carga	☐	☐
Sistemas	☐	☐
Línea Aérea	☐	☐
Comercial	☐	☐
Operaciones	☐	☐
Administración	☐	☐

P.11 Otros, especificar.

_____

P.12 ¿Existe facturación interna entre los diferentes departamentos? *
Marca solo un óvalo.

☐ Sí
☐ No

P.13 Indique el criterio de valoración utilizado para determinar los precios internos de transferencia. *
Marca solo un óvalo.

☐ Precio de mercado
☐ Coste standard
☐ Coste variable
☐ Coste total
☐ Otro: _____

P.14 El sistema de costes actualmente se instaló: *
Marca solo un óvalo.

☐ En los últimos 2 años
☐ Hace entre 2-5 años
☐ Hace entre 5-10 años
☐ Hace más de 10 años

P.15 ¿La compañía tiene establecido un plan estratégico? *
Marca solo un óvalo.

☐ Sí
☐ No

P.16 La duración del Plan Estratégico es: *
Marca solo un óvalo.

☐ Inferior a 3 años
☐ Entre 3 y 5 años
☐ Superior a 5 años
☐ Otro: _____

P.17 El Plan Estratégico se actualiza: *
Marca solo un óvalo.

☐ Cada año
☐ Cada 2 años
☐ Otro: _____

P.18 ¿La compañía tiene aprobados por escrito los objetivos anuales? *
Marca solo un óvalo.

☐ Sí
☐ No

P.19 ¿Se utilizan estos objetivos para la confección del presupuesto anual? *
Marca solo un óvalo.

☐ Sí
☐ No

P.20 ¿En qué momento se efectúan los presupuestos? *
Marca solo un óvalo.

☐ Durante el tercer trimestre del ejercicio anterior al ejercicio del presupuesto en cuestión (suponiendo una empresa el ejercicio de la cual coincidiera con el año natural, nos estaríamos refiriendo a julio-septiembre del ejercicio t-1, por la confección del presupuesto)
☐ Durante el mes anterior al inicio del ejercicio (diciembre en el ejemplo) del presupuesto en cuestión
☐ Ya iniciado el ejercicio (durante el año t se realiza el presupuesto del año t)
☐ Otro: _____

P.21 ¿En qué momento se aprueban los presupuestos? *

Marca solo un óvalo.

☐ Durante el tercer trimestre del ejercicio anterior al ejercicio del presupuesto en cuestión (suponiendo una empresa el ejercicio de la cual coincidiera con el año natural, nos estaríamos refiriendo a julio-septiembre del ejercicio t-1, por la confección del presupuesto)
☐ Durante el mes anterior al inicio del ejercicio (diciembre en el ejemplo) del presupuesto en cuestión
☐ Ya iniciado el ejercicio se aprueba el presupuesto del año en curso
☐ Otro: _____

P.22 Punto de partida en el momento de la confección del presupuesto: *

Marca solo un óvalo por fila.

	Sí	No
Se confecciona a partir de la realidad del ejercicio anterior/es (presupuesto incremental)	☐	☐
Presupuesto base cero	☐	☐
Presupuesto base cero para determinadas actividades y/o servicios, para costes generales o de estructura, se utiliza el presupuesto incremental en función del resultado del ejercicio anterior	☐	☐
Se confecciona sobre la base de la realidad del ejercicio anterior más los objetivos fijados al presupuesto plurianual para este ejercicio (presupuesto incremental)	☐	☐
Otro criterio	☐	☐

Appendix

P.23 En el cuadro siguiente indique, para las variables listadas, cual es el nivel de detalle en el momento de la confección del presupuesto:
Marca solo un óvalo por fila.

	No se calcula	Diaria	Semanal	Quincenal	Mensual	Trimestral	Otra
AKO's	☐	☐	☐	☐	☐	☐	☐
PKT's	☐	☐	☐	☐	☐	☐	☐
Coeficiente de ocupación PAX	☐	☐	☐	☐	☐	☐	☐
Ingreso/PKT)	☐	☐	☐	☐	☐	☐	☐
Ingreso/AKO	☐	☐	☐	☐	☐	☐	☐
Ingreso/ESK /equival. seat km)	☐	☐	☐	☐	☐	☐	☐
TKT's	☐	☐	☐	☐	☐	☐	☐
Coeficiente de ocupación carga	☐	☐	☐	☐	☐	☐	☐
Número de PAX	☐	☐	☐	☐	☐	☐	☐
Etapa media	☐	☐	☐	☐	☐	☐	☐
Horas Bloque Avión día	☐	☐	☐	☐	☐	☐	☐
Puntualidad	☐	☐	☐	☐	☐	☐	☐
Regularidad	☐	☐	☐	☐	☐	☐	☐
Número de reclamaciones	☐	☐	☐	☐	☐	☐	☐
Número de equipajes extraviados	☐	☐	☐	☐	☐	☐	☐
Índice de calidad percibida	☐	☐	☐	☐	☐	☐	☐
EBITDAR	☐	☐	☐	☐	☐	☐	☐
EBITDA	☐	☐	☐	☐	☐	☐	☐

P.24 ¿Se revisan los presupuestos durante el ejercicio presupuestario? *
Marca solo un óvalo.

☐ Sí
☐ No

P.25 Indique, en el cuadro siguiente, cuál es la periodicidad con que se suelen preparar informes sobre la evolución de cada una de las variables siguientes:
Marca solo un óvalo por fila.

	No se calcula	Diaria	Semanal	Quincenal	Mensual	Trimestral	Otra
AKO's	☐	☐	☐	☐	☐	☐	☐
PKT's	☐	☐	☐	☐	☐	☐	☐
Coeficiente de ocupación PAX	☐	☐	☐	☐	☐	☐	☐
Ingreso/PKT)	☐	☐	☐	☐	☐	☐	☐
Ingreso/AKO	☐	☐	☐	☐	☐	☐	☐
Ingreso/ESK /equival. seat km)	☐	☐	☐	☐	☐	☐	☐
TKT's	☐	☐	☐	☐	☐	☐	☐
Coeficiente de ocupación carga	☐	☐	☐	☐	☐	☐	☐
Número de PAX	☐	☐	☐	☐	☐	☐	☐
Etapa media	☐	☐	☐	☐	☐	☐	☐
Horas Bloque Avión día	☐	☐	☐	☐	☐	☐	☐
Puntualidad	☐	☐	☐	☐	☐	☐	☐
Regularidad	☐	☐	☐	☐	☐	☐	☐
Número de reclamaciones	☐	☐	☐	☐	☐	☐	☐
Número de equipajes extraviados	☐	☐	☐	☐	☐	☐	☐
Índice de calidad percibida	☐	☐	☐	☐	☐	☐	☐
EBITDAR	☐	☐	☐	☐	☐	☐	☐
EBITDA	☐	☐	☐	☐	☐	☐	☐

P.26 ¿Calculan las desviaciones producidas entre el presupuesto y la realidad? *
Marca solo un óvalo.

☐ Sí
☐ No

P.27 ¿Se utilizan las desviaciones para analizar las causas de las diferencias, para el control de las actuaciones y para la toma de medidas y acciones correctoras, respecto a los objetivos marcados? *

Contestar solo so han contestado a "¿Calculan las desviaciones producidas entre el presupuesto y la realidad?":"Sí")

Marca solo un óvalo.

☐ Sí
☐ No

P.28 ¿Se realiza algún tipo de análisis de desviaciones entre resultados previstos y reales en los que se segmente por efecto precio, efecto volumen y efecto mix? *

Marca solo un óvalo.

☐ Sí
☐ No

P.29 ¿La compañía tiene implementado un cuadro de mando integral? *

Marca solo un óvalo.

☐ Sí
☐ No

P.30 ¿Considera adecuada su implementación? *

Marca solo un óvalo.

☐ Totalmente adecuada
☐ Muy adecuada
☐ Adecuada
☐ Poco adecuada
☐ No adecuada
☐ No sabe/no contesta

P.31 ¿Por qué?

_____

_____

_____

P.32 ¿Cuáles son las partes que se incluyen en este cuadro de mando integral? *
Marca solo un óvalo por fila.

	Sí	No
Resumen ejecutivo	☐	☐
Análisis del entorno económico	☐	☐
Análisis del sector de transporte aéreo	☐	☐
Análisis de riesgos y oportunidades	☐	☐
Objetivos e indicadores cualitativos	☐	☐
Objetivos e indicadores cuantitativos	☐	☐
Cuenta de resultados	☐	☐
Estado de tesorería	☐	☐
Seguimiento de inversiones	☐	☐
Estimación económica de cierre de ejercicio	☐	☐

P.33 ¿A quién se distribuye el cuadro de mando? *
Marca solo un óvalo.

☐ Comité de dirección
☐ Consejo de administración
☐ Primer nivel directivo
☐ Otro: _____

MUCHAS GRACIAS POR SU COLABORACIÓN

UNIVERSITAT ROVIRA I VIRGILI
QUALITY AND SAFETY IN THE AIRLINE INDUSTRY AND THEIR INFLUENCE ON COMPANY PROFITABILITY
Nicole Kalemba

UNIVERSITAT ROVIRA I VIRGILI
QUALITY AND SAFETY IN THE AIRLINE INDUSTRY AND THEIR INFLUENCE ON COMPANY PROFITABILITY
Nicole Kalemba

UNIVERSITAT ROVIRA I VIRGILI
QUALITY AND SAFETY IN THE AIRLINE INDUSTRY AND THEIR INFLUENCE ON COMPANY PROFITABILITY
Nicole Kalemba

This Doctoral Thesis aimed to contribute to an understanding of the consequences and impact of quality and safety on profitability of airline companies, as well as to emphasize the importance and need for management accounting and its Key Performance Indicators (KPIs) in the airline industry. In order to cover this goal, a compendium of six academic papers were developed to answer to the research questions introduced and deal with existing gaps in the literature.

The main findings and results revealed a positive and significant influence of service quality on the profitability measured as Economic return (ROI, or *return on investment*) of US airline companies; and a non-significant effect for quality on airline passenger revenues. While the effect of safety was vice versa. Thus, a non-significant effect for safety on profitability of airlines was confirmed, whereas the effect of safety on airline passenger revenues was significant.

UNIVERSITAT
ROVIRA i VIRGILI