



## **Efficiency in the tourism sector**

A conceptual analysis of international performance

**José Pedro Pequeno de Teiga Mano**

Thesis to obtain the Master of Science Degree in

### **Industrial Engineering and Management**

Supervisors: Prof. Diogo Filipe da Cunha Ferreira  
Prof. Maria Isabel Craveiro Pedro

#### **Examination Committee**

Chairperson: Prof. José Rui Figueira  
Supervisors: Prof. Diogo Filipe da Cunha Ferreira  
Member of the Committee: Prof<sup>a</sup>. Ana Sara Costa

**November 2021**



## **Declaration**

I declare that this document is an original work of my own authorship and that it fulfills all the requirements of the Code of Conduct and Good Practices of the Universidade de Lisboa.



## Abstract

In the twenty-first century, authors and scholars are faced with an overwhelming number of articles and dispersed information in every literature field. It is essential and for the greatest interest of mankind, that systematic reviews are undertaken with the goal of organizing and selecting the existent information. This way, providing scholars with easier access to synthesize reliable information and allowing them to continue with a sustained field progression.

An uprising field, prominent in the last three decades is tourism. Tourism has become a major global economic activity as the largest industry and employer of the world. Without possibly questioning its importance, tourism has become a vital source of wealth for many nations. Consequently, the field has caught the attention of governments, academics, and organizations all around the globe.

The present dissertation performs a systematic review, more precisely a Meta-analysis with a statistical and bibliometric analysis regarding the existent research on the efficiency of the tourism sector, fulfilling the current gap. Reviewing the current state of the tourism efficiency measurement literature serves as the main goal of this study.

By applying the PRISMA method, a sample of 130 articles is formed, with articles published from 1991 until 2021. The articles included measure the efficiency of tourism establishments or firms, more precisely hotels, airports, airline companies, and travel agencies. Ultimately, the dissertation concludes that the European and Asian countries were the most studied, more specifically Taiwan, Spain, and Portugal. The universally most used method is DEA. The most used inputs and outputs vary from sector to sector but are all number of assets or expenditures related. The publication growth during the period under analysis was 2,18%. The most relevant documents, authors, and sources in this literature field are Hwang and Chang, (2003), the Portuguese author Barros and the journal Tourism Management.

**Keywords:** Tourism efficiency, Frontier analysis, Systematic review, Meta-analysis, PRISMA, Bibliometric analysis



## Resumo

No século XXI, todos os autores e académicos são obrigados a lidar com uma avassaladora quantidade de artigos e de informação que se encontra dispersa pelos mais diversos meios literários. É essencial e extremamente benéfico para a humanidade, que revisões/análises sistemáticas sejam elaboradas para organizar e congregar a informação existente. Deste modo, tornando mais fácil o acesso de académicos a informação mais fidedigna permitindo que continuem com uma sustentada progressão do sector.

Um campo de estudo em ascensão, preponderante nas últimas três décadas é o turismo. O turismo tornou-se uma primordial atividade económica global sendo a maior indústria e o maior empregador do mundo. Sem sequer questionar a sua importância, o turismo tornou-se numa crucial fonte de riqueza para inúmeros países. Consequentemente, este campo tem cativado a atenção de governos, académicos e organizações em todo o mundo.

A presente dissertação realiza uma revisão sistemática, mais precisamente uma meta-análise recorrendo a uma análise estatística e bibliométrica sobre o conteúdo existente relacionado com a eficiência do setor turístico, completando a lacuna literária atual. O objetivo principal deste estudo é rever e analisar o atual estado da literatura no campo da medição da eficiência no setor do turismo.

Recorrendo ao método PRISMA, múltiplos artigos são recolhidos e compilados formando uma amostra de 130 documentos. Os artigos incluídos na amostra avaliam a eficiência do turismo em estacionamentos e empresas, mais precisamente em hotéis, aeroportos, companhias aéreas e agências de viagem. Por fim, a presente dissertação conclui que os países europeus e asiáticos foram os mais estudados, mais especificamente Taiwan, Espanha e Portugal. O método universalmente mais utilizado é o DEA. Os inputs e outputs mais utilizados variam de setor para setor, contudo são todos relacionados com número de ativos ou despesas. O crescimento de publicações no período analisado é de 2,18%. Os documentos, autores e fontes mais relevantes nesta área da literatura são Hwang e Chang, (2003), o autor português Barros e o jornal *Tourism Management*.

**Palavras-chave:** Eficiência no turismo, Análise de fronteiras, Análise sistemática, Meta-análise, PRISMA, Análise bibliométrica.





## Acknowledgments

This dissertation represents much more than the material scientific work presented. It portrays the cherry on top of a magnificent and challenging 5 years academic path. These past years in IST have been the most demanding of my life so far, filled with some of the best and worst moments I have ever experienced. Therefore, I feel compelled to seize this section's opportunity to display my deepest appreciation for the people that have stuck with me along the way.

Firstly I must express my sincere gratitude to my supervisors, Prof. Diogo Ferreira and Prof. Isabel Pedro, without whom I would not have been able to complete this dissertation. I am grateful for all the support given and for providing me with much-needed assistance, while being patient at the same time. Thank you.

I would also like to show my appreciation to IST, I never thought I would benefit so much from being constantly mentally and physically crushed and run over along these years. It taught me I am able to face and overcome any kind of obstacle life may throw at me.

Above anything I would like to thank my parents, Teresa and José, not only for supporting a 22-year-old comedian and procrastinator, but especially for all the love, patience, motivation, and endless perseverance that is crucial in every single part of my life. A big thanks to the rest of my family that were always proud of their "little future engineer".

I could not finish without thanking the ones that have accompanied me along this journey.

To my colleagues and dear friends, Francisca Corte-Real, Mariana Salema, Sofia Sarmento, António Morgado, José Fonseca, João Ferreira, Carlota Gouveia, Rita Noritake, Alex Villas-Boas, and all my remaining LEGI/MEGI closest friends that I apologize for not naming due to the lack of space, but you know exactly who you are, THANK YOU. Thanks for all the laughs, for the help and support, for your notes, for your advice, and essentially for sharing this journey with me.

Of course, I could not forget to thank my beloved Cotzes and Cats. Not only did you all welcomed me into your group, helped me in every way imaginable, guided me, taught me, motivated me, but you also shared with me some of my favorite moments and experiences that I will remember for life. You guys supported me and never let me down, thanks for all the constant love and kidney problems. If it were not for you my university experience would not have been anything nearly close to what it was, I am lucky and proud to be part of this borrowed family.

To some of my for-life best friends who believed in me, inspired me and with whom I could, and hope can always count, Ana Margarida Calheiros, Margarida Sá, and, especially to my unpaid personal supervisor and close friend Inês Vieira whom I made sure to bother with questions every chance I had, my deepest appreciation.

I would also like to address my appreciation to some people that although are not currently present in my life, did have a significant impact on my journey. Thank you Inês, Margarida Magalhães, and Beatriz Correia, you helped me in ways you may not even understand.

To all the above, thank you for believing in me even when I did not myself.

Thank you all for this journey.



# Table of Contents

<b>Abstract</b> .....	<b>v</b>
<b>Resumo</b> .....	<b>vii</b>
<b>Acknowledgments</b> .....	<b>ix</b>
<b>List of tables</b> .....	<b>xiii</b>
<b>1 Introduction</b> .....	<b>1</b>
1.1 Problem contextualization .....	1
1.2 Dissertation objectives .....	2
1.3 Dissertation structure.....	3
<b>2 Tourism</b> .....	<b>5</b>
2.1 What is there to know? .....	5
2.2 Performance measurement .....	9
2.3 Efficiency .....	10
2.4 Frontier Analysis.....	11
<b>3 Literature Review</b> .....	<b>13</b>
3.1 What does the literature say about this?.....	13
3.1.1 Reviews of research .....	13
3.1.2 Reviews of reviews .....	17
3.2 What is missing in the literature? .....	21
<b>4 Reviews</b> .....	<b>23</b>
4.1 What are reviews and why do we have them? .....	23
4.2 Types of Reviews .....	25
4.3 Narrative vs Systematic Reviews.....	26
4.4 Different types of systematic reviews.....	28
4.5 Meta-analysis .....	32
<b>5 Materials and methods: Data collection and extraction method</b> .....	<b>35</b>
<b>6 Results, analysis, and discussions</b> .....	<b>39</b>
6.1 A statistical global overview of data .....	39
6.1.1 A statistical overall analysis of the countries and continents studied .....	41
6.1.2 A statistical overall analysis of the methodologies applied .....	42
6.1.3 A statistical overall analysis of the number of publishments during the years .....	43
6.2 Statistical analysis over the Hotel sector .....	45
6.2.1 Inputs and Outputs variables applied .....	45
6.2.2 Methodologies applied .....	47
6.2.3 Countries studied .....	48
6.3 Statistical analysis over the Airports sector. ....	49
6.3.1 Inputs and Outputs variables applied .....	49
6.3.2 Methodologies applied .....	51

6.3.3	Countries studied .....	52
6.4	Statistical analysis over the Airline Company’s sector .....	53
6.4.1	Inputs and Outputs variables applied .....	53
6.4.2	Methodologies applied .....	55
6.4.3	Countries studied .....	55
6.5	Statistical analysis over the Travel Agencies sector .....	55
6.5.1	Inputs and Outputs variables applied .....	55
6.5.2	Methodologies applied .....	56
6.5.3	Countries studied .....	56
<b>7</b>	<b>Bibliometric Analysis .....</b>	<b>57</b>
7.1	Co-citation analysis.....	61
7.1.1	Document’s references co-citation analysis results.....	62
7.1.2	Authors’ co-citation analysis results .....	64
7.1.3	Sources’ co-citation analysis results.....	66
7.2	Discussion on the bibliometric analysis results.....	68
<b>8</b>	<b>Concluding remarks, limitations, and future directions for research.....</b>	<b>71</b>
8.1	Conclusions.....	71
8.2	Limitations .....	74
8.3	Future research .....	74
	<b>References.....</b>	<b>75</b>
	<b>Appendix A .....</b>	<b>87</b>
Appendix A.1 .....		88
Appendix A.2 .....		89
	<b>Appendix B .....</b>	<b>92</b>
	<b>Appendix C .....</b>	<b>94</b>
	<b>Appendix D .....</b>	<b>109</b>
Appendix D.1 .....		109
Appendix D.2 .....		109
Appendix D.3 .....		110
Attachments D.4.....		111
Attachments D.5.....		112

## List of tables

<b>Table 1</b> - Tourism definitions.....	7
<b>Table 2</b> - Different tourism-related definitions .....	8
<b>Table 3</b> - Efficiency definitions .....	11
<b>Table 4</b> - Summary of reviews of reviews .....	15
<b>Table 5</b> - Summary of reviews of research .....	19
<b>Table 6</b> - Differences between traditional reviews .....	27
<b>Table 7</b> - Authors and different thematics used when defining reviews .....	30
<b>Table 8</b> - Types of review articles (n = 139).....	31
<b>Table 9</b> - Different meta-analysis definitions.....	32
<b>Table 10</b> - Statistical measures applied to the data collected of 130 articles.....	39
<b>Table 11</b> - Statistical measures applied to data collected from more than 100 times cited articles....	40
<b>Table 12</b> - Main information regarding the collection .....	58
<b>Table 13</b> - Ten most utilized journals.....	59
<b>Table 14</b> - Top 10 Most productive countries (based on first author's affiliation).....	60
<b>Table 15</b> - Top 10 Most frequent keywords.....	61
<b>Table 16</b> - TC and TC/year of the fifteen most cited publications .....	62
<b>Table A.17</b> - Typology of literature review types .....	87
<b>Table A.18</b> - Main review types characterized by methods used .....	88
<b>Table B.19</b> - PRISMA 2020 Checklist .....	91
<b>Table C.20</b> - Sample articles data .....	93
<b>Table D.21</b> - The ten most impactful institutions .....	108
<b>Table D.22</b> - Document Co-citation analysis data .....	109
<b>Table D.23</b> - Author's Co-citation analysis data .....	110
<b>Table D.24</b> - Source's Co-citation analysis data .....	111



## List of figures

<b>Figure 1</b> - PRISMA Statement.....	37
<b>Figure 2</b> - Analysis of sectors studied in the literature.....	41
<b>Figure 3</b> - Number of studies from each Continent.....	42
<b>Figure 4</b> - Methodologies applied in the sample.....	43
<b>Figure 5</b> - Published articles per year.....	44
<b>Figure 6</b> - Published articles per 10 years period.....	44
<b>Figure 7</b> - Top 15 most used input variables in the hotel sector.....	45
<b>Figure 8</b> - Top 15 most used output variables in the hotel sector.....	46
<b>Figure 9</b> - Top 10 most used methods in the hotel sector.....	47
<b>Figure 10</b> - Countries addressed in the hotel sector.....	48
<b>Figure 11</b> - Top 10 most used input variables in the airport sector .....	50
<b>Figure 12</b> - Top 5 most used output variables in the airport sector.....	51
<b>Figure 13</b> - Top 5 most used methodologies in the airport sector.....	52
<b>Figure 14</b> - Countries studied in the airport sector.....	53
<b>Figure 15</b> - Inputs used in the airline company's sector .....	54
<b>Figure 16</b> - Outputs used in the airline company's sector .....	54
<b>Figure 17</b> - Inputs used in the travel agency's sector .....	56
<b>Figure 18</b> - Outputs used in the travel agency's sector .....	56
<b>Figure 19</b> - Growth of the number of articles and Mean of TC per year .....	58
<b>Figure 20</b> - Document's references co-citation analysis network using VOSviewer software .....	63
<b>Figure 21</b> - Authors' co-citation analysis network using VOSviewer software .....	65
<b>Figure 22</b> - Sources' co-citation analysis network using VOSviewer software .....	66
<b>Figure D.23</b> - Cumulative growth of the sources throughout the years .....	108





## List of abbreviations

<b>ASK</b>	Available Seat-Kilometers
<b>ATM</b>	Air Traffic Management
<b>CATA</b>	Computer-Aided Text Analysis
<b>DEA</b>	Data Envelopment Analysis
<b>eWOM</b>	Electronic Word Of Mouth
<b>F&amp;B</b>	Food and Beverages
<b>KPI</b>	Key Performance Indicator
<b>PRISMA</b>	Preferred Reporting Items for Systematic Reviews and Meta-Analysis
<b>QUOROM</b>	Quality of Reporting of Meta-analyses
<b>SALSA</b>	Search, Appraisal, Synthesis, and Analysis
<b>SF</b>	Stochastic Frontier
<b>SFA</b>	Stochastic Frontier Approach
<b>TC</b>	Total Citations
<b>TCCM</b>	Theory-Context-Characteristics-Methodology
<b>UK</b>	United Kingdom
<b>USA</b>	United States of America
<b>VFP</b>	Variable Factor Productivity Regression
<b>VRS</b>	Variable Returns to Scale



# 1 Introduction

In this chapter, a brief introduction is made about the topics and the concepts discussed in this dissertation. It provides a framework for the problem and the motivation behind it. Additionally, the dissertation's structure is also presented.

## 1.1 Problem contextualization

As humanity evolves, it has become irrefutable that knowledge is key. As humans advance as a society and education increases worldwide, this fact has become gradually more present in the common mindset. Every day new papers are published, a new theme is being explored and new questions emerge regarding any subject of the literature. As a consequence, twenty-first-century scholars have increasingly become swamped into mountainous virtual piles of new data and knowledge.

As noted by Dwivedi et al. (2011) and quoted by Kim et al. (2018) and Pahlevan-Sharif et al. (2019) *“for a field to progress, it must be conscious of its historical patterns to obtain insights into possible future developments and implications that contribute to the accumulation of knowledge”*. It is therefore critical for the sustained progression of literature, that reviews studies are undertaken to analyze and detail what has already been done in each individual literature field. Specifically systematic reviews, are essential and have become the author's best help, providing them with accurate and selective data and preventing them from nosediving into oceans of inadequate or valueless articles. Although systematic review's importance is explored further in this dissertation, it is noteworthy to highlight its crucial contribution to knowledge development.

A field of study that has seen an increase in interest in the last decades is tourism. Although its emerging significance has been firstly recognized in 1950, not until 1970 has tourism become a progressive field of study (Robinson et al., 2013). However, it is now, not only acknowledged as a major global economic activity but also has become the largest industry and largest employer in the world. Consequently, the field has caught the attention of many governments, academics, and organizations in both the public and private sectors (Lickorish and Jenkins, 1997). Without possibly questioning its importance, tourism has become a vital source of wealth for many nations. The increase of interest in the tourism literature has been noticed and reported by many authors, for example Gursoy and Sandstrom (2016) and McKercher and Tung (2015). An actual study that clearly reveals this exponential growth of articles being published in the tourism literature is the one by McKercher and Tung (2015), where the authors disclose that the number of journal titles has inflated from a dozen to hundreds of papers in a few decades.

Within the tourism field of study, one particular subfield that has been prevalent in the last decade is the performance measurement field. As written by Altin et al. (2018), the significance of performance measurement and management regarding the success of businesses has been

emphasized by all management perspectives and theories, and in this case, the tourism industry is no exception.

Both Sainaghi et al. (2017) and Assaf and Josiassen (2015) concur that the previous decade has seen a growth in scholarly interest in tourism performance measurement, with authors as Peypoch et al. (2012), Assaf and Josiassen (2012), Barros and Dieke (2008) and Barros (2005), commenting on it. Although, as stated by Sainaghi et al. (2017), it offers several benefits for practitioners, the concept of tourism performance is not yet fully explored. Embedded in the performance measurement is the efficiency measurement which is one of few components that constitutes performance. This is an important technique that should be integrated into every business or industry, since, the simple use of performance or efficiency measurement, has proven to enhance the overall performance of businesses (Spekle & Verbeeten, 2014). Nevertheless, as the crucial activity, it might be for the strategic planning and management of tourism, developing a performance measurement study of quality remains a considerable challenge.

## **1.2 Dissertation objectives**

Despite some articles being published in the last decade addressing performance measurement in tourism and hospitality, there is still a noticeable gap in the tourism literature. Some reviews have been developed but none has exclusively focused on the efficiency of the tourism sector. Moreover, the most recent studies addressing the performance measurement in tourism have only used articles dated until 2017. This may not seem a lot, but the truth is that such an exponentially fast-growing industry as tourism is, develops a lot in a few years, and, in addition, as it is of common knowledge, it is important to highlight that the last 2 years (2020 and 2021) have not been normal years for the humanity or economy. The Covid-19 Pandemic has affected every single sector of the economy and tourism is no exception. It might be therefore interesting to explore what recent tourism-related studies have found or concluded from measuring the performance or efficiency of the tourism sector during such unusual and impactful conditions. Thus, not only do reviews that address exclusively the efficiency measurement in tourism not exist but there is also no evidence of performance measuring papers that include research articles in the last 4 years, and therefore this dissertation not exclusively, but also includes in its analysis this last unexplored four years.

The present work consists of a dissertation. The dissertation's main goal is to assess and analyze the current state and condition of the existent literature. Firstly it contextualizes the readers and develops a literature review with the target of uncovering any noticeable gaps. Later, it defines several important topics related to tourism, reviews, and efficiency and then determines the most appropriate type of review for this study to adopt. Furtherly it carries out the most appropriate type of review, in this case, a systematic review and meta-analysis are performed by using the PRISMA method to collect the articles. Later with the data collected, it produces a statistical analysis followed by a bibliometric analysis. Lastly, it analyses and concludes the results.

### 1.3 Dissertation structure

The structure of this dissertation is as follows:

**Chapter 1** – Introduction: A contextualization of the problem, along with the objectives, is presented so that the reader can have a better understanding of the dissertation.

**Chapter 2** – Tourism, “What is there to know?”: In this second chapter a brief contextualization of tourism, including a historical context is presented, as well as several definitions by different authors. The importance of tourism is also explained and addressed in the chapter. Further on in the chapter appear some sub-chapters that explain, define, and introduce: “Performance Measurement”, “Efficiency” and “Frontier Analysis”

**Chapter 3** – Literature Review: This chapter is composed of two sub-chapters. The first one provides a theoretical analysis resulting in an overview of key findings. It also includes two tables presenting some of the information retrieved. The tables include the authors, period studied, journal, article type, keywords, methodology used, and main conclusions. The second sub-chapter presents a short summary of what is missing in the literature.

**Chapter 4** – Methodology: The methodology presented in this chapter is theoretically based. This fourth chapter is composed of five sub-chapters. Firstly, a sub-chapter presents a small brief into reviews, contextualizing how they emerged, defining them, and explaining their significance. A second one introduces and gives a small historical context of what types of reviews exist. A third sub-chapter presents a comparison between the two main types of reviews: Narrative vs Systematic. The next sub-chapter enumerates and explores the types of systematic reviews that exist. Lastly, a method/type of review is chosen and the chapter defines and introduces the method: Meta-analysis.

**Chapter 5** – Data collection and extraction method. This chapter explains the process of data collection using the PRISMA method, it provides information regarding the inclusion and exclusion criteria and displays the PRISMA flow diagram.

**Chapter 6** – Results, analysis, and discussions: This chapter examines the collected data by performing statistical analysis. Firstly, an overall analysis is made and later four separate subchapters perform statistical analysis focused on each individual sector studied.

**Chapter 7** – Bibliometric Analysis: In this chapter as the name indicates, a bibliometric analysis is applied using the Bibliometrix RStudio package software and the VOSviewer software. Firstly a general analysis is made and then three co-citation analyses are made, specifically for the documents, authors, and sources of the sample.

**Chapter 8** – Conclusions, limitations, and future work: In this last chapter, the most important conclusions and results are presented. It also contains the limitations and constraints of the present work, as well as suggestions and recommendations for future research.



## 2 Tourism

This chapter is divided into three sections. Section 2.1 presents definitions of tourism along with its evolution throughout the years and some background history. Section 2.2 introduces the technique of performing measurement, as well as some definitions. Section 2.3 focus specifically on efficiency and provides some definitions as well. Lastly, Section 2.4 presents the frontier analysis which are the methods used to measure the above-mentioned topics.

### 2.1 What is there to know?

From the beginning of mankind, the primate Man traveled for numerous reasons, rather seeking better surviving conditions, looking for resources, or simply exploring new places. As Jayapalan (2001) wrote in his book, traveling is an ancient social phenomenon, that has brought fascinating achievements to mankind. Although initially, the basic surviving needs were the main purpose of travels, gradually Man started traveling for pleasure and enjoying leisure time.

As humanity evolved so did the tools, the means of transport, communication and technology which transformed travel into a progressively easier activity. Nowadays millions of people all around the globe take pleasure in visiting and moving from one country to another in relatively short periods of time. Without a doubt that the most significant change and evolution in traveling occurred during the Industrial Revolution, as Jayapalan (2001) states. People had access to even more transports and began moving in larger groups to other locations, distant from their own residences. This era was an extremely important steppingstone to the nowadays common term “tourism”.

Curiously, regarding the origin of the word “tourism”, and according to Leiper (1979), the word appeared first in the era of the Grand Tour, which was a period between the mid-17th century and the end of the 18th century, where young men would embark into travels pursuing an enrichment of their study curriculum. Theobald (2005), strengthen the idea that the word’s roots were connected to the Greek term for a circle. More specifically the author claims that the word “tour” descends from the Latin “*tornare*” and the Greek “*tornos*”, which means circle or a circular movement. It is also added that the suffix “-ism” can be defined as “action or process” and the “-ist” implies “one that performs a given action”. Therefore, Theobald (2005) believes that when both are put together, the word tourism resembles the idea of a circle, meaning that a tour represents a journey that is a round trip, where the starting point is also the finishing point. Lastly, following the author's line of thought, a tourist denotes the person who takes or performs such a journey.

Both Theobald (2005) and Robinson et al. (2013) agree that in the 1950s, the creation of the commercial airline industry and consequently the growth of mass tourism presented a turning point for general tourism. After this, scholars and researchers started to acknowledge the rising significance of tourism, although it only became a field of serious research in the 1970s when it became to be more explored by scholars. These initial scholars helped to elaborate the concept of tourism, with it becoming recognized as a vital field of study with severe impacts on economies, communities and environments.

Roughly a decade later the field of tourism, started to appear as a legitimate field of study in many universities. Although it is often coupled with hospitality, tourism is not as focused on the business accommodations and food service operations as hospitality is, it focuses much more on the global experience of the travel, as well as all the marketing and destination management involved (Robinson et al., 2013).

If there were still questions regarding the weight and impact of tourism, in 1992 those questions vanished as tourism became the largest industry and largest employer in the world. Becoming such a colossal industry comes with consequences, and therefore the importance of studying tourism became increasingly more essential due to the not only positive impacts that tourism was having on several destination areas as well as its residents (Theobald, 2005). Without possibly questioning its importance, tourism has become a vital source of wealth for many nations and has turned into a high priority for many people.

As the monumentally critical sector it is, tourism must be studied intensively and, for that to be possible, a valid definition of tourism is required. However, as many authors have stated, it is almost impossible to achieve a unanimous definition for such a complex concept (Leiper, 1979; Tribe, 2009; Jayapalan, 2001; Lickorish & Jenkins, 1997; Lubbe, 2003; Theobald, 2005). One may ask, why is it that important to define tourism? Burkart and Medlik (1974:39) answered this question and explained its relevance. They both started by agreeing that a proper definition is needed for various purposes. Firstly, it is needed because, to study a given subject it is necessary to establish parameters for research content, therefore, to systematically analyze a phenomenon it is indispensable to define what it covers. Secondly, in absence of a standard definition, there would be no consensus on any type of tourism measurement, being it economical or not, for example when dealing with a statistical study, for a phenomenon to be measured, it is required to be priorly defined in practice available techniques of measurement. Finally, since it also concerns administrative and legislative purposes, or industrial purposes, where for example, some legislations may apply to certain activities and not to others. Regardless of this need, researchers have not reached yet a unanimous definition, although, according to Lubbe (2003), the need to arrive at a consistent definition has already been addressed by several authors and organizations. In particular, the League of Nations, the World Tourism Organisation (WTO), the Organisation for Economic Cooperation and Development, and the United Nations Organisation have all solicited that a definition must be established.

Theobald (2005) states that the reason why tourism is so difficult to define comes from the fact that it means different things to different people and therefore no universal definition has been established yet. Tribe (2009) associates this difficulty with the complexity of tourism and adds that the fact that every proposed tourism definition is criticized and can often be improved upon, only aggravates the problem. Lastly, Lickorish and Jenkins (1997) claim that tourism intersects with several sectors of the economy. It is often classified as multifaceted due to its need for economic, social, cultural and environmental inputs. The main problem, according to the author is that tourism is not like most common industries that can be measured in tonnes or liters, it does not have a physical output to be measured and there is no standard structure that represents it in every country. Any core component of this industry may differ between nations, as for example accommodation or transports.



For scholars and tourism analysts, this definition problem is a constant difficulty, and although some techniques have already been developed to facilitate measuring its impact, there is still no unanimously accepted definition of what the tourism industry englobes.

As said, many authors have attempted to define tourism, some of the definitions used are shown in Table 1.

Table 1 - Tourism definitions

Authors	Definition of Tourism
Hermann V. Schullard (1910) in Jayapalan (2001)	"...the sum total of operators, mainly of an economic nature, which directly relates to the entry, stay and movement of foreigners inside and outside a certain country city or region"
Hunziker and Krapf (1942) in Jayapalan (2001)	"Tourism is the totality of the relationship and phenomenon arising from the travel and stay of strangers, provided the stay does not imply the establishment of a permanent residence and is not connected with a remunerated activity."
Hunziker and Krapf (1942) in Burkart and Medlik (1974:40)	"the sum of the phenomena and relationships arising from the travel and stay of non-residents, in so far as they do not lead to permanent residence and are not connected to any earning activity"
Australian Department of Tourism & Recreation (1975:2).	"Tourism is an identifiable nationally important industry. The industry involves a wide cross-section of component activities including the provision of transportation, accommodation, recreation, food, and related services"
Ansett Airlines (1977:773) in Leiper (1979)	"Tourism refers to the provision of transportation, accommodation, recreation, food, and related services for domestic and overseas travelers. It involves travel for all purposes, including recreation and business"
McIntosh (1977:ix) in Leiper (1979)	"Tourism can be defined as the science, art, and business of attracting and transporting visitors, accommodating them, and graciously catering to their needs and wants."
Jafari (1977:8) in Leiper (1979)	"Tourism is the study of man away from his usual habitat, of the industry which response to his needs, and of the impacts that both he and the industry have on the host's socio-cultural, economic and physical environments"
Wahab (1977:26)	"A human intentional activity that serves as a means of communication and as a link of interaction between the peoples, inside a country or even beyond its geographical demarcations. It involves the temporary displacement of people from one region to another, country, or even continent, with the objective of satisfying necessities and not the realization of remunerated activity. For the visited country, tourism is an industry whose products are consumed in loco, producing invisible exports."
Leiper (1979)	"It is the system involving the discretionary travel and temporary stay of persons away from their usual place of residence for one or more nights, excepting tours made for the primary purpose of earning remuneration from points in the route."
Mathieson et al. (1982) in Berendien Lubbe (2003)	"tourism is 'the temporary movement of people to destinations outside their normal places of work and residence, the activities undertaken during their stay in those destinations, and the facilities created to cater to their needs"
Ottawa Conference of (1991)	"Tourism comprises the activities of persons traveling to and staying in places outside their usual environment for not more than one consecutive year for leisure, business, and other purposes."
Cooper et al. (1993:4)	"Tourism can be thought of as a whole range of individuals, businesses, organizations, and places which combine in some way to deliver a travel experience. Tourism is a multidimensional, multifaceted activity, which touches many lives and many different economic activities."
Holloway (1994:1).	"movement of people away from their normal place of residence"
Middleton, in Bennett (1995:6) quoted in Berendien Lubbe (2003)	"Tourism is deemed to include any activity concerned with the temporary short-term movement of people to destinations outside the places they normally live and work, and their activities during the stay at these destinations"
McIntosh et al. (1995:10)	"the sum of the phenomena and relationships arising from the interaction of tourists, business suppliers, host governments and host communities in the process of attracting and hosting these tourists and other visitors"
Tribe (1997:640)	"tourism is essentially an activity engaged in by human beings and the minimum necessary features that need to exist for it to be said to have occurred include the act of travel from one place to another, a particular set of motives for engaging in that travel (excluding commuting for work), and the engagement in activity at the destination."
Cooper et al., (1998:8) in Tribe (2009)	"a multidimensional, multifaceted activity which touches many lives and many different economic activities"

United Nations World Tourism Organization (2008)	"It comprises the activities of persons traveling to and staying in places outside their usual environment for not more than one consecutive year for leisure, business, and other purposes not related to the exercise of an activity remunerated from within the place visited."
United Nations World Tourism Organization (2012)	"The duster of production units in different industries that provide consumer goods and services demanded by visitors. Such industries are called tourism industries because visitor acquisition represents such a significant share of their supply that, in the absence of visitors, their production of these would cease to exist in meaningful quantity."

Furthermore, other specific concepts should also be defined. Therefore, in Table 2 some definitions regarding the individual that practices tourism, are presented.

Table 2 - Different tourism-related definitions

Authors	Different Definitions
International Union of Official Travel Organizations (1963:14)	"visitor": "any person visiting a country other than that in which he has his usual place of residence, for any reason other than following an occupation remunerated from within the country visited." "tourists": "temporary visitors staying at least twenty-four hours in the country visited and the purpose of whose journey can be classified under one of the following headings: leisure, business, family, mission, meeting." "excursionists": "temporary visitors staying less than twenty-four hours in the country visited (including travelers on cruise ships)"
The Shorter Oxford English Dictionary (1800) in Tribe, J. (2009).	"tourist": "one who makes a tour or tours; one who does this for recreation; one who travels for pleasure or culture, visiting a number of places for their objects of interest, scenery or the like"
United Nations World Tourism Organization, (2008a)	"visitor": "a traveler taking a trip to the main destination outside his/her usual environment, for less than a year, for any main purpose (business, leisure or other personal purpose) other than to be employed by a resident entity in the country or place visited. "
American Heritage Dictionary	"tourist": "one who travels for pleasure"
Merriam Webster Dictionary	"tourist": "one that makes a tour for pleasure or culture"
Cambridge online dictionary	"tourist": "someone who visits a place for pleasure and interest, usually while they are on holiday"
Nash (1981:462).	"tourist": "a person at leisure who also travels"
Statistical Commission of the United Nations (1968) in Lickorish and Jenkins (1997)	visitor': "any person visiting a country other than that in which he has his usual place of residence for any reason other than following an occupation remunerated from within the country visited."
Lickorish and Jenkins (1997)	'visitor': "any person travelling to a place other than that of his/her usual residence for less than 12 months and whose main purpose of the trip is other than the exercise of an activity remunerated from within the place visited"
McIntosh et al. (1995:9)	"tourist": "the most important element of tourism because without tourists, there is no tourism. Also, the tourist is the prime actor in this industry and seeks various experiences and satisfactions, the nature of which will largely determine the destinations chosen and the activities enjoyed."
Smith (1977:2) in Graburn, N. H. H. (1983)	"tourist": "temporarily leisured person who voluntarily visits a place away from home for the purpose of experiencing a change"

As the huge global industry that it is, tourism has evolved and grown into different areas, therefore tourism can be divided into different types. According to Jayapalan (2001), tourism can be split based on nature, utility, time, and distance, providing the following types: Annual Holiday, Pleasure, Relaxation, Rest and Recreation, Health, Participation in Sports, Curiosity, and Culture, Ethnic and Family, Spiritual and Religious, Status and Prestige, Professional or Business, Education, Industrial Tour, Seasonal Tour, Social Tour International Tour, Association Tour, Group Tours. Although numerous types of tourism indeed exist, it is not this dissertation's main concern to explore them separately.

From this small brief into tourism, one may conclude that, mainly since 1950, tourism has evolved into a major international industry. It has attracted the entire world and its economic advantages are recognized by numerous experts. As quoted from Jayapalan (2001), *“Tourism is a painless procedure for transfer of real resources from industrially capital surplus developed countries to the low-income developing countries”* and therefore countless countries rely upon its income. It is also one of the largest sources of employment, it not only offers employment for specialized or skilled personal but also for unskilled due to its large and diversified needs. Furthermore, it enables the wealth generated in a specific area of a country to be shifted to other areas of the same country. Tourism also provides an improvement of social and political understanding between nations and continents, being, therefore, without a doubt, an important tool for promoting cultural exchanges and international cooperation (Jayapalan 2001).

As Lubbe (2003), Theobald (2005), and Du et al. (2014) stated, tourism is the world’s biggest industry on every economic measure, particularly concerning capital investment, gross output, employment (as mentioned above), tax contributions, and value-added. Not only this, but is also the fastest growing industry, and, by turning into an important social and economic force, has enabled it to be affordable not only for the rich but for almost everyone all over the world (McIntosh et al., 1995). International tourism, therefore, represents a crucial global trade flow, although, as Lickorish and Jenkins (1997) commented since it is a multi-faceted activity, it is very complex to estimate its precise value.

The tourism sector has passed through some dramatic changes in the past decades, with much more journals and papers being published in the literature (Gursoy & Sandstrom, 2016; McKercher & Tung, 2015). According to McKercher and Tung (2015), the number of journal titles has inflated from less than 10 before 1980 to an impressive 290 in 2015. These numbers show the growth in interest regarding the tourism industry. As it provides a mass movement of people throughout the world, tourism also inevitably creates consequences, and the measurement and study of those consequences are essential so they can be fixed or minimized, turning tourism into a sustainable harmless industry. Thus, as written by Lickorish and Jenkins (1997) there is still room for much more improvement regarding the study and exploration of tourism. As people are gradually becoming part of “the global village”, they need to be aware of the contemporary global trends and also the avoidable and unavoidable effects of tourism (Lubbe, 2003). Thus, there is still a lot to be studied and analyzed in this industry and the interest in the field must keep growing.

## **2.2 Performance measurement**

Performance measurement provides several benefits to practitioners (Sainaghi et al., 2017). As Chen et al. (2015) and Altin et al. (2018) state, performance measurement is linked to strategy formulation and it can assist organizations when analyzing and evaluating their performance development. According to Spekle and Verbeeten (2014), the simple use of performance measurement can improve the overall performance of firms or industries, it is therefore essential for the management and strategic planning of tourism. Neely et al. (1995) once stated that although frequently addressed, performance measurement is scarcely defined. Therefore, Neely et al. (1995), proceeded to define it

as *“the process, metric or set of metrics used to quantify both the efficiency and effectiveness of actions.”*

Regarding the hospitality and tourism literature, performance measurement has long ago been an important issue (Assaf & Josiassen, 2015). When focusing only on hotels Ben and Goaid (2016) claim that hotel firms have high fixed costs, and therefore, to survive and create a profit margin they must maintain a high-performance level. Hence, for the sake of evaluating the performance of implemented strategies, hotels are required to use adequate performance measurement tools.

Although having considerable limitations, many performance measures in hospitality and tourism used to be financially focused and be evaluated by the number of tourism arrivals, occupancy rate, and labor productivity (Anderson & Michello, 1999). These methods would not consider the inputs and outputs setting of tourism firms and it would be impossible to determine a relative benchmark to increase performance. As claimed by Sainaghi et al. (2017), performance measurement in the tourism sector has germinated to various different methods and perspectives, with them being: competitiveness, tourism productivity, efficiency, metrics in use, and performance measurement systems. A suitable metric to measure performance in tourism is the “efficiency” (Luo & Homburg, 2008). This method has been recently used by diverse authors to measure hotel and tourism performance (Assaf & Tsionas., 2019). The numbers that prove this recent growth of interest in the efficiency method can be seen in Sainaghi et al. (2017), where it is shown that from 1996-2014, 170 studies were published using efficiency and 75 of this were tourism-related. It is also presented that from the 170 papers sample, 72 were published in the years 2011-2014 and a total of 129 from 2007-2014.

In its paper, Cracolici et al. (2008) presented an interesting view, where the authors compared the tourist territory to a commercial company, in its perspective if both are equally analyzed, then one may hypothesize that it should be possible to manage efficiently the tourism area’s input. These inputs are the physical territory and human resources, while the arrivals, value-added, bed nights, customer satisfaction, and employment would constitute the output. Therefore, the efficiency of use of a tourist destination could be measured to assess its performance, this would enable tourist destination managers to analyze and diagnose any possible dysfunction, improving the operational and strategic planning of tourism policies. As Assaf and Tsionas (2019) mentioned, the use of efficiency metrics is well-suited for evaluating theories and experimenting putting into practice strategies associated with a competitive upper hand.

### **2.3 Efficiency**

The existence of a general misconception of the true meaning of efficiency cannot be denied and might be considered a substantial problem. As Coleman (2015) said, the terms efficiency and inexpensive are not synonymous, since, for example, a company may become less expensive but also less efficient at the same time. The concept is therefore essentially a tradeoff between cost and service or function. Hubbell (2007) made an interesting comment regarding efficiency, defining it as the barometer of the “how” of operations since it basically informs and measures the performance of operations if everything is working in the best way possible. An operation can reach maximum

efficiency by attaining strategic outcomes without compromising quality and by being as inexpensive as possible. This way, efficiency connects quality, strategy, and effective distribution. As Sanders (1987), once wrote, *“the term efficiency has proven to be chameleon-like”*, what it means is that efficiency may be defined in various ways, consonant to the purpose or field of study. Several authors have attempted to define this term, and some definitions are presented in Table 3.

Table 3 - Efficiency definitions

Author	Definition of efficiency
Kaldor (1939)	<i>"efficiency is defined in terms of the aggregative benefits of an activity outweighing the aggregative costs."</i>
Farrell (1957)	<i>"When one talks about the efficiency of a firm one usually means its success in producing as large as possible an output from a given set of inputs. Provided that all inputs and outputs were correctly measured, this usage would probably be generally accepted."</i>
Posner (1977) in Margolis (1987).	<i>"Efficiency means exploiting economic resources in such a way that value-human satisfaction as measured by aggregate willingness to pay for goods and services- is maximized."</i>
Färe et al. (1985)	<i>"an informal definition is that efficiency is the quality or degree of producing a set of desired effects."</i>
Gary Lawson in Coleman (2015)	<i>"deem[] actions or institutions 'efficient' to the extent that they increase or improve 'social welfare."</i>
Niavis and Tsiotas (2019).	<i>"the ability of destinations to exploit the capacity of their hotels, labor, and attractions to maximize their tourism demand"</i>

Keller and Bieger (2006) also highlighted the often-seen inconsistency regarding the relation between "effectiveness" and "efficiency", and Drucker (1974), presented a simple but accurate definition stating that *"Efficiency is concerned with doing things right. Effectiveness is doing the right things."*

Now that both concepts of efficiency and performance are defined, a question that might stand is "Why is it important to measure efficiency?". Fried et al. (1993) presented two main reasons why, firstly, because efficiency is used to measure performance and therefore it is a success indicator. Secondly, seeing that only by analyzing and studying it may one identify the sources of its efficiency, or lack of it, and therefore explore how to improve overall performance.

Finally, as Fare et al. (1985) highlighted, efficiency is a crucial feature of a producer's performance, which unfortunately is sometimes neglected by the literature.

## 2.4 Frontier Analysis

Efficiency is usually measured by some index associated with the perceived and desired performance. To analyze efficiency and performance, scholars, as a rule, tend to use methods of frontier analysis.

To measure or estimate efficiency, one must begin with calculating the production or cost frontiers. Assaf and Tsionas (2019) defined this frontier as being a representation of the maximum level of outputs that can be obtained considering a certain vector of inputs. Estimating these frontiers using an arbitrary sample of inputs/outputs is not an easy task, as mentioned by Assaf and Josiassen (2015). Authors have relied on different statistical methods to evaluate the production frontiers, the various techniques used can be classified into two main categories: nonparametric and parametric frontier approaches (Cracolici et al., 2008).

Assaf and Josiassen (2015) stated that: “*The nonparametric approach to frontier estimation imposes limited structure on the estimation of the frontier technology*”. There are different methods that are considered nonparametric, but the most popular and well-known is the Data Envelopment Analysis (DEA). This method was first based on the work of Farrell (1957) and then later elaborated by Charnes et al. (1978). Its popularity by scholars comes from its flexibility and simplicity since it does not require any previous specification or assumption regarding its functional form and also it is possible to be applied when various inputs are used to produce several outputs (Cracolici et al., 2008; Coelli et al., 2005). According to Coelli et al. 2005, DEA models can be measured using either inputs or outputs orientation, contingent on the industry or context. Thus, the technique may be used to measure efficiency on both public or private sector agencies, (for example airports, hospitals, schools, or hotels, fast-food chains, banks, etc) (Cracolici et al., 2008).

Although it is commonly the method of election among scholars, DEA has a prime limitation, it considers random errors as a source of inefficiency, and as a consequence, it is criticized to be notably sensitive to outliers and sample dimension (Assaf & Josiassen, 2015; Assaf & Tsionas, 2019). DEA implements a linear programming approach while, a parametric method, for example, the Stochastic Frontier Approach (SFA), utilizes an econometric approach (Assaf & Tsionas, 2019). Taking this different approach, the most prominent method is the SFA which, according to Assaf and Josiassen (2015), takes a parametric fashion to estimate the same frontier. The authors also explain that the efficiency scores are computed in comparison to the maximum feasible output given by the stochastic frontier. In comparison to the DEA method Assaf and Tsionas (2019), highlight that the SFA method considers an extra component, concerning the random noise effect, which as mentioned before, frames the model as less sensitive to random errors.

There has been an extensive debate in the literature, regarding which is the best frontier approach. However, there is not a correct answer for this question, since both parametric and nonparametric methods have their advantages and disadvantages. There is not a plain or straightforward solution for this debate given that, even though they both are identical in terms of how they establish the frontier and measure the efficiency/inefficiency, there is also a notable difference. A brief comparison between both methods is presented by Button and Weyman (1994), where the authors state that the nonparametric approach provides a measurement of the efficiency while the parametric approach measures and explains the efficiency obtained. According to Assaf and Josiassen (2015), the most flexible approach is nonparametric since there is no need for a specification of a functional form between inputs and outputs. Nevertheless, as previously mentioned, the authors also state that the approach is limited for not allowing random errors.

### **3 Literature Review**

This chapter presents a comparative study of the existing literature, intending to evaluate what has already been done and which are the most commonly used methods. It also shows the recommendations of different authors and identifies the gap present in the literature.

#### **3.1 What does the literature say about tourism efficiency?**

When analyzing the literature on the efficiency of the tourism sector two different types of articles were found, reviews articles of what has already been made on the area and also reviews of reviews. Therefore, this literature review can be divided into two parts, the first one being the reviews of research.

##### **3.1.1 Reviews of research**

Firstly, his part of the literature review addresses the review articles published in the field. According to Grant and Booth (2009), the Oxford English Dictionary defines “review” as “To view, inspect, or examine a second time or again”, and this definition can in general terms characterize all review types that currently exist. These types of articles are usually focused on gathering research, disposing of useless information, and condensing the best of the remaining research.

From the research made on the tourism literature only a few studies were found, none of which were specifically efficiency focused. Although no reviews were efficiency-related, some explored it indirectly by emphasizing performance. Performance and efficiency are related since the first one is a broader topic that englobes many elements and efficiency is one of those elements that helps to measure performance. Three different studies were found exploring performance, for instance, Sainaghi *et al.* (2017) conducted a meta-analysis of tourism performance measurement by synthesizing tourism and hospitality research. A bibliometric analysis was used since it is a conventional form of meta-analysis. The study was based on quantitative content analysis, using the CATA approach, which stands for Computer-Aided Text Analysis. This analysis carried off 978 articles covering nineteen years (from 1996 to 2014), and the sample was selected according to their keywords, journal, and year of publication. In the author's view, CATA is not a commonly used method in the literature, and therefore, future research should consider taking its approach. It is also recommended that extra focus should be taken regarding innovative approaches and using performance measurement with a wider range of approaches. Lastly, it was suggested that a longitudinal analysis should be taken, rather than a cross-sectional one, to determine how KPIs are molded by greater internal and external forces.

Another study on the field, and the first to critically review the application of frontier studies in the tourism literature, is the one from Assaf and Josiassen (2015). The authors made a summary of what characterizes the studies in the literature, starting by giving a background of frontier analysis and then debating on the dissimilarity between the nonparametric and parametric frontier methods. A meta-analysis was conducted to explore the consequences of the frontier methods on the estimation of the efficiency in tourism studies. From the critical review, one could easily conclude that DEA studies have

higher average efficiency than SFA studies, that Europe has higher efficiency than the rest of the world, that there are more studies on the hotel sector compared with only a few studies on the travel agency and restaurant sectors, and finally that there are not enough macro studies to compare nonparametric and parametric frontier methods. Given these conclusions it was recommended for future scholars to carefully select the orientation which best suits the industry under analysis, study the effect of destination management or government investments on the efficiency of the tourism industry and consider using the Bayesian approach instead of the maximum likelihood method. It was also suggested by the authors that more macro studies are needed, future research should focus on the need for more variability in the geographical distribution of frontier studies and address the efficiency comparison between countries.

The most recent study found in this field was a critical literature review by Altin *et al.* (2018), published in the International Journal of Contemporary Hospitality Management. The literature review was performed founded on three dimensions: an advance on ontological and epistemological issues, on the purpose of performance measurement, and the emerging contexts. The lack of articles was evident since only three papers were found that explored the literature regarding the hotel performance measurement. It is commented that there is a need to address the ontological and epistemological structure of performance management studies. The authors draw attention that there is a need to conduct bibliometric studies that consider quantitative methods and employ relational bibliometric analyses. Future research should focus on offering solutions to the management of performance, rather than on the measurement issues, and should also review the progress on performance criteria in the hotel industry. It is lastly recommended that the study of how sustainability could affect organizations both in the short and long term should also be addressed.

Table 4 presents a summary of the most important data of the literature on reviews of research.



Table 4 - Summary of reviews of research

Authors/ Period studied	Journal	Type of article	Keywords	Methodology	Main Conclusions
Sainaghi <i>et al.</i> (2017)  Years of articles used: 1996 - 2014	Tourism Management	Analytical meta-approach	Performance measurement; Computer-aided text analysis (CATA); Content analysis	This study performs a meta-analysis of tourism performance measurement by synthesizing tourism and hospitality research. Performs a bibliometric analysis of tourism performance measurement journal articles. Articles were selected according to three criteria: keywords, journals, year of publication. Based on quantitative analyses uses CATA on 978 articles.	Future research should: -Focus on innovative approaches; -Study the areas of collaboration and networks; -Use PMS with a broader range of approaches; -Use CATA; -Perform longitudinally rather than cross-sectional analyses to determine how KPIs are shaped by broader internal and external forces;
Altin <i>et al.</i> (2018)  Years of articles used: 1980 - 2017	International Journal of Contemporary Hospitality Management	Critical literature review	Performance management, Performance measurement, Critical review, Hospitality, Tourism	Critical literature review based on three dimensions: progress on ontological and epistemological issues, on the purpose of performance measurement, and the emerging contexts.	Only three papers that have investigated the literature related to hotel PM were found. Researchers should focus on: - Address ontological and epistemological structure of performance management studies. - Building performance management processes or performance management as a social system or learning system rather than a control system - Conduct bibliometric studies consider quantitative methods and employ relational bibliometric analysis, such as co-citation or co-word analysis helping theory development - Offering solutions to the management of performance, rather than on the measurement issues. - Studying how sustainability could affect organizations both in the short- and long term. - Reviewing the progress on performance criteria in the hotel industry.

<p>Assaf and Josiassen (2015)</p> <p>Years of articles used: 1997 - 2013</p>	<p>Journal of Travel Research</p>	<p>Review and Meta-Analysis</p>	<p>Frontier analysis, Review, Meta-analysis, Future directions</p>	<p>This study is the first to critically review the application of frontier studies in the tourism literature. It summarizes the characteristics of the current studies in the literature, by providing a background and description of frontier analysis and discussing the difference between the nonparametric and parametric frontier methods. Only focuses on studies from the hotel sector. Conducts a meta-analysis to examine the effect of the frontier methods and other related sample characteristics on the efficiency estimates in the context of tourism studies.</p>	<p>DEA studies have higher average efficiency than SFA studies. VRS has a higher average than the CRS specification. Europe has higher efficiency than the rest of the world. Not enough macro studies to compare nonparametric and parametric frontier methods. More studies on the hotel sector, only a few studies on the travel agency and restaurant sectors. More studies are driven by data availability rather than an understanding of the industry. Future studies should:</p> <ul style="list-style-type: none"> <li>- Pay attention to model specification.</li> <li>- Carefully select the orientation which best suits the industry under analysis.</li> <li>- Standardize the selection of inputs and outputs to allow more comparison among future studies.</li> <li>- Discuss the determinants of efficiency in the industry on micro and macro levels.</li> <li>- Study the effect of destination management or government investments on the efficiency of the tourism industry.</li> <li>- Focus on the need for more variability in the geographical distribution of frontier studies.</li> <li>- Develop more macro studies.</li> <li>- Address the efficiency comparison between countries.</li> <li>- Add more flexibility to the SF models by imposing less restrictive distributions or assumptions on the inefficiency term.</li> <li>- Consider using the Bayesian approach instead of the maximum likelihood method.</li> </ul>
--	-----------------------------------	---------------------------------	--	--	--

### 3.1.2 Reviews of reviews

Review of reviews type of articles are studies made to analyze and comment on the already existent reviews on the tourism efficiency literature, measuring and balancing the number of studies made as well as their individual focuses. They provide a glance at how reviews have been undertaken in the area of hospitality and tourism, determine the existent trends and discuss the impacts of these studies in the literature. These studies usually conclude by giving a brief overall of what has been made and what is missing, giving multiple suggestions of research topics for future reviews.

The first study of this type to ever been published on the matter is “Review of reviews: A systematic analysis of review papers in the hospitality and tourism literature“ by Kim *et al.* (2018), it is a systematic analysis of review studies and was published on the International Journal of Hospitality Management. The analysis looks into the leading hospitality and tourism journals listed in the Web of Science and after applying their data collection method it comes to a final sample size of 171 review studies. By analyzing and classifying these articles Kim *et al.* (2018) conclude that there is a wealth of qualitative reviews compared with quantitative and a noticeable lack of meta-analytical reviews. The reviews are usually tourism-focused rather than hospitality focused and the top fields of studies are both economics and finance, followed by customer behavior and marketing. As a rule, the data collection method used is based on multiple keyword searches. The authors recommend future researchers contemplate other journal indexes when collecting review studies for their sample and also pointed out the number of meta-analytical reviews, which was relatively low due to their more complex review approach and analysis technique.

Later on, Assaf and Tsionas (2019) published a paper introducing a review of performance modeling in tourism research, mainly focusing on frontier models. Shockingly only one study was found implementing a stochastic DEA in the tourism literature. This comes as a surprise since the method can provide several advantages, particularly if followed by a method that could provide formal statistical conclusions. For instance, the computational benefits of a Bayesian technique applied to this problem should be an interesting field to be explored. The authors noticed that most Stochastic Frontier applications in tourism have not considered some issues as endogeneity and heterogeneity. It came as a concern that estimating stochastic frontier in a dynamic framework has not been a regular practice in the tourism literature. It was recommended that tourism scholars should take a more vigorous look into the measurement of tourism performance subject to bad outputs since it is urgent to pay stronger attention to it. Revolutionary models that should be able to differentiate bad outputs from inputs are needed in the tourism context.

In general, the authors suggest that more attention should be paid to some methodological issues as endogeneity, bad outputs, heterogeneity, dynamic formulation, Bayesian estimation, bootstrapping, and stochastic estimation.

Due to the scarcity of studies assessing the nature and quality of the systematic review papers published in tourism and hospitality literature Pahlevan-Sharif *et al.* (2019) published “A systematic review of systematic reviews in tourism” in the Journal of Hospitality and Tourism Management. This study differs from the previous one by using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) method, allowing a more standardized procedure and achieving a final

sample size of 192 articles. From this sample, the authors perceived that the studies performed from 2012 to 2017 covered more than 75% of the articles, which reveals a humongous growth of interest in the sector. The study also exposed Google Scholar as being the most popular search engine with more than 40% of the sample relying on it. The authors also criticized previous studies for not taking into consideration or indicating on the paper the eligibility criteria provided by the PRISMA protocol for systematic reviews. Furthermore, another critic was made, pointing out that it was not clear to what extent could the current systematic reviews in tourism support the sector, as a consequence of their scattered and inconsistent nature. Absent in several papers was also a flow diagram describing the steps of the systematic process of review (Pahlevan-Sharif *et al.*, 2019). As a recommendation, it is suggested the implementation of protocols appropriated for this specific type of review, not only for the scholars but also at the journal level, accordingly, demanding authors to adopt the PRISMA items when conducting systematic reviews. Ultimately the authors urge that there remains an urgent need for consistency of systematic reviews in the field of tourism and hospitality.

Similar to this study and using an adaptation of the PRISMA method Kim (2020) published an article in the International Journal of Hospitality Management. This study essentially diverges by taking mainly a personal value orientation. Providing the adapted PRISMA diagram, the sample came down to a final 37 articles that addressed personal values and values orientation, all these published on the scope from 2000 to 2018 in top-tier journals. The author stresses that the current literature on personal values has been predominantly addressing particular contexts rather than general contexts and there is a lack of a comprehensive literature review of personal values, (Kim, 2020). Therefore, there were several recommendations made by Kim (2020). Future research should consider different theoretical backgrounds related to personal values when performing a broader systematic review of literature in the hospitality and tourism fields. Scholars rather than applying a selective approach should seek to employ a more comprehensive one, attempting to avoid the misconception of the inherent theoretical backgrounds of personal values and the consequences of personal values on the selective contexts. Attention was drawn to the need to explore the application of personal values by other hospitality and tourism studies using a broader scope of systematic literature review.

Table 5 presents a summary of the most important data of the literature on reviews of reviews.

Table 5 - Summary on reviews of reviews

Authors/ Period studied	Journal	Type of article	Keywords	Methodology	Main Conclusions
Assaf and Tsionas. (2019)  Years of articles used: 1984 - 2018	Annals of Tourism Research	Review of research	-Performance modeling; -Frontier models; -Tourism performance;	Elaborates on key methodological issues including endogeneity, bad outputs, dynamic formulations, heterogeneity, Bayesian estimation, bootstrapping, and stochastic DEA. For each of these areas we discuss and introduce some recent methodological breakthroughs	A major issue that has been largely ignored in the tourism literature is the importance of estimating SF in a dynamic framework. In general, more attention should be paid to the following methodological issues: - endogeneity, - bad outputs, -dynamic formulation, - heterogeneity, - Bayesian estimation, - bootstrapping -stochastic estimation...
Pahlevan-Sharif, <i>et al.</i> (2019)  Years of articles used: 2000 - 2017	Journal of Hospitality and Tourism Management	Systematic review of systematic reviews	-Systematic review; -PRISMA; -Tourism knowledge; -Tourism research	This review analyses systematic reviews in the field of tourism to shed light on the criteria employed to conduct the reviews, by considering the items of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA).	Found several systematic reviews that did not provide a clear explanation of their process of data collection. More than 75% of the reviews were conducted since 2012 and only less than 9% of them were conducted before 2009. The majority of the tourism and hospitality scholars have not considered many of the items constituting the PRISMA protocol for systematic reviews. The authors suggest that there remains an urgent need for consistency of systematic reviews in the field of tourism and hospitality.
Kim <i>et al.</i> (2018)  Years of articles used: 1987- 2016	International Journal of Hospitality Management	Systematic analysis of review papers	Hospitality and tourism; Review studies; Web of science journals; Citation analysis;	A short review of the hospitality and tourism research, roles of review studies, and roles of citation analysis are presented. A detailed explanation of the methods is provided, along with a presentation of the results outlined in terms of the overall status quo of review studies, research trends, and	The reviews analyze an average sample size of 496 articles. A natural extension of this study would be to consider other journal indexes when retrieving review studies for the sample  The number of meta-analytical reviews was relatively low due to their more complex review approach and analysis technique There were made more:

				<p>their research influence. A discussion is presented based on the results of the study and its limitations and implications for future studies.</p>	<p>-Qualitative than quantitative reviews, and the number of meta-analytical reviews was relatively low.  -Tourism-focused reviews rather than hospitality-focused.  -Studies in the fields of economics and finance, followed by customer behavior and marketing.  -Review papers applying as a data collection method, keyword searching.</p>
<p>Kim (2020)</p> <p>Years of articles used: 2000 - 2018</p>	<p>International Journal of Hospitality Management</p>	<p>Systematic literature review of different studies</p>	<p>Personal value orientation; Systematic review; Tourism and hospitality; Rokeach; Schwartz; Stern</p>	<p>Systematic investigation and synthesis of the literature on personal values with an emphasis on how the personal value construct has been employed in the hospitality and tourism fields and what should be considered for future research in these fields. This study developed a review protocol containing information on search terms, databases, and screening criteria. (PRISMA) A flowchart was used, with some adjustments for this study.</p>	<p>The literature on personal values has been dominated by particular contexts rather than general contexts, by the lack of a comprehensive literature review of personal values, and by partial match or non-match between the fundamental concept and operationalization of personal values. Future research should:  -Employ a comprehensive approach rather than a selective one to avoid the misunderstanding of the underlying theoretical backgrounds of personal values and the impact of personal values on the selective contexts  -Consider other theoretical backgrounds related to personal values when conducting a broader systematic review of literature in the hospitality and tourism fields.</p>

### 3.2 What is missing in the literature?

Based on this literature review, one can easily notice that there are no current reviews focused exclusively on the efficiency of the tourism sector. Some authors address the need of using the PRISMA method correctly and that there is usually an absence of a flow diagram describing the steps of the systematic process of review. This was pointed out by Pahlevan-Sharif *et al.* (2019) who also urged for the need for consistency of systematic reviews in the field of tourism and hospitality.

Regarding efficiency, authors like Assaf and Josiassen (2015) believe there is a need to address the efficiency comparison between countries. Kim *et al.* (2018) pointed out that the number of meta-analytical reviews, was relatively low due to their more complex review approach and analysis technique, and therefore, more articles in this field should invest in this type of review. Altin *et al.* (2018), draw attention to the need to conduct bibliometric studies that consider quantitative methods and employ relational bibliometric analyses. Lastly, in their paper Pahlevan-Shari *et al.* (2019), specifically highlight that there exists a gap in the tourism literature regarding studies that explicitly present the methodic and systematic process that the literature reviews undertake.

Other important facts to highlight from the previous last chapter:

- There are more qualitative than quantitative reviews.
- Noticeable lack of meta-analytical reviews.
- Reviews are usually tourism-focused rather than hospitality-focused.
- In the last decade, there is a humongous growth of interest in the tourism sector.
- Google Scholar is the most popular search engine.
- There are no current specifically efficiency-focused reviews.
- DEA studies have higher average efficiency than SFA studies.
- There is a need for bibliometric studies that consider quantitative methods.





## 4 Reviews

The following chapter is designated to the review's method. Firstly, an introduction, background, and definition of what are reviews. Following some history of how they emerged between scholars and the weight of their role in the literature. Succeeding an explanation about the two major existent types of reviews, where the narrative/traditional review is commented and then in the next sub-chapter is compared with the systematic review.

After the comparison between narrative and systematic reviews, the different types of systematic reviews are enumerated and described with the supplement of a table showing the several terms used by multiple authors. This chapter ends by choosing the most suitable method for the current theme - meta-analysis - and offering a small brief and definition of what the method consists of.

### 4.1 What are reviews and why do we have them?

According to the Oxford English Dictionary, a review article can be defined as "a paper in a journal that summarizes recent literature on developments in a particular subject". This same dictionary also defines the word "review" as: "To view, inspect, or examine a second time or again", which can loosely portray all different existent types of reviews.

Another, commonly seen, definition of "review papers" was written in the book of Bem (1995), where the author characterized them as being "critical evaluations of material that has already been published". With these definitions, one can form an idea of what are these types of articles, but the question that still stands is: why do they exist?

Alongside our evolution, as the human brain was developing and becoming more conscious of its surroundings, the curiosity, and the need to learn and find answers also grew and evolved. Humanity has undertaken many studies and research to find answers and to learn more about life, the universe and everything that exists in it. Countless research was read to find things out, to have a better understanding of the world. As written in "An Introduction to Systematic Reviews" by Gough *et al.* (2017:5), human beings have built theories and concepts and collected data to understand and find answers to numberless questions regarding all kinds of disciplines, interests and perspectives of groups or individuals. Frequently new "primary" research is undertaken, every single year thousands of novel studies are developed, nevertheless, it is rational to gather and review what has already been done, what already exists in the literature.

For a field of study to advance a continuous growth of research scholarship must be developed. Researchers need to be aware of its historical patterns to acquire insights for potential future developments (Dwivedi *et al.*, 2011). The same is defended in Kumar *et al.* (2020), where the authors emphasize that for a field to progress it is essential that prior studies are consolidated and synthesized in a logical order supported by the discoveries and conclusions of prior research.

It is illogical to even doubt the need for such fundamental components of the literature. In absence of studies that assess what has already been done, explored, or developed in a certain field, how can someone plan what more needs to be studied? Without knowing what has previously been done, how can future scholars decide what to study, or how could they be sure that answers to their

doubts or questions do not exist already? As Gough *et al.* (2017:5) wrote, it would be unethical to engage in a new research study without previously getting informed on already existent research. The authors even state that without the presence of a review article of previous research in any given field, the need for new primary research is purely unknown.

There is therefore an irrefutable need for reviews of existent research, or in other words, as said by Gough *et al.* (2017:5), there is a necessity for secondary research or secondary level of analysis that gathers the findings of primary level research. It is also defended by the authors that reviews should be one of the first steps before taking any kind of major decision regarding academia planning new primary research.

In the current century organizations are confronted with having to handle an overabundance of data, information, and knowledge, within an ever-rising complex and diversified global environment (Dwivedi *et al.*, 2011). As written in Carr (2002), the process of being a ceaseless learner in this current information age is a noteworthy challenge.

It has become tremendously difficult, in several areas, for an individual scholar to read, evaluate and synthesize the existing knowledge, keeping track of everything that has already been done not to mention bringing this up to date periodically (Dybå *et al.*, 2008). As a consequence, reviews became crucial tools for researchers that desire to be updated on new studies and findings that are piling up in their field of research.

Fundamentally, as an article, a literature review can offer a thorough overview of literature associated with a theory or method and synthesize earlier research to fortify the foundation of knowledge (Paul *et al.*, 2020). Overall the prime purpose of review studies is to analyze the literature that has, to the moment, been done in the field (Kim *et al.*, 2018). As these articles allow scholars to learn about the existing knowledge and understand how it was acquired, they can also display the gaps of what has not been found yet. Offering this way, a ground for planning and interpreting new primary studies (Gough *et al.*, 2017:5). Reviews offer the scholars a state-of-the-art understanding of the field they are interested in, allowing them to recognize the already mentioned gaps (Paul *et al.*, 2020).

Reviews are required to specify areas with scarcity of evidence and consequently suggest that additional studies are needed. Commonly, classic review authors, suggest guidelines and point out directions for future scholars to update and innovate the literature. This way, by having a target of discouraging future researchers to stop working with the same outdated theories and methods, one can state that review articles serve as a platform for future research. By giving reference to methods, variables, novel contexts and theories, these reviews have the power to guide researchers to take advantage and explore a certain field to its overall potential (Dybå *et al.*, 2008; Paul *et al.*, 2020).

In their book, Gough *et al.* (2017:5) enumerated several reasons why reviews are needed. Firstly, there is always the possibility of individual research to be fallible, all research should be treated as questionable in a certain way, therefore the need to review papers analyze and synthesize them is essential, especially since there are cases where research reports had fabricated results. Some studies may not even be trustful enough, not because of mistakes but because of its scope or context being of limited relevance. Undertaking an analysis, side by side, of all prior research, is usually too

much work for a single individual. By providing a more extensive and understandable picture founded by many studies instead of a single study, reviews offer, as said before, an opportunity for subjects to be explored to their vast potential. Finally, it is of extreme importance to emphasize that new primary research results are most likely to be inappropriate, irrelevant, and probably unnecessary if conducted without holding full information of prior research.

Although Palmatier *et al.* (2018:2) recognize their existence and usefulness, they also note that not every review article “can offer all of these benefits.” Nonetheless, Hulland and Houston (2020), agree with the previous benefits and complement them by pointing out that many reviews resolve inconsistencies across extant studies. Repeatedly, studies in the same field provide different results, a review article is usually capable of identifying such inconsistencies and determining potential explanations for those discrepancies. Consequently, new knowledge is created from the process of explaining possible reasons for inconsistency. Furtherly, the authors also considered as a review benefit, mapping the scope of the topical domain of a certain field, overviewing the existing state of knowledge.

From the mountainous volume of papers that have already been published, review articles make up a considerable minor, although quite an appropriate percentage. Nevertheless, as Bettencourt and Housto (2001) claim, even though they might represent a small percentage of published articles, reviews, when published, tend to be extremely useful to scholars in leading forthcoming research in the reviewed domain.

As quoted by Gough *et al.* (2017:5): “*The expansion of evidence-based practice across sectors has lead to an increasing variety of review types. However, the diversity of terminology used means that the full potential of these review types may be lost amongst a confusion of indistinct and misapplied terms.*” Therefore, to clean out such confusion, this dissertation will now address the existent types of reviews and their main characteristics.

## **4.2 Types of Reviews**

Although there is not a unanimous consensus on how reviews are divided into types, and how many different types of reviews exist, in general, the majority of authors agree on the existence of two distinct types of reviews: a narrative review and a systematic review. However, some authors as Green *et al.* (2006), when addressing review types, state that the general classification of “literature review” is composed of three strains: a narrative review, qualitative systematic review, and quantitative systematic review. Without wanting to specify, yet, between qualitative and quantitative systematic reviews, initially, it will be considered only the two broader types mentioned above.

Originally the first and only type of review was the narrative review, which is now also commonly referred to as the traditional review. Until the 1980s/1990s, narrative reviews were primarily responsible for aggregating data from numerous studies. Essentially, the process of undertaking a review, as described in Borenstein *et al.* (2009), would consist of an expert in a given field, who would collect and analyze the existing research that addressed a question, summarize the results and conclusions, and then reach his own conclusion on the subject. Carr (2002) defined traditional reviews

as: “a narrative summary of some clinical topic or group of topics, often provided by an expert in the field and usually characterized as an unsystematic compilation of opinion and evidence”

Even though traditional reviews were not undertaken systematically, authors as Gough *et al.* (2017:5) and Cook *et al.* (1997) defend that the majority of literature reviews written in the 1990s and 2000s were appropriate and represented a contribution to several academic debates. Traditional reviews are useful when dealing with the need to describe the history or progress of a problem and its management, or when seeking to debate data regarding a specific field in a certain context. They generally offer details on research they sampled, but without justifying the reason why those studies were chosen, or the criteria of research selection.

Although traditional reviews can conceptually integrate different independent fields while drawing analogies Cook *et al.* (1997) affirms that in the specific field of medicine, the clinical recommendation, and the actual evidence in narrative reviews, in many cases, have an incomplete and fragile connection or may even be based on biased citations of studies. Consequently, suggestions given in published traditional reviews frequently differ from the ones found in systematic reviews.

Many authors have commented on their similar opinion on narrative literature reviews. Gough *et al.* (2017:5) state that reviews were initially conducted without explicit, proper, and systematic methods, which makes them vulnerable and doubtful. The same opinion is shared by Noblit and Hare (1988), Briner and Walshe (2014:417), and Grant and Booth (2009) which criticized this type of review, arguing it presents several limitations, usually lacks reliability, validity, and scientific rigor.

In their book, Borenstein *et al.* (2009) highlighted two main limitations of narrative reviews. Firstly, the subjectivity inherent in this type of review as well as their lack of transparency. In other words, the authors criticize this method giving examples of different ways authors may differ when undertaking them. A reviewer performing narrative literature may prefer quantity over quality and choose extensive research, the opposite may also happen, the amount of substantial evidence needed to conclude may even vary from author to author. As a consequence of this, there are even reported studies, in medicine, where two narrative reviews with the same theme, reached opposite conclusions, where one reported the treatment as effective and the other as ineffective. Another limitation is that, in the author's opinion, when the numbers of studies in a certain field increases, the narrative reviews become more difficult to undertake and consequently less useful. To develop a traditional review, a thought process of synthesizing research is required, and with the growth of available research, it becomes impossible for reviewers to synthesize this amount of data in their heads.

Consequently, due to these limitations and the lack of quality of traditional narrative reviews, an evident increase in formal methods of systematic reviews has been registered. Systematic reviews have been chosen and appreciated for their clear set of methodic rules for searching papers and choosing which should or not be included in the sample of analysis (Dybå *et al.*, 2008; Borenstein *et al.*, 2009).

### **4.3 Narrative vs Systematic Reviews**

Either narrative or systematic, every review is an observational and analytical research study, and according to Cook *et al.* (1997), they are influenced by systematic and random errors. As a result, the

amount of concern addressed on minimizing errors and bias reflects on the quality and credibility of the study. As the author states this is the key aspect distinguishing narrative reviews from systematic reviews. A traditional narrative review is more likely to be based on bias studies while a systematic review is more trustworthy to provide unbiased conclusions from systematic research. As a consequence, systematic reviews are undertaken to answer more specific and commonly narrow questions, and they stand out by providing objective, replicable, systematic and comprehensive coverage of a particular field (Weed, 2006).

Systematic reviews are less likely to commonly seen forms of bias due to their caution when using methods of research. Some of these articles are performed almost like if they were primary research papers, following the same principles but with a clear difference regarding the unit of study (Carr, 2002). According to Grant and Booth (2009), the author to be believed to describe a systematic review method for the first time was James Lind in 1772. In his book “A Treatise on the Scurvy: In Three Parts”, Lind wrote:

*“As it is no easy matter to root out prejudices ... it became requisite to exhibit a full and impartial view of what had hitherto been published on the scurvy ... by which the sources of these mistakes may be detected. Indeed, before the subject could be set in a clear and proper light, it was necessary to remove a great deal of rubbish.”* - Lind (1772) in Grant and Booth (2009)

As the systematic review became increasingly more exploited, other definitions were made. Dyba *et al.* (2007) made an interesting comparison between the systematic reviews research methods and their similarities with a survey. Obviously with the main difference being that a survey involves people while a systematic review involves literature. Carr (2002) defines systematic reviews as a synopsis of primary research that contains an explicit report of the objectives and methods and has been undertaken to fulfill a formerly established meticulous and replicable methodology. Almost a decade after Mulrow and Cook *et al.* (1997) compared these two types of reviews Dyba *et al.* (2007) adapted one of their tables, creating Table 6, that summarizes the different aspects between narrative and systematic reviews:

*Table 6 - Differences between traditional reviews*

<b>Feature</b>	<b>Traditional/Narrative reviews</b>	<b>Systematic reviews</b>
Question	Often broad in scope	Often a focused research question
Identification of research	Not usually specified, potentially biased	Comprehensive sources and explicit search strategy
Selection	Not usually specified, potentially biased	Criterion-based selection, uniformly applied
Appraisal	Variable	Rigorous critical appraisal
Synthesis	Often a qualitative summary	Qualitative and/or quantitative synthesis
Inferences	Sometimes evidence-based	Usually evidence-based

*Source: Dyba et al. 2007*

In a systematic review, contrary to an unsystematic review, authors are expected to report the source of the information gathered and detail the process of how the data was used to reach a conclusion. As other authors mentioned already, to limit bias and offer correct and faithful data, it is fundamental to explain how the methods and the data processing are done. Systematic reviews are therefore widely

considered and recognized as the most reliable and rigorous method. They provide an overview of the relevant and important primary research concerning any particular field (Alan *et al.*, 2002). Contrary to the narrative review, a well-structured systematic review provides a summary of the best evidence available, by undertaking explicit and rigorous methods to identify, analyze and synthesize relevant studies. By applying these systematic methods, and then defining and documenting them, the authors offer the opportunity for other scholars to critically appraise and replicate the review (Dyba *et al.*, 2007).

Another not usually mentioned benefit is the reduction in delays between research findings and the implementation of those findings. For example, in the clinical field of medicine, by assimilating extensive amounts of data in short periods, the time between a research discovery in the area and the application of that method in a patient's treatment, is significantly reduced. By providing the best available evidence in a condensed and explicit way, this type of review presents a substantial benefit to any clinical (Carr 2002). In addition, systematic reviews that carry out quantitative techniques, when compared to narrative reviews, are more likely to identify small but clinically significant treatment effects, according to Cook *et al.* (1997).

Although systematic reviews have common principles and similar processes Gough *et al.* (2017:5) point out that these may vary not only in types of questions, data, or method but also in terms of scope, range, and depth. This dissertation will therefore proceed to address the different types of systematic reviews.

#### **4.4 Different types of systematic reviews**

Many authors appreciate and recognize the weight of systematic reviews, for example, Carr (2002) considers this type of article as being the most reliable and trustworthy method when dealing with the need to summarize and condense massive volumes of research studies and findings. On top of that, authors as Gough *et al.* (2017,p.6), emphasize the need for reviews to be undertaken performing appropriate and rigorous systematic methods, as well as to contain a clear explanation of how the method was used. These last authors offer the following definitions: Systematic: "undertaken according to a fixed plan or system or method"; Review: "a critical appraisal, an analysis" and therefore a Systematic Review: "a review of existing research using explicit, accountable rigorous research methods".

For the sake of finding papers in bibliographic databases and alternative electronic sources, keyword strings and sources are selected and specified in systematic reviews. Often it is unavoidable to search key journals and books individually and manually to spot papers that are not fully indexed (Dyba *et al.*, 2007). Four main activities constitute the process of systematically reviewing research, with those being: clearly explaining the prime question being asked and mapping the research; evaluating research reports with a critical view; consolidating the information in a logical and coherent statement; and determining which conclusions can be reached (Gough *et al.*, 2017,p.7).

Struggling to describe the operation of systematically reviewing and synthesizing research studies and their findings, a wide number of authors, relied on several terms, including "systematic review", "systematic literature review", "research synthesis", and "meta-analysis". All of these terms

roughly fit the purpose but, as Dyba *et al.* (2007) stressed out, it is important to notice that systematic reviews and meta-analysis are not the same. In order to determine and critically appraise a specific field of study, systematic reviews employ reproducible procedures and methods, so that future scholars may benefit from state-of-the-art discoveries and insights (Paul *et al.*, 2020).

By being reproducible, systematic reviews may pass the wrong impression that they are all alike. The truth is that although every single one of them should be replicable, there are several distinct types of systematic reviews. As a consequence of the differences between fields and the various questions that originate reviews, systematic reviews branched and grew into different types. The same was defended by authors like Paul *et al.* (2020) that recommend employing well-grounded methodological procedures when undertaking a systematic review and claim there are several different approaches one might choose. Also, Gough *et al.* (2017,p.7) supported that there is not just one way to conduct systematic reviews. To gather the findings, a variety of methods is needed when undertaking a review of the literature, due to the diversity of questions and the broad spectrum of fields. These may include reviewing more qualitative data looking for new theories or in a more quantitative approach, reviewing statistical data when dealing with questions about effectiveness or efficiency.

As mentioned before, there is not a specific unanimous agreement on how review types are divided into groups. The most conventional division amongst scholars is the one used by Grant and Booth (2009) where reviews are classified into quantitative, qualitative, and mixed-method studies. According to the author, due to the foundations of organizations like Campbell Collaboration and Cochrane Qualitative Methods Group, (organizations that, as provided by Carr (2002), prepare, maintain, and disseminate results of systematic reviews on health care, enriching the literature), a visible turn, concerning the inclusion of a greater range of study designs incorporating those review types, has been noticed. Paré *et al.* (2015) recognize the influence and weight of the Cochrane Handbook for Systematic Reviews of Interventions and incorporated in their paper the three main types of systematic review, which according to the book are: meta-analyses, qualitative systematic reviews, and realist reviews.

Interestingly, in their book, Noblit and Haren (1988) presented a distinction, stating that reviews can either be interpretive or integrative. The first term would define reviews that reach synthesis by including concepts detected in the primary studies into a higher-order theoretical structure. Creating concepts, and theories that combine those concepts is the main focus of interpretive reviews. In contrast, reviews with the primary purpose of merging or summarizing data so that generalization can be established, are nominated integrative reviews. This type of review focuses on collecting and combining specific data or offering an explanatory report of the data, and to do so they rely on different methods, such as meta-analysis. Considering this, it is suggested that interpretive reviews are more appropriate to synthesize qualitative papers, while integrative reviews are mainly suited to synthesize quantitative studies. However, furthering in their book, the authors affirmed that both types are unavoidably connected and therefore any interpretive review will include elements of an assemblage of data and inevitably integrative synthesis will contain components of interpretation.

Due to not existing a concordance between authors regarding how to label and characterize the reviews, it is a considerable challenge to categorize review papers. Table 7 presents six different authors, that classified reviews in their studies, and links them with various terminologies that are often used when labeling reviews.

Table 7 - Authors and different thematics used when defining reviews

Types / Authors	Paul <i>et al.</i> (2020)	Paré <i>et al.</i> (2015)	Grant <i>et al.</i> (2009)	Carr (2002)	Kim <i>et al.</i> (2018)	Paul and Criado (2020)
Theory-based	x	x				x
Theme-based	x				x	
Framework-based	x					x
Theory-context-characteristics- methodology (TCCM)	x					
Framework and theory development	x					x
Hybrid-narrative	x	x				x
Bibliometric analysis	x					x
Meta-analysis	x	x	x	x	x	x
Morphological analysis	x					
Narrative review		x		x	x	
Descriptive review		x				
Critical review		x	x		x	
Scoping review		x	x			
Qualitative systematic review		x	x	x	x	
Realist review:		x				
Umbrella review		x	x			
Literature review			x			
Mapping review			x			
Mixed methods review			x		x	
Overview			x	x		
Rapid review			x			
State-of-the-art review			x			
Systematic review			x		x	
Systematic search and review			x			
Systematized review			x			
Domain-based review						x
Structured review						x
Method-based review						x

As can be seen from Table 7, some terms are commonly used between authors to classify review types. In their study, Paul *et al.* (2020) suggest scholars use well-grounded methodological approaches, which may cover the following types: theory-based; theme-based; framework-based; theory-context-characteristics-methodology (TCCM)-based; framework and theory development; hybrid-narrative; bibliometric analysis; meta-analysis; morphological analysis. Although they mentioned these 9 different types of reviews, no more individual details or characteristics were presented in their paper. Beyond also considering theory-based, hybrid-narrative, and meta-analysis Paré *et al.* (2015) present seven more types of reviews, including narrative review; descriptive review; critical review; scoping review; qualitative systematic review; realist review; umbrella review.

Furthermore, the authors also present the table displayed in Appendix A.1, which clearly summarizes some aspects of each individual type. The same author also presents Table 8 that reveals the major review types found between 1999 and 2013.



Table 8 - Types of review articles (n = 139)

Review type	Number of reviews	Percentage (%)
Theoretical	52	37
Narrative review	38	27
Meta-analysis	14	10
Descriptive review	13	9
Hybrid review	9	7
Critical review	7	5
Scoping review	6	4
Qualitative systematic review	-	-
Realist review	-	-
Umbrella review	-	-

Source: Paré et al. 2015

Carr (2002) and Kim *et al.* (2018) present four terminologies in common, in their studies, qualitative systematic review; quantitative systematic review, meta-analysis, and narrative reviews. The main contrasting aspect is that Carr (2002) also considers the overview reviews and does not differentiate between quantitative systematic reviews and meta-analysis. On the other hand, Kim *et al.* (2018) instead of addressing the overview type, consider both critical and narrative as the same type and attach mixed methods reviews to the list.

Paul and Criado (2020) state that reviews can be broadly classified as domain-based, theory-based, method-based, and meta-analytical. Additionally, they split domain-based reviews into structured reviews, framework-based reviews, bibliometric reviews, hybrid reviews, and reviews aiming for theory development.

Lastly analyzing 14 distinct types of reviews Grant and Booth (2009) present and characterize the following terminologies: critical review; literature review; mapping review/ systematic map; meta-analysis; mixed studies review/mixed methods review; overview; qualitative systematic review/qualitative evidence synthesis; rapid review; scoping review; state-of-the-art review; systematic review; systematic search and review; systematized review and umbrella review. In their paper, these authors, determined the most common review types and their respective features and mapped them against SALSA's framework (Search, Appraisal, Synthesis, and Analysis). This way all review types were analyzed and their features were outlined, as well as their perceived strengths and weaknesses. The main characteristics of these review types were summarized and combined into the table presented in Appendix A.2, built by Grant and Booth (2009).

Roughly explained, briefs of research that do not contain detailed reports of systematic methods, are generally designated narrative reviews. Studies, where the conclusions or findings of primary studies are only summarized and not statistically aggregated, are characterized as qualitative systematic reviews. In this case, these reviews may even be more specified, and considering their features, can be labeled as an overview, critical review, literature review, state-of-the-art review, systematized review, umbrella review, theory-based review, etc....On the other hand, a systematic review that implements statistical techniques to aggregate the results and findings can be

denominated as a quantitative systematic review. This quantitative type of review can also englobe more specified methods as bibliometric analysis. The most commonly used and known type of quantitative systematic review is the meta-analysis, that by aggregating quantitatively the results of various studies, reach more accurate and credible conclusions (Alan *et al.*, 2002).

Taking into consideration all the aspects mentioned above and not looking to over-specify each one of the 28 different terminologies for reviews, this article considers, for this case, the most appropriate type of review, to be a quantitative approach of systematic reviews, more specifically a meta-analysis.

#### 4.5 Meta-analysis

Several definitions of meta-analysis have appeared in the last decades. Carr (2002) considers that every systematic review that contains statistical synthesis of the findings or results of various trials, can be named meta-analysis. Dyba *et al.* (2007) and Paré *et al.* (2015) define meta-analysis as being a specific methodological and statistical method for extracting and aggregating quantitative data in the form of standard effect measures. Grant and Booth (2009) use the following description to describe meta-analysis: “a technique that statistically combines the results of quantitative studies to provide a more precise effect of the results.”

Many other definitions exist in the literature, but they all surround the same fundamental points, therefore meta-analysis is broadly defined as statistical techniques or types of reviews used to collect and combine results. Some definitions are presented in Table 9.

Table 9 - Different meta-analysis definitions

Authors	Meta-analysis definitions
Cook <i>et al.</i> (1997)	“A meta-analysis is a type of systematic review that uses statistical methods to combine and summarize the results of several primary studies. “
Lipsey and Wilson (2000)	“Mathematically combining the results from existing findings.”
Carr (2002)	“systematic review that contains statistical synthesis of the findings or results of various trials, can be named meta-analysis.”
Dyba <i>et al.</i> (2007)	“specific methodological and statistical method for aggregating quantitative data.”
Grant <i>et al.</i> (2009)	“a technique that statistically combines the results of quantitative studies to provide a more precise effect of the results.”
Pati and Lorusso (2018)	“meta-analysis makes a deeper statistical assessment of available data and findings (essentially correlations among variables), from many previous quantitative studies.”
(Paré <i>et al.</i> , 2015)	“a methodological and statistical method for extracting and aggregating quantitative data in the form of standard effect measures”

Often meta-analyses offer rigorous answers by combining results of various similar studies, providing a solution for busy scholars or investigators that have difficulty keeping updated on the current literature Carr (2002).

According to Paré *et al.* (2015) meta-analyses are commonly developed with four primary goals, which involve: appraise the coherence of primary study’s findings, if any heterogeneity is found, the method determines, and describes the reasons behind it, estimate a summary effect size and also a

confidence interval, and lastly, use sensitivity analyses to evaluate the robustness of the cumulative effect size.

All papers included in the meta-analysis are required to be fairly similar so they can be considered valid. As a consequence, it requires that identical outcomes should be measured equally and in the same time interval. Meta-analysis came to be known essentially for its facility to pick individual studies and make them useful by combining them with others in a composite evidence base. These compilations are extremely useful and appreciated by scholars that do not have time to review scattered individual studies. However, there is a particular accusation that persists, a critic that some meta-analysis combines “apples and oranges”. Although it may be possible to find meta-analysis that compares studies that are not sufficiently similar, this must not be considered a criticism of the method, but rather to the inappropriate use of the technique by reviewers, states Grant and Booth (2009).

By solving and explaining controversies that appear in conflicting studies, meta-analyses are deemed a powerful method of research. When compared to qualitative systematic reviews, meta-analyses present several advantages, including an increase in power, better precision, and the capacity to find patterns among studies (Paré *et al.*, 2015). Meta-analysis can estimate more precisely the effects of a certain phenomenon being studied, by combining statistically significant with statistically insignificant findings from the literature (Paré *et al.*, 2015). Hurland and Houston (2020) defend that this method of review is increasingly popular in countless different fields. The same is recognized by Paul and Criado (2020) that adds that it is an increasingly popular quantitative method that is becoming greatly recognized as possibly one of the best statistical assessments of former studies. With all these facts and benefits taken into consideration, this article will therefore conclude that meta-analysis is the most appropriate method to be undertaken on this analysis of tourism efficiency.



## 5 Materials and methods: Data collection and extraction method

This research is conducted following the guidelines of the PRISMA statement. The PRISMA method is a data collection and extraction method that was created by 29 experts to assure that authors organize and develop a clear and complete reporting of systematic reviews and meta-analyses (Liberati et al., 2009). This method is known for being widely used and is considered one of the best and more precise systematic methods for data collection and extraction.

Initially, the Preferred Reporting Items for Systematic reviews and Meta-Analyses statement was published in 2009 as an upgrade of a previous 1999 guidance designated QUOROM statement (which stands for Quality of Reporting of Meta-analyses) and focused on the reporting of meta-analyses (Moher et al., 1999). This PRISMA 2009 statement made a positive impact on the overall quality of the literature, as demonstrated by Leclercq et al. (2019), observational studies imply that the utilization of the method is concomitant with systematic reviews being reported as far more complete and meticulous. This 2009 statement of the model was recently updated to PRISMA 2020, according to (Page et al., 2021), to reflect modern signs of progress in the \methods of systematic reviews. In accordance with the above authors, the use of the most recent version of PRISMA brings huge potential to scholars since complete reporting enables readers to appraise the applicability of methods and thus the reliability of the results and conclusions.

While performing the data collection, a checklist of 27 parameters was taken into consideration as well as a four-phase flow diagram. Table B.19 ( Appendix B) presents the full list of parameters considered in the checklist. The 27 parameters checklist addresses the title, abstract, methods, results, discussion, and funding to guarantee a complete reporting of systematic reviews. The flow diagram is a helpful visual tool that presents clearly and simply the schematic of the collection and extraction procedure.

The four phases included in the PRISMA flow diagram are: the identification, where the keywords are used to search for articles in databases, the screening which can be divided into two phases, the screening of the titles and abstracts of the potential studies, and the eligibility where the full-text articles are checked for the inclusion and exclusion criteria, and finally the fourth phase the inclusion, where the studies are added to the final sample.

The first step of the PRISMA method involves the identification of potential articles to be included in the forward revision, after searching in various databases. The databases selected and used were the Web of Science, Scopus, and Google Scholar, and the search was executed in the exact respective order, during August and September of 2021. A keyword simulation test was carried out to obtain the highest number of results, after experimenting with different words, the search began to take place using the following chosen keywords “tourism efficiency”. Reference lists from the sample of studies gathered were also used to increase the search and the scope of the final sample.

Overall, the sum of the total results of the three databases was two thousand five hundred sixty-two (2562) studies, with this sample being the outcome of the first search. From this significantly vast sample, a group of (438) duplicates was removed and the remaining (2124) studies were examined through the inclusion and exclusion criteria.

Starting with the inclusion criteria, for an article to be included it must meet the following characteristics: written in English; published from January 1991 to August 2021; contemplate efficiency measures or measurements; reviews; articles; tourism efficiency-focused, quantitative studies, international studies, and studies concerning any of the following sectors: hotels, airports, airline companies or/and travel agencies. From the exclusion criteria were excluded articles from the following types: letters; reports; books; book chapters; editorials; notes; biographical items; retracted publications; TV reviews; film reviews; fiction reviews; art reviews; bibliographies; conference articles; expert opinions and commentaries. A massive total of 1872 articles, from the sample after removing duplicates, were excluded because they failed all inclusion criteria or included at least one exclusion criterion. The reports sought for retrieval were at this point 252, although from this number, 79 reports could not be retrieved.

To the remaining 173 articles that passed the inclusion and exclusion selection, a full-text analysis was conducted to appraise the eligibility of the documents. Articles that did not use clear data collection methods; did not present the total sample number, the source of the data, the specific countries, the years of the data collected, the inputs and output data; evaluated hotel chains without presenting the number of establishments, measured the efficiency by region, state, province or country instead of individual hotels, or presented unclear results, were rejected from the sample. Therefore, a total of 82 studies were rejected in this step.

Additionally, as mentioned above, another method was added to include more papers to the study, by analyzing some reference lists an additional 90 articles were identified and sought for retrieval. From this number, 35 could not be accessed and therefore were added to the not retrieved list and excluded. Out of the last 55 studies, 15 were excluded due to measuring hotel efficiency by region, state, or province, due to evaluating hotel chain efficiency without focusing on the individual hotels, and due to dubious or unclear data collection methods. This last-mentioned exclusion resulted in a total of 40 extra studies added to the final sample.

As shown in Figure 1 the PRISMA diagram is presented detailing the study selection process and showing the procedure taken to arrive at the final sample of 130 studies that met the inclusion criteria.

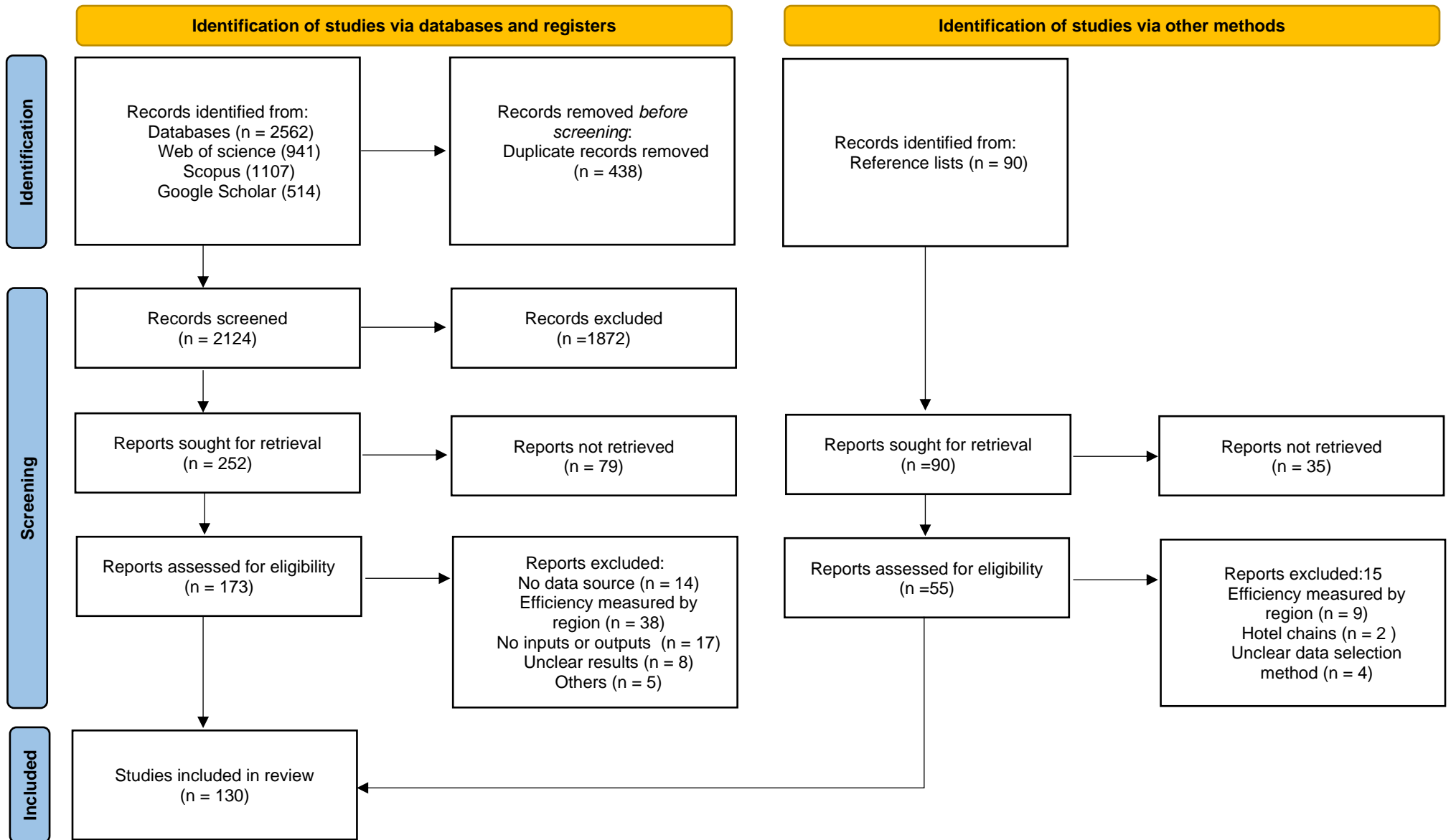


Figure 1- PRISMA Statement





## 6 Results, analysis, and discussions

Once the selection and collection of quantitative papers regarding tourism efficiency measurement, using the PRISMA methodology, is concluded, the next step is to extract all the important data. For the data extraction, a simple but laborious procedure is carried out by analyzing every single one of the 130 articles separately and retrieving the following relevant data: author name and publication's year, country of study, year(s) studied, sample size, sector (hotel, airport, airline company, travel agency), methodologies used, inputs variables used, output variables used and main results and conclusions.

All the retrieved data is gathered in an excel table so it can be easily accessed and analyzed. The table containing all the important data is presented in Appendix C. This extensive chapter is divided into various sub-chapters. Firstly, a statistical global overview of the data is presented, with no differentiation between sectors. Subsequently, the sub-chapters are divided into each specific sector (Hotels, Airports, Airline Companies, and Travel agencies) so that the individual analysis can generate more faithful and appropriate results.

### 6.1 A statistical global overview of data

Statistical measures are applied in Table 10 regarding the data compiled in Appendix C. The analyses calculate several statistical measures related to the number of years studied, the number of articles composing the sample, the number of methodologies used in the paper, the number of inputs, and the number of outputs. Table 11 presents the same statistical measures related to the same data, however, this analysis also includes the number of times each article has been cited and focuses only on the studies that were cited more than 100 times.

*Table 10.- Statistical measures applied to the data collected of 130 articles*

	<b>Number of years studied</b>	<b>Sample number</b>	<b>Number of Methods</b>	<b>Number of inputs</b>	<b>Number of outputs</b>
<b>Mean</b>	4	160	1	3	3
<b>Median</b>	3	43	1	3	3
<b>Mode</b>	1	15	1	3	3
<b>Standard deviation</b>	4	481	0.42	1	1
<b>Coefficient of variation(%)</b>	92	301	36	39	46
<b>Minimum value</b>	1	3	1	1	1
<b>Maximum value</b>	22	3600	3	11	6

Table 11 - Statistical measures applied to the data collection of more than 100 times cited articles

	<b>Number of years studied</b>	<b>Sample number</b>	<b>Number of Methods</b>	<b>Number of inputs</b>	<b>Number of outputs</b>	<b>Number of citations</b>
<b>Mean</b>	3	49	1	4	3	164
<b>Median</b>	3	44	1	4	3	152
<b>Mode</b>	1	43	1	3	3	152
<b>Standard deviation</b>	3	29	0.45	2	1	62
<b>Coefficient of variation(%)</b>	93	59	35	39	46	38
<b>Minimum value</b>	1	12	1	1	1	101
<b>Maximum value</b>	11	150	2	7	6	338

The first object of analysis is the number of years studied. As it can be seen in both tables, although the average number of studies can be considered quite acceptable to perform a contextualized performance measurement, there is a vast number of papers focusing their data research on a single year of activity. Regarding the number of articles that compose the samples, in Table 10 a tremendous coefficient of variation can be spotted, due to the large dispersion of the values, as can be seen through the minimum and maximum rows. The explanation behind this dispersion of sample values is due to the fact that in these global analyses all 4 sectors are considered. This affects massively the results since papers measuring hotel efficiency use the overall highest samples than those that focus on airports, for example. Curiously this dispersion is not seen on the second table. The largest sample was used by Scholochow et al. (2010) to explore the Austrian hotel sector, with an astonishing total of 3600 hotels considered. For the second analysis, Pulina et al. (2010) use the biggest sample to measure the efficiency of Italian hotels.

When looking at the next object of analysis, the results do not vary significantly between analyses. It can be positively stated that the majority of studies employ only one method when measuring tourism efficiency. It is however true that some papers apply 2 or 3 different methods, the authors that do so are usually not only looking to obtain more accurate results but also to compare the different methodologies and the dissimilarities between their efficiency results. Focusing on the use of inputs and output, although it is more evident in Table 11, more often than not, more inputs than output variables are taken into consideration. It is although commonly preferred by authors to use a reasonable amount of 3 to 4 input variables. The inputs and outputs are roughly repeated in the greater part of studies present in the same sector. Finally, when examining the citations column of Table 11, there are obviously few values dispersions since the analyzed sample is merely composed of papers with more than 100 citations and therefore presents a more cohesive dataset.

As for the sectors examined, from the analysis of 130 articles, the majority measures the efficiency of hotels (94 articles), the second-largest group explores the airport sector (24), the

remaining papers focus on airline companies (7) and travel agencies (5). In a plain visual way, Figure 2 provides a chart where the percentage of each sector is illustrated.

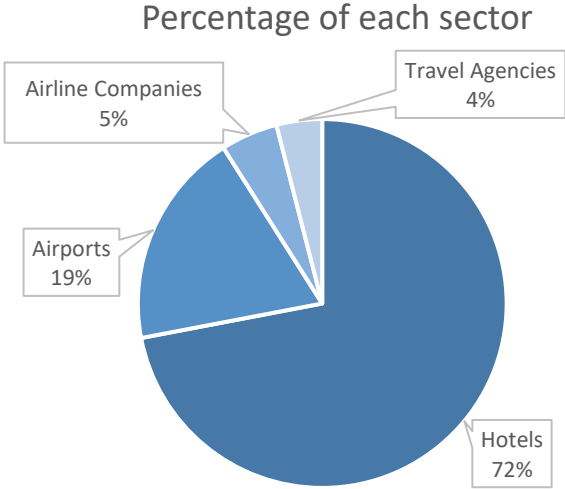


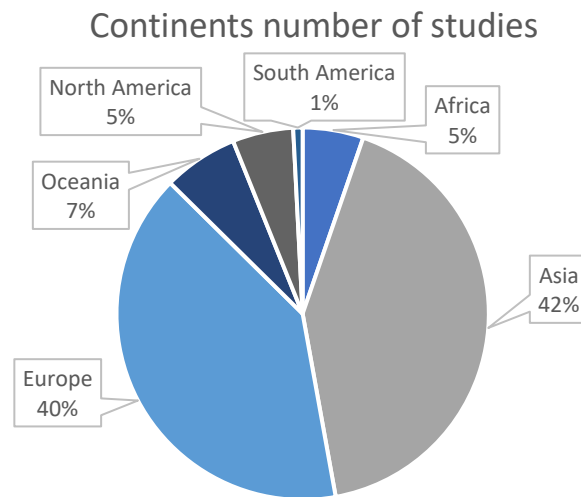
Figure 2 - Analysis of sectors studied in the literature

**6.1.1 A statistical overall analysis of the countries and continents studied**

This current section explores the diversity of countries studied on the article sample. Every year new studies have been executed to explore, analyze and improve the tourism efficiency of firms, regions, or countries. This global run after achieving efficiency on tourism comes as no surprise since as already cited above, tourism is the biggest and most profitable sector in the world. However, although tourism is increasingly growing around the globe, according to Yucel (2020), the 10 most visited tourist destination countries still account for approximately 45% of the total tourism receipts. In an attempt to distribute these profits many different countries are investing in studies and research to measure and upgrade their tourism efficiency, lowering the expenditures and increasing the revenues.

It is therefore interesting to analyze which countries have been more concerned in measuring and improving their tourism efficiency. This section gives statistical information regarding the countries and continents studied on the article sample. In an overall analysis, 52 countries were studied and the country emerging in more articles was Taiwan with 37 published papers, followed by Spain (22) and Portugal (13).

Figure 3 exhibits the presence of countries from each continent studied in the literature. In other words, it shows, in an elementary visual form, the percentage of studies executed with data from each continent. It can be easily spotted that Asia and Europe dominate the field of tourism measurement, being present in roughly 82% of all studies. It is surprising North America’s underperformance, bearing in mind that, according to Yucel (2020), it has 2 of the 10 most visited countries in the world, more specifically the USA and Mexico.



*Figure 3 - Number of studies from each Continent*

Curiously when looking into the continents with more countries being studied, Europe leads this field, with articles evaluating firms from 24 different countries, this represents approximately 46% of all countries from the sample. In second place significantly spaced from the remaining, the Asian continent contributes with 16 studied countries. The remaining continents with countries belonging to the sample are: Africa (5), Oceania (3), North America (2), and South America (2). The lack of nation's variety in some continents is not only related to the shortage of studies but also to the fact that some continents are composed of few but comparatively sizable countries, such as: Australia, the USA, and Canada. The scarcity of articles and countries reviewed in Africa and South America might occur as a consequence of being collectively substantially poor continents. Africa in particular, according to the United Nations 2021 Snapshot, has 33 of all the world's 42 least developed countries, therefore the resources spent in studies are limited, and measuring tourism efficiency does not come as a priority.

### **6.1.2 A statistical overall analysis of the methodologies applied**

As decades passed, more and new methods emerged in the field of efficiency measurement. The most used and recognized methods have already been addressed in chapter 2. Two peculiar methods catch the eye when looking at the earlier years analyzed in the sample. Them being the Multiple Regression Analysis methods, only used by Baker and Riley (1994), and the Variable Factor Productivity Regression (VFP) model appearing also once in Oum et al. (2006). Researchers can use multiple regression to analyze the strength of the relation between a dependent variable (or outcome) and various predictor variables, as well as the relative relevance of each predictor (Petchko, 2018). The VFP regression model is solely the ratio of total combined output over the total variable input (Oum et al., 2006).

The Bayesian distance frontier model and the Bootstrapped Malmquist Index also almost negligibly appear on the sample, the first one according to the authors was used as a consequence of many studies in the field failing to integrate the distance function when estimating the frontier methods (Assaf & Josiassen, 2012). Regarding the Bootstrapped Malmquist Index, bootstrapping implies

replicating the data-generating process, creating a properly large number of pseudo-samples while the Malmquist Index is simply the ratio of two input distance functions (Simar & Wilson, 1999).

The results are presented in Figure 4, where a graph of the methods used is displayed.

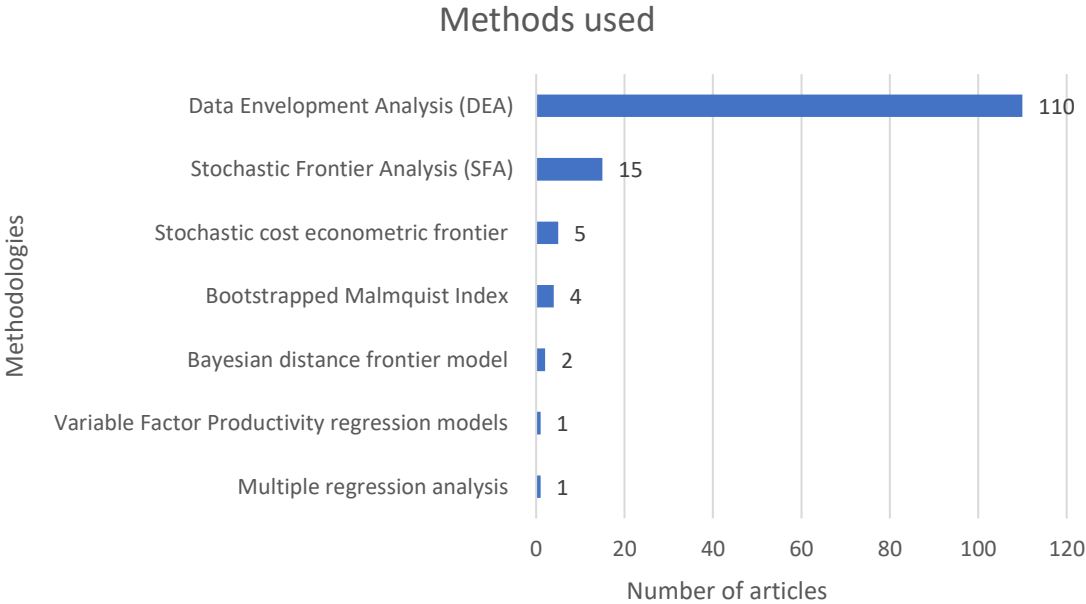


Figure 4 - Methodologies applied in the sample

As can easily be spotted, there are no doubts concerning which is the most widely utilized method to measure tourism efficiency. DEA is applied in roughly 85% of the 130 articles in the sample. However, some articles, as mentioned before, include more than one method, combining DEA with SFA, Malmquist Index, or even other auxiliary regression, distance, or cost functions. It is also worthwhile to point out that some articles instead of using the classic simple DEA method, apply or create other DEA variations. Some examples of methods used that are more aimed at a specific objective but based on DEA are the following: input-oriented DEA; output-oriented DEA; Hyperbolic Network Data Envelopment Analysis (HNDEA); Network DEA; non-radial DEA; Multi-activity DEA; Cross-efficiency DEA; eWOM-informed DEA; DEA Window and integer DEA.

Figure 4 also reveals that SFA is the second most common method used in the field, present in 15 different studies. It comes as no surprise that both DEA and SFA would appear as the most used methods, however, although DEA is most popular in comparison, such a one-sided distribution is still quite astonishing. Several studies provide on their conclusions, a comparison between both DEA and SFA results and analysis, in general, the conclusion reached was that both methods achieved similar results as is the case of Honma and Hu (2012) and Pels et al. (2003).

**6.1.3 A statistical overall analysis of the number of publications during the years**

Scanning the fluctuation of published articles throughout the years is an interesting analysis to carry out. The number of articles published across the years in a certain field might reflect the levels of concern to scholars, the resources available, the urgency, or even the importance of the field.

Therefore, for this matter to be explored, Figure 5 illustrates the variance of articles published over the sample years (1991-2021).

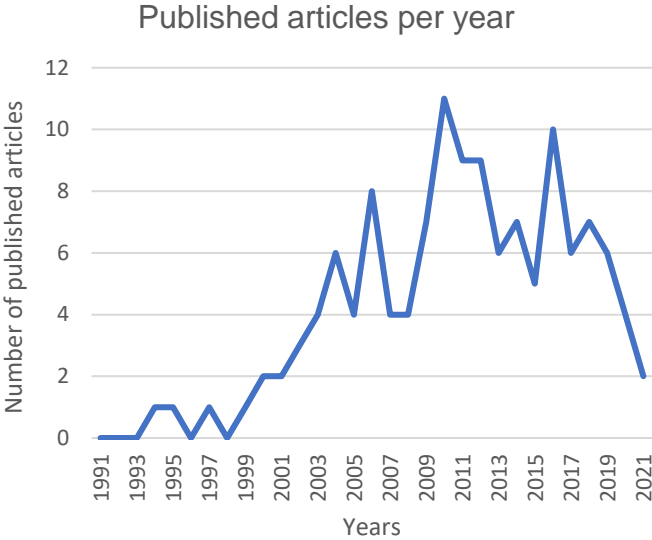


Figure 5 - Published articles per year

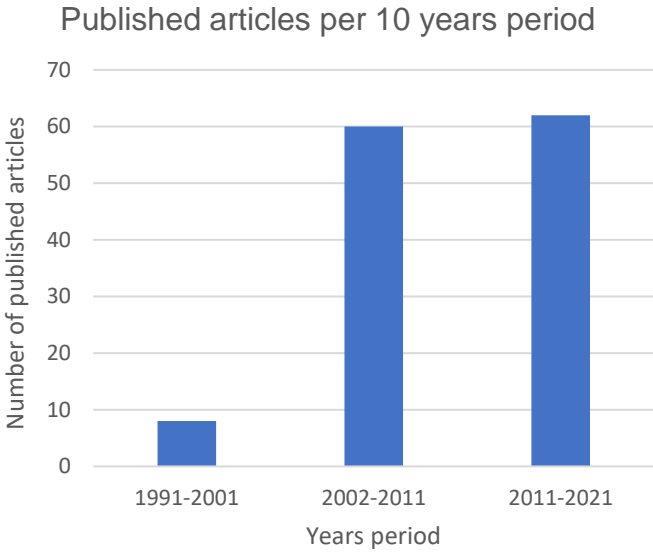


Figure 6- Published articles per 10 years period

Initially, the published articles per year graph was expected to be sufficient for the analysis, however, after observing the data, a second graph was believed essential for a better interpretation. Observing Figure 5, one may be admired by the ups and downs presented during the last decade. It would be expected that the number of published articles per year would constantly increase throughout the years, due to technological evolution and the growth of tourism and education. However, as it can be witnessed, there are some drastic declines in the number of papers published. It comes as a shock that 2010 turns out to be the year with more publications, holding a total of 11 papers published, curiously all in the hotel sector. The most shocking detail might be the shortage of articles available since 2018. In the last three years, a miserable sum of 12 articles were published. This lack of articles may be a consequence of two factors with the first one being the Covid-19 pandemic. As it is universally known coronavirus pandemic influenced globally almost every sector, being tourism obviously one of the most affected. Since the last months of 2019, the world has experienced a tremendous decrease in traveling and dislocation in general, as a consequence of the high transmissibility of the virus. This may have led scholars or firms to prioritize other urgent studies instead of the measurement of efficiency of closed or empty tourism infrastructures. Another probably crucial factor is the difficulty to retrieve recently published documents. New articles are harder to access not only because of the lack of openly published studies but also for the scarcity of available online copies. This is clearly an affecting obstacle that limited accessibility to recent data and can reflect on only two publications been collected from 2021.

Additionally, since this layout of the data could mislead readers, Figure 6 is presented providing a different analysis. Data are grouped into 10-year periods, with the first period exceptionally composed of 11 years. Visually it can now be spotted that every 10 years since 1991/1992 the number of

published articles in the field has increased. The sample is composed of 8 articles issued until 2001, 60 articles from 2002 to 2011, and a remaining of 62 publications since 2012. Although there can only be spotted a slight increase of two studies between the last two periods, it can still be stated that the number of published articles has been increasing throughout the decades.

To analyze the data extracted in the best fitting way, henceforward the analysis presented will be exclusively related to each single sector at a time.

### 6.2 Statistical analysis over the Hotel sector

Not only by practitioners and owners but also by scholars, the performance evaluation of hotels has long been a subject of interest (Tsai et al., 2011). The hotel's efficiency measurement represents the high majority of studies in the sample, with 95 out of 130 authors targeting this type of firm. This section is divided into several sub-chapters where different variables are explored.

Firstly, since the articles are already allocated into their respective sectors, the use of inputs will be properly analyzed. Likewise, the number and type of outputs will also be studied and the results discussed. The methodologies applied in the studies will once more be addressed as well as the countries' diversity.

#### 6.2.1 Inputs and Outputs variables applied

The number and type of inputs variables are critical factors that directly influence the results of every type of study. In the hotel industry, nearly all inputs utilized to measure efficiency are cost/expenses or number of assets related. As a rule, authors tend to select their inputs after performing a brief literature review and scanning the variables elected by other colleagues. Out of 95 articles, 36 different inputs were reported. However, since some variables were used only a negligible number of times, Figure 7 was developed with data of the 15 most generally accepted inputs.

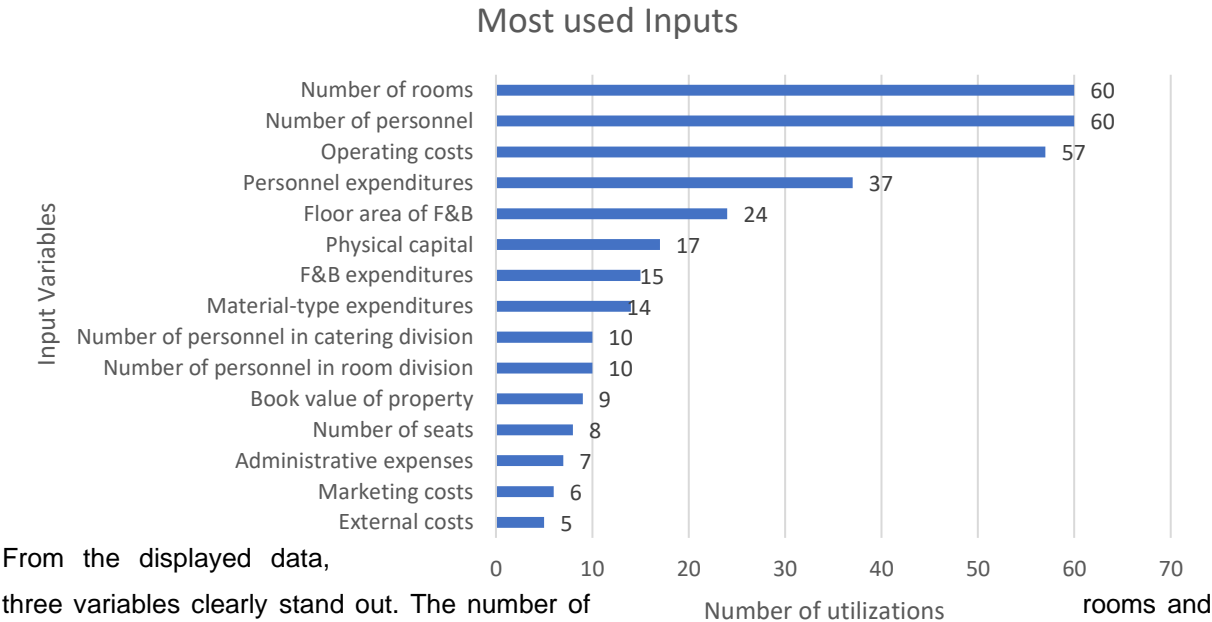


Figure 5- Top 15 most used input variables in the hotel sector

number of personnel are the two leading inputs, either being used in 60 studies, which statistically represent 63% of the sample (each). In third place appears the operating costs, followed by personnel expenditures and floor area of food and beverage, respectively. The number of rooms and number of personnel are quite self-explanatory variables, considering personnel any kind of employees, from the room services to the cleaning staff, to the restaurant waitresses or even the receptionists. However, it is worth it to point out that the fact that the number of personnel is not used in more studies may come as a consequence of some particular authors have separated the general employees into two inputs, the “number of personnel in catering division” and the “number of personnel in room division”.

The operating costs variable is found in a respectable number of studies and englobes various if not all types of expenditures related to hotel operations, basically everything spent to keep the hotel working. To quantify the F&B department (food and beverages) four different variables are used. Firstly, to evaluate the capacity, the authors choose between two measurements: “Floor area of F&B” or “Number of seats”, this last one as regard to the capacity to serve customers in hotel restaurants and bars. The remaining two variables related to F&B are the “F&B expenditures” which represent all expenses affiliated to the materials, cooking processes, food waste, and other catering costs, and “Average F&B price”, which was only utilized once by Deng et al. (2019).

Occasionally, the operating costs are divided into several specified variables as: “Material-type expenditures”; “Administrative expenses”; “Marketing costs”; “Cleaning costs”; “Maintenance costs” and “Energy costs”. The evaluation of physical capital and the property’s book value also appear as fairly used inputs, especially in more economically driven studies.

Focusing on the outputs, a total of 21 variables were found. Similar to the input analyses, in the interest of narrowing down the most influential information, Figure 8 presents data from the top 15 most chosen outputs.

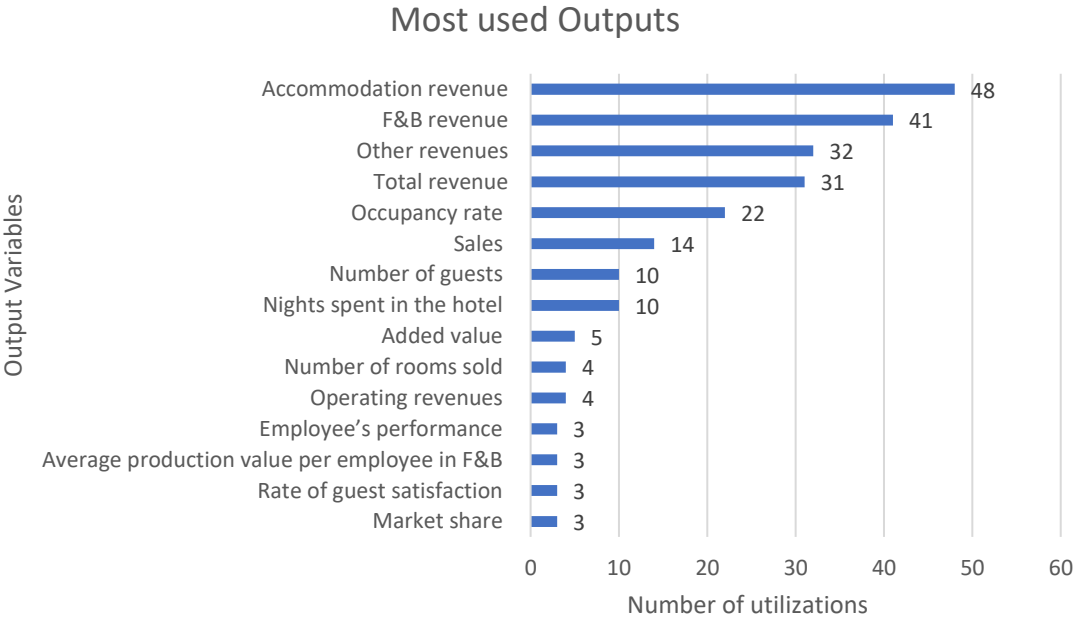


Figure 6- Top 15 most used output variables in the hotel sector



Being used in 48 of the 95 articles, the “Accommodation revenue” rules the output variables, contributing to the efficiency measurement of around 47% of all hotels. This variable composes the earnings strictly related to the room division. Comes as no surprise that the second most used output is the “F&B” expenditures” that, once more, concern the earnings only related to the catering division. It is interesting to notice that the four most used variables are revenue-related. In the fifth place, as the first non-revenue variable used, comes the “Occupancy rate”, which, depending on the author, may represent the ratio between the number of guests and number of rooms, while for other authors may represent the ratio between “available nights” or “opening days” with “nights spent in the hotel”.

As regards to, number of assets-related outputs, the two most used variables are “Number of guests” and “Number of rooms sold”. Two curious variables used at least in three studies each are the “Employee’s performance” and the “Rate of guest satisfaction, both of which are evaluated grounded on multiple surveys and questionnaires fulfilled by customers.

Coinciding with Figure 8 data, the three/four variable outputs most commonly used together are: “Accommodation revenue; F&B revenue and other revenues” although, in many cases, the last variable is replaced by the “Occupancy rate”. This is also consistent with the mean calculation results that show the average number of outputs used in the hotel sector is of 2,5 which means, most studies rely on two/three output variables to measure hotel efficiency.

**6.2.2 Methodologies applied**

From the hotel sector sample, a total of 28 methods or variants of methods were found. According to the media calculation, most authors rely only on one methodology per study.

Since most of the methodologies used are variants of the DEA and SFA methods and do not appear a relevant number of times, Figure 9 displays the 10 most used methods to measure the efficiency of the hotel sector. As can be observed in the figure, these 10 most utilized methods, appear a total of 81 times, while the remaining 18 methods/variants only appear 24 times

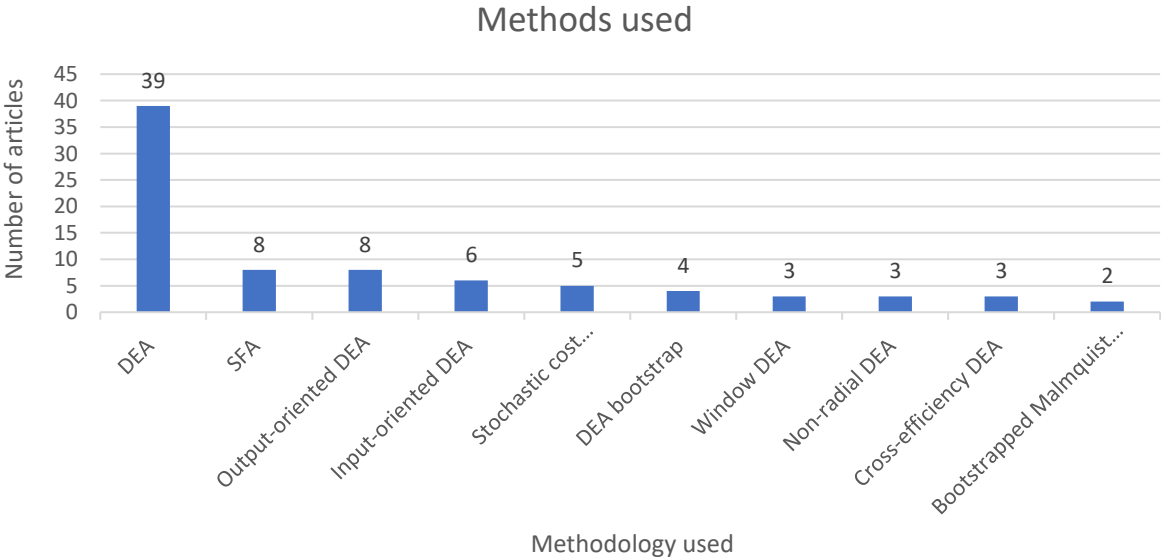


Figure 7 - Top 10 most used methods in the hotel sector

Once more, as expected, the Data Envelopment Analysis method rises as the most utilized method of the sector. It not only appears 39 times as the simple classic DEA method, but also when considering the variants, is utilized on an additional 38 articles, and, as a result, influencing 77 out of 95 articles, representing roughly 81% of the sample. In the second place, tied up with the third, SFA emerges being used in eight studies. As well as the DEA, if we consider the SFA variants, the number of appearances rises to ten, which is significantly lower than the DEA but is still a respectable number.

Regarding the Output-oriented DEA and the Input-oriented DEA, both are the most used methods variants, and are nearly self-explanatory, with each being a DEA-based method that focuses more specifically on the output and input variables, respectively.

The Bootstrapped Malmquist Index and the Stochastic cost econometric frontier are the only two methods out of the top 10 most used that are not directly DEA or SFA supported. The first one as already been mentioned in sub-chapter 6.1.2, therefore, focusing on the Stochastic cost econometric frontier method, it was proposed for the first time by Farrell (1957), and as Barros et al. (2010) briefly defined, it calculates the difference between inefficient units and the efficiency frontier by taking into account the residuals which contain two components: noise and inefficiency.

To conclude this section, it is important to point out that the results obtained from the statistical analysis of methodologies in the hotel sector are coincident with the ones provided by the global overall analysis of section 6.1.2.

**6.2.3 Countries studied**

The following section provides a short analysis regarding the countries where the hotels of the sample are located. The data used in the studies are scattered around the six habitable continents of the world, with the two most studied continents being Asia and Europe, with 13 and 11 countries studied respectively. In addition, Asia and Europe also share one country, Turkey, which is part of both continents and also evaluated in the sample. The least represented continent turns out to be North America, with the only addressed country being the United States.

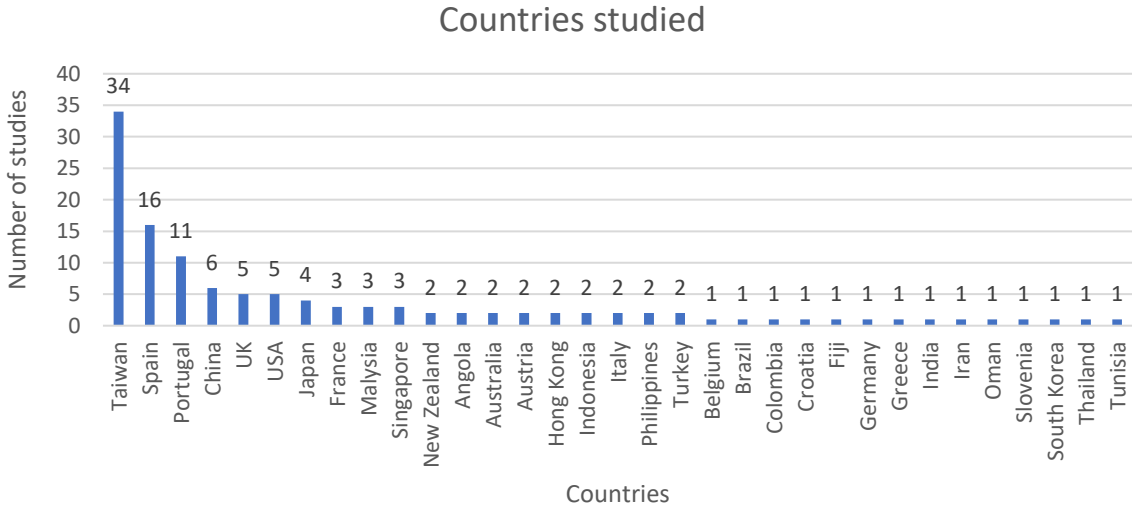


Figure 8- Countries addressed in the hotel sector

The range of countries and the number of studies that exploit them are illustrated in Figure 10. The exhibited data shows that Taiwan continues to lead as the country mentioned in more studies, with 34 appearances, followed again by Spain and Portugal. These three most studied countries appear in more than 64% of the sample articles.

When combining the countries' results with the years of publication, some interesting conclusions can be spotted. Looking into the last 5 years, seventeen publications were made, from this amount, eleven were of European countries, five from Asian countries and one from South America, more precisely Colombia. These results may lead us to believe that recently the attention of scholars towards European countries has increased. This may be a consequence of, according to the International Tourism Highlights, 2019 Edition, five of the 10 most visited countries in the world are from Europe, more specifically: France, Spain, Italy, Germany, and the United Kingdom. This increase of interest in the hotel efficiency of European countries may definitely bring several advantages to Europe, from reducing costs to increasing the service quality, resulting in higher customer satisfaction and eventually in an increase of tourism as a whole which, as a consequence, will lead to higher returns and profits.

### **6.3 Statistical analysis over the Airports sector**

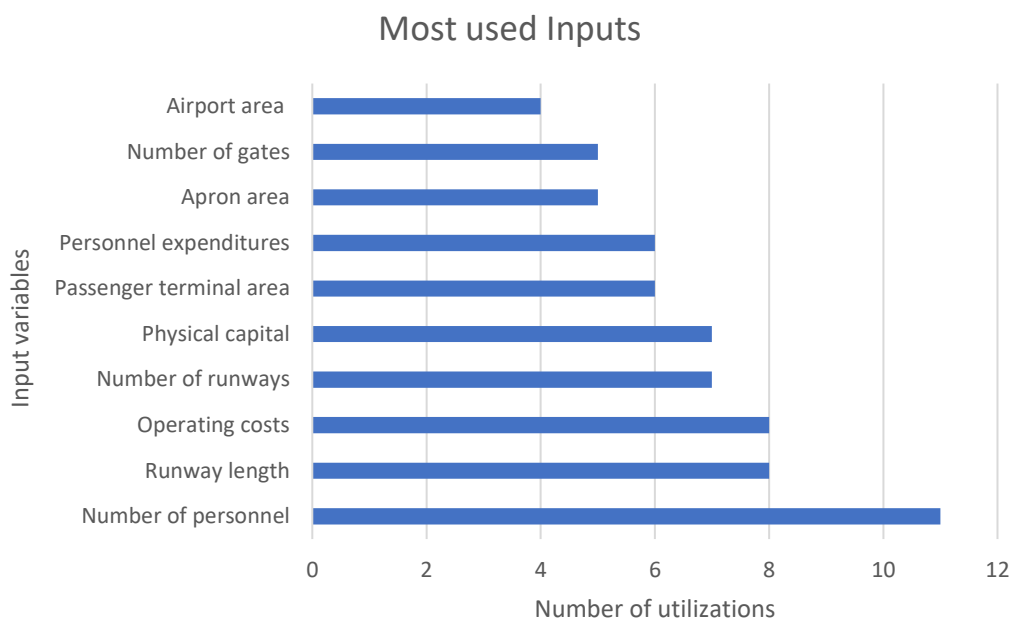
Air transport is an essential component of tourism, with more than 70% of international tourists arriving at their destinations by air. The main reason behind such popularity is due to it providing the fastest connection between tourists and their destinations (Fernández et al., 2018). Related to this, airports are an essential component of the air transport journey. Every day there are cases of flights where passengers spend the same amount of time, or even more, at the airport facilities, as they do inside the plane. Therefore, the airport experience may easily persuade tourists' first impression of a city or country, which as a consequence may affect the economic development on national levels (Wiltshire, 2018).

The current sub-chapter analysis the airport sector measurement of efficiency according to the same variables as the previous one.

#### **6.3.1 Inputs and Outputs variables applied**

Similar to the hotel sector, in the airport sector the input variables used are also cost or number of assets/capacity related. However, it can be noticed that in this sector, there are much more inputs concerned with the dimension and quantity of physical assets than there are related to expenses. The same rule to select the variables is applied, where usually authors scan the literature to choose the most popular elected inputs.

From a sample of 24 articles, a total of 18 different input variables were found. From the scale of the input, the five more utilized variables are utilized in approximately 53% of all the studies. The top 10 most used inputs are presented in Figure 11.



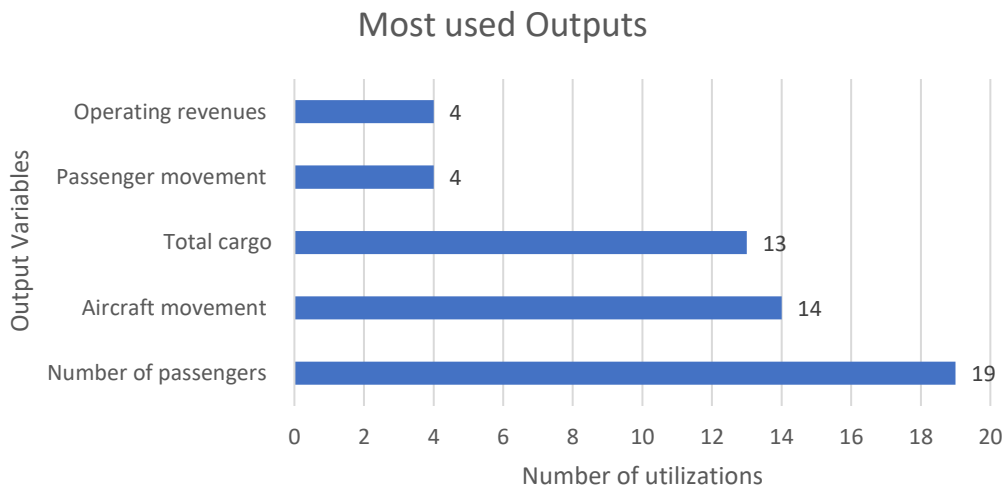
*Figure 9- Top 10 most used input variables in the airport sector*

As the figure exhibits, the number of personnel leads as the most used variable being picked in eleven out of twenty-four studies. From these top 10 inputs, only three are costs related, with them being the Operating costs, which englobes all functional costs related to the airport activity, the Physical capital of the airport facilities, and the Personnel expenditures. When using the term personnel, the authors englobe all different types of employees, from the airplane-related tasks to the cleaning staff, the check-in desks, security, luggage department, among others.

Out of the seven, non-costs related variables, four are relative to dimensions and three are measured as quantities. When evaluating airport dimensions, the first most used variable is the runway length, which as the name implies measures the size of the runway. The other dimension related inputs are measured by area, those being the Passenger terminal area, concerning the spaces designated for passengers to board, wait or get of the aircraft, the Apron area which is the area of an airport where aircraft are parked, loaded/unloaded, refueled, boarded, or maintained and finally the Airport area, which englobes all facilities areas of the airport premises. The remaining three inputs are the number of personnel, which, as already been mentioned above, the number of runways which generally is proportional to the size of the airports, and the number of gates where passengers board and get off the planes. Another related input is the number of planes although it is frequently more used in the airline company's sector.

Looking into the outputs, 17 variables were found, one less than the amount of the input. According to the data collected the average number of outputs used is lower than the inputs, with less than three variables per study.

For the sake of narrowing down the most influential information, Figure 12 presents data from the top 5 most chosen outputs. The analysis was restricted to the most used five variables since these are applied in more than 78% of the articles.



*Figure 10 - Top 5 most used output variables in the airport sector*

The combination of two variables most used in the sector is “Number of passengers” and “Total cargo”. The most used output is the number of passengers that visit the airport, being utilized in 79% of all articles. This number accounts for the passengers checking in for departure and the ones that arrived and had to pass through the airport after getting off the plane.

Two peculiar variables commonly chosen are Aircraft movement and Passenger movement. The Aircraft movement or ATMs, also designate sometimes as air traffic movement is defined as the number of passengers using the airport and the amount of freight moved through the facilities of the airport (Martin & Roman, 2006). According to Sarkis and Talluri (2004), the passenger movement can either be passengers arriving or departing through commercial airline or helicopter, or passengers doing scale, which means, a passenger stopping momentarily at a given airport and eventually departing on a plane with the same flight number and counted only once.

The third most used output is the Total cargo variable, it is also used in the airline sector and is typically measured in tonnes, representing the number of tonnes that were transported annually. The ability to move great amounts of cargo (or passengers) is consequently related to the input variables concerning the sizes of the terminals, which according to Yoshida and Fujimoto (2004) influences operations that play an important role in the airport activity.

### **6.3.2 Methodologies applied**

From the airport sector sample, only 12 methods or variants of methods were found. According to the media calculation, and similar to the hotel sector, most authors rely on only one methodology per study to measure efficiency.

Since most of the methodologies used are variants of the DEA and SFA methods and do not appear a relevant number of times, Figure 13 displays the 5 most used methods to measure the efficiency of the hotel sector. The sample displayed only contains the five most used methodologies since these five are present in more than 78% of the studies.

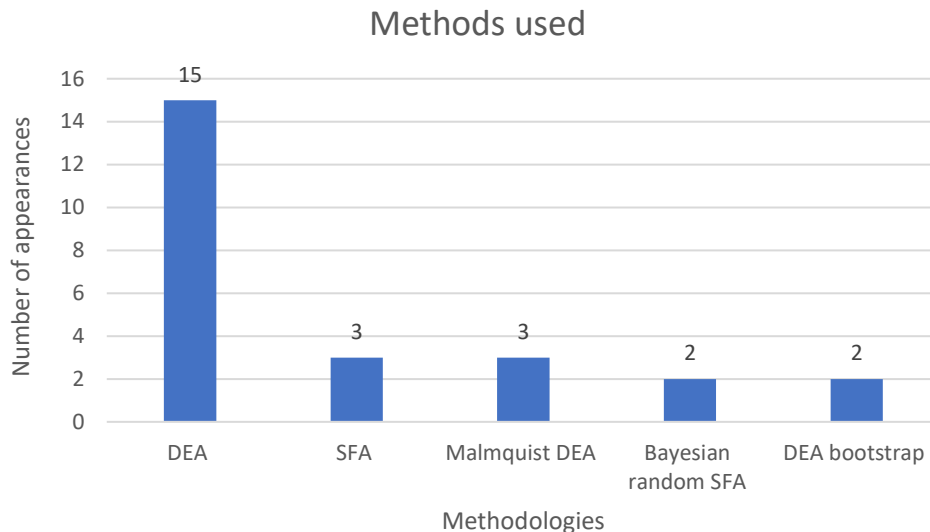


Figure 11- Top 5 most used methodologies in the airport sector

As can be observed in the figure, these five most utilized methods, appear a total of 25 times, while the remaining seven methods/variants only appear one time each.

These results are still concordant with the ones that analyzed the methods before, with DEA as the most applied method by a significant lead, followed by the SFA method and two DEA variants. The data envelopment analysis method is used in the airport efficiency measurement in roughly 63% of the articles collected, and when considering all its variants the percentage increases to more than 79%, which unquestionably proves it is dominating the literature.

From the correlation between the year of publication and the methodology applied, no conjectures could be exploited.

### 6.3.3 Countries studied

The following section provides a short analysis regarding the countries where the airport facilities of the sample are located. The data used in the studies are spread through the six habitable continents of the world, however, South America and Africa only have one published article and one studied country each, namely Brazil and Mozambique.

Europe and Asia maintain the podium as the continents with most countries studied, however, opposite to the hotel sector, in the airport sector, Europe has more countries evaluated than Asia, with respectively 19 and 10 countries. This means that out of the 35 countries present in the sample, more than 54% of them are located in Europe.

Regarding the number of articles published, Europe still appears in the first place, with 11 articles, however, surprisingly, the second place goes to Oceania, with 7 articles published. Still, ahead of the Asian continent, North America stands as the third continent studied in more articles, with 5 articles published, four of them concerning only the United States. These results show that the authors focused on Asian countries (4 articles), usually use several countries in their sample, when comparing to Oceania that only has two countries studied (Australia and New Zealand) but appears in 7 articles.

Figure 14 displays the countries whose airports were studied.

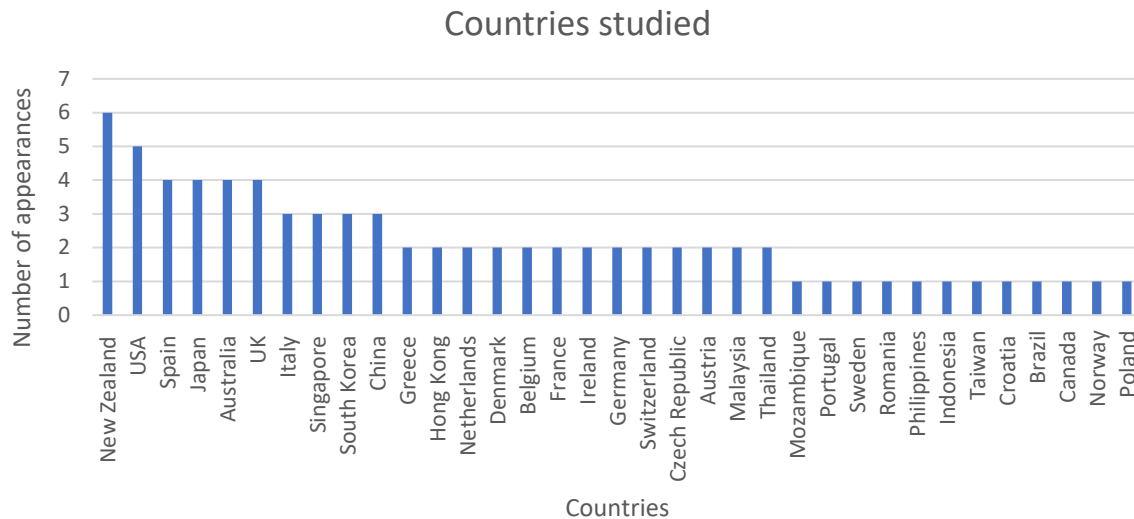


Figure 12 - Countries studied in the airport sector

As Figure 14 illustrates Taiwan is no longer the most studied country, in fact, it is one of the least explored countries being only present in one publication. The most explored country is New Zealand with six articles published (since 2006), followed by the United States with five, and Spain, Japan, Australia, and the UK with four each.

#### 6.4 Statistical analysis over the Airline Company's sector

Airline companies are undisputedly a key contributor to the tourism industry. The weight these companies have in tourism is critical since, as Bowen (2000) cited in his paper: "the addition of a single international flight can have a discernible impact on receipts and employment in the tourism sector, with positive spillover effects throughout the broader economy". Creating and managing efficiently airline companies is extremely beneficial given that, as Morley (2003) stated, a more efficient airline industry provides lower traveling prices, consequently luring more travelers and increasing tourism, which will lead to strong economic benefits to the destination.

The Airline company's sector is, as expected, quite similar to the airport sector, however, it was important to separate both since the second one focuses only on a micro perspective of individual facilities while the current sector considers companies as a whole.

##### 6.4.1 Inputs and Outputs variables applied

When comparing the inputs and outputs used in this sector with the previous one, it was clear and expectable that many variables were shared. From the seven studies collected in the sample, a total of nine input and eight output variables were used. After calculating the average number of variables used, the results show a media value of four inputs and two outputs per article.

Figure 15 and Figure 16 illustrate respectively the inputs and output variables used.

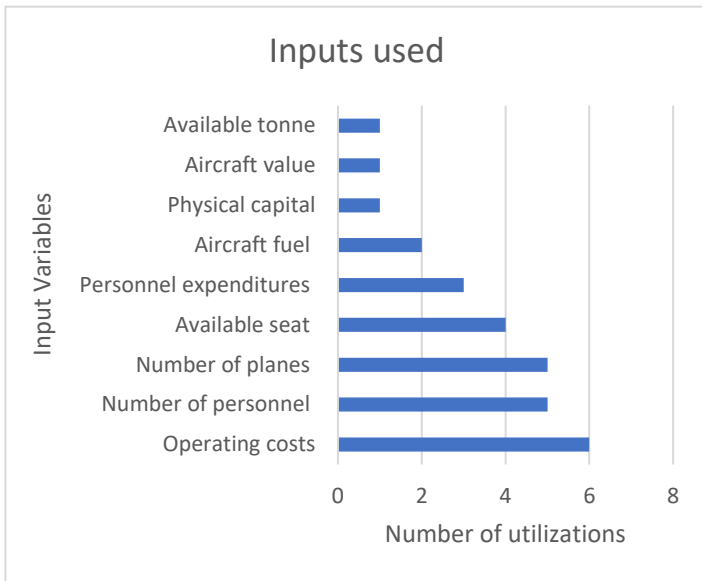


Figure 145- Inputs used in the airline company's sector

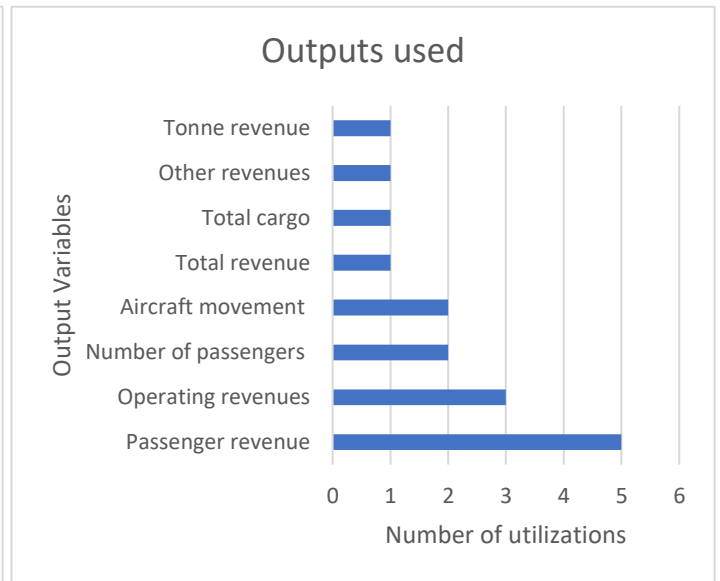


Figure 136- Outputs used in the airline company's sector

Starting with the input variables, all inputs used by the authors are displayed above, similar to the other sectors, the variables are cost and assets related. The most used input is utilized in 86% of the studies, in other words, six out of seven articles use Operating costs to measure efficiency, with the exception being Assaf and Josiassen (2012).

The number of personnel and number of planes are also two variables that have already been used and mentioned in the airport sector, although the second one was only used once. The available seat input is a novelty only used in this sector, it is also described as available seat-kilometers or ASK, and, according to Mhlanga (2019), it measures the total number of available seat kilometers (in million) per airline, by taking the sum of the products of the number of passenger seats available for sale on each flight stage and the stage length. From the remaining inputs, the personnel expenditures and physical capital have already been mentioned before. The Aircraft fuel is measured by the number of gallons of fuel consumed and the remaining variables are self-explanatory with the available tonne also named available tonne per kilometer.

The majority of output variables have also already been used and commented on. The passenger revenue is the most used variable being utilized in almost 72% of the articles, which means it was chosen as an output in five of the seven studies published. The remaining variables are cost or assets related and have already been mentioned and explained before.

It is still worthy to highlight that the average number of inputs used is almost double of the outputs and the variety of different input variables is still more diversified than the outputs. The minimum number of inputs used was 3 and the maximum five, while the minimum number of outputs used was 1 and the maximum 3.

There is still a need to point out that a sample with only seven articles is considered a small sample and therefore it would not be wise either reasonable to make any kind of assumption with the results obtained.



## **6.4.2 Methodologies applied**

Since it is such a limited sample and the diversity of methodologies used is minor, there is no need to provide a graphic with the results. As expected, the same method leading the other sectors is also the most used in the airline company's sector. DEA once again emerges with a percentage of 72% of the studies relying on it. The remaining methods are the Bayesian distance frontier model and the Bootstrapped Malmquist Index, each appearing only once and have already been explained in the 6.1.2 section.

## **6.4.3 Countries studied**

Regarding the countries studied, this section is not relevant to be analyzed since most of the companies are extremely international and work with airports all around the globe.

A total of 77 different airline companies were studied in the sample. The nationalities of the companies, or, in other words, the locations of their headquarters are the following countries: UK; Australia; Austria; Brunei; Canada; China; Cyprus; Finland; France; Germany; Hungary; Iceland; India; Indonesia; Ireland; Italy; Japan; Malaysia; Netherlands; Philippines; Poland; Portugal; Singapore; South Korea; Spain; Switzerland; Taiwan; Turkey; USA.

## **6.5 Statistical analysis over the Travel Agencies sector**

As written by Köksal and Aksu (2007) analyzing the efficiency of the service sector is an important issue in the global economy and travel agencies not only work in the service sector but more specifically in the tourism sector. Given the importance and worldwide scale of today's tourist industry, it appears reasonable to assess the effectiveness of firms whose primary goal is to connect supply and demand (Fuentes, 2011). Therefore, the current section analysis, although very briefly, the travel agency sector. The reason behind it being a brief analysis is the sample's dimension since it is only composed of five articles.

### **6.5.1 Inputs and Outputs variables applied**

From the five articles measuring travel agencies' efficient measurement, seven input and five output variables were found. According to the data collected, the average number of inputs used by authors is three per study, while the average number of outputs doesn't even come close to two variables.

Figure 17 and Figure 18 display, respectively, the input and output variables used in the sample. The inputs do not vary much from the other sectors, the two most used variables are the number of personnel and the potential service, appearing each in three out of five articles. The variable "Potential service" was used and described by Fuentes (2011) as the maximum number of customers that the agency would have been able to help that year based on its service capacity during that period, as a proxy variable for the level of investment. Total expenditures, Operational costs, Personnel expenditures, and Physical capital continue to be commonly used input variables in essentially every sector addressed.

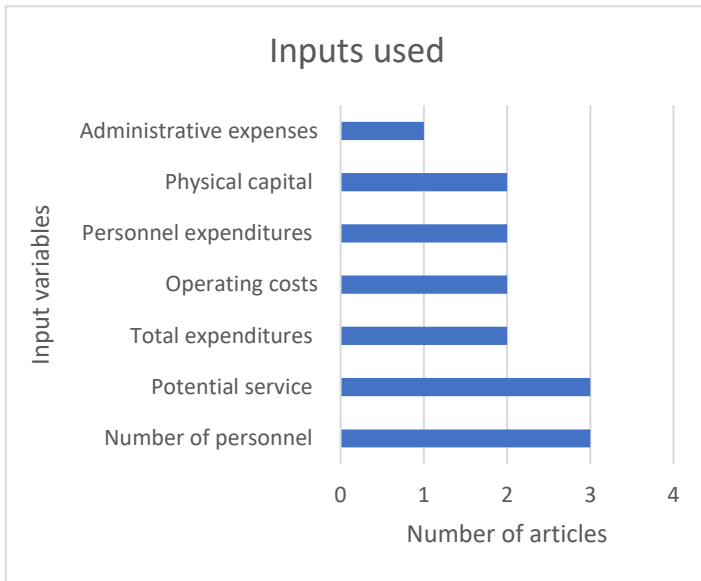


Figure 167- Figure K - Inputs used in the travel agency's sector

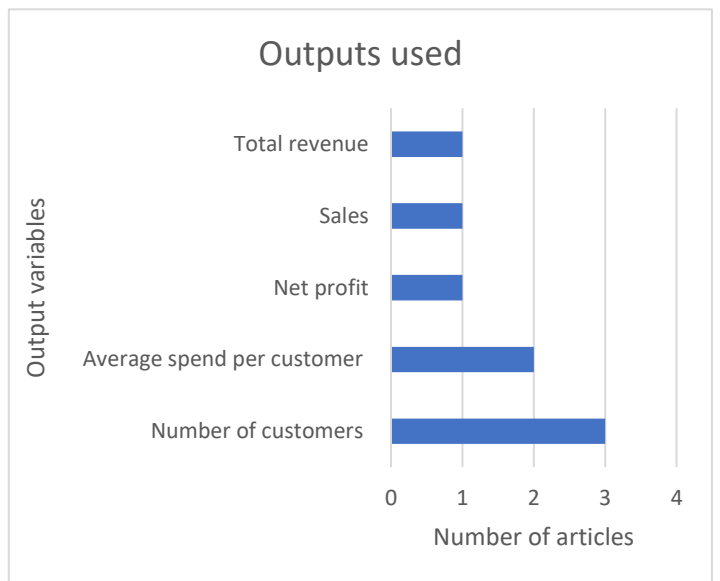


Figure 158- Figure L - Outputs used in the travel agency's sector

Regarding the outputs, the most used output is the number of customers, being used in three out of five articles, which composes 60%. This variable can be compared to the number of passengers and number of guests that were mentioned in the analysis of the previous sector. The second most used variable is the average spend per customer followed by net profit, sales, and total revenue, which are all pretty self-explanatory outputs.

### 6.5.2 Methodologies applied

Once again, due to the small size of the sample, no visual content is necessary to display the results found. Out of the five articles, four of them used the classic model of DEA and the remaining article used a variant of the method jointly with the inverse  $\theta$ -convexity. According to Goncalves et al. (2012), (the authors that used the method), this is the most natural method for production frontier theory. As the authors explain, generally when measuring technical efficiency the main assumption is made, more precisely convexity, and several methods, such as the DEA method assume it. The main difference is that when using the inverse  $\theta$ -convexity method the assumption of convexity is released. This method has however only been used once on the entire 130 articles sample.

We may conclude once more that the DEA is the most used method globally and specifically in each sector. In the travel agency's sector, it as the simple method or as a variant is used in all the studies of the sample.

### 6.5.3 Countries studied

In the travel agency's sector, only five countries were studied, precisely one per article. The countries studied were: Turkey; Spain; Taiwan; Morocco and Croatia in this respective order. Although the sample is small, three continents are represented in this section, Europe, Asia, and Africa.

## 7 Bibliometric Analysis

This chapter applies a bibliometric analysis to the data collected. Bibliometric analyses were initially designed, according to Broadus (1987) and Liao et al. (2018), as a cross-disciplinary science that focused on quantitatively evaluating bibliographic data using statistical and mathematical methods. It employs statistical tools to analyze and assess the progression of certain disciplines by sorting data such as citations, author affiliations, keywords, themes covered, and methodologies used in studies published in the literature (Leung et al., 2017). Therefore, this approach is frequently used to assess the development of a variety of topics, sectors, and areas of the literature.

Bibliometric methods are divided into two categories: evaluative techniques and relational techniques (Benckendorff & Zehrer, 2013). The first group assesses performance using productivity measurements, impact metrics, and hybrid metrics to determine the overall impact of the academic research (Hall, 2011). The relational techniques search for links between published articles, by considering their keywords, citations, authors, and affiliations to conduct co-occurrence (Figueroa-Domecq et al., 2015). Some of the most used relational techniques are co-citation and bibliographic coupling, therefore this chapter will further apply co-citation analysis to the references (documents), authors, and sources collected.

To perform this bibliometric analysis the sample scope had to be narrowed, therefore the number of articles used henceforward is lower than the number included in the statistical analysis. The reason behind this is that when performing this type of analysis, it was not possible to utilize the citation data from more than one database. As mentioned before, to compose the 130 articles sample, studies from three distinct databases were gathered, more precisely Scopus, Web of Science, and Google Scholar. Although many articles were simultaneously found in different databases, there were still some studies missing. Hence, after tracking down and counting the articles, it was concluded that from the 130 articles sample, the Web of Science had 107 articles, Scopus had 118, and Google scholar only had 94 studies. Therefore, with the purpose of working with the largest possible sample, the Scopus citation files were chosen to perform the analysis. In other words, the sample size has now decreased from 130 to 118 articles, which is still a respectable sample size.

To conduct the analysis, Scopus data files were imported into the Bibliometrix R package software. Using Biblioshiny in the Rstudio software, it was not only possible to extract essential data, but also to develop pictographic and interpretive tables and graphics.

The informational data provided in this section follows the guidance of the recommendations given by Aria and Cuccurullo (2017) the authors of the article “bibliometrix: An R-tool for comprehensive science mapping analysis” which elaborates specifically on how to develop a bibliometric analysis using the utilized software. Firstly, Table 12 provides the main information given by the system, including the number of documents, range of years publications, number of authors, number of authors appearances, average citations per document, ratios between the number of documents and authors, and vice versa. It also provides the results of the annual growth rate of publications, which can be better explored in Figure 19.

Tabela 12 - Main information regarding the collection

Description	Results
Documents	118
Period	1994-2021
Annual Growth Rate	2.81%
Average citations per documents	59.19
Authors	204
Author Appearances	278
Authors of single-authored documents	13
Authors of multi-authored documents	191
Documents per Author	0.58
Authors per Document	1.73
Co-Authors per Documents	2.36
Collaboration Index	1.95

The above table confirms the 118 articles composing the already mentioned sample. Although the selected period of study was from 1991 to 2021, as can be seen, the oldest published article found was from 1994, making the period of study slightly shorter. A total of 204 authors were found with 278 appearances registered. The results show a ratio of 0.58 documents per author and 1.73 authors per document which implies, consistently with the number of authors of single-authored and multi-authored documents, that the average study is written by more than one author.

Regarding the Annual Growth Rate of published articles, there is a percentage increase of 2.81. Figure 19 displays the growth rate of the number of published articles and the mean total citations (TC) of the collection.

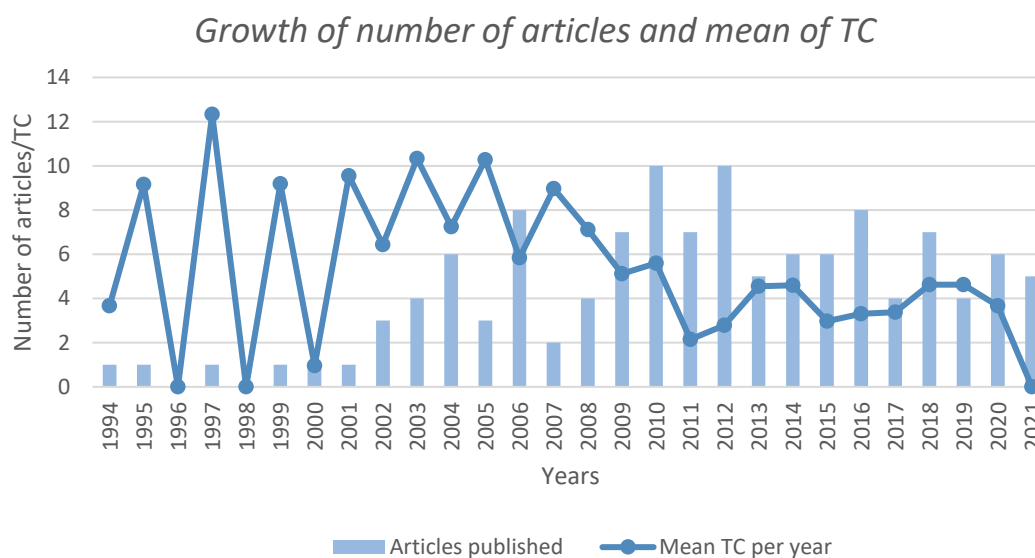


Figure 17- Growth of number of articles and Mean of TC per year

It can be observed that these two variables are not aligned with each other, in other words, when one grows, the other does not necessarily grow as well, in some cases, it might even decrease, which can be spotted for instance from 2006 to 2007. Therefore, a split analysis can be made, firstly focusing on the number of articles published. In the year 2004, the first peak of 6 articles can be spotted, followed by a decrease of three in 2005 and successively an increase of five articles creating a new

peak. A similar sequence occurs when in 2007 the number of published documents once again lowers to only two articles, and then an increase until a new maximum, however, this time the increase occurred progressively until 2010 where a top of 10 articles was achieved. The same maximum was reached in 2012 after a decrease of three units. After this peak, most studies were published in the years 2016 and 2018 with eight and seven articles respectively, followed by 2020 where six documents were published. Therefore despite the percentage of the growth rate of the number of published articles being 2.81, the publications numbers can be seen oscillating throughout the period understudied.

Regarding the mean of TC, it reached the peaks in 1997 followed by 2003, 2005, and 1999, thus, proving that it is not even closely, directly related to the number of publications. Since inflation appears to occur at random intervals of time, it can be stated that neither the mean of TC nor the number of publications follows a linear course through the years.

From the sample of 118 articles, 50 different journals served as sources. The top 10 journals with more published articles are displayed in Table 13. These ten journals together published a total of 58% of all articles of the sample. As expected, all journals are tourism, hospitality, or air transport-related.

*Table 13 - Ten most utilized journals*

Sources	No. of Articles	% of Articles	Total Citations
TOURISM MANAGEMENT	12	10	1066
INTERNATIONAL JOURNAL OF HOSPITALITY MANAGEMENT	11	9	1054
TOURISM ECONOMICS	11	9	425
JOURNAL OF AIR TRANSPORT MANAGEMENT	9	8	693
INTERNATIONAL JOURNAL OF CONTEMPORARY HOSPITALITY MANAGEMENT	7	6	119
TRANSPORTATION RESEARCH PART E: LOGISTICS AND TRANSPORTATION REVIEW	5	4	844
CURRENT ISSUES IN TOURISM	4	3	59
ASIA PACIFIC JOURNAL OF TOURISM RESEARCH	3	3	103
CORNELL HOSPITALITY QUARTERLY	3	3	44
INTERNATIONAL JOURNAL OF CULTURE TOURISM AND HOSPITALITY RESEARCH	3	3	28

As can be seen, the source of the highest number of articles is the Tourism Management journal, with 12 documents, followed by the International Journal of Hospitality Management and Tourism Economics, both with 10 publications. Regarding the sources with higher local impact, Tourism Management still appears in first place with a total of 1066 citations, followed by the International Journal of Hospitality Management with 1054, and stealing the third place comes the Transportation Research Part E: Logistics and Transportation Management with 844 citations.

Figure D.23 (Appendix D.1) illustrates the cumulative growth of the sources throughout the years. From this figure, one may notice that although Tourism Management leads the sample, its publications

remain steady since 2017 while other journals as Tourism Economics, International Journal of Hospitality Management, and International Journal of Contemporary Hospitality Management increase their publications in recent years.

Table 14 presents the top ten countries with more publications. To clarify, countries' analyses have already been developed above, however, that data was regarding the country whose information was used for the study, in other words, the analysis was made regarding the countries under study. In the section, the data is related to the most productive countries based on the first author's affiliation, as suggested by Aria and Cuccurullo (2017).

*Table 14 - Top 10 Most productive countries (based on first author's affiliation)*

<b>Country</b>	<b>No. of Articles</b>	<b>%of Articles</b>
China	26	25
Spain	18	17
USA	12	11
Portugal	10	10
Australia	7	7
Greece	4	4
Hong Kong	3	3
South Africa	3	3
UK	3	3
Croatia	2	2

When focusing on the countries, this sample has a reach of 23 countries. These ten most productive countries compose 85% of the sample. As can be spotted, China appears in first place followed by Spain, the USA, and Portugal, which combined alone represent 63% of the sample. The main reason behind China appearing as the most productive country in terms of articles might be from the fact that Taiwan may still be officially considered as a Republic of China, and as demonstrated in the last chapter, Taiwan is the number one most studied country of the sample.

It's worth mentioning that many studies are affiliated with more than one country. Table D.21 (Appendix D.2) provides the ten most impactful institutions, with the first one being the Technical University of Lisbon. The data in this table is aligned with the results of Table 14, since, within the 10 institutions, only two are not present in the table, more specifically (France and New Zealand), with China (and Taiwan) appearing 3 times and Spain twice.

Before presenting the co-citation analysis it is also interesting to display the most used keywords. To do so, Table 15 divides the keywords into two categories, one being the Author's Keywords (DE) which are the most used words by the authors, and the Keywords-Plus (ID) which are words that regularly appear in the titles of an article's references, but do not appear in the title of the article itself. For each of the categories, the top 10 most frequent keywords are displayed. From the table it can be observed that the most used Author's keyword is "Efficiency", appearing in 39 articles and the most used Keyword-Plus is "Data envelopment analysis" appearing in 45 articles.

Table 15 - Top 10 Most frequent keywords

Author Keywords (DE)	No. of Articles	Keywords-Plus (ID)	No. of Articles
Efficiency	39	Data envelopment analysis	45
Data envelopment analysis	31	Efficiency measurement	30
DEA	16	Airport	19
Hotel industry	14	Technical efficiency	17
Hotels	13	Eurasia	16
Performance	9	Service sector	14
Data envelopment analysis	8	Performance assessment	12
Airports	7	Taiwan	11
Cost efficiency	7	Europe	10
Tourism	7	Spain	10

## 7.1 Co-citation analysis

Co-citation analysis is a bibliometric technique proposed by Small (1973). This technique evaluates the frequency with which two articles are referenced together, suggesting their resemblance and proximity (White & Griffith, 1981). It can not only be used for publication as it can also be applied to authors and sources. Two documents are considered to be co-cited if they are simultaneously cited by a third one. The association between those two documents is as strong as the number of documents citing both documents, in other words, the more papers citing the same two documents the firmer their association (Ruggeri et al., 2019). Co-cited documents are sorted into separate clusters, this allocation process is made considering the knowledge foundations of a study field and the resemblance of themes (Small, 1980). According to Small (1973), this analysis technique enables the study of dynamics of scientific evolution and conceptual shifts of a certain field.

The current sub-chapter will henceforward be divided into three sections to perform a co-citation analysis of the documents/references, the authors, and the sources. Table 16 presents the results of the top fifteen publications given by biblioshiny.

The total number of citations is exhibited in the table with the purpose of identifying the most influential articles on the subject of tourism efficiency. Additionally, the number of average citations per year is also included, since, according to Paul and Singh (2017) and Hao et al. (2019) it offers an impartial view of the impact of each article without prioritizing the year of publication. The total number of citations is recurrently used in this analysis since it provides an unbiased look at each article's impact.

Looking at the table it is possible to conclude that the article with the highest number of citations is Hwang and Chang (2003) with 339 citations and being indeed the most impactful and influential in the collection. It is important to note that the documents with higher total citations are mainly the ones with an also greater average number of citations per year. However, the article from Hsieh and Lin (2010) is an example of a case that has a ratio of TC/year reasonably high for the number of total citations.

Table 16 - TC and TC/year of the fifteen most cited publications

Publication	Title	TC	TC/Year
HWANG SN, 2003, TOUR MANAGE	Using Data Envelopment Analysis to Measure Hotel Managerial Efficiency Change in Taiwan	339	17.84
BARROS CP, 2005, ANN TOUR RES	Measuring efficiency in the hotel sector	297	17.47
GILLEN D, 1997, TRANSP RES PART E LOGIST TRANSP REV	Developing measures of airport productivity and performance: an application of data envelopment analysis	296	11.84
MOREY RC, 1995, CORNELL HOTEL RESTAUR ADM Q	Evaluating a Hotel GM's Performance: A Case Study in Benchmarking	238	8.82
ANDERSON RI, 1999, INT J HOSP MANAGE	Measuring efficiency in the hotel industry: A stochastic frontier approach	202	8.78
MARTIN JC, 2001, J AIR TRANSP MANAGE	An application of DEA to measure the efficiency of Spanish airports prior to privatization	191	9.10
PELS E, 2003, TRANSP RES PART E LOGIST TRANSP REV	Inefficiencies and scale economies of European airport operations	183	9.63
CHEN CF, 2007, TOUR MANAGE	Applying the stochastic frontier approach to measure hotel managerial efficiency in Taiwan	174	11.60
OUM TH, 2006, J AIR TRANSP MANAGE	Privatization, corporatization, ownership forms and their effects on the performance of the world's major airports	168	10.50
BARROS CP, 2008, TRANSP RES PART E LOGIST TRANSP REV	Measuring the economic efficiency of airports: A Simar–Wilson methodology analysis	155	11.07
HSIEH LF, 2010, INT J HOSP MANAGE	A performance evaluation model for international tourist hotels in Taiwan—An application of the relational network DEA	154	12.83
CHIANG WE, 2004, ANN TOUR RES	A DEA evaluation of Taipei hotels.	153	8.50
FERNANDES E, 2002, TRANSP RES PART A POLICY PRACT	Efficient Use of Airport Capacity	153	7.65
SARKIS J, 2004, TRANSP RES PART A POLICY PRACT	Performance based clustering for benchmarking of US airports	152	8.44
YOSHIDA Y, 2004, TRANSP RES PART E LOGIST TRANSP REV	Japanese-airport benchmarking with the DEA and endogenous-weight TFP methods: testing the criticism of overinvestment in Japanese regional airports	144	8.00

### 7.1.1 Document's references co-citation analysis results

From here forward, the graphs presented to analyze the co-citation are designated as co-citation maps or bibliometric networks. The following graphs were constructed using VOSviewer software. The VOSviewer software was developed by Van Eck and Waltman (2010) as a computer program for bibliometric mapping. This software addresses the graphical representation of bibliometric maps, being particularly helpful by presenting wide bibliometric maps in a clear and comprehensible way. Therefore, VOSviewer was chosen for its ability to provide easy visualization of the co-citation network.

On these bibliometric maps, circles symbolize the items (which in this approach will be document references, authors, and sources). These circles increase in size as the number of citations or occurrences grows. In this study, the weighting attribute is measured in the number of citations. Therefore, articles, authors, and sources with a higher number of citations are shown more notably and close to each other than articles with fewer citations. According to the developers of the software,



the weighting of the items implies their value and significance among their specific clusters. The path length calculates the distance between items; the closer two items are, the stronger they are related. The lines shown connecting different items are named links. Each link was given a strength rating, which is displayed as a positive numerical value. The stronger the link, the greater the strength (Shah et al., 2019).

Figure 20 presents the bibliometric network of the article's co-citation. To avoid a possible overlapping of the items, not all articles are displayed.

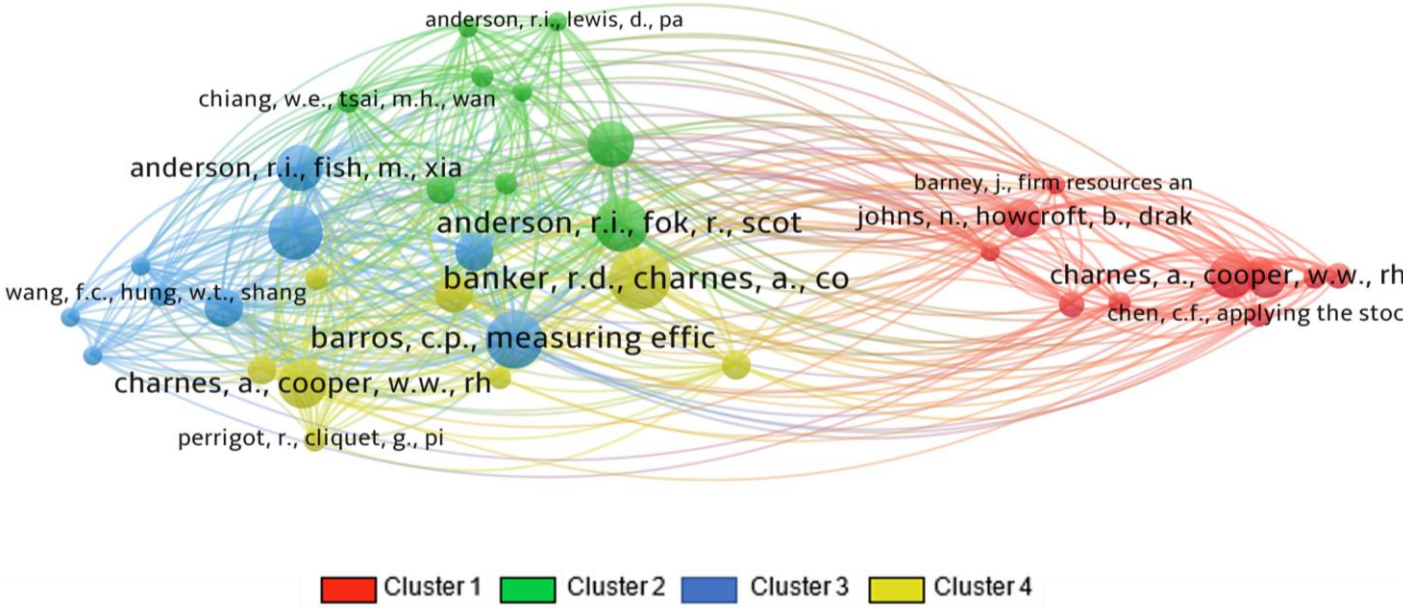


Figure 18 - Document's references co-citation analysis network using VOSviewer software

Three different normalization methods could be used: No normalization, Association strength, Fractionalization, or Lin/Log modularity. In this analysis the association strength method was applied, given that it is the most broadly used. The software allowed a minimum number of citations of a cited reference to be selected. Since there were 4142 cited references found, it was chosen a minimum of 6 citations so that, consequently, the analysis would englobe a total of 37 documents. Within these 37 documents, four clusters were identified. The results provided by the software reveal a total of 429 links and 12301 link strength.

In Table D.22 (Appendix D.3), the four clusters and all the information regarding the number of links, number of citations, and total links strength are provided.

**Cluster 1** is composed of eleven articles which makes it the largest sample. It is the second most cited cluster, with a total of 98 citations. However, it is also the weakest cluster, with only 450 total links strengths. The oldest reference mentioned is from 1978, an article that measures the efficiency of several decision-making units, written by Charnes et al. (1978), this is also the most cited document, with a total of 15 citations. The most recent reference is the one by Chen (2007) making all the articles present in the cluster published between 1978 and 2007. The articles with the most impact are Johns et al. (1997) with 82 link strength (and 13 citations), Hwang and Chang (2003) with 59 link strength

(and also 13 citations), Barros (2005b) with 43 link strength (and 7 citations), and again the same author Barros (2004) with 40 total link strength and 8 citations. The only author with more than one article referenced is Barros, a Portuguese scholar whose both articles evaluated the efficiency measurement of Portuguese firms.

**Cluster 2** contains nine documents, making it, as well as cluster 3, the second largest group. This is the least cited cluster, with a total number of only 83 citations. It contains the oldest set of collected articles, all ranging from the 1950s until the early 2000s. It is also the one with the oldest article from the analysis, with it being Farrel (1957) one of the pioneers of productive efficiency measurement. The articles with more impact are Anderson et al. (2000) with a respectable 145 link strength and Baker and Riley (1994) with 82 link strength, these are also the two documents with more citations having respectively nineteen and sixteen citations each. Other impactful articles are Reynolds (2003) with 66 link strength and Chiang et al. (2004) with 61 link strength. The vast majority of articles composing this cluster were either published in the United Kingdom or the United States of America.

**Cluster 3** is a collection of nine articles, as referred above in the previous cluster. It is the most impactful cluster, with a total of 803 link strengths. With a sum of 106 citations, this is also the most cited collection. The most important articles are Hwang and Chang (2003) with 159 link strength (and 19 citations), which is the greatest value of the entire analysis, Barros (2005a) with 144 link strength (and 20 citations), Anderson et al. (1999) with 118 link strength (16 citations) and Chen (2007) with 107 link strength (13 citations). All the articles included focus on measuring specifically the efficiency of the hotel industry, including single local hotels and multinational hotel chains. This is also the cluster composed of the most recent set of articles, all ranging from 1999 until 2015. It includes the most recent document, from Parte-Esteban and Alberca-Oliver (2015b), both Spanish authors that study the hotel industry both in a regional and corporate approach.

**Cluster 4** is composed of only eight articles being the least numerous of the four clusters. Although it is the one with fewer articles it is the second with the highest impact, having a total link strength of 607. It is however the second to last cluster regarding the number of citations, with only a sum of 91 citations. Similar to cluster 1, all articles constituting the cluster were published between the 1970s and 2010. Banker et al. (1984) with 141 link strength and 22 citations, Barros and Mascarenhas (2005) with thirteen citations and 95 link strength, Charnes et al. (1978) with 92 link strength and 17 citations and Pulina et al. (2010) with nine citations and 72 link strength compose the articles with the most impact in this cluster.

### **7.1.2 Authors' co-citation analysis results**

Once again, similar to the document's analysis, the association strength method was applied. This time VOSviewe gathered a total of 3403 authors. Therefore, a restriction of 30 minimum citations of an author was implemented. With this restriction, a total of 45 items were found. Within these 45 authors, were divided into four clusters.

Figure 21 presents the bibliometric network of the author's co-citation. Once more, to avoid a possible overlapping of the items, not all articles are displayed.

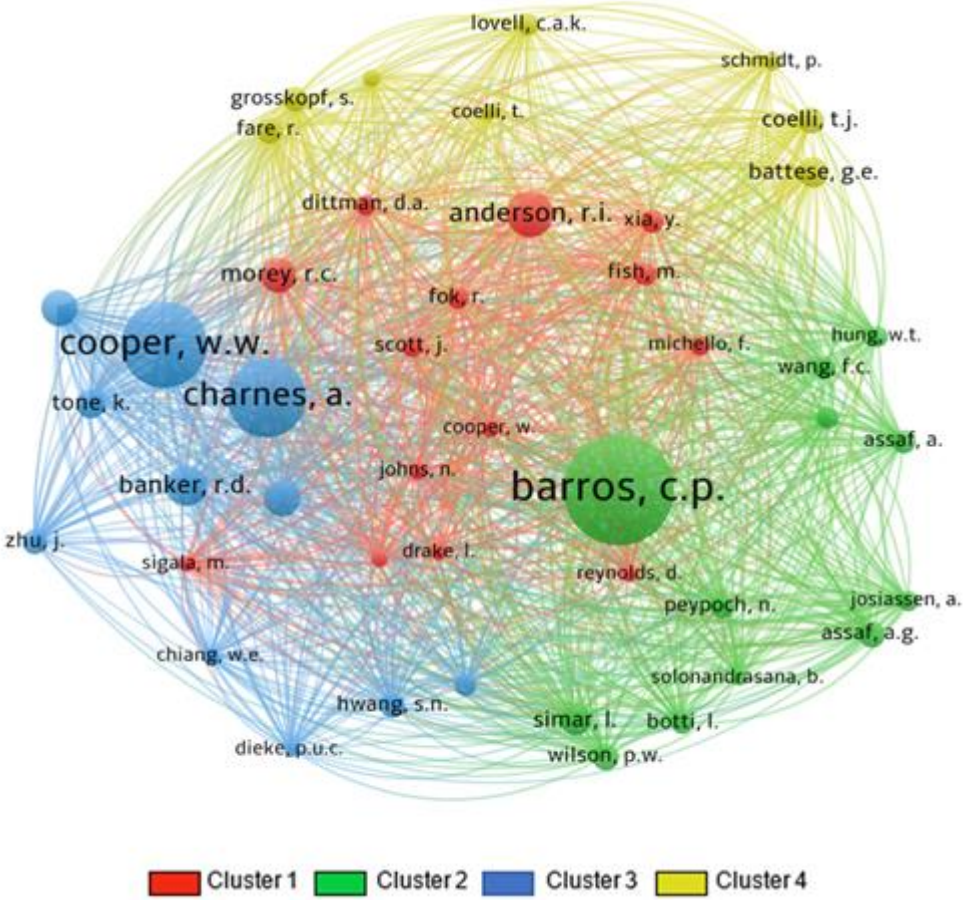


Figure 19- Authors' co-citation analysis network using VOSviewer software

The overall results provided by the software reveal a combined total of 41787 link strength and 989 links. These results are massively greater than the ones obtained in the previous co-citation analysis. Table D.23 (Appendix D.4) provides the four clusters and all the information regarding the number of links, the number of citations, and total links strength is provided.

**Cluster 1** includes fourteen authors, being the largest cluster of the analysis. It is the one with the highest number of links (616), which turns out to be irrelevant since, after all, it is the second to last regarding total links strength (21948) and the number of citations (648). On this cluster all authors have the same number of links (44) and the number of citations and total links strength are almost aligned, meaning the authors with higher total links strength are also the ones with more citations. The most relevant authors are Anderson (3618 links strength and 105 citations), Morey (2565 links strength and 78 citations), and Fox (1616 links strength and 46 citations). Curiously, all these three authors are included in cluster 2 of the previous document's co-citation analysis.

**Cluster 2** is composed of twelve authors and is ranked second concerning the number of citations (799) and link strength (25399). Barros is the author with more impact, not only on the cluster but also on the entire analysis. With a number of citations of 285 and a remarkable value of 8599 link

strength, Barros leads the ranking, followed by Simar with 2031 link strength and 65 citations and Assaf with 54 citations and 1771 link strength. Barros is also the author with the greater contribution to the sample, with a total of 13 published articles, followed by Assaf with 9 publications. Although these three authors do not appear altogether, both Barros and Simar are included in cluster 1 of the document's co-citation analysis and Assaf and Barros in cluster 3.

**Cluster 3** has one less item than the last cluster, with a total of eleven authors. With 25399 link strength and 799 citations, this is the most impactful cluster of the analysis. Once again, all authors have the same number of links (44) except for Zhu that has 43. Cooper (5624 link strength and 213 citations), Charnes (4848 link strength and 192 citations), and Banker (2462 link strength and 90 citations) are the three most influential authors of the cluster. The three authors mentioned above, do not only appear together in clusters 1 and 4 of the document's co-citation analyses, but they also share the exact same article, more precisely Banker et al. (1984).

**Cluster 4** is composed of only eight authors, being, therefore, the most limited cluster. Additionally, it is also the least relevant one with only 375 citations and 10588 link strength. Similar to cluster 3, all authors share the same number of links, again 44, with the exception of Schmidt that only has 43. The most relevant items are Battese (1820 link strength and 66 citations), Coelli (1767 link strength and 55), and Fare (1656 link strength and 54 citations). None of the authors mentioned can be found in Figure 18 due to their low number of local citations of their articles.

**7.1.3 Sources' co-citation analysis results**

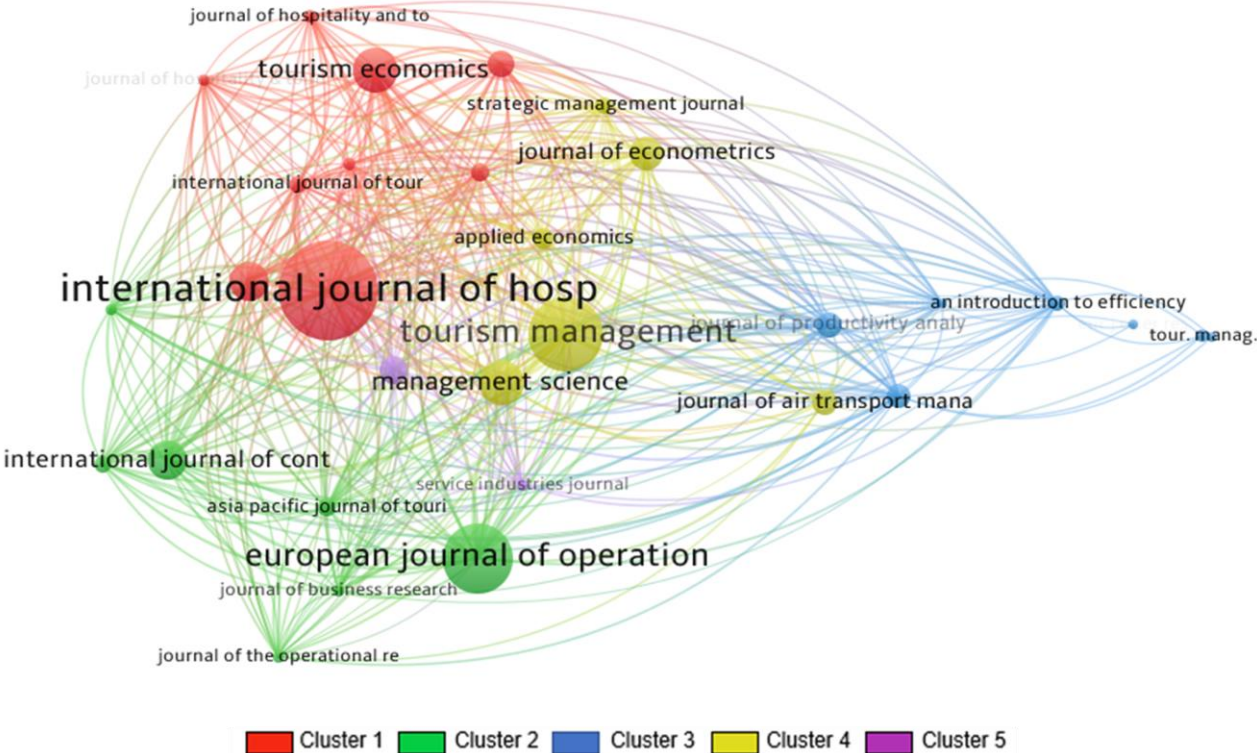


Figure 20- Sources' co-citation analysis network using VOSviewer software

In Figure 22, the frequency with which two sources are co-cited is determined by assessing the sources (journals) where the articles were published. Once more, since the journals (sources) are the items, they are represented by circles. The number of citations influences the size of the circle proportionally. Therefore, journals within the same cluster or linked hold similarities.

For the third time, the association strength method was once again used. A total of 1491 sources were collected by VOSviewer and a restriction of a minimum number of 20 citations of a source was imposed. From the implementation of the restriction, 31 items were found, scattered into five clusters. The results provided by the software display a total of 379 citations and 23129 link strength. These five clusters and all the data related to the number of links, number of citations, and total links strength are provided in Table D.24 (Appendix D.5).

**Cluster 1** is the widest collection, being composed of nine sources. This cluster is the most relevant leading in all rankings, having the highest number of links (236), the highest value of total link strength (17880), and having the most citations (710). Leading the ranking some renowned journals appear as the International Journal of Hospitality Management (6780 link strength and 282 citations), the Tourism Economics (2722 link strength and 111 citations), and Annals of Tourism Research (2408 link strength and 98 citations). All sources are related to tourism, hospitality, and traveling with the exception of the American Business Review that has 1049 link strength and 41 citations.

**Cluster 2** has the same number of items as cluster 3, including seven sources. It is the second cluster with the highest number of links (189) but only the third regarding total link strength (10836) and number of citations (434). The most influential journals are the European Journal of Operational Research (3699 link strength and 187 citations), the International Journal of Contemporary Hospitality Management (2846 link strength and 96 citations), and the Asia Pacific Journal of Tourism Research (1083 link strength and 41 citations). In this cluster, three journals are tourism and hospitality-focused, other three are operational and business research-oriented and the other remaining source is service industries related, probably having the publications of the travel agencies studies.

**Cluster 3** is composed of seven sources, as already mentioned. It is the second to last important cluster regarding the number of citations (232) and total link strength (3830). The journal with more citations (58) is Omega with a total link strength of 1216, followed by the Journal of Productivity Analysis with 54 citations and 1483 link strength.

**Cluster 4** includes 6 items, being the second smallest collection of journals. It is however ranked as the second most influential journal, with 539 citations and 11504 total link strength. In first place in this cluster appears one of the topmost renowned and better-ranked journals related to the tourism sector, the Tourism Management with 4995 link strength and 201 citations. This journal is followed by the Management Science with 2324 link strength and 113 citations and the Journal of Econometrics with 1693 link strength and 80 citations. From these 6 journals, three are management related, two are economic and econometric oriented and one is related to air transport.

**Cluster 5** has only two journals being the shorter cluster of all the analyses presented. Consequently, it is the least relevant cluster with only 88 citations and 2202 total link strength. The two journals included are the Cornell Hotel and Restaurant Administration Quarterly (1579 link strength and 65 citations) and the Service Industries Journal (623 link strength and 23 citations). This is undoubtedly the least influential and important cluster, most likely due to the fact it is only composed of two not renowned journals.

## **7.2 Discussion on the bibliometric analysis results**

Once the bibliometric study with the co-citation analysis is finished, it is necessary to conduct a concise discussion summarizing the main results observed. The prior analysis conceives the opportunity to assess the growth of studies on the tourism efficiency literature over the years. It also provides a snapshot of the most important and cited articles along with the most influential authors and journals on the subject.

The sample of 118 studies, is composed of articles published from 1994 until 2021 giving an average of three publications per year. Although the publication rate is not proportionally constant and bearing in mind all the oscillations throughout the years, there is a 2.18 percentage of publications growth rate during the already mentioned period. During this period, the total citation per year function was compared next to the number of published articles and it was concluded that both variables are not remotely aligned. The found documents have an average of fifty-nine citations each and, altogether, the whole sample englobed a total of 204 different articles. It was also revealed a humongous discrepancy between the number of authors developing multi-authored documents and single-authored documents, with the first ones being almost 15 times the size of the second ones. Consequently, as can be spotted in Table 12, a positive ratio of 1.73 authors per article can be spotted, with it rising to 2.63 when looking into co-authors.

Given that this is an international performance analysis paper, articles from numerous countries and institutions around the globe have been analyzed. Although the considerable diversity of countries, China, Spain, USA, and Portugal lead as the countries with the most published articles, in the previous respective order. These four countries combined include 63% or all found articles. Regarding the sources, despite all journals having multiple authors from numerous nations, when looking into the editorial board of each of the top five most used journals, the boards are all mainly composed by USA editors, and the same applies to seven out of the top ten most used papers, except for Current Issues in Tourism, International Journal of Culture Tourism and Hospitality Research and expectably the Asia Pacific Journal of Tourism Research. The reason behind the huge presence of the United Nations in the literature may come from the fact that the USA is the second country with more universities and according to the World University Rankings 2021 from the top twenty universities fourteen are based in the US. The US is also the second nation with the highest number of Scientific Journals, (according to the World Atlas website), this may also be an influential aspect behind the already presented data. However, as mentioned before, this is just a fact related to the sources publishing the articles and not about the countries studied in the mentioned documents.

As previously stated, bibliometric techniques are commonly used by scholars to determine which publications, authors, and journals are the most influential in a certain field. From the co-citation analysis, a respectable number of items are assessed and therefore some conclusions can be made.

From this analysis, the top five documents, considering the number of citations are: "Using data envelopment analysis to measure hotel managerial efficiency change in Taiwan" by Hwang and Chang, (2003); "Measuring efficiency in the hotel sector" by Barros (2005a); "Developing measures of airport productivity and performance: an application of data envelopment analysis" by Gillen (1997); "Evaluating a Hotel GM's Performance: A Case Study in Benchmarking" by Morey and Dittman (1995) and "Measuring efficiency in the hotel industry: A stochastic frontier approach" by Anderson et al. (1999a). From these articles, Gillen (1997) and Morey and Dittman (1995) do not appear in Figure 20 because they do not fulfill the requirement established of a minimum number of six citations of a cited reference. Considering total link strength the article from Hwang and Chang (2003) is the most relevant. These articles are considered to be the most influential studies in the tourism efficiency measurement literature.

The authors' co-citation analysis revealed that the five most influential authors, regarding the total number of citations, are: Barros, Assaf, Wu J, Hu JL, and Tsai. These last three authors are not presented in Figure 21 since they do not fulfill the requirement of the restriction mentioned in section 7.1.2. Even though only Barros had an article classified above as one of the most influential, the remaining authors have published numerous articles on the field of tourism efficiency, and therefore, are crucial and influential on the literature. However, the authors most relevant in terms of total link strength are Barros, Cooper, and Charnes in the respective order.

The sources' co-citation analysis has proven that in terms of citations, *Tourism Management*, *International Journal of Hospitality Management*, *Transportation Research Part E: Logistics and Transportation Review*, *Journal of Air Transportation Management*, and *Annals of Tourism Research* are the top five most cited sources. The first two mentioned above are also the journals with the most impact considering their total link strength. These are also some of the most prestigious journals in the field of tourism and travel. All of the described journals are included in the bibliometric network of Figure 22.





## **8 Concluding remarks, limitations, and future directions for research**

This final chapter of this dissertation is divided into three sections. It starts by providing a brief overview of the procedures and a summary of the main results and conclusions reached by the authors present in the sample, followed by some comments on the results achieved. Later, the limitations and constraints of this dissertation are disclosed and, lastly, possibilities for future extensions of this work are investigated.

### **8.1 Conclusions**

As already mentioned, tourism is not only acknowledged as a major global economic activity but also has become the biggest industry and largest employer in the world. Consequently, the field has caught the attention of many governments, academics, and organizations in both the public and private sectors (Lickorish & Jenkins, 1997). Within the tourism field of study, one particular subfield that has been prevalent in the last decade is the performance measurement field. Although, as stated by Sainaghi et al. (2017), it offers several benefits for practitioners, the concept of tourism efficiency is not yet fully explored.

This thesis focus is analyzing what has already been done in the tourism efficiency measurement literature. Several steps were taken before reaching a final sample and analyzing their data results. Firstly a tourism contextualization was made, followed by a literature review to evaluate what indeed was missing in the literature and how could this study be of any use. Further, a review-focused chapter was written, with the purpose of narrowing down and choosing the most appropriate types of reviews to implement. This resulted in the decision of making a systematic meta-analysis, more precisely, to appeal to a meta-analysis method to collect data and then use statistical analysis and a bibliometric analysis to assess the data. Thus, the Preferred Reporting Items for Systematic Reviews and Meta-Analysis method was used. This inclusion and exclusion collection method narrowed 2562 documents into a final sample of 130 articles. With this final sample, several statistical analyses were carried out, starting with a global overview of the data, succeeding several sector-focused analyses. Finally, a bibliometric analysis was performed using both the Bibliometrix R package software and the VOSviewer software. On this bibliometric analysis, relational techniques were used, more precisely the co-citation analysis of the documents, authors, and sources from the sample.

In terms of the author's main conclusions in the hotel efficiency sector, a large percentage of studies have demonstrated high levels of inefficiency in the hotel industry all around the globe, in other words, the majority of hotels in the samples turned out to be not efficient. However, at least seven different studies from Taiwan, Portugal, Colombia, the USA, and Spain have found in their samples the opposite results, precisely the presence of more efficient than inefficient hotels.

Concerning the hotel's star rating, the greater part of the articles that addressed this matter have stated that four-star hotels hold higher levels of efficiency when compared to five-star hotels. Nevertheless, a Portuguese study from Oliveira et al. (2013) has determined the contrary stating that

on average five-star hotels are slightly more efficient than four-star hotels, the same study has also concluded that hotels that do not possess golf courses are more efficient. Moreover, Oukil et al. (2016) defended that star rating and cultural attractions are the most critical factors influencing a hotel's efficiency.

When comparing chain-managed hotels and independent-managed hotels, it was unanimously concluded that chain-affiliated hotels perform more efficiently than independent hotels (Sigala et al., 2005; Assaf et al., 2010). It was also discovered that international hotels or international chain-hotels have higher efficiency levels (Ben Aissa and Goaid, 2016; Yu and Chen, 2019). Concerning the hotel's size, once again an inconsistency has been spotted. Although Fernández and Becerra (2013) and Ohe and Peypoch (2016) have reported larger hotels to have more efficiency than small hotels, a Croatian study by Poldrugovac et al. (2016) has claimed that small hotels have higher efficiency than medium-sized hotels. Additionally, an examination of the Spanish hotel industry has pointed out the absence of evidence that proves the size of a hotel chain correlates with its efficiency.

Further statements have been made by Arbelo et al. (2017) and Arbelo et al. (2018), which defend that resort hotels are more efficient than hotels located in urban areas. Related to the location of the hotels, Barros (2004) stated that the least efficient hotels are situated outside the main tourist areas. Hu and Liang (2016) have even specified there may be a relation between hotel performance and their airport distance, stating that hotels near airports worsen the efficiency. Lastly, Anderson et al. (1999) revealed that high-efficiency scores are consistent with a highly efficient and competitive market, and Arbelo-Pérez et al. (2019) associated lower efficiency levels with hotels that offered all-inclusive packages.

To sum up, the following conclusions were found, starting with a global overview, there is a vast number of papers focusing their data research on a single year of activity. From the analysis of 130 articles, the majority measures the efficiency of hotels (94 articles), the second-largest group explores the airport sector (24), the remaining papers focus on airline companies (7) and travel agencies (5). In total 52 countries were studied and the country emerging in more articles was Taiwan with 37 published papers, followed by Spain (22) and Portugal (13). Asia and Europe dominate the field of tourism measurement, being present in roughly 82% of all studies. There are no doubts concerning which is the most widely utilized method to measure tourism efficiency, DEA is applied in roughly 85% of the 130 articles in the sample. SFA is the second most common method used in the field, present in 15 different studies. In terms of publications per year, 2010 turns out to be the year with more publications, holding a total of 11 papers published, curiously all in the hotel sector.

The conclusions obtained from the hotel sector reveal that out of 95 articles, 36 different inputs were reported, with the number of rooms and number of personnel being the two most used variables. Looking at the outputs, a total of 21 variables were found and the most common output is the "Accommodation revenue". It was also found that most studies rely on two/three output variables to measure hotel efficiency. Additionally, a total of 28 methods or variants of methods were found with the Data Envelopment Analysis method rising as the most utilized method of the sector. Geographically, the two most studied continents are Asia and Europe, with Taiwan as the most studied country.

Regarding the airport sector, a total of 18 different input variables were found with the number of personnel leading as the most used variable. Looking into the outputs, 17 variables were found. According to the data collected the average number of outputs used is lower than the inputs, with less than three variables per study. The most used output is the number of passengers that visit the airport. Twelve methods or variants of methods were found with DEA being the most applied method by a significant lead, followed by the SFA method. Europe and Asia maintain the podium as the continents with most countries studied, however, opposite to the hotel sector, in the airport sector, Europe has more countries evaluated than Asia. However, the most explored country is New Zealand.

In the airline company sector, a total of nine input and eight output variables were used with a media value of four inputs and two outputs per article. The most used input is the Operating costs and for the outputs, the passenger revenue is the most used variable. DEA is once again the most used method and 77 different airline companies were studied in the sample.

The travel agencies sector revealed that seven input and five output variables were found and the average number of inputs used by authors is three per study, while the average number of outputs is two variables. The two most used inputs are the number of personnel and the potential service, while the most used output is the number of customers. The DEA is the most used method and the countries studied were: Turkey; Spain; Taiwan; Morocco and Croatia.

Finally, the results of the bibliometric analysis are discussed in sub-chapter 7.2, the main conclusions are the following. It shows a publication growth rate of 2.18%, a total of 204 different authors, the four countries with the most published articles are China, Spain, the USA, and Portugal. The editorial boards of the top five most used journals are composed mainly by USA editors. Considering the number of citations and total link strength, "Using data envelopment analysis to measure hotel managerial efficiency change in Taiwan" by Hwang and Chang (2003) is considered to be the most influential study in the tourism efficiency measurement literature. The most influential author both in the number of citations and total link strength is the Portuguese author Barros. Lastly, in terms of citations, Tourism Management is the most cited and renowned source.

Adding to the interpretation of results one can highlight the poor distribution and variability in the geographical distribution of frontier studies, with only Europe and Asia representing the majority of studies. These results are similar to the ones found by Assaf and Josiassen (2015) who also stated the lack of studies focused on travel agencies, compared to the hotel sector and this current dissertation reached the same conclusions. This dissertation addresses and fulfills several aspects and suggestions made by Altin et al. (2018), Assaf and Josiassen (2015), and Pahlevan-Sharif et al. (2019), including conducting a study that considers quantitative methods and employs relational bibliometric analysis, such as co-citation, addresses the efficiency comparison between countries, provides a clear explanation of the process of data collection, and contributes to fight the lack of systematic reviews in the field of tourism and hospitality.

This dissertation also concludes by analyzing authors' conclusions and the publications by year that several external global effects influence, not only the performance of hotels but also the number of studies developed. Examples of those events are for instance: Covid 19 pandemic, SARS 2003, National crisis, terrorist events, and natural catastrophes as hurricanes and earthquakes.

This work has the potential to be extremely beneficial to future scholars and stakeholders. It gathers all the essential information needed to conduct a measurement of tourism efficiency as well as an extensive layout of what already exists in the literature. This thesis not only saves tremendous time and work to authors interested in evaluating tourism establishments' efficiency but also encourages and guides stakeholders to perform those studies.

## **8.2 Limitations**

As every scientific study, this too has its limitations and constraints, these aspects are addressed in the present sub-chapter.

The first and most important liability of this study may be human error. Although methods were carefully followed and two software were used, a considerable part of the dissertation was manually handled. More specifically, the process of reviewing individually and extracting data from every single document of the sample in chapter 5. This data was also partly labored by hand relying on the Microsoft Excel software program, therefore possible flaws may have occurred.

Secondly, a certain constraint was the accessibility restrictions of multiple articles that were not openly available through the University of Lisbon VPN. Furtherly, although the databases used are three of the most recognized by tourism authors, they might have limited and influenced the number and type of articles found.

Additionally, there are limitations associated with every model and software, therefore some possible errors may have been derived from the programs used. An indisputable limitation of this study was related to the fact that the bibliometric analysis software, both the Bibliometrix RStudio package software and the VOSviewer software only allowed data files from certain databases. Although these two software were chosen because they both accept Scopus and Web of Science databases, they do not allow a merge between files from both software, in other words, the software only works with data files from a single database per bibliometric analysis. This is the main reason behind the shortage of articles in the sample and consequently the decision not to separate the bibliometric analysis into sectors.

## **8.3 Future research**

As already mentioned, and proved in this study, growth in publications on the field studied in this dissertation can be observed. Both Sainaghi et al. (2017) and Assaf and Josiassen (2015) concur that the previous decade has seen a growth in scholarly interest in tourism performance measurement. However, although, as stated by Sainaghi et al. (2017), the concept of tourism efficiency offers several benefits for practitioners, it is not yet fully explored. Therefore, some recommendations for future research are provided in this section.

It would be interesting if future scholars developed a similar analysis but focused on or included other sectors that were not explored here. The current study only included tourism efficiency documents that measured the efficiency of hotels, airports, airline companies, and travel agencies. However, when performing the inclusion and exclusion procedures, it was noticed the presence of many publications that measured the efficiency by region, state, county, province, city, or country. It

would probably bring several benefits engaging in such analysis since they have the same objective as the ones focused on the sectors explored in this study. Another type of article found during the collection methods measured the efficiency of restaurants, fast-food chains, cruises, and national parks. Exploring each sector would be an advantageous option, but for a better perception of the current literature state, the present dissertation suggests for a global analysis englobing all the sectors mentioned above to be made.

Other databases may also be used, although the ones used in this study are recommended as the most appropriate. As well, other software may be used to develop the bibliometric analysis for instance any of the following: BibExcel, Cite Space, Sci2, Netdraw, or SITKIS. Finally, the PRISMA method is still recommended to be used since it is the most reliable method to collect data for systematic reviews. It is obviously also quite important to better analyze the hotel efficiency on the most recent pandemic years and how Covid 19 pandemic has influenced tourism.

## **References**

- Abbott, M. (2015). Reform and efficiency of New Zealand's airports. *Utilities Policy*, 36, 1-9.
- Abbott, M., & Wu, S. (2002). Total Factor Productivity and Efficiency of Australian Airports. *Australian Economic Review*, 35(3), 244–260.
- Alberca, P., & Parte, L. (2020). Efficiency in the holiday and other short-stay accommodation industry. *Sustainability (Switzerland)*, 12(22), 1–22.
- Altin, M., Koseoglu, M. A., Yu, X. & Riasi, A. (2018). Performance measurement and management research in the hospitality and tourism industry. *International Journal of Contemporary Hospitality Management*, 30(2), 1172–1189.
- American Heritage Dictionary - Search. (n.d.). Retrieved June 1, 2021, from <https://www.ahdictionary.com/>
- Anderson, R. I., Fish, M., Xia, Y. & Michello, F. (1999). Measuring efficiency in the hotel industry: A stochastic frontier approach. *International Journal of Hospitality Management*, 18(1), 45–57
- Anderson, R. I., Fish, M., Xia, Y., & Michello, F. (1999). Measuring efficiency in the hotel industry: A stochastic frontier approach. *International Journal of Hospitality Management*, 18(1), 45–57.
- Anderson, R. I., Fok, R. C. W., & Scott, J. (2000). Hotel industry efficiency : an advanced linear programming examination. *American Business Review*, 18(1).
- Anderson, R. I., Lewis, D., & Parker, M. E. (1999). Another Look at the Efficiency of Corporate Travel Management Departments: 37(3), 267–272.
- Ang, S., Chen, M., & Yang, F. (2018). Group cross-efficiency evaluation in data envelopment analysis: An application to Taiwan hotels. *Computers and Industrial Engineering*, 125, 190–199.
- Arbelo, A., Pérez-Gómez, P., & Arbelo-Pérez, M. (2017). Cost efficiency and its determinants in the hotel industry. *Tourism Economics*, 23(5), 1056–1068.
- Arbelo, A., Pérez-Gómez, P., & Arbelo-Pérez, M. (2018). Estimating efficiency and its determinants in the hotel sector using a profit function. *Current Issues in Tourism*, 21(8), 863–876.
- Arbelo-Pérez, M., Arbelo, A., & Pérez-Gómez, P. (2017). Impact of quality on estimations of hotel efficiency. *Tourism Management*, 61, 200–208.
- Arbelo-Pérez, M., Arbelo, A., & Pérez-Gómez, P. (2020). Technological Heterogeneity and Hotel Efficiency: A Bayesian Approach. *Cornell Hospitality Quarterly*, 61(2), 170–182.
- Arbelo-Pérez, M., Pérez-Gómez, P., & Arbelo, A. (2019). Impact of all-inclusive packages on hotel efficiency. *Current Issues in Tourism*, 22(8), 905–920.
- Aria, M., & Cuccurullo, C. (2017). bibliometrix: An R-tool for comprehensive science mapping analysis. *Journal of Informetrics*, 11(4), 959–975.
- Ashrafi, A., Seow, H. V., Lee, L. S., & Lee, C. G. (2013). The efficiency of the hotel industry in Singapore. *Tourism Management*, 37, 31–34.
- Assaf, A. (2009a). Are U.S. airlines really in crisis? *Tourism Management*, 30(6), 916–921.
- Assaf, A. (2009b). Accounting for size in efficiency comparisons of airports. *Journal of Air Transport Management*, 15(5), 256–258.
- Assaf, A. (2010). Bootstrapped scale efficiency measures of UK airports. *Journal of Air Transport Management*, 16(1), 42–44.
- Assaf, A. (2011). A fresh look at the productivity and efficiency changes of UK airlines. *Applied Economics*, 43(17), 2165–2175.
- Assaf, A. G. & Josiassen, A. (2012). Identifying and Ranking the Determinants of Tourism Performance: A Global Investigation. *Journal of Travel Research*, 51(4), 388–399.

- Assaf, A. G. & Josiassen, A. (2015). Frontier Analysis: A State-of-the-Art Review and Meta-Analysis. *Journal of Travel Research*, 55(5), 612–627.
- Assaf, A. G. & Tsionas, M. G. (2019a). A review of research into performance modeling in tourism research - Launching the Annals of Tourism Research curated collection on performance modeling in tourism research. *Annals of Tourism Research*, 76, 266–277.
- Assaf, A. G. & Tsionas, M. G. (2019b). A review of research into performance modeling in tourism research - Launching the Annals of Tourism Research curated collection on performance modeling in tourism research. *Annals of Tourism Research*, 76, 266–277.
- Assaf, A. G., & Josiassen, A. (2012). European vs. U.S. airlines: Performance comparison in a dynamic market. *Tourism Management*, 33(2), 317–326.
- Assaf, A., & Cvelbar, L. K. (2010). The Performance of the Slovenian Hotel Industry: Evaluation Post-privatisation-Coleção principal da Web of Science.
- Assaf, A., Barros, C. P., & Josiassen, A. (2010). Hotel efficiency: A bootstrapped metafrontier approach. *International Journal of Hospitality Management*, 29(3), 468–475.
- Baker, M., & Riley, M. (1994). New perspectives on productivity in hotels: some advances and new directions. *International Journal of Hospitality Management*, 13(4), 297–311.
- Banker, R. D., Charnes, A., & Cooper, W. W. (1984). Some Models for Estimating Technical and Scale Inefficiencies in Data Envelopment Analysis. *Source: Management Science*, 30(9), 1078–1092.
- Barney, J. (1991). Firm Resources and Sustained Competitive Advantage. *Journal of Management*, 17(1), 99–120.
- Barros, C. A. P., & Santos, C. A. (2006). The Measurement of Efficiency in Portuguese Hotels Using Data Envelopment Analysis. *Journal of Hospitality & Tourism Research*, 30(3), 378–400.
- Barros, C. P. (2004). A Stochastic Cost Frontier in the Portuguese Hotel Industry: *Tourism Economics*, 10(2), 177–192.
- Barros, C. P. (2005a). Measuring efficiency in the hotel sector. *Annals of Tourism Research*, 32(2), 456–477.
- Barros, C. P. (2005b). Evaluating the efficiency of a small hotel chain with a Malmquist productivity index. *International Journal of Tourism Research*, 7(3), 173–184.
- Barros, C. P. (2006). Analysing the Rate of Technical Change in the Portuguese Hotel Industry: *Tourism Economics*, 12(3), 325–346.
- Barros, C. P. (2014). Airports and tourism in Mozambique. *Tourism Management*, 41, 76–82.
- Barros, C. P., & Alves, F. P. (2004). Productivity in the tourism industry. *International Advances in Economic Research* 2004 10:3, 10(3), 215–225.
- Barros, C. P., & Dieke, P. U. C. (2008). Measuring the economic efficiency of airports: A Simar-Wilson methodology analysis. *Transportation Research Part E: Logistics and Transportation Review*, 44(6), 1039–1051.
- Barros, C. P., & Mascarenhas, M. J. (2005). Technical and allocative efficiency in a chain of small hotels. *International Journal of Hospitality Management*, 24(3), 415–436.
- Barros, C. P., Dieke, P. U. C., & Santos, C. M. (2010). Heterogeneous technical efficiency of hotels in Luanda, Angola. *Tourism Economics*, 16(1), 137–151.
- Barros, C. P., Peypoch, N., & Solonandrasana, B. (2009). Efficiency and productivity growth in hotel industry. *International Journal of Tourism Research*, 11(4), 389–402.
- Bazargan, M., & Vasigh, B. (2003). Size versus efficiency: a case study of US commercial airports. *Journal of Air Transport Management*, 9(3), 187–193.

- Bell, R. A., & Morey, R. C. (1995). Increasing the Efficiency of Corporate Travel Management through Macro Benchmarking: *Journal of Travel Research*, 33(3), 11–20.
- Bem, D. J. (1995). Writing a Review Article for *Psychological Bulletin*. In *Psychological Bulletin*, 118, (2), 172-177.
- Ben Aissa, S. & Goaid, M. (2016). Determinants of tourism hotel market efficiency. *International Journal of Culture, Tourism, and Hospitality Research*, 10(2), 173–190.
- Benckendorff, P., & Zehrer, A. (2013). A NETWORK ANALYSIS OF TOURISM RESEARCH. *Annals of Tourism Research*, 43, 121–149.
- Bettencourt, L. A. & Houston, M. B. (2001). The Impact of Article Method Type and Subject Area on Article Citations and Reference Diversity in *JM*, *JMR*, and *JCR*. *Marketing Letters*, 12(4), 327–340.
- Borenstein, M., Hedges, L. v., Higgins, J. P. T. & Rothstein, H. R. (2009). Introduction to Meta-Analysis, 3-17.
- Bowen, J. (2000). Airline hubs in Southeast Asia: national economic development and nodal accessibility. *Journal of Transport Geography*, 8(1), 25–41.
- Briner, R. B. & Walshe, N. D. (2014). From passively received wisdom to actively constructed knowledge: Teaching systematic review skills as a foundation of evidence-based management. In *Academy of Management Learning and Education*, 13, (3), 415–432.
- Broadus, R. N. (1987). Toward a definition of “bibliometrics.” *Scientometrics* 1987 12:5, 12(5), 373–379.
- Brown, J. R., & Ragsdale, C. T. (2002). The Competitive Market Efficiency of Hotel Brands: An Application of Data Envelopment Analysis: *Journal of Hospitality & Tourism Research*, 26(4), 332–360.
- Burkart, A. J. & S. Medlik. (1974). *Tourism: Past, Present and Future*, 39-40.
- Button, K. J. & Weyman-Jones, T. G. (1994). X-efficiency and technical efficiency. *Public Choice*, 80(1–2), 83–104.
- Carr, A. B. (2002). Systematic reviews of the literature: the overview and meta-analysis. In *Dental clinics of North America*, 46, (1), 79–86.
- Charnes, A., Cooper, W. W. & Rhodes, E. (1978). Measuring the efficiency of decision making units. *European Journal of Operational Research*, 2(6), 429–444.
- Chen, C. F. (2007). Applying the stochastic frontier approach to measure hotel managerial efficiency in Taiwan. *Tourism Management*, 28(3), 696–702.
- Chen, C. M., Delmas, M. A. & Lieberman, M. B. (2015). Production frontier methodologies and efficiency as a performance measure in strategic management research. *Strategic Management Journal*, 36(1), 19–36.
- Chen, T. H. (2009). Performance measurement of an enterprise and business units with an application to a Taiwanese hotel chain. *International Journal of Hospitality Management*, 28(3), 415–422.
- Chiang, W. (2006). A hotel performance evaluation of Taipei international tourist hotels – using data envelopment analysis. *Asia Pacific Journal of Tourism Research*, 11(1), 29–42.
- Chiang, W. E., Tsai, M. H., & Wang, L. S. M. (2004). A DEA evaluation of Taipei hotels. *Annals of Tourism Research*, 31(3), 712–715.
- Chin-Tsu Chen, Jin-Li Hu, & Jern-Jou Liao. (2010). (PDF) Tourists’ nationalities and the cost efficiency of international tourist hotels in Taiwan.
- Chiu, Y. H., & Wu, M. F. (2010). Performance evaluation of international tourism hotels in Taiwan - Application of context-dependent DEA. *INFOR*, 48(3), 155–170.



- Chiu, Y., Huang, C., & Ting, C. (2012). A non-radial measure of different systems for Taiwanese tourist hotels' efficiency assessment. *Central European Journal of Operations Research* 2010 20:1, 20(1), 45–63.
- Chou et al. (2012). A STUDY OF THE PERFORMANCE ON HUMAN RESOURCE MANAGEMENT STRATEGY IN TOURISM INDUSTRY WITH DATA ENVELOPMENT ANALYSIS - Web of Science special collection.
- Coleman, B. D. (2015). The Efficiency Norm. *Boston College Law Review*, (56), 2-19.
- Cook, D. J., Mulrow, C. D. & Haynes, R. B. (1997). Systematic reviews: Synthesis of best evidence for clinical decisions. In *Annals of Internal Medicine* (Vol. 126, Issue 5, pp. 376–380). American College of Physicians.
- Cooper, C. (1993). *Tourism: Principles and Practice*, 4-5.
- Cracolici, M. F., Nijkamp, P. & Rietveld, P. (2008). Assessment of tourism competitiveness by analysing destination efficiency. *Tourism Economics*, 14(2), 325–342.
- Davutyan, N. (2007). Measuring the quality of hospitality at Antalya. *International Journal of Tourism Research*, 9(1), 51–57.
- De Jorge, J., & Suárez, C. (2014). Productivity, efficiency and its determinant factors in hotels. *Service Industries Journal*, 34(4), 354–372.
- Definition of “tourist” or “temporary visitor.” (n.d.). Retrieved June 1, 2021, from <https://digitallibrary.un.org/record/1484980>
- Deng, Y., Veiga, H., & Wiper, M. P. (2019). Efficiency evaluation of hotel chains: a Spanish case study. *SERIEs*, 10(2), 115–139.
- Dicionário Cambridge: Significados, Definições e Traduções. (n.d.). Retrieved June 1, 2021, from <https://dictionary.cambridge.org/pt/>
- Dictionary by Merriam-Webster: America's most-trusted online dictionary. (n.d.). Retrieved June 1, 2021, from <https://www.merriam-webster.com/>
- Dragan, D., Keshavarzsaleh, A., Jereb, B., & Topolšek, D. (2018). Integration with transport suppliers and efficiency of travel agencies. *International Journal of Value Chain Management*, 9(2), 122.
- Drucker, P. F. (1974). *Management: Tasks, Responsibilities, Practices*. New York: Harper & Row, 36.
- Du, D., Lew, A. A., & Ng, P. T. (2014). Tourism and Economic Growth: *Journal of Travel Research*, 55(4), 454–464.
- Dwivedi, Y. K., Venkitachalam, K., Sharif, A. M., Al-Karaghoul, W. & Weerakkody, V. (2011). Research trends in knowledge management: Analyzing the past and predicting the future. *Information Systems Management*, 28(1), 43–56.
- Dybå, T. & Dingsøyr, T. (2008). Strength of Evidence in Systematic Reviews in Software Engineering. *ESEM'08: Proceedings of the 2008 ACM-IEEE International Symposium on Empirical Software Engineering and Measurement*, 178–187.
- Färe, R., Grosskopf, S. & Lovell, C. A. K. (1985). The Measurement of Efficiency of Production, 1-7.
- Farrell, M. J. (1957). The Measurement of Productive Efficiency. *Journal of the Royal Statistical Society. Series A (General)*, 120(3), 253.
- Farrell, M. J. (1957). The Measurement of Productive Efficiency. *Journal of the Royal Statistical Society. Series A (General)*, 120(3), 253.
- Fernandes, E., & Pacheco, R. R. (2002). Efficient use of airport capacity. *Transportation Research Part A: Policy and Practice*, 36(3), 225–238.
- Fernández, M. A., & Becerra, R. (2013). An Analysis of Spanish Hotel Efficiency: *Cornell Hospitality Quarterly*, 56(3), 248–257.

- Fernández, X. L., Coto-Millán, P., & Díaz-Medina, B. (2018). The impact of tourism on airport efficiency: The Spanish case. *Utilities Policy*, 55, 52–58.
- Figuerola-Domecq, C., Pritchard, A., Segovia-Pérez, M., Morgan, N., & Villacé-Molinero, T. (2015). Tourism gender research: A critical accounting. *Annals of Tourism Research*, 52, 87–103.
- Foo Lee, Y., & Mohhidin Othman. (2011). DATA ENVELOPMENT ANALYSIS TO MEASURE EFFICIENCY OF HOTELS IN MALAYSIA.
- Fragoudaki, A., & Giokas, D. (2016). Airport performance in a tourism receiving country: Evidence from Greece. *Journal of Air Transport Management*, 52, 80–89.
- Fragoudaki, A., Giokas, D., & Glyptou, K. (2016). Efficiency and productivity changes in Greek airports during the crisis years 2010–2014. *Journal of Air Transport Management*, 57, 306–315.
- Fried, H. O., Schmidt, S. S. & Lovell, C. A. K. (1993). The Measurement of Productive Efficiency: Techniques and Applications, 3-20.
- Fu, Y., Li, D., & Li, N. (2011). Hotel performance evaluation based on Cross-efficiency DEA models. *International Conference on Management and Service Science*, MASS 2011.
- Fuentes, R. (2011). Efficiency of travel agencies: A case study of Alicante, Spain. *Tourism Management*, 32(1), 75–87.
- George Assaf, A. (2012). Benchmarking the Asia Pacific tourism industry: A Bayesian combination of DEA and stochastic frontier. *Tourism Management*, 33(5), 1122–1127.
- Ghosh, & Bandyopadhyay. (2014). Efficiency and Ranking of Operating No-frill Airlines in Eastern India: An Application of Data Envelopment Analysis (DEA)- Web of Science special collection.
- Gillen, D., & Lall, A. (1997). Developing measures of airport productivity and performance: an application of data envelopment analysis. *Transportation Research Part E: Logistics and Transportation Review*, 33(4), 261–273.
- Glossary of tourism terms | UNWTO. (n.d.). Retrieved June 1, 2021, from <https://www.unwto.org/glossary-tourism-terms>
- Goncalves, O., Liang, Q. bin, Peypoch, N., & Sbai, S. (2012). Technical efficiency measurement and inverse B-convexity: Moroccan travel agencies. *Tourism Economics*, 18(3), 597–606.
- Gough, D., Oliver, S. & Thomas, J. (2017). *An Introduction to Systematic Reviews*, 1-18.
- Grant, M. J. & Booth, A. (2009). A typology of reviews: An analysis of 14 review types and associated methodologies. In *Health Information and Libraries Journal*, 26(2), 91–108.
- Green, B. N., Johnson, C. D. & Adams, A. (2006). Writing narrative literature reviews for peer-reviewed journals: secrets of the trade. *Journal of Chiropractic Medicine*, 5(3), 101–117.
- Gursoy, D. & Sandstrom, J. K. (2016). An Updated Ranking of Hospitality and Tourism Journals. *Journal of Hospitality and Tourism Research*, 40(1), 3–18.
- Hao, A. W., Paul, J., Trott, S., Guo, C., & Wu, H. H. (2019). Two decades of research on nation branding: a review and future research agenda. *International Marketing Review*, 38(1), 46–69.
- Help | Oxford English Dictionary. (n.d.). Retrieved June 1, 2021, from <https://public.oed.com/help/>
- Hermans, D., & Graburn, N. (1985). The Anthropology of Tourism. *Man*, 20(1), 189.
- Holloway, J. (1996). Global Capital and the National State. In *Global Capital, National State and the Politics of Money* (pp. 116–140). Palgrave Macmillan UK.
- Honma, S., & Hu, J.-L. (2012). Analyzing Japanese hotel efficiency. *Tourism and Hospitality Research* 12(3), 155–167.
- Hsieh, L. F., & Lin, L. H. (2010). A performance evaluation model for international tourist hotels in Taiwan for international tourist hotels in Taiwan—An application of the relational network DEA. *International Journal of Hospitality Management*, 29(1), 14–24.

- Hu, B. A., & Cai, L. A. (2004). Hotel Labor Productivity Assessment. *Journal of Travel & Tourism Marketing*, 16(2–3), 27–86.
- Hu, J. L., & Liang, H. L. (2016). Operating Efficiency of International Tourist Hotels in Taiwan by Taking Into Account Congestion. *International Journal of Hospitality and Tourism Administration*, 17(3), 223–242.
- Hu, J. L., Chiu, C. N., Shieh, H. S., & Huang, C. H. (2010). A stochastic cost efficiency analysis of international tourist hotels in Taiwan. *International Journal of Hospitality Management*, 29(1), 99–107.
- Hu, J. L., Shieh, H. S., Huang, C. H., & Chiu, C. N. (2009). Cost efficiency of International tourist hotels in Taiwan: A data envelopment analysis application. *Asia Pacific Journal of Tourism Research*, 14(4), 371–384.
- Huang, C. W. (2017). Assessment of efficiency of manual and non-manual human resources for tourist hotel industry: An application of the hybrid DEA model. *International Journal of Contemporary Hospitality Management*, 29(4), 1074–1095.
- Huang, C. wei, Ho, F. N., & Chiu, Y. ho. (2014). Measurement of tourist hotels' productive efficiency, occupancy, and catering service effectiveness using a modified two-stage DEA model in Taiwan. *Omega (United Kingdom)*, 48, 49–59.
- Huang, Y., Mesak, H. I., Hsu, M. K., & Qu, H. (2012). Dynamic efficiency assessment of the Chinese hotel industry. *Journal of Business Research*, 65(1), 59–67.
- Hubbell, L. L. (2007). Quality, efficiency, and accountability: Definitions and applications. *New Directions for Higher Education*, 2007(140), 5–13.
- Hulland, J. & Houston, M. B. (2020). Why systematic review papers and meta-analyses matter: an introduction to the special issue on generalizations in marketing. In *Journal of the Academy of Marketing Science*, 48(3) 351–359. Springer.
- Hwang, S. N., & Chang, T. Y. (2003). Using data envelopment analysis to measure hotel managerial efficiency change in Taiwan. *Tourism Management*, 24(4), 357–369.
- Introduction. (2005). In *An Introduction to Efficiency and Productivity Analysis*, Springer-Verlag, 1–9.
- Johns, N., Howcroft, B., & Drake, L. (1997). The use of data envelopment analysis to monitor hotel productivity. *Progress in Tourism and Hospitality Research*, 3(2), 119–127.
- Kaldor, N. (1939). Welfare Propositions of Economics and Interpersonal Comparisons of Utility. *The Economic Journal*, 49(195), 549.
- Kan Tsui, W. H., Balli, H. O., Gilbey, A., & Gow, H. (2014). Operational efficiency of Asia–Pacific airports. *Journal of Air Transport Management*, 40, 16–24.
- Keh, H. T., Chu, S., & Xu, J. (2006). Efficiency, effectiveness and productivity of marketing in services. *European Journal of Operational Research*, 170(1), 265–276.
- Keller, P. & Bieger, T. (2006). *Marketing Efficiency in Tourism: Coping with Volatile Demand*.
- Kim, C. S., Bai, B. H., Kim, P. B. & Chon, K. (2018). Review of reviews: A systematic analysis of review papers in the hospitality and tourism literature. *International Journal of Hospitality Management*, 70, 49–58.
- Kim, M. (2020). A systematic literature review of the personal value orientation construct in hospitality and tourism literature. *International Journal of Hospitality Management*, 89, 102–572.
- Köksal, C. D., & Aksu, A. A. (2007). Efficiency evaluation of A-group travel agencies with data envelopment analysis (DEA): A case study in the Antalya region, Turkey. *Tourism Management*, 28(3), 830–834.
- Kumar, A., Paul, J. & Unnithan, A. B. (2020). 'Masstige' marketing: A review, synthesis and research agenda. *Journal of Business Research*, 113, 384–398.

- Lam, S. W., Low, J. M. W., & Tang, L. C. (2009). Operational efficiencies across Asia Pacific airports. *Transportation Research Part E: Logistics and Transportation Review*, 45(4), 654–665.
- Law, R., Ye, Q., Chen, W. & Leung, R. (2009). An analysis of the most influential articles published in tourism journals from 2000 to 2007: A Google Scholar approach. *Journal of Travel and Tourism Marketing*, 26(7), 735–746.
- Least Developed Countries (LDCs) | Department of Economic and Social Affairs. (n.d.). Retrieved October 14, 2021, from <https://www.un.org/development/desa/dpad/least-developed-country-category.html>
- Leclercq, V., Beudart, C., Ajamieh, S., Rabenda, V., Tirelli, E., & Bruyère, O. (2019). Meta-analyses indexed in PsycINFO had a better completeness of reporting when they mention PRISMA. *Journal of Clinical Epidemiology*, 115, 46–54.
- Leiper, N. (1979). The framework of tourism. Towards a definition of tourism, tourist, and the tourist industry. *Annals of Tourism Research*, 6(4), 390–407.
- Leisure, a New Perspective: Papers Presented at a National Seminar in Canberra - Australia. Department of Tourism and Recreation.
- Leonard J. Lickorish & Carson L. Jenkins. (1997). *An Introduction to Tourism*. Butterworth-Heinemann, 1-63.
- Leonard J. Lickorish, & Carson L. Jenkins. (1997). *An Introduction to Tourism*.
- Leung, X. Y., Sun, J., & Bai, B. (2017). Bibliometrics of social media research: A co-citation and co-word analysis. *International Journal of Hospitality Management*, 66, 35–45.
- Liao, H., Tang, M., Luo, L., Li, C., Chiclana, F., & Zeng, X.-J. (2018). A Bibliometric Analysis and Visualization of Medical Big Data Research. *Sustainability* 2018, Vol. 10, Page 166, 10(1), 166.
- Liberati, A., Altman, D. G., Tetzlaff, J., Mulrow, C., Gøtzsche, P. C., Ioannidis, J. P. A., Clarke, M., Devereaux, P. J., Kleijnen, J. & Moher, D. (2009). The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate healthcare interventions: explanation and elaboration. *BMJ (Clinical Research Ed.)*, 339.
- Liu, H., Tsai, H., & Wu, J. (2018). Regional hotel performance and benchmarking in the Pearl River Delta: An input and output efficiency analysis. *International Journal of Contemporary Hospitality Management*, 30(2), 855–873.
- Lu, Y. H., & Chen, C. F. (2012). Research note: Analysing the efficiency of the Taiwanese hotel industry: A stochastic metafrontier approach. *Tourism Economics*, 18(5), 1143–1150.
- Lubbe, B. (2003). *Tourism Management in Southern Africa*, 3-78.
- Luo, X. & Homburg, C. (2008). Satisfaction, complaint, and the stock value gap. *Journal of Marketing*, 72(4), 29–43.
- Manasakis, C., Apostolakis, A., & Datsaris, G. (2013). Using data envelopment analysis to measure hotel efficiency in Crete. *International Journal of Contemporary Hospitality Management*, 25(4), 510–535.
- Margolis, S. E. (1987). Two Definitions of Efficiency in Law and Economics. *The Journal of Legal Studies*, 16(2), 471–482
- Mariani, M. M., & Visani, F. (2019). Embedding eWOM into efficiency DEA modelling: An application to the hospitality sector. *International Journal of Hospitality Management*, 80, 1–12.
- Martín, J. C., & Román, C. (2001). An application of DEA to measure the efficiency of Spanish airports prior to privatization. *Journal of Air Transport Management*, 7(3), 149–157.
- Martín, J. C., & Román, C. (2006). A Benchmarking Analysis of Spanish Commercial Airports. A Comparison Between SMOP and DEA Ranking Methods. *Networks and Spatial Economics* 2006 6:2, 6(2), 111–134.

- McKercher, B. & Tung, V. (2015). Publishing in tourism and hospitality journals: Is the past a prelude to the future? *Tourism Management*, 50, 306–315.
- Mendieta-Peñalver, L. F., Perles-Ribes, J. F., Ramón-Rodríguez, A. B., & Such-Devesa, M. J. (2016). Is hotel efficiency necessary for tourism destination competitiveness? An integrated approach: *Tourism Economics*, 14(1), 3-26.
- Mhlanga, O. (2018). Drivers of restaurant efficiency in South Africa: a stochastic frontier approach. *International Journal of Culture, Tourism, and Hospitality Research*, 12(4), 407–419.
- Mhlanga, O. (2019a). Drivers of efficiency and their influence on airline performances in South Africa: a bootstrapped meta-frontier approach. *International Journal of Culture, Tourism, and Hospitality Research*, 14(1), 121–135.
- Mhlanga, O. (2019b). Factors impacting airline efficiency in southern Africa: a data envelopment analysis. *GeoJournal*, 84(3), 759–770.
- Michael Hall, C. (2011). Publish and perish? Bibliometric analysis, journal ranking and the assessment of research quality in tourism. *Tourism Management*, 32(1), 16–27.
- Min, H., Min, H., & Joo, S. J. (2008). A data envelopment analysis-based balanced scorecard for measuring the comparative efficiency of Korean luxury hotels. *International Journal of Quality & Reliability Management*, 25(4), 349–365.
- Miro, A.-P. (2016). EVALUATION OF TECHNICAL EFFICIENCY OF THE HOTEL SECTOR AND CAMPSITES IN SPAIN-Web of Science special collection.
- Morey, R. C., & Dittman, D. A. (1995). Evaluating a Hotel GM's Performance: A Case Study in Benchmarking. *Cornell Hospitality Quarterly*, 36(5), 30–35.
- Morley, C. L. (2003). Impacts of International Airline Alliances on Tourism: *Tourism Economics*, 9(1), 31–51.
- N. Jayapalan. (2001). *Introduction To Tourism*, Atlantic Publishers & Distributors, 1-40.
- Neely, A., Gregory, M. & Platts, K. (1995). Performance measurement system design: A literature review and research agenda. In *International Journal of Operations and Production Management*, 15, (4),80–116.
- Ngo, T., & Tsui, K. W. H. (2020). A data-driven approach for estimating airport efficiency under endogeneity: An application to New Zealand airports. *Research in Transportation Business and Management*, 34.
- Ngo, T., & Tsui, K. W. H. (2021). Estimating the confidence intervals for DEA efficiency scores of Asia-Pacific airlines. *Operational Research*.
- Niavis, S. & Tsiotas, D. (2019). Assessing the tourism performance of the Mediterranean coastal destinations: A combined efficiency and effectiveness approach. *Journal of Destination Marketing and Management*, 14, 100-379.
- Noblit, G. W. & Hare, R. D. (1988a). *Meta-Ethnography: Synthesizing Qualitative Studies*, 5-14.
- Ohe, Y., & Peypoch, N. (2016). Efficiency analysis of Japanese Ryokans: A window DEA approach. *Tourism Economics*, 22(6), 1261–1273.
- Oliveira, R., Pedro, M. I., & Marques, R. C. (2013a). Efficiency and its determinants in Portuguese hotels in the Algarve. *Tourism Management*, 36, 641–649.
- Oliveira, R., Pedro, M. I., & Marques, R. C. (2013b). Efficiency performance of the Algarve hotels using a revenue function. *International Journal of Hospitality Management*, 35, 59–67.
- Oliveira, R., Pedro, M., & Marques, R. (2015). Efficiency Evaluation of Portuguese Hotels in the Algarve using Data Envelopment Analysis (DEA)- Web of Science special collection
- Organisations, I. U. of O. T. (1963). Definition of 'tourist' or 'temporary visitor'; UN,. Retrieved June 1, 2021, from <https://digitallibrary.un.org/record/1484980>

- Oukil, A., Channouf, N., & Al-Zaidi, A. (2016). Performance evaluation of the hotel industry in an emerging tourism destination: The case of Oman. *Journal of Hospitality and Tourism Management*, 29, 60–68.
- Oum, T. H., Adler, N., & Yu, C. (2006). Privatization, corporatization, ownership forms and their effects on the performance of the world's major airports. *Journal of Air Transport Management*, 12(3), 109–121.
- Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., ... Moher, D. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *Systematic Reviews* 2021 10:1, 10(1), 1–11.
- Pahlevan-Sharif, S., Mura, P. & Wijesinghe, S. N. R. (2019). A systematic review of systematic reviews in tourism. *Journal of Hospitality and Tourism Management*, 39, 158–165.
- Palmatier, R. W., Houston, M. B. & Hulland, J. (2018). Review articles: purpose, process, and structure. In *Journal of the Academy of Marketing Science*, 46(1), 1–5. Springer New York LLC.
- Paré, G., Trudel, M. C., Jaana, M. & Kitsiou, S. (2015). Synthesizing information systems knowledge: A typology of literature reviews. *Information and Management*, 52(2), 183–199.
- Parte-Esteban, L., & Alberca-Oliver, P. (2015a). New insights into dynamic efficiency: The effects of firm factors. *International Journal of Contemporary Hospitality Management*, 27(1), 107–129.
- Parte-Esteban, L., & Alberca-Oliver, P. (2015b). Determinants of technical efficiency in the Spanish hotel industry: regional and corporate performance factors. *Current Issues in Tourism*, 18(4), 391–411.
- Pati, D. & Lorusso, L. N. (2018). How to Write a Systematic Review of the Literature. *Health Environments Research and Design Journal*, 11(1), 15–30.
- Paul, J. & Criado, A. R. (2020). The art of writing literature review: What do we know and what do we need to know? *International Business Review*, 29(4), 101-717.
- Paul, J., & Singh, G. (2017). The 45 years of foreign direct investment research: Approaches, advances and analytical areas. *The World Economy*, 40(11), 2512–2527.
- Paul, J., O'Cass, A., Lim, W. M., Hao, A. W. & Bresciani, S. (2020). 'Systematic Literature Reviews.', *International Journal of Consumer Studies (Special Issue)*.
- Pels, E., Nijkamp, P., & Rietveld, P. (2003). Inefficiencies and scale economies of European airport operations. *Transportation Research Part E: Logistics and Transportation Review*, 39(5), 341–361.
- Pestana Barros, C. & Dieke, P. U. C. (2008). Technical efficiency of African hotels. *International Journal of Hospitality Management*, 27(3), 438–447.
- Petchko, K. (2018). Data and Methodology. *How to Write About Economics and Public Policy*, 241–270.
- Peter Robinsion, Michael Lück, Stephen L. J. Smith & Michael Lackey. (2013). *Tourism*, 3-110.
- Peypoch, N., Randriamboarison, R., Rasoamananjara, F. & Solonandrasana, B. (2012). The length of stay of tourists in Madagascar. *Tourism Management*, 33(5), 1230–1235.
- Poldrugovac, K., Tekavcic, M., & Jankovic, S. (2016). Efficiency in the hotel industry: An empirical examination of the most influential factors. *Economic Research-Ekonomska Istrazivanja*, 29(1), 583–597.
- Pulina, M., Detotto, C., & Paba, A. (2010). An investigation into the relationship between size and efficiency of the Italian hospitality sector: A window DEA approach. *European Journal of Operational Research*, 204(3), 613–620.

- Rabar, D., Zenzerović, R., & Šajrih, J. (2017). An empirical analysis of airport efficiency: The Croatian case. *Croatian Operational Research Review*, 8(2), 471–487.
- Resolution of the international conference on travel and tourism statistics, Ottawa, Canada, 24-28 June 1991. (n.d.). Retrieved June 1, 2021.
- Reynolds, D. (2003). Hospitality-productivity assessment using data-envelopment analysis. *The Cornell Hotel and Restaurant Administration Quarterly*, 44(2), 130–137.
- Ruggeri, G., Orsi, L., & Corsi, S. (2019). A bibliometric analysis of the scientific literature on Fairtrade labelling. *International Journal of Consumer Studies*, 43(2), 134–152.
- Sáez-Fernández, F. J., Jiménez-Hernández, I., & Ostos-Rey, M. del S. (2020). Seasonality and efficiency of the hotel industry in the balearic islands: Implications for economic and environmental sustainability. *Sustainability (Switzerland)*, 12(9).
- Sainaghi, R., Phillips, P. & Zavarrone, E. (2017). Performance measurement in tourism firms: A content analytical meta-approach. In *Tourism Management*, 59, 36–56.
- Sanders, J. (1987). Road Signs and the Goals of Justice. *Michigan Law Review*, 85(5).
- Sarkis, J., & Talluri, S. (2004). Performance based clustering for benchmarking of US airports. *Transportation Research Part A: Policy and Practice*, 38(5), 329–346.
- Schmidgall, R., Woods, R. H. & Christian Hardigree. (2007). Hospitality's most influential scholars: Fifteen years of citation analyses (1989-2004). In *Journal of Hospitality and Tourism Education*, 19, (2), 32–43.
- Scholochow, C., Fuchs, M., & Höpken, W. (2010). ICT Efficiency and Effectiveness in the Hotel Sector — A Three-Stage DEA Approach. *Information and Communication Technologies in Tourism 2010*, 13–24.
- Sellers-Rubio, R., & Casado-Díaz, A. B. (2018). Analyzing hotel efficiency from a regional perspective: The role of environmental determinants. *International Journal of Hospitality Management*, 75, 75–85.
- Shah, S. H. H., Lei, S., Ali, M., Doronin, D., & Hussain, S. T. (2019). Prosumption: bibliometric analysis using HistCite and VOSviewer. *Kybernetes*, 49(3), 1020–1045.
- Shahroudi, K., & Dery, M. (2011). Assessment of the Efficiency of Guilan Province's Hotels Using Two-Stage DEA Method. *Australian Journal of Basic and Applied Sciences*, 5(9), 1495–1502.
- Shang, J.-K., Hung, W.-T., & Wang, F.-C. (2008). Service outsourcing and hotel performance: three-stage DEA analysis. *Applied Economics Letters*, 15(13), 1053–1057.
- Shieh, H. S., Hu, J. L., & Liu, T. Y. (2017). An environment-adjusted dynamic efficiency analysis of international tourist hotels in Taiwan. *Current Issues in Tourism*, 20(16), 1749–1767.
- Sigala, M. (2003). The information and communication technologies productivity impact on the UK hotel sector. *International Journal of Operations & Production Management*, 23(10), 1224–1245.
- Sigala, M., Jones, P., Lockwood, A., & Airey, D. (2005). Productivity in hotels: A stepwise data envelopment analysis of hotels' rooms division processes. *Service Industries Journal*, 25(1), 61–81.
- Simar, L., & Wilson, P. W. (1999). Estimating and bootstrapping Malmquist indices. *European Journal of Operational Research*, 115(3), 459–471.
- Simar, L., & Wilson, P. W. (2007). Estimation and inference in two-stage, semi-parametric models of production processes. *Journal of Econometrics*, 136(1), 31–64.
- Small, H. (1973). Co-citation in the scientific literature: A new measure of the relationship between two documents. *Journal of the American Society for Information Science*, 24(4), 265–269.

- Small, H. (1980). CO-CITATION CONTEXT ANALYSIS AND THE STRUCTURE OF PARADIGMS. *Journal of Documentation*, 36(3), 183–196.
- Speklé, R. F. & Verbeeten, F. H. M. (2014). The use of performance measurement systems in the public sector: Effects on performance. *Management Accounting Research*, 25(2), 131–146.
- Such Devesa, M. J., & Peñalver, L. F. M. (2013). Research note: Size, efficiency and productivity in the Spanish hotel industry - Independent properties versus chain-affiliated hotels. *Tourism Economics*, 19(4), 801–809.
- Tan, Y., & Despotis, D. (2021). Investigation of efficiency in the UK hotel industry: a network data envelopment analysis approach. *International Journal of Contemporary Hospitality Management*, 33(3), 1080–1104.
- Tarim, Ş., Dener, H. I., & Tarim, Ş. A. (2000). Efficiency measurement in the hotel industry: Output factor constrained DEA application. *Anatolia*, 11(2), 111–123.
- Theobald, W. F. (2005). *Global Tourism - Third Edition*. Butterworth-Heinemann, 1-52.
- Ting, C.-T., & Huang, C.-W. (2011). Measuring the Effectiveness of Mutual Learning for Taiwan's Tourist Hotels with the DEA Approach: *Cornell Hospitality Quarterly* 53(1), 65–74.
- Top 8 Countries With The Highest Number Of Scientific Publications In The World - WorldAtlas. (n.d.). Retrieved October 27, 2021, from <https://www.worldatlas.com/articles/top-8-countries-with-the-highest-number-of-scientific-publications-in-the-world.html>
- Tourism : principles, practices, philosophies (Livro, 1995) [WorldCat.org]. (n.d.). Retrieved June 1, 2021, from <https://www.worldcat.org/title/tourism-principles-practices-philosophies/oclc/782176007>
- Tribe, J. (1997). The indiscipline of tourism. *Annals of Tourism Research*, 24(3), 638–657.
- Tribe, J. (2009). Philosophical Issues in Tourism . *Aspects of Tourism*, (37), 25-62.
- Tsai, H., Wu, J., & Zhou, Z. (2011). Managing Efficiency in International Tourist Hotels in Taipei using a DEA Model with Non-discretionary Inputs. *Asia Pacific Journal of Tourism Research*, 16(4), 417–432.
- Tsaur, S. (2001). The operating efficiency of international tourist hotels in Taiwan. *Asia Pacific Journal of Tourism Research*, 6(1), 73–81.
- Tsui, W. H. K., Gilbey, A., & Balli, H. O. (2014). Estimating airport efficiency of New Zealand airports. *Journal of Air Transport Management*, 35, 78–86.
- UNWTO Tourism Highlights, 2008 Edition. (2008). In *UNWTO Tourism Highlights, 2008 Edition*. World Tourism Organization (UNWTO).
- UNWTO Tourism Highlights, 2012 Edition. (2012). In *UNWTO Tourism Highlights, 2012 Edition*. World Tourism Organization (UNWTO).
- Van Eck, N. J., & Waltman, L. (2010). Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics* 2009 84:2, 84(2), 523–538.
- Wahab, S. A. (1977). *Introdução à administração do turismo*. Biblioteca Pioneira, 25-26.
- Wang, F.-C., Hung, W.-T., & Shang, J.-K. (2006). Measuring the Cost Efficiency of International Tourist Hotels in Taiwan. *Tourism Economics*, 12(1), 65–85.
- Weed, M. (2006). Sports tourism research 2000–2004: A systematic review of knowledge and a meta-evaluation of methods. *Journal of Sport and Tourism*, 11(1), 5–30.
- White, H. D., & Griffith, B. C. (1981). Author cocitation: A literature measure of intellectual structure. *Journal of the American Society for Information Science*, 32(3), 163–171.
- Wiltshire, J. (2018). Airport competition: Reality or myth? *Journal of Air Transport Management*, 67, 241–248.



- Wöber, K. W. (2000). Efficiency Measures in Benchmarking Decision Support Systems: A Hotel Industry Application. *Information and Communication Technologies in Tourism 2000*, 450–459.
- World University Rankings 2021 | Times Higher Education (THE). (2021). [https://www.timeshighereducation.com/world-university-rankings/2021/world-ranking#!/page/0/length/25/sort\\_by/rank/sort\\_order/asc/cols/stats](https://www.timeshighereducation.com/world-university-rankings/2021/world-ranking#!/page/0/length/25/sort_by/rank/sort_order/asc/cols/stats)
- Wu, J., & Liang, L. (2010). Measuring hotel performance using the integer DEA model. *Tourism Economics*, 16(4), 867–882.
- Wu, J., Tsai, H., & Zhou, Z. (2011). Improving efficiency in international tourist hotels in Taipei using a non-radial DEA model. *International Journal of Contemporary Hospitality Management*, 23(1), 66–83.
- Yang, C., & Lu, W.-M. (2006). Performance Benchmarking For Taiwan's International Tourist Hotels. <Http://Dx.Doi.Org/10.1080/03155986.2006.11732750>, 44(3), 229–245.
- Yin, P., Tsai, H., & Wu, J. (2015). A hotel life cycle model based on bootstrap dea efficiency the case of international tourist hotels in taipei. *International Journal of Contemporary Hospitality Management*, 27(5), 918–937
- Yoshida, Y., & Fujimoto, H. (2004). Japanese-airport benchmarking with the DEA and endogenous-weight TFP methods: testing the criticism of overinvestment in Japanese regional airports. *Transportation Research Part E: Logistics and Transportation Review*, 40(6), 533–546.
- Yu, M. M., & Lee, B. C. Y. (2009). Efficiency and effectiveness of service business: Evidence from international tourist hotels in Taiwan. *Tourism Management*, 30(4), 571–580.
- Yu, M.-M. (2012). An integration of the multi-component DEA and GAR models to the measurement of hotel performance. *Current Issues in Tourism*, 15(5), 461–476.
- Yu, M.-M., & Chen, L.-H. (2019). Evaluation of efficiency and technological bias of tourist hotels by a meta-frontier DEA model. *Journal of the Operational Research Society*, 71(5), 718–732.
- Yu, X., Kim, N., Chen, C. & Schwartz, Z. (2012). Are you a tourist? : tourism definition from the tourist perspective. *Tourism Analysis : An Interdisciplinary Tourism & Hospitality Journal*, 17(4).
- Yucel, A. G. (2020). Are shocks to tourist arrivals permanent or transitory? A comprehensive analysis on the top 20 most-visited countries. *Current Issues in Tourism*, 24(16), 2294–2311.
- Zaman, M., Botti, L., & Vo Thanh, T. (2016). Does managerial efficiency relate to customer satisfaction? The case of Parisian boutique hotels. *International Journal of Culture, Tourism, and Hospitality Research*, 10(4), 455–470.
- Zambrano, E. C., & Aguilar, Y. G. (2017). Medición de la eficiencia de hoteles: caso de estudio en Colombia. *Revista Virtual Universidad Católica Del Norte*, 51, 143–155.
- Zhang, Q., & Ma, J. (2011). Research on business efficiency of hotel and tourism enterprises based on the influence of innovation factors. *Energy Procedia*, 5, 742

## Appendix A

## Appendix A.1

Table A.17 - Typology of literature review types

Overarching goal	Theoretical review types	Scope of questions	Search strategy	Nature of primary sources	Explicit study selection	Quality appraisal	Methods for synthesizing findings
Summarization of primer knowledge	Narrative review	Broad	Usually selective	Conceptual and empirical	No	No	Narrative summary
	Descriptive review	Broad	Representative	Empirical	Yes	No	Content analysis/ frequency analysis
	Scoping review	Broad	Comprehensive	Conceptual and empirical	Yes	Not essential	Content or thematic analysis
Data aggregation or integration	Meta-analysis	Narrow	Comprehensive	Empirical (quantitative only)	Yes	Yes	Statistical methods (meta-analysis technique)
	Qualitative systematic review	Narrow	Comprehensive	Empirical (quantitative only)	Yes	Yes	Narrative synthesis
	Umbrella review	Narrow	Comprehensive	Systematic reviews	Yes	Yes	Narrative synthesis
Explanation building	Theoretical review	Broad	Comprehensive	Conceptual and empirical	Yes	No	Content analysis or interpretive methods
	Realistic review	Narrow	Iterative and purposive	Conceptual and empirical	Yes	Yes	Mixed-methods approach
Critical assessment of extant literature	Critical review	Broad	Selective or representative	Conceptual and empirical	Yes or no	Not essential	Content analysis or critical interpretive methods

(Paré et al 2015)

## Appendix A.2

Table A.18 - Main review types characterized by methods used

Label	Description	Methods used (SALSA)			
		Search	Appraisal	Synthesis	Analysis
Critical review	Aims to demonstrate writer has extensively researched literature and critically evaluated its quality. Goes beyond mere description to include the degree of analysis and conceptual innovation. Typically results in hypothesis or model	Seeks to identify the most significant items in the field	No formal quality assessment. Attempts to evaluate according to contribution	Typically narrative, perhaps conceptual or chronological	Significant component: seeks to identify conceptual contribution to embody existing or derive a new theory
Literature review	Generic term: published materials that provide an examination of recent or current literature. Can cover a wide range of subjects at various levels of completeness and comprehensiveness. May include research findings	May or may not include comprehensive searching	May or may not include quality assessment	Typically narrative	Analysis may be chronological, conceptual, thematic, etc.
Mapping review/ systematic map	Map out and categorize existing literature from which to commission further reviews and/or primary research by identifying gaps in the research literature	Completeness of searching determined by time/scope constraints	No formal quality assessment	It may be graphical and tabular	Characterizes quantity and quality of literature, perhaps by study design and other key features. May identify the need for primary or secondary research
Meta-analysis	A technique that statistically combines the results of quantitative studies to provide a more precise effect of the results	Aims for exhaustive, comprehensive searching. May use funnel plot to assess the completeness	Quality assessment may determine inclusion/exclusion and/or sensitivity analyses	Graphical and tabular with a narrative commentary	Numerical analysis of measures of effect assuming the absence of heterogeneity
Mixed studies review/mixed methods review	Refers to any combination of methods where one significant component is a literature review (usually systematic). Within a review context, it refers to a combination of review approaches for example combining quantitative with qualitative research or outcome with process studies	Requires either very sensitive search to retrieve all studies or separately conceived quantitative and qualitative strategies	Requires either a generic appraisal instrument or separate appraisal processes with corresponding checklists	Typically both components will be presented as narrative and in tables. May also employ graphical means of integrating quantitative and qualitative studies	Analysis may characterize both kinds of literature and look for correlations between characteristics or use gap analysis to identify aspects absent in one literature but missing in the other

Overview	Generic term: summary of the [medical] literature that attempts to survey the literature and describe its characteristics	May or may not include comprehensive searching (depends on whether systematic overview or not)	May or may not include quality assessment (depends on whether systematic overview or not)	Synthesis depends on whether systematic or not. Typically, narrative but may include tabular features	Analysis may be chronological, conceptual, thematic, etc.
Qualitative systematic review/ qualitative evidence synthesis	Method for integrating or comparing the findings from qualitative studies. It looks for 'themes' or 'constructs' that lie in or across individual qualitative studies	May employ selective or purposive sampling	Quality assessment typically used to mediate messages, not for inclusion/exclusion	Qualitative, narrative synthesis	Thematic analysis may include conceptual models
Rapid review	Assessment of what is already known about a policy or practice issue, by using systematic review methods to search and critically appraise existing research	Completeness of searching determined by time constraints	Time-limited formal quality assessment	Typically narrative and tabular	Quantities of literature and overall quality/direction of effect of literature
Scoping review	Preliminary assessment of potential size and scope of available research literature. Aims to identify the nature and extent of research evidence (usually including ongoing research)	Completeness of searching determined by time/scope constraints. May include research in progress	No formal quality assessment	Typically tabular with some narrative commentary	Characterizes quantity and quality of literature, perhaps by study design and other key features. Attempts to specify a viable review
State-of-the-art review	Tend to address more current matters in contrast to other combined retrospective and current approaches. May offer new perspectives on the issue or point out areas for further research	Aims for comprehensive searching of current literature	No formal quality assessment	Typically narrative may have tabular accompaniment	The current state of knowledge and priorities for future investigation and research
Systematic review	Seeks to systematically search for, appraise, and synthesize research evidence, often adhering to guidelines on the conduct of a review	Aims for exhaustive, comprehensive searching	Quality assessment may determine inclusion/exclusion	Typically narrative with tabular accompaniment	What is known; practice recommendations. What remains unknown; uncertainty around findings, recommendations for future research
Systematic search and review	Combines strengths of critical review with a comprehensive search process. Typically addresses broad questions to produce 'best evidence synthesis'	Aims for exhaustive, comprehensive searching	May or may not include quality assessment	Minimal narrative, a tabular summary of studies	What is known; practice recommendations. Limitations

Systematized review	Attempt to include elements of the systematic review process while stopping short of the systematic review. Typically conducted as postgraduate student assignment	May or may not include comprehensive searching	May or may not include quality assessment	Typically narrative with tabular accompaniment	What is known; uncertainty around findings; limitations of the methodology
Umbrella review	Specifically refers to review compiling evidence from multiple reviews into one accessible and usable document. Focuses on broad condition or problem for which there are competing interventions and highlights reviews that address these interventions and their results	Identification of component reviews, but no search for primary studies	Quality assessment of studies within component reviews and/or of reviews themselves	Graphical and tabular with a narrative commentary	What is known; practice recommendations. What remains unknown; recommendations for future research

Source: Grant et al 2009

## Appendix B

Table B.19- PRISMA 2020 Checklist

Section and Topic	Item #	Checklist item	Location where item is reported
<b>TITLE</b>			
Title	1	Identify the report as a systematic review.	
<b>ABSTRACT</b>			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	
<b>INTRODUCTION</b>			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	
<b>METHODS</b>			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	

	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	
<b>RESULTS</b>			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	
Study characteristics	17	Cite each included study and present its characteristics.	
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	
<b>DISCUSSION</b>			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	
	23b	Discuss any limitations of the evidence included in the review.	
	23c	Discuss any limitations of the review processes used.	
	23d	Discuss implications of the results for practice, policy, and future research.	
<b>OTHER INFORMATION</b>			
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	
Competing interests	26	Declare any competing interests of review authors.	
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	

## Appendix C

Table C.20- Sample articles data

Authors	Title	Country of study	Year/s of study	Sample	Sector	Methodology	Inputs	Outputs	Main results
Baker and Riley (1994)	New perspectives on productivity in hotels: some advances and new directions	Germany; France; UK	1990	20 hotels	Hotels	Three-stage DEA	Number of personnel; Number of rooms; Room rate	Average production value per employee; Occupancy rate; F&B revenue; Value added	The UK hotels in the sample achieved lower occupancy rates, and had a greater proportion of sales in food and beverages, where the departmental operating profit is lower than in room sales. Despite this, they achieved higher gross operating profit, as a percentage of sales, than did the German and French hotels.
Morey and Dittman, (1995)	Evaluating a hotel GM's performance: A Case Study in Benchmarking	USA	1993	54 hotels	Hotels	DEA	Energy costs; Cleaning costs; Personnel expenditures; Material-type expenditures; Marketing costs; Operating costs; Administrative expenses	Accommodation revenue; Rate of guest satisfaction;	34/54 hotels are inefficient.
Gillen and Lall, (1997)	Developing measures of airport productivity and performance: an application of data envelopment analysis	USA	1989-1993	21 airports	Airports	DEA	Runway length; Passenger terminal area; Number of runways; Number of personnel; Airport area; Apron area; Number of gates	Number of passengers; Total cargo; Passenger movement	Having hub airlines and expanding gate capacity improves efficiency. Reducing the number of GA movements has a dramatic impact on improving efficiency, it is the most important factor affecting airside efficiency.
Anderson et al. (1999)	Measuring efficiency in the hotel industry: A stochastic frontier approach	USA	1994	48 hotels/motels	Hotels	SFA	Number of personnel; Number of rooms; Gaming related expenses; F&B expenditures; External costs	Total revenue;	Median efficiency 89.6%; Standard deviation: 1.5%. High-efficiency scores are consistent with a highly efficient and competitive market
Tarim et al. (2000)	Efficiency Measurement in the Hotel Industry:Output Factor Constrained DEA Application	Turkey	1997	21 hotels	Hotels	DEA	Investment; Number of personnel; Administrative expenses	Occupancy rate; The ratio of customers staying more than once in a hotel; Net profit	4-star hotels are more efficient than 5-star hotels
Wöber (2000)	Efficiency Measures in Benchmarking Decision Support Systems: A Hotel Industry Application	Austria	1997	61 hotels	Hotels	input-oriented DEA	Number of rooms; Number of seats; Number of opening days; Personnel expenditures; Material-type expenditures; Energy costs; Cleaning costs; Maintenance costs; Communication costs; Marketing costs; Administrative expenses	Accommodation revenue; F&B revenue; Occupancy rate	Some low-profitability hotels are run efficiently, and some high-profitability hotels are run inefficiently
Martin and Roman, (2001)	An application of DEA to measure the efficiency of Spanish airports prior to privatization	Spain	1997	27 airports	Airports	DEA	Personnel expenditures; Material-type expenditures; Physical capital	Number of passengers; Total cargo; Passenger movement; Aircraft movement	Results of our analysis show that there are some airports whose performance is clearly poor. Other airports present some problems if we focus our attention on the scale in efficiencies, and it is difficult to conceive how these airports are going to reach the targets.



Tsaur (2001)	The operating efficiency of international tourist hotels in Taiwan	Taiwan	1996-1998	53 hotels	Hotels	DEA	Operating costs; Number of personnel; Number of rooms; Floor area of F&B; Number of personnel in room division; Number of personnel in catering division; F&B expenditures;	Operating revenues; Occupancy rate; Accommodation revenue; F&B revenue; employees performance	The DEA results showed that the hotel industry in Taiwan is operating efficiently. However, almost three out of four hotels are considered to be relatively inefficient. The efficiency of chain-hotels is slightly better than the others.
Abbott and Wu, (2002)	Total Factor Productivity and Efficiency of Australian Airports	Australia	1990-2000	12 airports	Airports	Malmquist DEA	Runway length; Number of personnel; Amount of capital stock	Number of passengers; Total cargo;	Since 1989 the 12 main Australian airports have improved their performance in terms of total factor productivity. This rate of growth of productivity appears to have been significantly above that of the rest of the economy.
Brown and Ragsdale, (2002)	The Competitive Market Efficiency of Hotel Brands: An Application of Data Envelopment Analysis	USA	2001	46 hotel	Hotels	output-oriented DEA	Number of complaints from guests; Number of rooms; Cleaning conditions;	Rate of guest satisfaction;	The 2 Luxury hotels are efficient. Of the 16 Upscale hotels, 6 are efficient. Of the 16 Intermediate hotels, 8 are efficient. Of the 12 Parsimonious hotels, 7 are efficient.
Fernandes and Pacheco, (2002)	Efficient use of airport capacity	Brazil	1998	35 hotels	Hotels	DEA	Passenger terminal area; Airport area; Apron area; Number of gates	Number of passengers;	16/35 airports met the requirements, and were thus considered efficient. The remaining 19 airports were considered relatively inefficient.
Hwang and Chang, (2003)	Using data envelopment analysis to measure hotelmanagerial efficiency change in Taiwan	Taiwan	1994-1998	45 Hotels	Hotels	output-oriented DEA	Number of personnel; Number of rooms; Floor area of F&B; Personnel expenditures; Administrative expenses; Material-type expenditures	Accommodation revenue; F&B revenue; other revenues	The managerial efficiency of international tourist hotels in Taiwan is related to the level of internationalization of hotels.
Pels et al. (2003)	Inefficiencies and scale economies of European airport operations	Netherlands; Denmark; Belgium; France; Ireland; Portugal; Italy; Germany; Sweden; Switzerland; UK; Romania; Czech Republic; Austria	1995-1997	33 airports	Airports	SFA; DEA	Number of runways; Apron area; Number of gates	Number of passengers; Aircraft movement;	Privately operated airports such as LGW, LHR and corporatized airports like CPH (of which 49% of the shares were in private hands during the period under consideration) seem to be more efficient on average, and can act as a "peer" formany (public) airports.
Bazargan and Vasigh, (2003)	Size versus efficiency: a case study of US commercial airports	USA	1996-2000	45 airports	Airports	DEA	Number of runways; Number of gates; Operating costs;	Number of passengers; Aeronautical receipts; Aircraft movement; Percentage of on time operations	The small airports consistently outperform the large hubs based on the irrelative efficiency scores in all 5 years. However, the difference between small and medium, or large and medium, is not high enough to conclude that small out performs medium or medium outperforms large hubs.
Sigala (2003)	The information and communication technologies productivity impact on the UK hotel sector	UK	1999	93 hotels	Hotels	DEA	Number of rooms; Number of seats; Number of personnel; Number of managers; Personnel expenditures; Material-type expenditures; Energy costs; Administrative expenses;	Nights spent in the hotel; Occupancy rate; Accommodation revenue; F&B revenue; other revenues	Productivity gains do not accrue from ICT investments per se, but rather from the full exploitation of ICT networking and informalization capabilities
Barros, (2004)	A stochastic cost frontier in the Portuguese hotel industry	Portugal	1999-2001	42 hotels	Hotels	Stochastic Cobb-Douglas cost frontier mode	Operating costs; Personnel expenditures; F&B expenditures;	Nights spent in the hotel; Sales	Efficiency scores are low in comparison with what is found elsewhere in the same industry. 21 out of 42 hotels have lower efficiency scores than the median, signifying that the sample has a normal distribution. The least efficient hotels are all situated outside the country's main tourist areas.

Barros and Alves (2004)	Productivity in the tourism industry	Portugal	1991-2001	42 hotels	Hotels	output-oriented DEA; Bootstrapped Malmquist Index	Operating costs; Personnel expenditures; Number of personnel; Book value of property; external costs	Number of guests; Nights spent in the hotel; Sales	7/42 hotels in which improvements in technical efficiency co-existed with improvements in technological change. 16/42 hotels in which improvements in technical efficiency coexisted with a decline in technological change. 9/42 hotels in which deteriorating technical efficiency coexisted with improvements in technological change. 10/42 hotels in which deteriorating technical efficiency coexisted with deteriorating technological change.
Chiang et al. (2004)	A DEA evaluation of Taipei hotels	Taiwan	2000	25 hotels	Hotels	input-oriented DEA	Number of personnel; Number of rooms; Floor area of F&B; Operating costs;	Accommodation revenue; F&B revenue; other revenues; Yielding index	"Of the 25 properties, 14 have an overall efficiency score of 1.0, which is relatively efficient. Not all Taipei's franchised or
Hu and Cai (2004)	Hotel Labor Productivity Assessment	USA	1999	242 hotels	Hotels	input-oriented DEA	Number of personnel; Number of part-time personnel; Number of managers; Number of part-time managers	Accommodation revenue; Number of rooms sold	managed hotels performed more efficiently than the independent ones."
Sarkis and Talluri, (2004)	Performance based clustering for benchmarking of US airports	USA	1990-1994	44 airports	Airports	Cross-efficiency DEA	Number of runways; Number of personnel; Number of gates	Number of passengers; Total cargo; Passenger movement; Operating revenues	On average commercial hotels in both the limited service and B&B segments were more labor productive than those in the reference group of luxury hotels. The average difference in labor productivity between budget/ economy hotels and luxury hotels were not significant in limited and full service hotel categories.
Yoshida and Fujimoto, (2004)	Japanese-airport benchmarking with the DEA and endogenous-weight TFP methods: testing the criticism of overinvestment in Japanese regional airports	Japan	2000	67 airports	Airports	DEA; EW-TFP	Runway length; Passenger terminal area; Number of personnel; Access cost	Number of passengers; Aircraft movement; Total cargo;	A total of 15 airports are considered to be technically efficient in at least one of the 5 years under consideration; No airports are efficient for all 5 years, but FLL and SNA were both found to be efficient for 4 of the 5 years in our study.
Barros, (2005a)	Evaluating the Efficiency of a SmallHotel Chain with a Malmquist Productivity Index	Portugal	1999-2001	42 hotels	Hotels	output-oriented DEA; Bootstrapped Malmquist Index	Number of personnel; Personnel expenditures; Book value of property; operating costs; external costs	Number of guests; Nights spent in the hotel; Sales	The results from these methods consistently indicates that the efficiency of regional airports in mainland Japan are lower than others ,and that those airports constructed in the 1990s are relatively inefficient.
Barros, (2005b)	Measuring efficiency in the hotel sector	Portugal	2001	43 hotels	Hotels	output-oriented DEA;	Number of personnel; Personnel expenditures; Number of rooms; Area of the hotel; Book value of property; Operating costs; External costs	Number of guests; Nights spent in the hotel; Sales	Growth in technical efficiency for most hotels. The majority of hotels which improved in technical efficiency, declined in technological change.
Sigala et al. (2005)	Productivity in hotels: A stepwise data envelopment analysis of hotels' rooms division processes	UK	1999	93 hotels	Hotels	DEA	Number of rooms; Personnel expenditures; Cleaning costs; Maintenance costs; Administrative expenses	Accommodation revenue; F&B revenue; other revenues;	Majority of hotels are efficient. The findings suggest that scale economies and location are major issues in determining a unit's efficiency in Portugal or elsewhere.
Barros and Mascarenhas, (2005)	Technical and allocative efficiency in a chain of small hotels	Portugal	2001	43 hotels	Hotels	output-oriented DEA;	Number of personnel; Personnel expenditures; Number of rooms; Book value of property	Number of guests; Nights spent in the hotel; Sales	Independently owned and managed hotels had significantly lower productivity scores than chain managed hotels,
Barros and Santos, (2006)	The Measurement of Efficiency in Portuguese Hotels Using Data Envelopment Analysis:	Portugal	1998-2002	15 hotels	Hotels	DEA	Number of personnel; Physical capital; Personnel expenditures;	Added value; Sales; Total revenue	Only 1 hotel is simultaneously efficient under both VRS and CRS.

Barros (2006)	Analysing the Rate of Technical Change in the Portuguese Hotel Industry	Portugal	1998–2002.	15 hotels	Hotels	SFA	Number of personnel; Operating costs; Personnel expenditures; Book value of property	Sales; market share;	Only 2 hotels show both technical and allocative efficiency in the CRS, the value increases to 5 in the VRS. The study found no specific regional or property characteristics affecting the results.
Chiang (2006)	A hotel performance evaluation of Taipei international tourist hotels – using data envelopment analysis	Taiwan	2001	24 hotels	Hotels	DEA	Number of personnel; Number of rooms; Floor area of F&B; Operating costs;	Accommodation revenue; F&B revenue; other revenues; Yielding index	Relatively low efficiency scores, denoting a high degree of waste in the use of resources, despite the fact that technical change contributes to a reduction of costs
Keh et al. (2006)	Efficiency, effectiveness and productivity of marketing in services	Australia; China; Hong Kong; Fiji; Indonesia; Japan; Malaysia; New Zealand; the Philippines; South Korea; Singapore; Thailand	1999-2000	49 hotels	Hotels	Window DEA; triangular DEA	Number of rooms; Marketing costs; Operating costs;	Accommodation revenue; F&B revenue; Occupancy rate;	12 out of 24 are efficient. The high average efficiency score appears to confirm the high performance caused by fierce competition among the hotels. Although the franchised hotels or the managed hotels were expected to have better performance than the independent hotels before study, there is no indication showing that.
Oum et al. (2006)	Privatization, corporatization, ownership forms and their effects on the performance of the world's major airports	USA; Canada; Netherlands; Belgium; Spain; Germany; France; Denmark; Ireland; UK; Italy; Norway; Czech Republic; Austria; Poland; Switzerland; Australia; New Zealand; Thailand; Hong Kong; South Korea; Japan; Malaysia; China; Singapore	2001-2003	116 airports	Airports	VFP regression models	Investment; Number of personnel;	Capital; Infrastructure; Facilities	The median efficiency scores in DEA1, DEA2 and DEA3 were about 52, 42 and 56, respectively. These indicate that there is ample room for efficiency convergence towards the best practice norms within the hotel chain
Martin and Roman, (2006)	A Benchmarking Analysis of Spanish Commercial Airports. A Comparison Between SMOP and DEA Ranking Methods	Spain	1997	34 airports	Airports	SMOP; DEA	Personnel expenditures; Material-type expenditures; Physical capital	Number of passengers; Total cargo; Passenger movement; Aircraft movement	Airports with government majority ownership and those owned by multi-level of government are significantly less efficient than airports with a private majority ownership
Yang and Lu (2006)	Performance Benchmarking For Taiwan's International Tourist Hotels	Taiwan	2002	56 hotels	Hotels	DEA	Number of personnel; Number of rooms; Floor area of F&B; Operating costs;	Total revenue; Occupancy rate; Average production value per employee in F&B;	The worst performers were Melilla, El Hierro, Santander, San Sebastian and Pamplona in that order. Melilla and El Hierro attained the lowest overall performance scores. By contrast the best six airports performers were Tenerife Sur, Malaga, Mallorca, Lanzarote, Barcelona and Madrid. According to the cross-efficiency score, Lanzarote, Barcelona, Madrid, Tenerife Norte, Ibiza, Gran Canaria and Tenerife Sur are the most efficient airports in the Spanish System.

Wang et al. (2006)	Measuring the cost efficiency of international tourist hotels in Taiwan	Taiwan	2001	49 hotels	Hotels	input-oriented DEA; Tobit regression model	Number of rooms; Number of personnel in room division; Number of personnel in catering division; Floor area of F&B;	Accommodation revenue; F&B revenue; other revenues;	International chain hotels are generally more efficient than independent-owned ones. Hotels located in resort areas operate slightly better on average than ones located in metropolitan areas. Hotels that are close to CKS international airport operate slightly worse on average than ones far from the airport.
Köksal and Aksu, (2007)	Efficiency evaluation of A-group travel agencies with data envelopment analysis (DEA): A case study in the Antalya region, Turkey	Turkey	2004	24 travel agencies	Travel agencies	DEA	Number of personnel; Administrative expenses; Having service potential	Number of customers	The hotel industry in Taiwan is inefficient, with most efficiency losses attributable to technical inefficiencies.
Chen, (2007)	Applying the stochastic frontier approach to measure hotel managerial efficiency in Taiwan	Taiwan	2002	55 hotels	Hotels	SFA	Personnel expenditures; F&B expenditures; Material-type expenditures	Total revenue	The study's results show that there is no operating efficiency difference between the travel agency groups.
Davutyan (2007)	Measuring the quality of hospitality at Antalya	Turkey	2001	21 hotels	Hotels	input-oriented DEA; Tobit regression model	Number of personnel; Number of rooms; Operating costs;	Number of rooms sold; Sales;	The results reveal that hotels in Taiwan are on average operating at 80% efficiency.
Tsaur, (2007)	The operating efficiency of international tourist hotels in Taiwan	Taiwan	1996-1998	53 hotels	Hotels	DEA	Operating costs; Number of personnel; Number of rooms; Area of the hotel; Number of personnel in room division; Number of personnel in catering division	Accommodation revenue; F&B revenue; Occupancy rate; Average daily revenue rate; Average production value per employee in F&B; Operating revenues.	Four-star hotels have higher efficiency scores than five-star hotels.
Barros and Dieke, (2008)	Measuring the economic efficiency of airports: A Simar-Wilson methodology analysis	Italy	2001–2003	31 airports	Airports	DEA (Simar-Wilson, two-stage procedure)	Investment; Number of personnel; Operating costs	Number of planes; Number of passengers; Total cargo, Aeronautical receipts; Handling receipts; Commercial receipts	The DEA results showed that the hotel industry in Taiwan is operating efficiently
Barros and Dieke, (2008)	Technical efficiency of African hotels	Angola	2000–2006	12 hotels	Hotels	DEA (Simar-Wilson, two-stage procedure)	Investment; Operating costs	Accommodation revenue	Italian airports are well managed as far as technical efficiency is concerned.
Min et al. (2008)	A data envelopment analysis-based balanced scorecard for measuring the comparative efficiency of Korean luxury hotels	South Korea	2001-2003	6 hotels	Hotels	DEA	Personnel expenditures; Operating costs; Cost of sales	Accommodation revenue; F&B revenue; other revenues;	The majority of the hotels are not operating within the efficient frontier.
Shang et al. (2008)	Service outsourcing and hotel performance: three-stage DEA analysis	Taiwan	2005	57 hotels	Hotels	three-stage DEA	Number of personnel; Number of rooms; Floor area of F&B; Operating costs	Accommodation revenue; F&B revenue; other revenues;	A majority of the hotels that we evaluated looked fine with respect to their revenue during the review period, all but Marriott produced low pure technical efficiency scores in profitability during the review period. Marriott consistently recorded an efficiency score of 1. In terms of overall efficiency in profit, Marriott outperformed other hotels throughout the review period due to the greater utilisation of its resources.

Barros et al. (2009)	Efficiency and Productivity Growth in Hotel Industry	Portugal	1998–2004	15 hotels	Hotels	DEA	Number of personnel; Physical capital.	Added value; Sales	The average managerial efficiency score computed in the three-stage DEA procedure was 0.917 or alternatively that hotels on average are 8.3% resources waste. Furthermore, service outsourcing is not the main determinant of the efficiency of international tourist hotels in Taiwan.
Hu et al. (2009)	Cost Efficiency of International Tourist Hotels in Taiwan: A Data Envelopment Analysis Application	Taiwan	1997–2006	68 hotels	Hotels	DEA	Number of personnel; Number of rooms; Floor area of F&B	Accommodation revenue; F&B revenue; other revenues	In average, in the period under analysis, two hotels are efficient.
Assaf, (2009)	Accounting for size in efficiency comparisons of airports	UK	2002–2007	27 airports	Airports	SFA	Number of personnel; Physical capital; Operating costs; External costs	Operating revenues	The cost inefficiency of these hotels is from overall technical inefficiency. International tourist hotels in Taiwan have an average efficiency of 57%. Chain systems, non-metropolitan areas and occupancy rate have significantly positive impacts on all efficiency scores of Taiwan's hotels.
Assaf, (2009a)	Are U.S. airlines really in crisis?	USA	2002–2007	12 airports	Airports	Bayesian random SFA	Personnel expenditures; Operating costs; Aircraft fuel; Number of planes	Operating revenues	Results show that large airports are generally more technically efficient and have less operational wastage than small airports.
Yu and Lee, (2009)	Efficiency and effectiveness of service business: Evidence from international tourist hotels in Taiwan	Taiwan	2004	57 hotels	Hotels	Hyperbolic Network Data Envelopment Analysis (HNDEA)	Number of personnel in room division; Number of personnel in catering division; Floor area of F&B; Number of rooms; Operating costs	Accommodation revenue; F&B revenue; other revenues	Technical efficiency results indicate that U.S. airlines are operating at a declining efficiency rate.
Lam et al. (2009)	Operational efficiencies across Asia Pacific airports	Hong Kong; Singapore; South Korea; China; Japan; Australia; New Zealand	2001–2005	11 airports	Airports	DEA	Number of personnel; Physical capital; Trade value	Number of passengers; Total cargo; Aircraft movement	Productive efficiency and service effectiveness differ across hotel businesses. The HNDEA approach provides greater insights as to the source of organizational inefficiency.
Chen (2009)	Performance measurement of an enterprise and business units with an application to a Taiwanese hotel chain	Taiwan	2007	7 hotels	Hotels	DEA	Number of personnel; Area of the hotel; Number of rooms; Operating costs; Depreciation expenses	Occupancy rate; Rate of guest satisfaction; Number of guests; Accommodation revenue; other revenues	Technical, scale and mix efficiencies are high among the major Asia Pacific airports. Significant disparities in cost efficiencies were detected among the sampled airports due to the presence of country-specific effect and differences in allocative efficiencies.
Chiu and Wu, (2010)	Performance Evaluation of International Tourism Hotels in Taiwan—Application of Context-dependent DEA	Taiwan	2004–2006	49 hotels	Hotels	DEA (context-dependent)	Floor area of F&B; Number of rooms; Number of personnel;	Accommodation revenue; F&B revenue; other revenues	Three hotels are classified as efficient, since their efficiency scores are equal to one
Barros et al. (2010)	Heterogeneous technical efficiency of hotels in Luanda, Angola	Angola	1990–2007	12 hotels	Hotels	Stochastic cost econometric frontier	Personnel expenditures; Number of personnel; Physical capital;	Accommodation revenue; Net profit	In terms of ranking 25/49 have similar rankings in all levels of attractiveness values and 11 have the same progress values in all levels.
Chiu et al. (2012)	A non-radial measure of different systems for Taiwanese tourist hotels' efficiency assessment	Taiwan	2008	58 hotels	Hotels	DEA	Number of personnel; Operating costs; Number of rooms; Floor area of F&B;	Total revenue; Occupancy rate;	Hotels adopting a more strategic approach are better, and thus more efficient, than those that lack vision.

Hsieh et al. (2010)	An efficiency and effectiveness model for international tourist hotels in Taiwan	Taiwan	2005	14 hotels	Hotels	DEA Solver	Number of rooms; Number of personnel; Operating costs; Administrative expenses;	Occupancy rate; Total revenue	Most of the efficient units are strongly efficient and only one hotel is weakly efficient.
Hu et al. (2010)	A Stochastic Cost Efficiency Analysis of International Tourist Hotels in Taiwan	Taiwan	1997–2006	66 hotels	Hotels	SFA	Personnel expenditures; F&B expenditures; Operating costs;	Accommodation revenue; F&B revenue; other revenues;	Five efficient hotels and nine inefficient
Assaf et al. (2010)	Hotel efficiency: A bootstrapped metafrontier approach	Taiwan	2004–2008	78 hotels	Hotels	DEA bootstrap	Number of personnel in room division; Number of personnel in catering division; Number of rooms; Number of personnel;	Accommodation revenue; F&B revenue; other revenues; market share; employees performance	The average cost efficiency of international tourist hotels in Taiwan from 1997 to 2006 is 91.15%. The empirical results reveal that the efficiency of chain hotels is higher than that of independent hotels.
Assaf, (2010)	Bootstrapped scale efficiency measures of UK airports	UK	2007	27 airports	Airports	DEA bootstrap	Number of personnel, Airport area; Number of runways	Number of passengers; Total cargo; Aircraft movement	Chain hotels perform better than independent hotels and large hotels perform better than small hotels, both in terms of the group and metafrontier models.
Scholochow et al. (2010)	ICT Efficiency and Effectiveness in the Hotel Sector – A Three-Stage DEA Approach	Austria	2008	3,600 hotels	Hotels	three-stage DEA	Number of personnel; Operating costs; Marketing expenses; ICT budget	Total revenue; Nights spent in the hotel	Large airports are mainly scale efficient or operating under decreasing returns to scale region, while most small airports are operating under increasing returns to scale
Assaf and Cvelbar, (2010)	The Performance of the Slovenian Hotel Industry: Evaluation Post-privatisation	Slovenia	2005–2007	24 hotels	Hotels	DEA	Number of personnel; Number of rooms; Material-type expenditures; Operating costs; Number of seats; Depreciation expenses	Accommodation revenue; F&B revenue;	Intermediate ICT adopters show lowest allocative efficiency compared to heavy and weak ICT adopters. ICTS' effectiveness in generating hotel revenues is proved only for heavy and weak ICT adopters.
Pulina et al. (2010)	An Investigation into the Relationship Between Size and Efficiency of the Italian Hospitality Sector: A Window DEA Approach	Italy	2002–2005	150 hotels	Hotels	DEA	Personnel expenditures;	Added value; Sales;	None of the hotels is close to being fully efficient, but the efficiency has increased along the period.
Hsieh and Lin, (2010)	A performance evaluation model for international tourist hotels in Taiwan for international tourist hotels in Taiwan—An application of the relational network DEA	Taiwan	2006	57 hotels	Hotels	Network DEA	Number of personnel in room division; F&B expenditures; Number of personnel in catering division; Operating costs;	Accommodation revenue; F&B revenue;	Results indicate medium-sized hotels to be relatively the most technically efficient. The second best are the small-sized hotels.
Chen et al. (2010)	Tourists' nationalities and the cost efficiency of international tourist hotels in Taiwan	Taiwan	1996–2007	57 hotels	Hotels	DEA	Number of personnel; Number of rooms; Floor area of F&B; Personnel expenditures; F&B expenditures; Operating costs	Accommodation revenue; F&B revenue; other revenues	Few hotels have efficiently transformed their resources into service products, and that overall, accommodations departments are more efficient than catering departments. Hotels that are not independently owned perform better than those that are.
Wu and Liang, (2010)	Measuring hotel performance using the integer DEA model	Taiwan	2002–2006	23 hotels	Hotels	integer DEA	Number of personnel; Number of rooms; Floor area of F&B; Operating costs; Personnel expenditures;	Accommodation revenue; F&B revenue; other revenues	Hotels in Taiwan have become more cost-inefficient during 1996 to 2007.
Zhang and Ma, (2011)	Research on Business efficiency of Hotel and Tourism Enterprises based on the influence of innovation factors	China	2009	28 hotels	Hotels	DEA	Personnel expenditures; Physical capital; owner's equity; liquidity	Total revenue;	The efficiency of the tourist hotels in Taipei has been declining from 2002 to 2006. Results show that some hotels are efficient in the earlier years but inefficient in later years.

Fuentes, (2011)	Efficiency of travel agencies: A case study of Alicante, Spain	Spain	2007	22 travel agencies	Travel agencies	DEA	Number of personnel; Total expenditures; Potential service	Number of customers; Average spend per customer	The results show that the overall business efficiency of hotels is on a high level.
Tsai et al. (2011)	Managing Efficiency in International Tourist Hotels in Taipei using a DEA Model with Non-discretionary Inputs	Taiwan	2003-2007	21 hotels	Hotels	input-oriented DEA	Number of personnel; Operating costs; Number of rooms; Floor area of F&B;	Total revenue; Occupancy rate;	7 of the 22 agencies assessed are efficient, representing 31.82% of the sample total.
Wu et al. (2011)	Improving efficiency in international tourist hotels in Taipei using a non-radial DEA model	Taiwan	2006	23 hotels	Hotels	non-radial DEA	Number of personnel; Operating costs; Number of rooms; Floor area of F&B;	Accommodation revenue; F&B revenue; other revenues	From the 21 hotels, only 3 were considered efficient and only from a period of one to two years
(Assaf, 2011)	A fresh look at the productivity and efficiency changes of UK airlines	UK	2004-2007	18 airline companies	Airline Companies	Bootstrapped Malmquist Index	Operating costs; Personnel expenditures; Aircraft fuel; Aircraft value	Total revenue; Number of passengers; Aircraft movement	Nearly one-third of the hotels (8 of 23) were inefficient.
Fu et al. (2011)	Hotel performance evaluation based on Cross-efficiency DEA models	Taiwan	2010	57 hotels	Hotels	Cross-efficiency DEA	Number of personnel in room division; Operating costs; Number of rooms; Floor area of F&B; F&B expenditures; Number of personnel in catering division;	Accommodation revenue; F&B revenue;	There is a declining trend in the productivity and efficiency of most airlines in the sample. Seven airlines had significant TFP decrease, eight had significant efficiency decrease, seven had significant pure efficiency decrease, six had significant scale efficiency decrease, and seven had significant technological decrease.
Shahroudi and Dery, (2011)	Assessment of the Efficiency of Guilan Province's Hotels Using Two-Stage DEA Method	Iran	2010	28 hotels	Hotels	output-oriented DEA;	Number of personnel; Area of the hotel; Number of rooms;	Number of rooms sold; Number of guests;	Only 2 out of 57 are close to being efficient.
Ting and Huang, (2011)	Measuring the Effectiveness of Mutual Learning for Taiwan's Tourist Hotels with the DEA Approach:	Taiwan	2008	58 hotels	Hotels	different-system DEA	Number of personnel; Operating costs; Number of rooms; Floor area of F&B;	Total revenue; Occupancy rate;	3 hotels out of 28 hotels were efficient while the rest were inefficient. Hotel Park was the most efficient hotel.
Yen and Othman, (2011)	Data Envelopment Analysis to Measure Efficiency of Hotels in Malaysia	Malaysia	2002-2006	50 hotels	Hotels	DEA	Number of personnel; Number of rooms; Book value of property; Operating costs; F&B expenditures;	Number of rooms sold; Number of guests; Occupancy rate; Operating revenues; F&B revenue; other revenues;	Twelve business hotels have performed efficiently out of 58 hotels. Few of Taiwan's business hotels can gain efficiency through mutual learning from the leisure hotels—and some business hotels would actually lose efficiency if they adopted leisure properties' operating practices.
Assaf (2012)	Benchmarking the Asia Pacific tourism industry: A Bayesian combination of DEA and stochastic frontier	China, India, Indonesia, Japan, Malaysia, Philippines, Singapore, South Korea, Taiwan, Thailand, Australia and New Zealand	2007-2009	192 hotels	Hotels	empirical Bayes; DEA; Bayesian truncated frontier model	Number of personnel; Operating costs; Number of rooms;	Total revenue;	Efficiency of Malaysian hotels can be estimated by employing a DEA model that take into consideration multiple inputs and outputs.
Chou et al. (2012)	A study of the performance on human resource management strategy in tourism industry with data envelopment analysis	Taiwan	2009-2011	10 travel agencies	Travel agencies	DEA	Operating costs; Personnel expenditures; Physical capital	Total revenue;	The highest efficient hotel industries are Australia, Singapore and South Korea, while countries with the lowest efficient hotel industries are India, Taiwan and Thailand.
Goncalves et al. (2012)	Technical efficiency measurement and inverse B-convexity: Moroccan travel agencies	Morocco	2006–2008	15 travel agencies	Travel agencies	inverse $\theta$ -convex model; DEA-BCC	Operating costs; Personnel expenditures; Physical capital	Net profit; Sales	The total efficiency, pure technical efficiency, and scale efficiency of Lion Travel were higher than other agencies.

Lu and Chen, (2012)	Analysing the efficiency of the Taiwanese hotel industry: a stochastic metafrontier approach	Taiwan	1998–2007	56 hotels	Hotels	SFA	Material-type expenditures; Personnel expenditures; Physical capital	Accommodation revenue; F&B revenue; other revenues	The number of efficient travel agencies during the period analysed is 8 out of 15 with the inverse $\theta$ -convex model and only 4 out of 15 with the BCC model.
Huang et al. (2012)	Dynamic efficiency assessment of the Chinese hotel industry	China	2001–2006	31 hotels	Hotels	DEWA; dynamic Tobit regression model	Number of personnel; Physical capital; Number of rooms;	Total revenue; Occupancy rate;	Hotels differ in cost efficiencies; that is, international chain hotels have the highest cost efficiencies, while independent hotels have the lowest.
Yu (2012)	An integration of the multi-component DEA and GAR models to the measurement of hotel performance	Taiwan	2006	57 hotels	Hotels	Multi-activity DEA	Number of personnel in room division; Operating costs; Number of rooms; Floor area of F&B; F&B expenditures; Number of personnel in catering division;	Accommodation revenue; F&B revenue; other revenues;	The findings of the investigation indicate that the Chinese hotel industry is approaching an efficient operation in general, recovering from a major dip in 2003 resulting from the SARS outbreak.
Honma and Hu, (2012)	Analyzing Japanese hotel efficiency	Japan	2004–2008	15 hotels	Hotels	DEA; SFA	Number of personnel; Number of rooms; Number of seats;	Total revenue;	The results show that members of international chain-managed hotels perform significantly better than local chain-managed and independently managed hotels
Assaf and Josiassen, (2012)	European vs. U.S. airlines: Performance comparison in a dynamic market	"France; Spain; Italy; Netherlands; Switzerland; Austria; UK; Ireland; Germany; Turkey; Portugal;	1999–2008	17 European airlines; 13 U.S. airline; 1 Canadian	Airline Companies	Bayesian distance frontier model	Number of personnel; Number of planes; Aircraft fuel; Physical capital	Passenger revenue; other revenues	The results from DEA and SFA are consistent: being listed on the stock market has significant, positive effects on Japanese hotel efficiencies while the distance from an international airport has significant, negative effects on Japanese hotel efficiencies.
Oliveira et al. (2013)	Efficiency and its determinants in Portuguese hotels in the Algarve	Cyprus; Hungary; Finland; Iceland; Poland; USA; Canada; "	2005–2007	84 hotels	Hotels	DEA	Number of rooms; Number of seats; Number of personnel; Operating costs;	Total revenue;	European airlines have slightly higher efficiency and productivity growth than U.S. airlines.
Manasakis et al. (2013)	Using data envelopment analysis to measure hotel efficiency in Crete	Portugal	2008	50 hotels	Hotels	DEA	Number of personnel; Number of rooms; Operating costs	Accommodation revenue; F&B revenue; other revenues; Nights spent in the hotel;	The hotels show huge levels of inefficiency. The 5-star hotels seem on average to be slightly more efficient than the 4-star hotels. Hotels that do not possess golf courses are the more efficient.
Such Devesa and Peñalver, (2013)	Research note: Size, efficiency and productivity in the Spanish hotel industry –independent properties versus chain-affiliated hotels	Greece	2004–2006.	424 hotels	Hotels	DEA	Number of personnel; Number of rooms; Personnel expenditures;	Total revenue;	Nationally branded hotels are relatively the most efficient; internationally branded are the least efficient, while those operating under a local brand and the independent ones lie in between.
Oliveira et al. (2013)	Efficiency performance of the Algarve hotels using a revenue function	Spain	2005–2007	56 hotels	Hotels	SFA	Number of personnel; Number of rooms; Number of seats; Operating costs	Accommodation revenue; F&B revenue	The results on overall technical efficiency and productivity suggest that hotels managed by hotel chains operate with a higher production function.
Fernández and Becerra, (2013)	An Analysis of Spanish Hotel Efficiency	Portugal	2000–2009	166 hotels	Hotels	DEA	Number of personnel; Number of rooms;	Total revenue;	The five-star hotels have higher efficiency than those of four-star. Hotels with golf present higher efficiency than the hotels with out golf. Companies with more than one hotel display higher efficiency than the ones with only one hotel.



Ashrafi et al. (2013)	The efficiency of the hotel industry in Singapore	Spain	1995-2010	120 hotels	Hotels	non-radial DEA	Number of rooms; Operating costs	Accommodation revenue; F&B revenue; Occupancy rate; other revenues	Larger hotels have greater efficiency ratios. Chain membership was only significant for medium-category hotels and did not explain efficiency in high-category hotels. Hotels in the vacation segment show a significantly greater efficiency than those in the city or cultural segment.
Barros, (2014)	Airports and tourism in Mozambique	Singapore	2000-2012	16 airports	Airports	Bayesian random SFA	Personnel expenditures; Physical capital; Investment;	Number of planes; Number of passengers; Sales	2008 was the best efficient year for the hotel industry in Singapore. The years 2001-2003, 2009 and 2010 were inefficient.
De Jorge and Suárez, (2014)	Productivity, efficiency and its determinant factors in hotels	Mozambique	1997-2007	303 hotels	Hotels	DEA	Number of personnel; Number of rooms; Operating costs; Personnel expenditures;	Sales; market share;	Mozambican airports display a ranking that signifies the existence of different levels of efficiency at different airports. The most efficient airport is Maputo.
Huang et al. (2014)	Measurement of tourist hotels' productive efficiency, occupancy, and catering service effectiveness using a modified two-stage DEA model in Taiwan	Spain	2009	58 hotels	Hotels	DEA (two-stage procedure)	Number of rooms; Operating costs; Floor area of F&B; Marketing costs;	Occupancy rate; Average production value per employee in F&B; Accommodation revenue; F&B revenue; Number of guests;	The results show improvements in productivity due to innovation, with significant differences due to the geographic location, and a decrease in efficiency explained in terms of adaptation to supply. The number of stars of the hotel is inversely related to efficiency.
Kan Tsui et al. (2014)	Operational efficiency of Asia-Pacific airports	Taiwan	2002-2011	21 airports	Airports	DEA; Simar-Wilson bootstrapping regression analysis	Runway length; Passenger terminal area; Number of runways; Number of personnel;	Number of passengers; Total cargo; Aircraft movement	Taiwan's international tourist hotels perform very well in terms of productive efficiency. Service effectiveness of the catering division is significantly less than the occupancy division.
Tsui et al. (2014)	Estimating airport efficiency of New Zealand airports	Australia; New Zealand; China; South Korea; Japan; Malaysia; Philippines; Singapore; Indonesia; Thailand; Taiwan	2010-2012	11 airports	Airports	DEA; Bootstrapped Malmquist Index	Number of runways; Operating costs;	Number of passengers; Aircraft movement; Operating revenues	Adelaide, Beijing, Brisbane, Hong Kong, Melbourne and Shenzhen airports are the efficient airports. Percentage of international passengers handled by an airport, airport hinterland population size, dominant airline(s) of an airport when entering global airline strategic alliance and an increase in GDP per capita can explain variations in airport efficiency.
Ghosh and Bandyopadhyay (2014)	Efficiency and Ranking of Operating N O-frill Airlines in Eastern India: An Application of Data Envelopment Analysis (DEA)	New Zealand	2007-2010	3 airlines	Airline Companies	DEA	Operating costs; Number of personnel; Number of planes;	Number of passengers; Aircraft movement; Total cargo	The majority of New Zealand airports increased efficiency and productivity, but should decrease scale of operations in order to operate at their most productive size. Airport hub status, airport operating hours, airport ownership and the Rugby World Cup 2011 can explain variations in airport efficiency.
Abbott (2015)	Reform and efficiency of New Zealand's airports	India	1991-2012	14 airports	Airports	Malmquist DEA	Runway length; Operating costs;	Number of passengers; Aircraft movement;	All airlines' efficiencies are identical. Spice jet airline has the maximum degree of relative efficiency.
Parte-Esteban and Alberca-Oliver, (2015)	Determinants of technical efficiency in the Spanish hotel industry: regional and corporate performance factors	New Zealand	2001-2010	1385 hotels	Hotels	DEA	Book value of property; operating costs; Number of personnel;	Sales	Larger airports were more efficient than smaller airports. Jointly owned airports are somewhat less efficient.

Oliveira et al. (2015)	Efficiency Evaluation of Portuguese Hotels in the Algarve using Data Envelopment Analysis (DEA)	Spain	2005-2007	28 hotels	Hotels	DEA	Number of personnel; Number of rooms; Operating costs; Number of seats; Personnel expenditures;	Total revenue;	Madrid, the Basque Country and Catalonia are the regions with the highest levels of efficiency. The regions with the lowest levels of efficiency are Aragon, Castilla-Leon and Murcia. Hotel efficiency score is significantly influenced by regional and corporate factors, such as the tourist flow driven by each region, hotel location and hotel size.
Parte-Esteban and Alberca-Oliver, (2015a)	New insights into dynamic efficiency: the effects of firm factors	Portugal	2002-2011	1,805 hotels	Hotels	DEA	Book value of property; operating costs; Number of personnel;	Sales	Overall, hotel companies expressed high levels of inefficiency. Algarve is the region with more tourism (70%). Efficiency differences of the results are related to the managerial practices, the use of weak infrastructure, the seasonality and the institutional and contextual environment.
Yin et al. (2015)	A hotel life cycle model based on bootstrap DEA efficiency: The case of international tourist hotels in Taipei	Spain	2006-2011	20 hotels	Hotels	DEA bootstrap	Number of rooms; Operating costs; Number of seats; Personnel expenditures; Number of personnel in room division; F&B expenditures; Number of personnel in catering division; Floor area of F&B;	Accommodation revenue; F&B revenue; Occupancy rate;	Small firms have higher levels of aggregate efficiency than do medium and large firms. There is significant differences in dynamic efficiency among Spanish hotel companies.
Ben Aissa and Goaid, (2016)	Determinants of tourism hotel market efficiency	Taiwan	2000-2010	27 hotels	Hotels	DEA bootstrap	Operating costs; external costs	Total revenue;	Five hotels were in the maturity phase, including three middle-scale hotels. The efficiency scores were high, showing the good performance of these departments in their operations!
Miro (2016)	EVALUATION OF TECHNICAL EFFICIENCY OF THE HOTEL SECTOR AND CAMPSITES IN SPAIN	Tunisia	2011-2012	212 hotels	Hotels	Cross-efficiency DEA	Personnel expenditures; Material-type expenditures; Physical capital	Total revenue;	Poor efficiency can be observed for the majority of the hotels. Business hotels present higher average efficiency scores than resort hotels. Hotels affiliated to an international chain are more efficient than independent hotels.
Ohe and Peypoch, (2016)	Efficiency analysis of Japanese Ryokans: A window DEA approach	Spain	2005–2012	3234 hotels	Hotels	Window DEA	Number of rooms; Number of personnel	Total revenue; Nights spent in the hotel;	The efficiency level of Spanish hotel's sector is high and more competitive and efficient every year.
Poldrugovac et al. (2016)	Efficiency in the hotel industry: An empirical examination of the most influential factors	Japan	2013	105 hotels	Hotels	DEA	Energy costs; Cleaning costs; F&B expenditures; Personnel expenditures; Operating costs;	Total revenue; Occupancy rate;	Large-scale hotels/(ryokans) are relatively more efficient than mid- and small-scale hotels/(ryokans).
Fragoudaki and Giokas, (2016)	Airport performance in a tourism receiving country: Evidence from Greece	Croatia	2011	38 airports.	Airports	DEA bootstrap	Apron area; Runway length; Passenger terminal area	Number of passengers; Total cargo; Aircraft movement	The results show that average efficiency is high, but not all hotels are performing at their maximum efficiency. Small hotels have higher efficiency than medium-sized hotels.
Oukil et al. (2016)	Performance evaluation of the hotel industry in an emerging tourism destination: The case of Oman	Greece	2011	58 hotel	Hotels	DEA bootstrap	Number of rooms; Personnel expenditures;	Total revenue; Occupancy rate; Nights spent in the hotel; Number of guests;	11/38 airports are relatively efficient with an efficiency score equal to 1 (100%). The results indicated the scope for substantial efficiency improvements. In addition, island location, connectivity, and hotel infrastructure in the area were found to be significant factors affecting airport efficiency

Hu and Liang, (2016)	Operating Efficiency of International Tourist Hotels in Taiwan by Taking Into Account Congestion	Oman	1998-2009	69 hotels	Hotels	DEA-Solver-PRO	Number of rooms; Number of personnel; Floor area of F&B;	Accommodation revenue; F&B revenue; other revenues	The majority of hotels in Oman are technically inefficient. Most of the efficient hotels are located in the capital, Muscat. Star rating and cultural attractions are the most important factors influencing hotels' efficiency.
Zaman et al. (2016)	Does managerial efficiency relate to customer satisfaction? The case of Parisian boutique hotels	Taiwan	2014	12 hotels	Hotels	DEA	Number of rooms; Operating costs	Total revenue	We find that the 62 of 69 hotels are inefficiently congested. Hotels near airports worsen the efficiency.
Fragoudaki et al. (2016)	Efficiency and productivity changes in Greek airports during the crisis years 2010-2014	France	2010-2014	38 airports.	Airports	DEA	Apron area; Runway length; Passenger terminal area	Number of passengers; Total cargo; Aircraft movement	Only 1 hotel is efficient in both CCR and the BCC model. An increase in a company's efficiency negatively impacts guest satisfaction.
Mendieta et al. (2016)	Is hotel efficiency necessary for tourism destination competitiveness? An integrated approach	Greece	2010	15 hotel chains (29,453 hotels)	Hotels	DEA	Number of personnel; Number of rooms; Personnel expenditures;	Accommodation revenue; Total revenue	Despite the dramatic effects of the economic crisis on the socio-economic life of the country, overall airport efficiency and productivity improved, mainly due to exogenous factors such as international tourism growth. Only seven out of the thirty-eight airports included in the study exhibit the highest level of efficiency and maintain this throughout the whole period.
Zambrano and Aguilar, (2017)	Measuring the efficiency of hotels: Colombia case study	Belgium; France; Spain; UK; USA; China; Hong Kong	2013	15 hotels	Hotels	DEA	Personnel expenditures; Physical capital; Material-type expenditures; Book value of property;	Total revenue	"three factors with positive correlations with efficiency were identified: a greater degree of internationalization; growth based principally on light assets, centred on two large geographic areas, that is, America and Asia Pacific; a greater
Arbelo-Pérez et al. (2017)	Impact of quality on estimations of hotel efficiency	Colombia	2009-2013	838 hotels	Hotels	Stochastic cost econometric frontier	Physical capital; Personnel expenditures; Material-type expenditures; Operating costs	Total revenue	level of specialization due to multi-branding strategies."
Arbelo et al. (2017)	Cost efficiency and its determinants in the hotel industry	Spain	2008-2012	231 hotels	Hotels	Stochastic cost econometric frontier	Personnel expenditures; Physical capital; F&B expenditures; Operating costs	Accommodation revenue; F&B revenue; Total revenue	10/15 hotels have high efficiency
Hwai-Shuh et al. (2017)	An environment-adjusted dynamic efficiency analysis of international tourist hotels in Taiwan	Spain	2002-2011	45 hotels	Hotels	four-stage approach; dynamic DEA; Tobit regression	Number of rooms; Number of personnel; Floor area of F&B;	Accommodation revenue; F&B revenue; Total revenue	Hotels are operating with high cost efficiency and relatively low profit efficiency, showing significant revenue inefficiencies. Higher quality of hotels with four and five stars, relative to three-star ones, has a positive impact on the overall efficiency, as the extra cost of the highest quality is more than offset by the higher revenue.
Huang (2017)	Assessment of efficiency of manual and non-manual human resources for tourist hotel industry: An application of the hybrid DEA model	Taiwan	2012	67 hotels	Hotels	Hybrid DEA	Number of rooms; Number of personnel; Floor area of F&B; Operating costs;	Number of guests; Total revenue	Resort hotels are more efficient than hotels located in urban areas, which indicates that natural conditions and infrastructure in the area where the hotel is located has a positive and significant impact on efficiency. Labour productivity, the accumulation of knowledge and location are factors that largely determine the differences in efficiency between hotels.

Rabar et al. (2017)	An empirical analysis of airport efficiency: the Croatian case	Taiwan	2009-2014	7 airports	Airports	DEA	Operating costs; Personnel expenditures; Physical capital;	Total revenue	The external environment indeed affects the managerial efficiency of every hotel and the impact to each hotel is different. Chain-operated hotels have larger advantages of economies of scale than those of independent-operated hotels, making them use resources more efficiently and to cost down.
Dragan et al. (2018)	Integration with transport suppliers and efficiency of travel agencies	Croatia	2011	61 travel agencies	Travel agencies	DEA	Number of personnel; Total expenditures; Potential service	Number of customers; Average spend per customer	More than 32% of tourist hotels are evaluated as efficient and more than half the hotels have an efficiency score lower than the average.
Sellers-Rubio and Casado-Díaz, (2018)	Analyzing hotel efficiency from a regional perspective: The role of environmental determinants	Croatia	2008-2016	869 hotels	Hotels	DEA (two-stage procedure)	Number of rooms; Number of personnel;	Accommodation revenue; Occupancy rate;	Airports of Split, Pula and Zadar were found to be efficient in the four years, and the airports of Zagreb and Osijek in one single year. Based on the efficiency score averaged across the observed period, Split turned out to be most efficient whilst Osijek appeared to be least efficient.
Ang et al. (2018)	Group cross-efficiency evaluation in data envelopment analysis: An application to Taiwan hotels	Spain	2011-2015	7 hotel chains (21 hotels)	Hotels	Cross-efficiency DEA	Number of rooms; Number of personnel; Floor area of F&B; Operating costs;	Total revenue; Occupancy rate;	An enormous amount of the agencies turned out to be quite inefficient. Only seven of the total 61 agencies observed were found to work efficiently.
Liu et al. (2018)	Regional hotel performance and benchmarking in the pearl river delta: an input and output efficiency analysis	Taiwan	2013	41 hotels	Hotels	CAR-DEA	Operating costs; Marketing costs; Administrative expenses; F&B expenditures; Cleaning costs;	Accommodation revenue; F&B revenue; other revenues	The average hotel efficiency for the regions between 2008 and 2016 reflects a high degree of inefficiency.
Arbelo et al. (2018)	Estimating efficiency and its determinants in the hotel sector using a profit function	China	2008-2012	231 hotels	Hotels	stochastic frontier profit function	Personnel expenditures; Physical capital; F&B expenditures; Operating costs	Accommodation revenue; F&B revenue; other revenues	Ranking results show that Hotel Royal and Regent Hotel are excellent, Shangri-La Hotel is worst, as well as Howard Plaza Hotel and Ambassador Hotel are also relatively poor.
Mhlanga et al. (2018)	The airline industry in South Africa: drivers of operational efficiency and impacts	Spain	2012-2016	8 airline companies	Airline Companies	DEA; Tobit regression	Operating costs; Number of personnel; Number of planes; Personnel expenditures; Available seat	Passenger revenue; Operating revenues	Of the 41 hotels, 11 had good management efficiency. Hotels in Guangzhou outperformed the other two cities by showing better pure technical efficiency, while those in Macau had the best scale efficiency.
Fernández et al. (2018)	The impact of tourism on airport efficiency: The Spanish case	South Africa	2009-2016	35 airports	Airports	SFA	Number of personnel, Airport area; Physical capital;	Number of passengers; Total cargo; Aircraft movement; Total revenue	Resort hotels are more efficient than hotels located in an urban area. The average level of profit efficiency has remained virtually constant during the period under analysis, decreasing slightly during the first years of the economic crisis. Profit efficiency is lower than the cost efficiency.
Mhlanga, (2019)	Factors impacting airline efficiency in southern Africa: a data envelopment analysis	Spain	2012–2016	10 airline companies	Airline Companies	DEA; Tobit regression	Operating costs; Number of personnel; Number of planes; Personnel expenditures; Available seat	Passenger revenue; Operating revenues	Two structural drivers, namely, “aircraft size” and “seat load factor”, and two executional drivers, namely, “low cost business model” and “revenue hours per aircraft”, significantly impacted positively on airline efficiencies in South Africa.

Arbelo-Pérez et al. (2019)	Impact of all-inclusive packages on hotel efficiency	South Africa	2008-2014	102 hotel	Hotels	SFA	Personnel expenditures; Material-type expenditures; Operating costs; Physical capital;	Accommodation revenue; F&B revenue; other revenues	Results suggest that tourist-oriented airports may achieve higher efficiency levels than non-touristic ones. Airports with higher shares of "low-cost carrier" passenger traffic appear to perform more efficiently. By comparison, airports with higher shares of "charter passenger" traffic appear to perform less efficiently. Airports located in high-density touristic areas are expected to achieve higher efficiency levels than areas with less touristic density.
Deng et al. (2019)	Efficiency evaluation of hotel chains: a Spanish case study	Spain	2014	44 hotel chains (787 hotels)	Hotels	Bayesian SFA	Average room price; Average F&B price; Number of rooms; Personnel expenditures; Number of personnel; Material-type expenditures; Operating costs; Physical capital;	Total revenue	The findings reveal that, 'aircraft size', 'seat load factor', 'Low cost business model' and 'revenue hours per aircraft', significantly impacted positively on technical and cost efficiency of airlines. However, 'aircraft families' and 'ownership' negatively impacted on airline efficiency
Mariani and Visani, (2019)	Embedding eWOM into efficiency DEA modelling: An application to the hospitality sector	Spain	2015	268 hotels	Hotels	eWOM-informed DEA	Number of rooms; Number of personnel; Operating costs;	Total revenue	Hotels in the Canary Islands are more efficient in their cost management than in their profit management, revealing the importance of revenue inefficiencies. Hotels that offered all-inclusive packages exhibited lower efficiency levels than those hotels that did not provide this service.
Mhlanga, (2019)	Drivers of efficiency and their influence on airline performances in South Africa: a bootstrapped meta-frontier approach	Italy	2015-2018	9 airline companies	Airline Companies	DEA	Number of personnel; Operating costs; Number of planes; Available seat	Passenger revenue;	In the period of the economic crisis, hotel chains increase overall revenue by investing in fewer, big hotels rather than more, small hotels. In terms of revenue efficiency, it appears better for hotel chains to invest in hotels of three or fewer stars than in higher star rated hotels. There is no clear evidence of a relationship between the size of a hotel chain and its efficiency.
Yu and Chen, (2019)	Evaluation of efficiency and technological bias of tourist hotels by a meta-frontier DEA model	South Africa	2015	109 hotels	Hotels	output-oriented DEA	Number of rooms; Number of personnel;	Accommodation revenue; other revenues	33 hotels are efficient. The number of hotels improving their position in the efficiency rankings is lower than the number of hotels decreasing in the ranking. However, the average efficiency variation is positive and higher for 2- and 3- stars hotels than for 4- and 5- stars hotels.
Alberca and Parte, (2020)	Efficiency in the Holiday and Other Short-Stay Accommodation Industry	Taiwan	2005-2016	1271 hostels	Hotels	non-radial DEA	Number of personnel; Physical capital; Material-type expenditures;	Total revenue; Sales	Private airlines were performing better than state carriers, validating previous research in the area. Airlines with a cost structure of Low-cost carriers, namely, Fly Safair, Kulula and Mango are highly efficient while most Full Service Carriers are inefficient. Structural drivers, namely, "aircraft size", and "airline ownership" and one executional driver, namely, "the cost structure" significantly influence airline efficiency.

Sáez-Fernández et al. (2020)	Seasonality and efficiency of the hotel industry in the balearic islands: Implications for economic and environmental sustainability	Spain	2015-2017	170 hotels	Hotels	DEA; directional distance functions.	Personnel expenditures; Physical capital; Operating costs;	Accommodation revenue; other revenues	The international hotels achieve the best efficiency and possesses the most advanced technology, while the ordinary hotel has the worst efficiency and technology. Most hotels have technological bias and should adjust the curve of their production possibility frontier to match the meta-technology.
Arbelo-Pérez et al. (2020)	Technological Heterogeneity and Hotel Efficiency: A Bayesian Approach	Spain	2010–2014	101 hotels	Hotels	Bayesian random SFA	Personnel expenditures; Material-type expenditures; Physical capital; Operating costs;	Accommodation revenue; F&B revenue; other revenues	Firms geographically located in diversified destinations obtain better efficiency results than those located in non-diversified destinations. Considering regional efficiency, the most efficient firms are located in the Basque country, Catalonia, La Rioja, Madrid and the Canary Islands.
Ngo and Tsui, (2020)	A data-driven approach for estimating airport efficiency under endogeneity: An application to New Zealand airports	Spain	2006-2017	11 airports	Airports	DEA Window; Tobit regression	Personnel expenditures; Operating costs; Runway length;	Aircraft movement; Passenger revenue; other revenues	Establishments that do not close down their operations are markedly more efficient and are more efficient in the use of each input than the ones that do. A reduction in the levels of tourism seasonality would improve the economic sustainability of the hotels and reduce the environmental pressure at peak times.
Ngo and Tsui, (2021)	Estimating the confidence intervals for DEA efficiency scores of Asia-Pacific airlines	New Zealand	2008–2015	14 airline companies	Airline Companies	DEAS (Data envelopment analysis and stochastic)	Operating costs; Available seat; Available tonne	Passenger revenue; Tonne revenue; Operating revenues	Hotels in the sample have, on average, a high cost efficiency level, and their efficiency level has remained practically constant over the period in which the study was conducted. Estimated efficiencies differ between the random coefficients model and the fixed coefficients model.
Tan and Despotis, (2021)	Investigation of efficiency in the UK hotel industry: a network data envelopment analysis approach	"Brunei; Taiwan; China; Indonesia; Japan; South Korea; Malaysia; Philippines; Australia; Singapore;	2010-2018	179 hotels	Hotels	Network DEA	Personnel expenditures; Number of personnel; Physical capital;	Operating revenues; Added value; contextual variables	New Zealand airports did not perform well during the period of 2006–2017. Slight drop in New Zealand airports' efficiencies for the period of 2011–2012 associated with the negative impact of the Christchurch earthquakes.

## Appendix D

### Appendix D.1

#### Source Growth

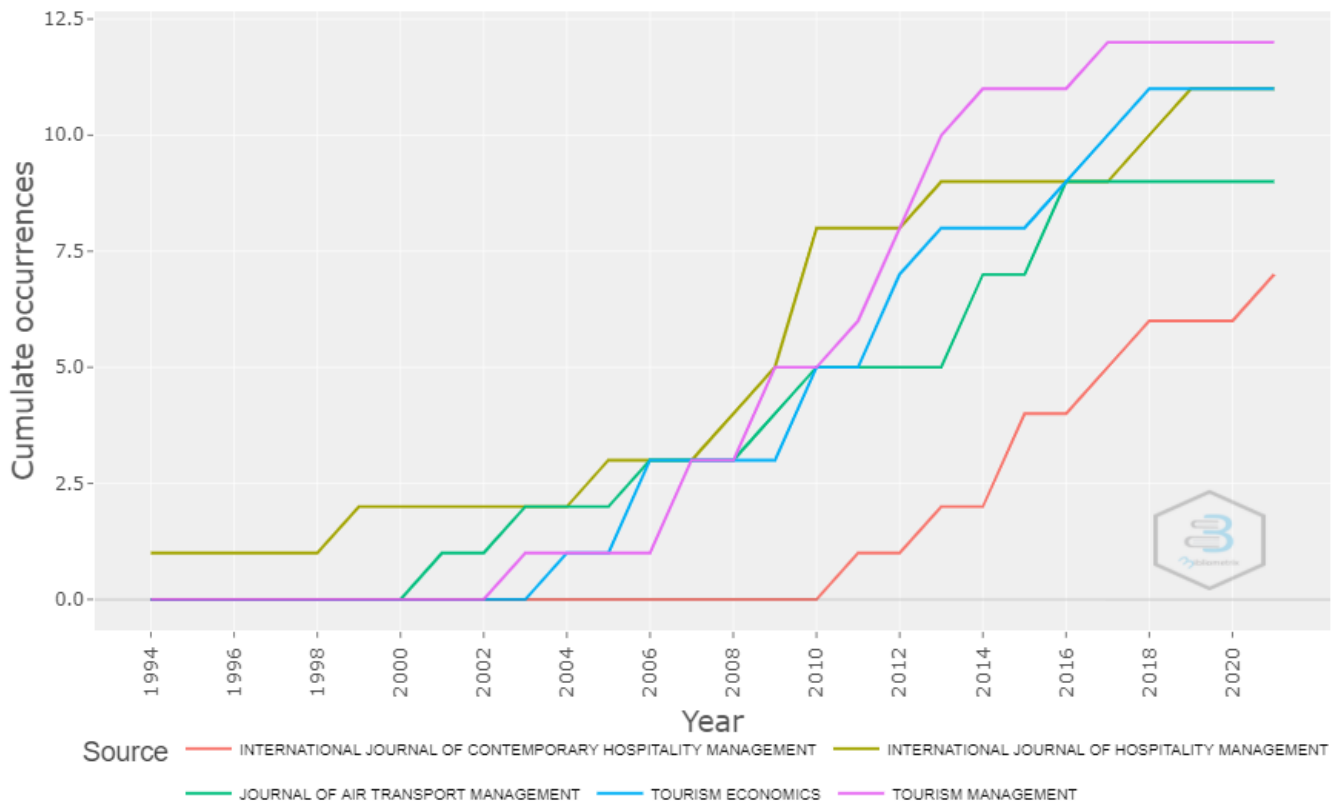


Figure D.21 - Cumulative growth of the sources throughout the years.

### Appendix D.2

Table D.21- The ten most impactful institutions

Affiliations	Articles
TECHNICAL UNIVERSITY OF LISBON	12
UNIVERSITY OF LA LAGUNA	8
NATIONAL CHIAO TUNG UNIVERSITY	7
MASSEY UNIVERSITY	6
UNIVERSITY OF SCIENCE AND TECHNOLOGY OF CHINA	6
VICTORIA UNIVERSITY	5
THE HONG KONG POLYTECHNIC UNIVERSITY	4
UNIVERSITY OF PERPIGNAN	4
CHANG JUNG CHRISTIAN UNIVERSITY	3
ESCUELA UNIVERSITARIA DE TURISMO DE TENERIFE	3





## Appendix D.4

Table D.23 - Author's Co-citation analysis data

Cluster 1				Cluster 2				Cluster 3				Cluster 4			
Authors	Links	Total links strength	Citations	Authors	Links	Total links strength	Citations	Authors	Links	Total links strength	Citations	Authors	Links	Total links strength	Citations
Anderson	44	3618	105	Barros	44	8599	285	Cooper	44	5624	213	Battese	44	1820	66
Morey	44	2565	78	Simar	44	2031	65	Charnes	44	4848	192	Coelli	44	1767	55
Fok	44	1616	46	Assaf	44	1771	54	Banker	44	2462	90	Fare	44	1656	54
Xia	44	1582	48	Peypoch	44	1719	49	Seiford	44	2214	79	Grosskopf	44	1591	50
Fish	44	1560	47	Wilson	44	1693	54	Rhodes	44	2091	80	Lovell	44	1210	44
Scott	44	1513	42	Botti.	44	1544	45	Hwang	44	1785	51	Farrell	44	1028	36
Dittman	44	1441	42	Shang	44	1450	45	Tone	44	1731	62	Schmidt	43	879	37
Michello	44	1398	41	Wang	44	1414	44	Chang	44	1602	45	Coelli	44	637	33
Reynolds	44	1252	32	Josiassen	44	1365	40	Zhu	43	1309	51				
Johns	44	1213	34	Assaf	44	1359	48	Chiang	44	1028	31				
Drake	44	1183	33	Hung	44	1312	40	Dieke	44	945	30				
Howcroft	44	1148	32	Solonandra	44	1142	30								
Sigala	44	1121	33												
Cooper	44	738	35												

## Appendix D.5

Table D.24- Source's Co-citation analysis data

Cluster 1				Cluster 2				Cluster 3			
Sources	Links	Total links strength	Citations	Sources	Links	Total links strength	Citations	Sources	Links	Total links strength	Citations
International Journal of Hospitality management	27	6780	282	European Journal of Operational Research	27	3699	187	Omega	30	1483	54
Tourism Economics	27	2722	111	International Journal of Contemporary Hospitality Management	27	2846	96	Journal of Productivity Analysis	28	1216	58
Annals of Tourism Research	27	2408	98	Asia Pacific Journal of Tourism Research	27	1083	41	An Introduction to Efficiency and Productivity Analysis	30	655	33
Journal of Travel Research	27	1642	62	The Service Industries Journal	27	1074	38	Econometrica	27	368	20
International Journal of Tourism Research	26	1061	38	Journal of Business Research	27	794	24	Tour. Manag.	5	62	26
American Business Review	26	1049	41	Cornell Hospitality Quarterly	27	749	23	J. Air Transp. Manag.	3	32	21
Progress in Tourism and Hospitality Research	26	785	28	Journal of the Operational Research Society	27	591	25	Eur J Oper Res	3	14	20
Journal of Hospitality and Tourism Research	25	745	27								
Journal of Hospitality & Tourism Research	25	688	23								

Cluster 4				Cluster 5			
Sources	Links	Total links strength	Citations	Sources	Links	Total links strength	Citations
Tourism Management	28	4995	201	Cornell Hotel and Restaurant Administration Quarterly	26	1579	65
Management Science	27	2324	113	Service Industries Journal	24	623	23
Journal of Econometrics	27	1693	80				
Applied Economics	27	1180	49				
Strategic Management Journal	27	874	37				
Journal of Air Transport Management	20	438	59				