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Hospitality Business Analytics: understanding analytics knowledge in hotel management

João Paulo Rodrigues

PhD in Tourism Management

Supervisors:
Prof. Maria Sousa, Professor, ISCTE University Institute of Lisbon
Prof. Ana Brochado, Professor, ISCTE University Institute of Lisbon

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Jury:

Prof. Álvaro Dias, Assistant Professor w/ Aggreg., Iscte
Prof. Manuel Oliveira, Associate Professor w/ Aggreg., Univ. Aveiro
Prof. Maria Monteiro, Retired Assistant Professor, ISCSP-UL
Prof. Maria Almeida, Assistant Professor w/ Aggreg., Univ. Algarve
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Prof. Maria Sousa, Assistant Professor w/ Aggreg., Iscte

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Recognitions:

I am deeply grateful for the immense support and sacrifices made by important individuals in my life during this significant research journey. I would like to express my heartfelt gratitude and love to my wife, Ana Paula, for her unwavering support and understanding, which enabled me to successfully complete my doctoral studies. I also extend my appreciation to my stepsons, Fabio, and João Mario, for their assistance and encouragement throughout this process. I dedicate this study to them, with the hope that it will inspire their own future endeavors.

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Abbreviations:

AI – Artificial Intelligence

ABI – Analytics and Business Intelligence

BA – Business Analytics

BI – Business Intelligence

BD – Big Data

BDA – Big Data Analytics

CCTV – Closed-Circuit Television

CRM – Customer Relationship Management

CRS – Central Reservation System

DSS – Decision Support Systems

ERP – Enterprise Resort Planning

ETL – Extract, Transform and Load

F&B – Food and Beverage

GDS – Global Distribution Systems

IDS – Internet Distribution Systems

IT – Information Technology

KPI – Key Performance Indicators

MIS – Management Information Systems

MOLAP – Multidimensional Online Analytical Processing

OLAP – Online Analytical Processing

OTA – Online Travel Agencies

POS – Point of Sales

PMS – Property Management System

RMS – Revenue Management System

UGC – User-Generated Content

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Abstract

The hospitality sector is seeing a rise in the use of words like Business Analytics (BA), Business Intelligence (BI), and Big Data (BD) due to the expansion of data produced by all technologies utilized in a hotel. Using business analytics, hotel managers can learn more about their industry and make better decisions. The purpose of this study is to understand the sensibility and knowledge that final-year students and recent graduates, who are part of the hospitality labor market, have as acquired from universities that teach courses related to the tourism and hospitality industry. On the other hand, it also intends to understand the level of knowledge that administrations and top management of hotels in Portugal has about the use of analytical systems and whether they have qualified staff to handle and analyze the information coming from this type of analytical systems.

To gather data from recent graduates or senior students as well as hotel managers, the research combines information from the literature review with documentation that was evaluated online, interviews with hotel managers, and the use of a questionnaire.

The findings from the questionnaire, which inquired both hotel directors and finalist students who will enter the labor market or are currently working, were assessed, and analyzed in order to compare the knowledge of experts in the hotel sector with the knowledge of students graduating in this field.

keywords

Hospitality, Hotel Industry, Hotel Management, Business Intelligence, Decision Making, Big Data, Business Analytics.

Resumo

O setor de hotelaria está a começar a usar conceitos como Business Analytics (BA), Business Intelligence (BI) e Big Data (BD) devido à expansão de dados produzidos por todas as tecnologias utilizadas num hotel. Através do BA, os gestores de hotéis podem aprender mais sobre seu setor e tomar melhores decisões.

Neste contexto, o objetivo deste estudo é compreender a sensibilidade e o conhecimento que os alunos finalistas e recém-formados, que fazem parte do mercado de trabalho da hotelaria, têm adquirido em universidades que ministram cursos relacionados à indústria de turismo e hospitalidade. Por outro lado, pretende também perceber o nível de conhecimento que as administrações e a gestão de topo dos hotéis em Portugal têm sobre a utilização de sistemas analíticos e se dispõem de pessoal qualificado para tratar e analisar a informação proveniente deste tipo de sistemas analíticos.

A fim de reunir dados de recém-formados ou estudantes seniores, bem como gestores de hotéis, a investigação combina uma revisão da literatura com documentação que foi analisada on-line, entrevistas com gestores de hotéis e a aplicação de um questionário aos estudantes.

Os resultados do questionário foram analisados de forma a comparar o conhecimento dos especialistas do setor hoteleiro com o conhecimento dos estudantes que se formam nesta área.

Palavras-Chave

Hospitality, Hotel Industry, Hotel Management, Business Intelligence, Decision Making, Big Data, Business Analytics.

CHARPTER 1

1 Introduction

The tourism and hospitality sectors did not fall behind in any of the many different information systems. With the accelerated growth of the Internet, everything has been boosted, where new apps of all type and genres arise all the time. This digital growing economy has attracted the attention of computer engineers and hotel managers, either by for the difficult choice for new operating systems and how they will all integrate to be able to extract information as a whole or how can managers be able to analyze volumes of information generated by these systems. Last years has witnessed significant changes, such as the transformation from non-digital services to digital services (Abbasi, Ahmed; Sarker, Suprateek; and Chiang, 2016). Also, the data type is no longer merely text-structured data, but rather images, audio, video, and social media content, referred to as unstructured data (Lam et al., 2017). With modern technology, new types of data, and advanced analytical tools provides firms both opportunities and challenges (Raguseo, 2018).

The challenge for hotel managers is to be able to store these significant volumes of data in a way that, through analytics tools, provides information that adds value to the business and helps, based on the analyzed patterns, on a better decision making and in the best knowledge of their business. As hotels operate in a competitive and dynamic environment, it is essential for hotels to utilize information effectively in order to improve hotel performance and compete with other hotels (Berezina et al., 2016). The hotel sector, although not one of the sectors of activity that most embraces the use of analytical technologies, has begun to realize its value and importance in identifying usage trends and decision making (Korte, 2013). The literature highlights that companies implementing analytical systems can achieve improved performance by making wiser, more accurate, and faster decisions. To make this possible, hotels and their managers need to have a deep understanding of the industry they operate in. Additionally, it is crucial to ensure that the entire organization is engaged and that human resources, whether internal, external, or recent graduates, are adequately trained and qualified to comprehend the business and analyze the insights derived from the implementation of decision support analytical systems. Academic schools play a crucial role in advancing the knowledge and understanding of business analytics in the hotel industry. Overall, academic institutions serve

as important catalysts for promoting the knowledge and understanding of business analytics in the hotel industry. They contribute to the development of skilled professionals, foster research, and innovation, and facilitate collaborations that drive advancements in data-driven decision making within the hospitality sector. However, it is crucial to ensure that university programs are closely aligned with the realities of the hotel business. This alignment requires a continuous assessment and adaptation of curriculum and teaching methodologies to reflect the evolving needs and challenges of the industry. Collaboration with industry professionals, regular industry engagement, and incorporating practical case studies and internships can enhance the relevance and applicability of academic programs in business analytics for the hotel industry. By bridging the gap between academia and industry, universities can equip students with the necessary skills and knowledge to effectively navigate the complexities of the hotel business and make valuable contributions through their expertise in business analytics. There is also a clear demand for individuals with the deep knowledge to manage the three perspectives of business decision making (Chiang et al., 2012)

To develop a thorough comprehension of analytics in the hotel industry, it is imperative to examine the diverse range of systems available to hotels and their interconnectivity. Additionally, exploring how analytical systems can aid in strategy formulation and improve decision-making using analytical models and key performance indicators is crucial. This necessitates addressing the integration of multiple information systems utilized within a hotel. The integration of these systems plays a pivotal role in achieving the objective of aggregating and consolidating pertinent information, enabling a deeper understanding of the business, and facilitating informed decision-making processes.

1.1 Research Problem

The primary objective of this research study is to examine and explore the behavioral intentions of users within the hotel industry towards the usage and acceptance of analytics technology. Specifically, the study aims to enhance understanding of the genuine business intelligence and business analytics requirements of hoteliers and their capacity to leverage this information for improved management practices. Furthermore, the study intends to shed light on the potential value and return on investment associated with implementing such systems in the hotel industry. By addressing these objectives, the research aims to provide valuable insights for decision-makers regarding the importance and feasibility of investing in analytics technology in the hotel industry.

This study aims to address the knowledge gap between the current understanding and utilization of analytical systems among hotel managers, and the knowledge and awareness possessed by recent graduates, especially those from management, hotel management, and tourism programs, as they enter the job market. The objective of this study is to examine the differences in knowledge and understanding of analytical systems, encompassing aspects such as implementation costs and the necessary organizational structure required for their effective utilization. By exploring these gaps, this study also aims to reveal the disparities between the industry's requirements and the preparedness of recent graduates in meeting those demands. The goal of this research is to deepen our understanding of the skills and knowledge needed in the hotel industry regarding analytical systems, with the aim of achieving better alignment between industry requirements and the readiness of graduates.

A comprehensive understanding of the problem that has been researched over the years is made possible by the literature review, which offers insightful information on the various stakeholders involved in the study topic. This study will methodically explore dilemmas, moving through each one in a systematic manner.

(1) Is the organizational culture of hotels ready to embrace Business Analytics systems?

A few studies readiness of the organizational culture in hotels to embrace Business Analytics systems can vary. Some hotels may already have a culture that values data-driven decision-making and is open to adopting and utilizing Business Analytics systems. These hotels may have a proactive approach towards embracing new technologies and promoting a culture of continuous improvement and innovation.

However, there may be hotels where the organizational culture is more traditional or resistant to change. In such cases, there might be challenges in embracing Business Analytics systems. Resistance to change, lack of awareness about the potential benefits of analytics, or a reliance on traditional decision-making processes could hinder the adoption of Business Analytics systems.

Overall, the readiness of the organizational culture in hotels to embrace Business Analytics systems depends on factors such as leadership support, willingness to adapt to new technologies, and the understanding of the value that analytics can bring to the business. Therefore, based on the existing research results, this paper will explore the relationship between business analytics and organizational culture.

(2) Do hotel managers and newly graduated professionals have a true understanding of their business (from all departments)?

Some previous studies pointed that the understanding of the hotel business can vary among hotel managers and newly graduated professionals. Hotel managers, especially those with experience and a deep knowledge of the industry, tend to have a better understanding of the intricacies and complexities of their business. They have likely gained insights through years of practical experience and exposure to various operational aspects.

On the other hand, newly graduated professionals may have a theoretical understanding of the hotel business through their academic studies. However, their practical knowledge and understanding of the industry may be limited, especially in terms of real-world challenges, industry dynamics, and specific operational aspects of hotels.

It is important to note that knowledge and understanding of the business can be acquired and enhanced through continuous learning, professional development, and hands-onexperience. While both hotel managers and newly graduated professionals may have different levels of understanding initially, it is essential for them to continually update their knowledge and seek opportunities to gain practical insights to better comprehend the complexities of the hotel industry. Therefore, based on the existing research results, this paper will explore the managers and newly graduated professionals' business knowledge.

(3) Is there awareness on the part of hotel managers and newly licensed professionals of the needs for systems integration and infrastructure to embrace analytical systems?

The awareness of the needs for systems integration and infrastructure to embrace analytical systems can vary among hotel managers and newly licensed professionals. Some hotel managers, especially those with a technology-driven mindset and a forward-thinking approach, may have a good understanding of the importance of systems integration and infrastructure for effective implementation of analytical systems. They recognize the value of integrating different information systems, such as property management systems, customer relationship management systems, and revenue management systems, to gather and consolidate data for analysis.

On the other hand, newly licensed professionals may have limited awareness of the specific needs for systems integration and infrastructure in relation to analytical systems. Their focus during their academic studies may have been more on the theoretical aspects of business

analytics rather than the practical considerations of integrating systems and infrastructure requirements.

It is important to emphasize the significance of awareness and understanding of systems integration and infrastructure for effective implementation of analytical systems in the hotel industry. As technology continues to advance and data becomes increasingly important, both hotel managers and newly licensed professionals need to recognize the critical role of integrating systems and ensuring a robust infrastructure to support the implementation and utilization of analytical systems for better decision-making and performance improvement in the hotel industry. This study summarizes the awareness to needs for systems integration and infrastructure to embrace analytical systems.

(4) Are hotel managers and newly graduated professionals aware of the costs involved when adopting analytical systems?

The awareness of the costs involved when adopting analytical systems can vary among hotel managers and newly graduated professionals. Hotel managers, especially those with experience in implementing technology solutions, are likely to have a better understanding of the costs associated with adopting analytical systems. They may be familiar with the upfront costs of purchasing or licensing the software, hardware, and infrastructure needed to support the systems, as well as ongoing costs such as maintenance, training, and data management.

On the other hand, newly graduated professionals may have limited awareness of the specific costs involved in adopting analytical systems. Their academic programs may have provided them with a theoretical understanding of business analytics, but they may not have been exposed to the practical considerations and financial aspects of implementing such systems.

However, it is important for both hotel managers and newly graduated professionals to develop an awareness of the costs involved in adopting analytical systems. Understanding the financial implications helps in making informed decisions regarding budgeting, resource allocation, and return on investment. It is crucial for organizations to conduct thorough cost-benefit analyses and consider the long-term value and potential benefits that analytical systems can bring to the hotel industry. This study summarizes hotel managers and newly graduated professionals aware of the costs involved when adopting analytical systems.

(5) Hotel managers and newly graduated professionals, will have adequate training and knowledge to understand analytical systems?

The level of training and knowledge regarding analytical systems can vary among hotel managers and newly graduated professionals. Hotel managers who have experience or background in data analysis, business intelligence, or related fields may already possess a good understanding of analytical systems and their applications in the hospitality industry. They may have received training or professional development in data analytics and may have practical experience in using analytical tools and interpreting data. On the other hand, newly graduated professionals may have received some exposure to analytical concepts and tools during their academic studies, depending on the curriculum of their program. However, their practical knowledge and experience with analytical systems may be limited.

To ensure that both hotel managers and newly graduated professionals have adequate training and knowledge to understand and effectively utilize analytical systems, it is important for ongoing education and training programs to be in place. Organizations can provide workshops, seminars, or on-the-job training to enhance the skills and knowledge of their employees. Academic institutions can also incorporate practical training and real-world applications of analytical systems in their curricula to better prepare graduates for the industry.

Ultimately, a combination of formal education, on-the-job training, and continuous professional development can help hotel managers and newly graduated professionals gain the necessary training and knowledge to understand and leverage analytical systems effectively in the hotel industry. Therefore, based on the existing research results, this paper will explore the relationship between adequate training and knowledge with business analytics and these questions gain relevance once conclusions are drawn from the study and should be addressed in the final section.

1.2 Research Object

The research aims to investigate the usage of Business Analytics in the hospitality industry in Portugal and explore the gap between the actual knowledge of Business Analytics usage in hotel management and the perceived knowledge of managers and newly graduated students who became professionals. By examining this relationship, the study seeks to uncover insights into the level of understanding and awareness of Business Analytics in the hospitality sector. Also, this research aims to investigate the influence mechanisms and pathways for promoting the use of analytics systems in the hospitality industry and in universities offering hotel management and tourism management courses. By understanding these mechanisms, the study

intends to provide recommendations and insights to advocate for the widespread adoption of business analytics in the industry.

The research proposed will be conducted in Portugal, involving Portuguese hotel managers as well as final-year students or recent graduate professionals from programs related to hotel management. Portugal, according to the latest Census 2021 publication by Instituto Nacional de Estatística (INE), has a total resident population of 10,343,066 inhabitants. The country has a significant student population, with 433,217 active students enrolled in various courses across polytechnics, private universities, and public universities. Specifically, there are 175 registered courses related to Tourism and Hospitality at the Direção Geral do Ensino Superior (DGES), offered by 102 schools across 18 courses. Based on this study, schools offering courses related to tourism and hospitality could enhance their curriculum and incorporate innovations that can better prepare students for the labor market. By focusing on technology, particularly the technology involved in hotel operations and business analytics, these schools can equip students with valuable knowledge and skills that align with industry demands. This can help graduates to be more competent and well-prepared when entering the workforce.

The tourism industry stands out as one of the sectors that has prominently embraced the latest technologies. However, not all organizations have been able to adopt these technologies at the same pace, with many laggings behind in implementing business intelligence strategies and digital listening practices. The key takeaway for practitioners is that companies need to articulate their business models and proactively innovate them. The emergence of digital technologies is opening up new avenues for tourism organizations to explore and develop innovative business models (Imtiaz & Kim, 2019).

1.3 Objectives

The main goal of this research is to assess and delve into the understanding and behavioral intentions of individuals in the hotel sector regarding their use and acceptance of analytics technology. The research specifically seeks to deepen insights into the actual needs for business intelligence and business analytics among hotel operators, and their ability to use this data to better their management techniques.

The study also aims to explore whether young graduates are aware of these challenges and if their integration into the workforce can have any impact on addressing these issues within hotels.

Furthermore, the study intends to shed light on the potential value and return on investment associated with implementing such systems in the hotel industry. By addressing these objectives, the research aims to provide valuable insights for decision-makers regarding the importance and feasibility of investing in analytics technology in the hotel industry.

CHARPTER 2

2 Literature Review

In the past decade, and particularly in the last five years, the tourism and hospitality industries have experienced a rise in the use of Big Data and Analytics (BDA). This trend has resulted in an increased emphasis on research in these domains (Mariani & Borghi, 2022). According to the authors, the existing literature on big data and analytics in the hospitality and tourism sector is expanding, but it remains fragmented.

In the hotel industry, there is a significant increase in data generated by all the systems involved on hotel operations and terms like Business Intelligence (BI), Big Data (BD) and Business Analytics (BA) are gaining importance. Business analytics can be a valuable tool for top management in the hospitality industry, enabling them to improve their understanding of the business and make more informed decisions. (Rodrigues et al., 2020). When managers have access to the appropriate technology and effectively utilize it, they can derive tangible and significant organizational benefits. This enables top managers to drive company growth in alignment with market developments, fostering a competitive advantage. (Rodolfo, 2015).

The literature review will be structured based on the different terms that have been commonly used over time in the field of analytics. This approach aims to enhance comprehension and provide a clearer understanding of the subject matter.

2.1 Business Intelligence

Over the years, Business Intelligence (BI) has evolved through various generations, each emphasizing different functionalities. Earlier generations of BI focused primarily on reporting, visualization, and scorecards. The initial generation of Business Intelligence (BI) systems primarily focused on basic reporting capabilities. However, subsequent generations introduced self-service BI, allowing users to independently perform analysis tasks and have more control over decision-making processes (Alghamdi & Al-Baity, 2022).

The term "Business Intelligence" was introduced by the Gartner Group, a prominent research and advisory firm, in the mid-1990s. However, the underlying concept of BI can be traced back to the Management Information Systems (MIS) reporting systems of the 1970s. These early systems focused on collecting and presenting data in the form of reports to support

managerial decision-making within organizations. Over time, the concept evolved and expanded, incorporating advancements in technology, data analysis techniques, and the integration of various data sources. The term BI, coined by Gartner, helped crystallize and popularize this concept, leading to the development and widespread adoption of more sophisticated BI methodologies and technologies (Turban et al., 2014).

2.1.1 Management Information Systems

During the initial period, between 1955 and 1970, there was a significant introduction of computers into industrial organizations, marking a widespread adoption of computing technology. During the same period, there has been substantial growth in computer-related activities known as "Management Information Systems". However, despite this growth, only a small number of these systems have had a significant impact on management practices. These systems have generally had limited influence on the decision-making process. The lack of an appropriate framework to understand and utilize the potential applications of these systems is believed to be a major reason for their failure to enhance management decision-making capabilities (Morton & Gorry, 1971). In the early 1970s, Michael Morton introduced the term "DSS" (Decision Support Systems), which was characterized as "*Interactive Computer-Based Systems that help decision-makers utilize data and models to solve unstructured problems"* (Fick & Sprague, 1980).

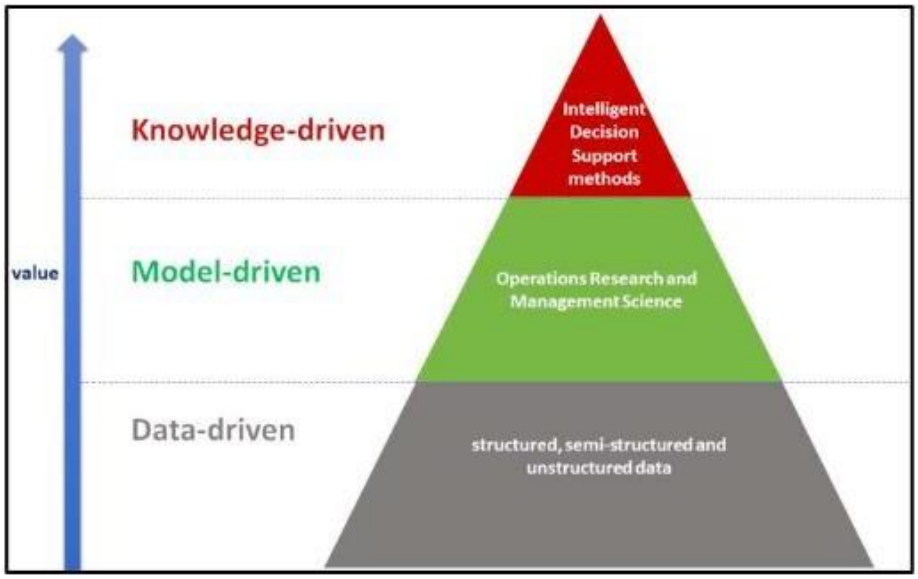
2.1.2 Decision Support Systems

In a recent study, Ben Rabia & Bellabdaoui (2020), argued that Decision Support Systems (DSS) have played a crucial role in providing decision-makers with a wide range of methods and tools to support their decision-making processes. DSS were introduced to provide top management with a comprehensive understanding of management activities, including strategic planning (executive decisions regarding the mission and overall objectives), management control (guidance by middle managers to achieve objectives), and operational control (supervision by front-line supervisors for specific tasks). DSS aims to offer a clear view of these activities to support effective decision-making at different levels of the organization (Ben Rabia & Bellabdaoui, 2020).

A decision support system (DSS) is an integrated human-machine decision-making process within an organization's decision chain. It possesses information processing capabilities that

facilitate interventions in strategic, tactical, or operational decisions, ultimately aiming to enhance efficiency and speed in decision-making. Since its emergence in the 1960s, DSS has been focused on the concepts of being Data-Driven (*includes all data available in any form: files, structured data, geographic data...*), Model-Driven (*uses models and methods from the field of Operations Research and Management Science*), and Knowledge-Driven (*a layer based on knowledge and the suggestion of recommendations to decision-makers*) (Ben Rabia & Bellabdaoui, 2020).

Figure 2.1 – Knowledge Pyramid of DSS



Source: "Simulation as a decision-making tool in a business analytics environment", Ben Rabia & Bellabdaoui (2020)

2.1.3 Intelligence and Business Intelligence

The ability of robots to imitate human cognitive processes has been referred to as "intelligence" by researchers studying artificial intelligence since the 1950s, according to Chen et al. (2012a). In the business and IT communities, the term "Business Intelligence" gained popularity only in the 1990s, signifying the application of data analysis and technology to derive valuable insights and support decision-making in organizational contexts.

Business Intelligence serves as an umbrella term encompassing various components such as architectures, tools, databases, analytical tools, applications, and methodologies, all aimed at facilitating data-driven decision-making within organizations. By leveraging business intelligence solutions, organizations can experience a substantial increase in decision-making efficiency by harnessing the power of historical or real-time data to gain valuable insights and inform strategic choices (AlArmouty & Fraihat, 2019). The widespread use of analytical

systems in the 1990s relied heavily on analytical techniques that drew inspiration fromstatistical methods developed in the 1970s and the emerging field of data mining techniques from the 1980s (Chen et al., 2012a).

As mentioned beforehand, since the 1990s, the concept of Business Intelligence has emerged as a suite of technological solutions enabling organizations to gather, integrate, and analyze extensive data repositories. These systems empower organizations to gain insights into their opportunities, strengths, and weaknesses (Ben Rabia & Bellabdaoui, 2020). Business intelligence is seen as a solution to the growing demand for precise, timely, and user-friendly access to relevant information using information technology. It enables decision-makers to make well-informed decisions in various organizational contexts, ultimately leading to better outcomes (Al-Edenat & Alhawamdeh, 2022).

Traditional Business Intelligence tools offer benefits in terms of historical data, they lack the ability to project future business outcomes and evaluate the overall impact of decisions on the entire business company activities. According to Ben Rabia and Bellabdaoui (2020), the ultimate objective of every decision-maker is to make intelligent and efficient decisions. BI is crucial in the decision-making process due to its ability to provide structured data, analysis, and presentation through analytical charts, dashboards, or Key Performance Indicators (KPI).

Due to the increasing volume of data and intense market competition, businesses are prioritizing investments in intelligent tools to gain a competitive edge. Business Intelligence has evolved over time, initially starting as a query and reporting software module, and subsequently incorporating additional functionalities such as Online Analytical Processing (OLAP), Mobile BI, Data Visualization, and Scorecards. BI software is undergoing a continuous transformation, integrating artificial intelligence and machine learning capabilities to automate data analysis processes. This evolution enables organizations to make more informed decisions and stay ahead in the dynamic business landscape (Alghamdi & Al-Baity, 2022).

Figure 2.2 – From Data to Knowledge

Source: Own source

2.1.4 Generations of Business Intelligence

The evolution of Business Intelligence can be categorized into three major generations, namely BI 1.0, BI 2.0, and BI 3.0 (Alghamdi & Al-Baity, 2022).

2.1.4.1 BI 1.0

Business Intelligence, as a data-centric approach, is deeply rooted in the field of database management. It heavily relies on a range of technologies for data collection, extraction, and analysis, enabling organizations to derive valuable insights from their data (Chen et al., 2012a).

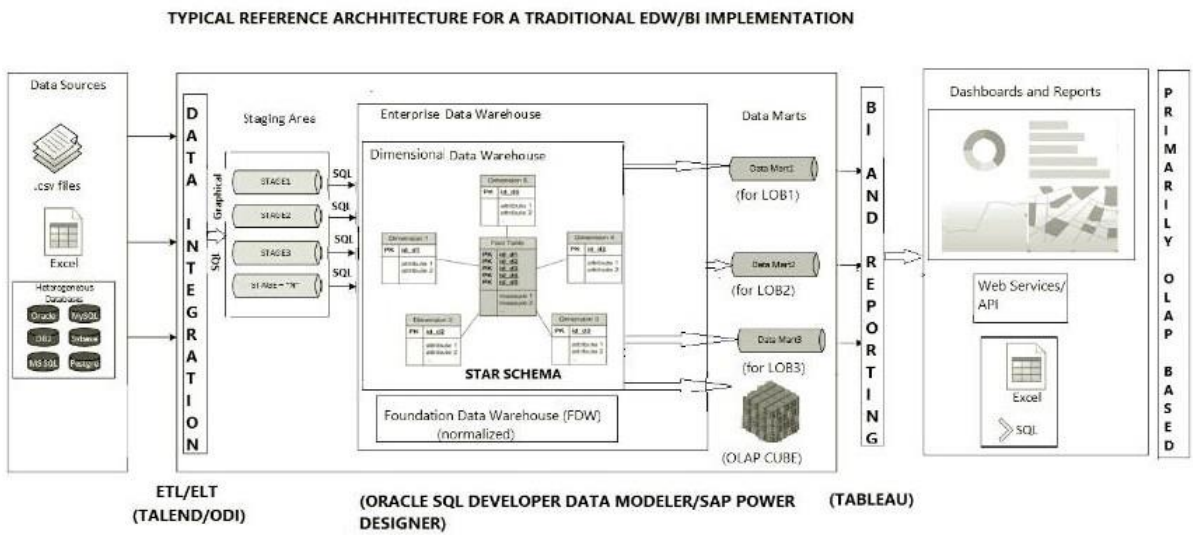
BI 1.0 refers to the initial generation of business intelligence, which primarily relied on OLAP (Online Analytical Processing) and was closely associated with Enterprise Data Warehouses, management information systems, executive information systems, and decision support systems. The technologies employed during this era utilized basic statistical techniques to analyze and present data (Alghamdi & Al-Baity, 2022).

The first generation of Business Intelligence (BI) systems, often referred to as traditional BI, relied heavily on OLAP (Online Analytical Processing) technology. These solutions were designed to handle primarily relational data formats and utilized Extract, Transform, Load (ETL) or Extract, Load, Transform (ELT) processes for data integration (Bulusu & Abellera, 2020).

The core component of the traditional BI architecture was the Enterprise Data Warehouse (EDW), which was typically designed based on a STAR-schema. The STAR-schema is a relational database model consisting of a central fact table surrounded by dimension tables. This schema allowed for efficient querying and analysis of data (Bulusu & Abellera, 2020).

Furthermore, the traditional BI systems could be extended to support Multidimensional Online Analytical Processing (MOLAP). MOLAP involved storing data in a specialized multidimensional database format, enabling fast and complex analytical operations. This approach facilitated the creation of OLAP cubes and provided advanced analytical capabilities for BI users (Bulusu & Abellera, 2020). The analytical techniques commonly employed in these systems, which gained popularity in the 1990s, are largely based on statistical methods that were developed in the 1970s. Additionally, they incorporate data mining techniques that originated in the 1980s. These methodologies form the foundation for analyzing and extracting insights from the data within the first-generation BI systems (Chen et al., 2012a).

Figure 2.3 – A typical architecture of a traditional (first-generation) BI Implementation



Source: "AI MEETS BI Artificial Intelligence and Business Intelligence", Bulusu & Abellera (2020)

2.1.4.2 BI 2.0

BI 2.0 marked a significant advancement in the field of Business Intelligence by integrating analytics into the BI framework. This phase witnessed substantial growth in data warehousing, with enhancements made to the Enterprise Data Warehouse to accommodate larger volumes and varieties of data. Additionally, there was a strong emphasis on data integration, enabling the consolidation of disparate data sources into a unified view (Bulusu & Abellera, 2020).

One of the key innovations introduced in BI 2.0 was the concept of self-service BI analytics. This empowered users to actively participate in BI activities and perform various tasks independently. Users gained the capability to engage in ad hoc querying, allowing them to explore and retrieve data based on their specific needs and analysis requirements.

Furthermore, self-service BI analytics enabled users to build their own Key Performance Indicators (KPIs), tailoring the metrics and measurements to align with their unique business goals and objectives. This newfound flexibility and autonomy in BI tasks significantly enhanced the agility and responsiveness of organizations in leveraging data for decision-making and performance monitoring purposes (Alghamdi & Al-Baity, 2022).

BI 2.0 brought about a transformative shift where even non-technical users gained the ability to prepare data for analysis. This empowered individuals without strong technical backgrounds to actively participate in the data analysis process. As a result, the time required

to gain insights from data was significantly reduced, and organizations experienced a decrease in IT bottlenecks (Bulusu & Abellera, 2020).

In practice, business users could leverage data discovery and visualization tools available within the BI environment to conduct their analysis. These tools provided intuitive interfaces and user-friendly functionalities that allowed individuals to explore and manipulate data visually, without relying heavily on technical expertise. By enabling business users to directly engage in analysis, BI 2.0 fostered a collaborative environment and accelerated the decision-making process within organizations (Bulusu & Abellera, 2020).

2.1.4.3 BI 3.0

BI 3.0 represents a paradigm shift towards an app-centric strategy, characterized by its collaborative nature and accessibility across various devices and platforms. This generation of BI emphasizes the ability to utilize BI functionalities anytime and anywhere, enabling users to leverage its capabilities on the go. A significant aspect of BI 3.0 is the integration of Advanced Analytics features within the business analytics cycle. This incorporation of advanced analytics techniques allows for more sophisticated data analysis, modeling, and prediction within the BI environment. These features empower users to perform in-depth analysis and gain valuable insights from their data (Alghamdi & Al-Baity, 2022).

BI 3.0 is built on the foundation of social workgroups, promoting collaboration, and facilitating independent creation, delivery, analysis, and management of content. This approach fosters a collaborative environment where users can work together, exchange ideas, and share insights seamlessly. Decision-makers within organizations benefit from BI 3.0 as it enables them to swiftly create and examine content on their own. This independence empowers decision-makers to explore data, analyze trends, and make informed decisions efficiently and effectively (Alghamdi & Al-Baity, 2022).

Furthermore, BI 3.0 harnesses the power of Artificial Intelligence (AI) in conjunction with BI. By combining AI technologies, such as machine learning and natural language processing, with traditional BI capabilities, organizations can leverage AI-driven insights to enhance decision-making processes, automate tasks, and uncover hidden patterns in their data (Alghamdi & Al-Baity, 2022).

Overall, BI 3.0 represents a shift towards an app-centric, collaborative, and AI-powered approach, enabling users to access BI capabilities on various devices, collaborate effectively, and leverage advanced analytics for informed decision-making (Bulusu & Abellera, 2020).

2.1.5 Business Intelligence definitions

According to Mallam et al. (2021), Business Intelligence (BI) has evolved over time, steadily improving its capabilities. It enables the development of strategies based on historical data and leverages past experiences and information to facilitate effective business planning and decision-making.

Business Intelligence involves harnessing a vast amount of corporate data, often referred to as Big Data, and processing it to generate valuable and actionable insights. The primary goalof BI is to transform raw data into useful information that can drive informed decision-making within an organization. By analyzing and interpreting the data, BI enables businesses to uncover patterns, trends, and correlations that can provide valuable insights and support strategic decision-making processes (Runtuwene et al., 2018).

Business Intelligence is recognized as a valuable technology for performance management. It encompasses activities such as data collection, integration, access, and analysis, all of which contribute to facilitating effective decision-making processes. (Delen et al., 2018).

The next table illustrates some of the definitions found in the literature:

Table 2.1 – Business Intelligence Definitions

Definitions	Authors
"BI is the set of techniques, methods, strategies and tools that allow the use of data and the information produced and, from this, determine the current organization status with respect to its customers, competitors, sellers and the market itself, and be able to make a decision."	Pantano & Romagnano (2022)
"BI concept is a broad category of technologies, applications, and processes for gathering, storing, accessing, and analyzing data to help its users make better decisions."	Ben Rabia & Bellabdaoui (2020)
"BI is a technology, tool, and software system that helps an organization collect data, automate, and produce information transformed into knowledge to make quality decisions."	Nyanga et al. (2020)
"Business Intelligence (BI) utilizes large number of data and information for analysis so that one can obtain important information. This type of information can be used to support decision-making process."	Runtuwene et al. (2018)

"Business Intelligence is an umbrella term that combines architectures, databases, analytical tools, methodologies, and applications to aid in decision-making processes."	Turban et al. (2014)
"Business Intelligence (BI) is a combination of processes, policies, culture, and technologies for gathering, manipulating, storing, and analyzing data collected from internal and external sources, in order to communicate information, create knowledge, and inform decision making. BI helps report business performance, uncover new business opportunities, and make better business decisions regarding competitors, suppliers, customers, financial issues, strategic issues, products and services."	Foley & Guillemette (2010), Delen et al. (2018)

Source: Own Production based on literature

2.1.6 Business Intelligence in Tourism

Nyanga et al. (2020), showed, through an in-depth analysis of the literature review, that the tourism industry was an early adopter of BI in order to benefit from the inherent advantages of its implementation. By implementing a business intelligence system, tourism firms can efficiently collect, store, and process information as needed, leading to increased competitiveness. The adoption of BI systems is crucial for the future of tourism companies, as it enhances efficiency and competitiveness within the industry (Nyanga et al., 2020).

In earlier publications, Yun (2004), claims that the tourism and hospitality industry adapts slowly to Business Intelligence strategies and in the hotel industry, only a small number of hotels have implemented analytical systems and knowledge management. Furtherer, Cooper (2006), emphasizes that the tourism industry is also hungry for data, in fact, having the right information at the right time provides businesses with knowledge about customers, buying behavior, and market trends. According to Magnini et al. (2003), hotel managers understand the importance of adapting to the changing business environment not only to remain competitive, but merely to survive. However, the authors argue that given the importance and complexity of data analytics and Business Intelligence analyses, senior hotel managers report a low level of understanding about those systems capabilities, how it works, and what value this technology contributes. According to Hallin & Marnburg (2008), analytical systems have had a strong presence in the management concepts debate in the last years, however, in the hospitality industry this subject has not yet reached the same dimension. The practice and study of Business Intelligence have multiplied in most industries, except for the tourism and hospitality sector (Cooper, 2006; Ruhanen & Cooper, 2004; Yun, 2004).

Nowadays, Ibrahim & Handayani (2022), states that there is a growing interest inexamining Business Intelligence in the tourism sector, as evidenced by reviews such as the oneconducted by Mariani et al. (2018). In their study, authors systematically analyze the level of awareness and deliberate engagement of hospitality and tourism academics in the areas of business intelligence and big data, where they extensively analyze articles in the tourism sectorbased on several characteristics, including the research subject, conceptual and theoretical characterization, data sources, data type and size, data collection methods, data analysis techniques, and data reporting and visualization (Mariani et al., 2018).

Tourism is complex due to its unique supply chain characteristics, which involve information and intensive coordination. The industry relies on a blend of multiple products sourced from various suppliers to create its final product and service (Ibrahim & Handayani, 2022). These characteristics present challenges for implementing innovative Business Intelligence solutions in the tourism industry and advancing knowledge in this field. In the tourism and hospitality industry, data and information are valuable resources for data-based management, contributing to the growth and competitiveness of destinations (Del Vecchio et al., 2018).

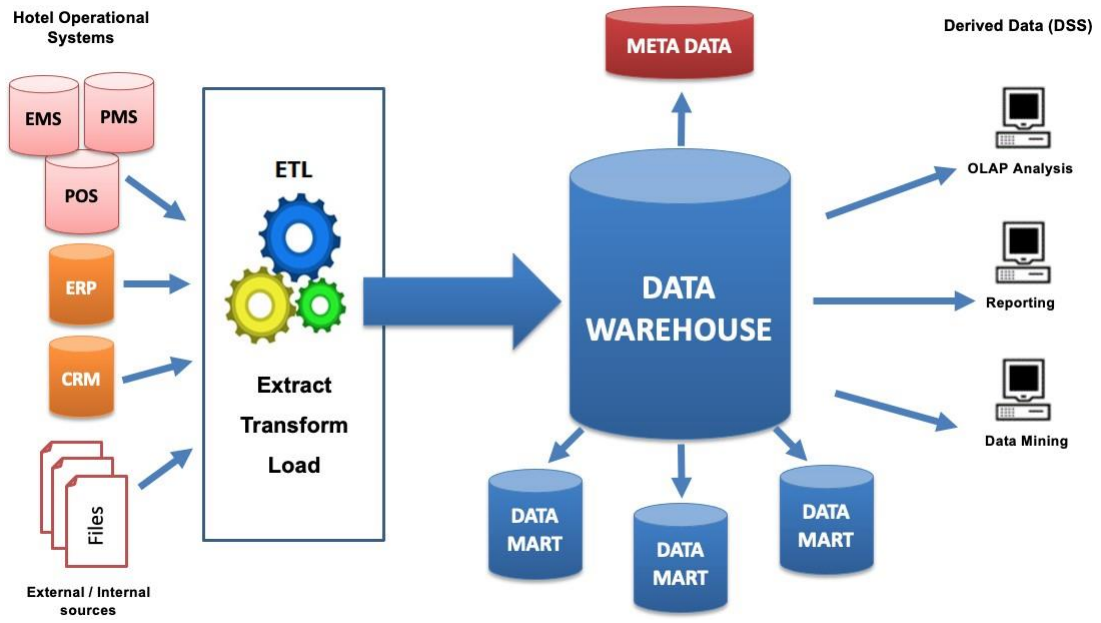
Tourism firms frequently employ Business Intelligence systems to effectively manage and store extensive data about their customers, particularly regarding their accommodation preferences. These systems enable organizations to collect and utilize valuable information about tourists they have served, facilitating data-driven decision-making and personalized services in the tourism industry (Fuchs et al., 2014b; Höpken et al., 2015). The BI system allows for the storage of diverse data concerning tourist experiences, encompassing details such as contact information, places of origin, destination preferences, and preferred activities. This comprehensive data repository enables tourism organizations to gain insights into customer preferences and behavior, facilitating targeted marketing, personalized services, and enhanced customer experiences (Fuchs et al., 2014a). By leveraging the stored data, tourism businesses can make informed decisions about the destinations and specific areas to take tourists to during their visits, leading to improved decision-making in the future (Höpken et al., 2015). However, due to the substantial expansion in data diversity, the conventional approach to business intelligence has become less effective and necessitates additional efforts to achieve timely results.

According to Shin et al. (2019), hotel technology encompasses five main categories, which are front desk technology, back office technology, meeting and event management technology,

restaurant and banquet management technology, and guest-related interface technology. To obtain knowledge from all operational systems within a hotel, it is crucial to have tools that can effectively organize, visualize, and conduct descriptive analysis of data. One such tool is online analytical processing (OLAP), which enables the extraction and analysis of data from multiple operational systems (Mariani et al., 2018).

In this example, various operational systems play a crucial role in the management of a hotel. One of the key systems is the Property Management System (PMS), which is essential for operational tasks. Additionally, the Event and Catering Management System (EMS) is significant, often interconnected with the Point of Sale (POS) system. Other systems like the Enterprise Resource Planning (ERP) may also be present, handling accounting, finance, human resources, and other related processes.

Figure 2.4 – Business Intelligence Framework – Hotel example



Source: Own Source, adapted from Bulusu & Abellera (2020)

2.1.7 Business Intelligence Perceptions and Beliefs

Despite the high promotion and praise of Business Intelligence (BI), not all expectations associated with its implementation are realized. Numerous reports of failed BI implementations and ongoing challenges persist. These challenges may stem from various factors such as inadequate data quality, lack of user adoption, poor integration with existing systems, insufficient training and support, and misalignment with organizational goals and strategies.

These instances highlight the importance of careful planning, effective change management, and continuous evaluation and improvement to maximize the benefits of BI and overcome potential obstacles (Clavier, Lotriet, & van Loggerenberg, 2012).

Business Intelligence is highly promoted and praised, yet not all expectations are realized. Instead, numerous reports of failed BI implementations and challenges prevail (Clavier, Lotriet, & Van Loggerenberg, 2012). Strong beliefs are set for BI and are systematically ranked as a top priority globally, But, unfortunately, not all organizations are well succeeded to realize significant business value from their BI investments. BI has failed to become widely pervasive (Gartner, 2008).

In their study, Clavier et al. (2012) discovered that different types of literature consistently highlight similar categories of challenges related to Business Intelligence (BI). These common challenges include data-related issues, alignment between BI, IT, and business functions, skills and expertise, sponsorship and support, and effective utilization of BI. Additionally, the authors identified additional challenges from both literature and practitioner sources, such as the lack of a well-defined discipline in an ambiguous environment, fragmented solutions and isolated data sources, absence of organizational and data structure, political factors, cultural barriers, and unclear requirements. These challenges underscore the complexity and multifaceted nature of implementing and managing BI initiatives, highlighting the need for a comprehensive and strategic approach to address these issues effectively.

According to (Magnini et al., 2003), hotel managers understand the importance of adapting to the changing business environment not only to remain competitive but merely to survive. As a result, technology has become large. As a result, technology has become a large and growing expense for many hotel corporations. However, given the importance and complexity of business intelligence and data mining processes, senior hotel managers report a low level of understanding about its capabilities, how it works, and what value this technology contributes (Magnini et al., 2003).

As mentioned by Fuchs et al. (2014b), literature only recently emphasizes BI and data management for knowledge creation in travel and tourism (Fuchs, Matthias; Höpken, 2009); (Magnini et al., 2003); (Min et al., 2002); (Morales & Wang, 2008); (Palmer et al., 2006) and (Wong et al., 2006). For tourism destinations only a few BI studies exist (Fuchs et al., 2013); (Fuchs, Matthias; Höpken, W.; Law, Rob; Ricci, 2011);(Fuchs, Matthias; Höpken, W.; Zanker, M.;Beer, 2014). However, being part of the service sector, tourism has inevitably been

associated with developments in new technologies and refreshed by organizational and structural innovations (Stamboulis & Skayannis, 2003).

Hotel managers understand the importance of adapting to the changing business environment not only to remain competitive but merely to survive. As a result, technology has become a large and growing expense for many hotel corporations. Under such a technology framework, business intelligence and data mining is a valuable competitive tool being adopted by hotel corporations to create customer value (Magnini et al., 2003).

Business intelligence and data mining can be a powerful and valuable marketing tool. However, just investing in business intelligence technology may not guarantee success. Finding a database expert who has experience creating models in the hotel industry is a significant benefit. With this, we are facing organizational learning where the processes of creation and acquisition of knowledge can be significantly improved through the application of Business Intelligence methods (Rodrigues et al., 2020).

2.2 Business Analytics

"*If you can't measure it, you can't manage it".* McAfee et al. (2012), states that there is a lot of wisdom in this well-known Peter Drucker expression, which explains why the recent explosion of digital data is so important nowadays. The authors argue that, thanks to big data, managers can measure and therefore know much more about their companies and directly translate that knowledge into better decision making and performance.

According to Vajirakachorn & Chongwatpol (2017), Business Intelligence and Business Analytics have drawn attention in both academic and business communities over the past decades. Delen & Ram (2018) reinforce this statement by saying that Business analytics has emerged as a rapidly growing term, garnering significant attention and recognition in both business and academic spheres like never before. Business analytics is recognized as crucial for knowledge generation and driving business innovation and that despite its significance has been extensively discussed in academic and business circles. However, Despite the growing recognition of the importance of knowledge orientation and business analytics capabilities in driving business model innovation, empirical research on their relationship remains limited. (Daradkeh, 2023).

In the past, information was regarded as a source of power. However, in recent decades, a significant shift has occurred, fundamentally altering our perception of information and its significance. The exponential growth of data has outpaced our ability to thoroughly explore and analyze it, presenting a new challenge in effectively harnessing its full potential (Stubbs, 2014a). In recent decades, there has been significant progress and advancements in various fields. Technological innovations, scientific discoveries, and socio-economic changes have shaped our world during this period. The rapid evolution of technology, such as the rise of the internet, mobile devices, and artificial intelligence, has revolutionized how we communicate, work, and access information. Data has undergone a rapid transformation, significantly impacting the world. The emergence of Big Data has made data readily available and inexpensive. However, the true value of data lies in its utilization to extract valuable and meaningful information. The key lies in effectively harnessing and analyzing data to derive actionable insights that can drive informed decision-making and create tangible value (Shiyu Liu et al., 2023).

2.2.1 From Business Intelligence to Business Analytics

Despite the existence of multiple Business Intelligence definitions, it is generally understood as a collection of methods, technologies, and tools that aim to enhance business decision- making processes. However, in recent times, there has been a shift in terminology, with the term "Business Intelligence" being increasingly replaced by "Business Analytics" (Delen et al.,2018). According to the authors, the concept of analytics is not a recent one, as references to corporate analytics can be found as early as the 1940s and gained more prominence and attention in the late 1960s with the advent of computers being utilized in decision support systems. (Delen & Ram, 2018).

Power et al. (2018), refers to Business Analytics as a compound noun and one would expect its meaning to be anchored in the two independent concepts of "Business" and "Analytics". The authors designate analytics as a broad umbrella term that includes Business Analytics and Data Analytics. Analytics is the progenitor concept for the compound word phrase "Business Analytics."

The literature indicates that terms such as Business Intelligence and Analytics emerged in the 1990s, along with the advent of the internet that revolutionized data accessibility, allowing for instant and real-time data sharing across organizations, countries, and even nations, have

gained increasing recognition among IT professionals and academia in recent decades. While technology has been a major focus over the past two decades, the transformative impact of communication technologies has been particularly remarkable since the year 2000, as evidenced by the literature (Bumblauskas et al., 2017). This period has witnessed significant advancements and changes driven by communication technologies, shaping the landscape of Business Intelligence and Analytics (Azevedo et al., 2014a). In recent years, the significance of information and, consequently, Business Analytics has become more apparent and has garnered increased attention. The growing recognition of the value that can be derived from data analysis has led to a heightened emphasis on Business Analytics as a critical component of decision-making and strategy formulation within organizations (Bumblauskas et al., 2017).

Chen et al. (2012a), outlines that organizations view both Business Intelligence Considering the wide range and diversity of BI solutions, it is evident that there is a scientific aspect underlying the data and Business Analytics in different ways, from tools, techniques, technologies, and systems to practices, methodologies, and applications that help enterprises make better and more timely decisions by analyzing critical business data.. Therefore, to enhance the capabilities of BI, it becomes essential to incorporate a complementary tool focused on predictive analysis through data collection and processing, which introduces the concept of Business Analytics. Business Analytics serves as a supplement rather than a replacement for BI, enabling organizations to derive deeper insights from their data. Therefore, the concepts of BI and BA cannot be seen as distinct, but complementary (Queiroz et al., 2022).

BI and Business Analytics, though having slight variations in definitions and scope, share a common goal of utilizing data and analytical tools to enhance business decision-making. Both terms encompass the process of extracting valuable insights from data to drive informed decisions and improve overall business performance (Delen & Ram, 2018). When comparing business analytics and business intelligence, the key distinctions lie primarily in the domains of statistics and domain-specific knowledge. Business analytics often involves a more advanced and in-depth application of statistical techniques to extract insights from data. It encompasses predictive modeling, data mining, machine learning, and other sophisticated statistical methods to uncover patterns, trends, and future outcomes. On the other hand, business intelligence typically focuses on collecting, organizing, and presenting data in a user-friendly manner to support decision-making processes. While BI may involve some basic statistical analysis, its primary objective is to provide users with easy access to relevant data and generate reports and visualizations that facilitate data exploration and monitoring (Stanton & Stanton, 2020).

Moreover, business analytics often requires domain-specific knowledge and expertise to interpret and analyze data within the context of a particular industry or business problem. This understanding allows analysts to apply the appropriate statistical techniques and derive actionable insights that align with the unique requirements of the organization (T. H. Davenport & Patil, 2012).

In summary, while business analytics and BI share similarities in terms of data-driven decision making, the primary differences lie in the advanced statistical methods used in analytics and the domain-specific knowledge required for effective analysis in specific industries (Stanton & Stanton, 2020).

2.2.2 Business Analytics definitions

According to Delen & Ram (2018), business analytics is a concept that is still evolving, and there is no universally accepted and authoritative definition for it. The authors argue that this lack of consensus is not reasonable, considering the varied ways in which the term is usedin practice, academic programs, and research. Given the diverse applications of Business Analytics, it is challenging to expect a standardized definition that encompasses all its uses. Different industries, organizations, and academic institutions may have their own interpretations and approaches to Business Analytics based on their specific needs and contexts.

In terms of university academic programs, the content and focus of what is taught about Business Analytics can vary. Different universities may offer courses or programs with varying emphases, such as data management, statistical analysis, predictive modeling, data visualization, or decision support systems. The curriculum may be designed to provide students with a combination of technical skills, business acumen, and analytical thinking to address real-world challenges. The specific courses and topics covered in Business Analytics programs can include data mining, machine learning, business intelligence, optimization, big data analytics, and data-driven decision making. Additionally, universities may incorporate case studies, practical projects, and internships to provide students with hands-on experience in applying analytics techniques to real-world scenarios.

Overall, the literature show that the field of Business Analytics is in a constant state of evolution, driven by advancements in technology, data availability, and analytical techniques, and its definition and content may differ depending on the context. As new technologies emerge and data sources expand, the scope and capabilities of Business Analytics continue to grow.

The field is continuously adapting to incorporate innovative approaches such as machine learning, artificial intelligence, and deep learning to enhance the analysis and interpretation of data. Moreover, as businesses recognize the value of data-driven insights, there is a growing demand for skilled professionals who can effectively leverage Business Analytics to drive strategic decision-making. As a result, the field of Business Analytics is dynamic and ever-evolving, with ongoing developments and advancements shaping its future trajectory. However, university academic programs typically aim to equip students with the knowledge and skills needed to analyze and leverage data for informed decision making in a business context (Baron, 2021; Chee Sun Lee & Sharon, 2022; Daradkeh, 2023; Delen & Ram, 2018; Shiyu Liu et al., 2023).

Given the diverse applications and interpretations of the term in practice, academic programs, and research, it is unreasonable to expect a single authoritative definition. Shiyu Liu et al. (2023) in recent review *"A Review on Business Analytics: Definitions, Techniques, Applications and Challenges"* states that "*At present, there is still no uniform definition of business analytics."*

Delen & Ram (2018), describes business analytics as the combination of art and science, employing advanced mathematical, statistical, machine learning, and network science techniques to uncover valuable insights. By utilizing diverse data sources and expert knowledge, business analytics supports enhanced decision-making processes in terms of both quality and speed. It serves as a catalyst for effective problem solving and decision-making.

The next table illustrates some of the definitions found in the literature:

Table 2.2 – Business Analytics Definitions

Definitions	Authors
"Business analytics is a common approach for enterprises to use historical data to drive optimal decisions and to create large business value."	Shiyu Liu et al. (2023)
"Business analytics, a term originally coined by industry, is perhaps the encapsulation of those tools aimed at converting data (big or small, structured, or unstructured) into actionable insight through a scientific/mathematical/intelligent process. "	Delen & Ram (2018)
"Business Analytics is a systematic thinking process that applies qualitative, quantitative, and statistical computational tools and methods to analyze data, gain insights, inform, and support decision-making."	D. J. Power et al. (2018)

"Extensive use of data, statistical and quantitative analysis, explanatory and predictive models, and fact-based management to drive decisions and actions."	Davenport and Harris (2017)
"Business Analytics is an application of relevant, measurable knowledge to strategic and tactical business objectives through data-based decision making."	Stubbs (2014b)
"Business analytics is "the generation of knowledge and intelligence to support decision making and strategic objectives.""	Goes (2014)

Source: Own Production based on literature

2.2.3 Techniques of Business Analytics

Business analytics encompasses a variety of techniques that are employed to analyze data and derive insights for informed decision-making. The selection and application of these techniques depend on the specific business objectives, available data, and analytical requirements of the organization. According to Delen & Ram (2018), business analytics is commonly categorized into three types: descriptive analytics, predictive analytics, and prescriptive analytics. By combining these three types of analytics, organizations can achieve a holistic view of their data, revealing valuable insights, making reliable predictions, and recommending optimal actions to enhance business performance. Each type of analytics utilizes distinct methodologies and tools tailored to the organization's objectives and data resources. Descriptive analytics provides historical context and summarization, predictive analytics enables forecasting and trend identification, and prescriptive analytics offers actionable recommendations for informed decision-making. By combining these analytics approaches, businesses can extract maximum value from their data and drive growth and efficiency (Shiyu Liu et al., 2023).

2.2.3.1 Descriptive Analytics

According to Chee Sun Lee & Sharon (2022) , historical data analysis involves interpreting sets of data from a specific timeframe to identify valuable trends and patterns. This process entails examining detailed information within the data, such as the occurrence of events, the value of operations, and the failure mode. By drilling down into the historical data, organizations can gain insights into past performance and understand key factors that contributed to success or failure. This analysis helps inform decision-making and can guide future strategies and actions.

Analyzing data individually can be challenging due to its sheer volume. To make data more manageable and meaningful, it is often summarized and presented in a concise form (Kaur et

al., 2018; Yellapu, 2018). Descriptive analytics techniques, such as calculating mean, median, mode, percentage, etc., are commonly employed for this purpose. In business settings, historical data is often stored to assess past performance and make informed decisions regarding consumer behavior and retail sales. Basic tools like MS Excel, SPSS, MATLAB, and others can be utilized to perform descriptive analytics and extract valuable insights from the data (Saxena et al., 2021).

Descriptive analytics focuses on summarizing and understanding historical data in an organized manner by describing the relationship between variables in a sample or population to gain insights into past trends, patterns, and performance (Baron, 2021). The author pointed out that descriptive analytics often involves clustering and presenting challenges such as interpreting available records and handling missing or inaccurate data. However, he states that it is a crucial foundation for predictive, comparative, and prescriptive analytics, which rely on the insights gained from analyzing historical data. By effectively utilizing descriptive analytics, organizations can make informed decisions, predict outcomes, compare performance, and prescribe optimal actions to drive business success. In general, involves utilizing historical data to provide insights that enable corporations to improve and manage their business processes effectively. This systematic approach offers additional advantages as it helps improve the well-being of workers.

Delen & Ram (2018), describes descriptive analytics as the entry level in analytics taxonomy. In simpler terms, they state that descriptive analytics, also called BI (because BI has been a widely adopted technology trend in the field of information systems for supporting managerial decision-making since the early 2000s), is often referred to as business reporting because its focus is on creating reports that summarize past business activities, to answer the questions of "*What happened?*" or "*What is happening?*". According to the authors, these reports can be categorized into three types: static snapshots, dynamic performance indicators, and ad-hoc reporting. Static snapshots provide a periodic summary of business transactions to decision-makers. Dynamic performance indicators offer real-time or near real-time updates on key metrics, presented in visually appealing dashboards. Ad-hoc reporting allows decision-makers to create customized reports using user-friendly graphical interfaces to address specific decision-making scenarios. Overall, these reports aim to provide knowledge workers, managers, and executives with easily understandable and actionable insights about the business.

Later, Soldić-Aleksić et al. (2020), goes in the same direction describing that analytics primarily focuses on past events and aims to answer the question of "*What happened in the*

past?". The author raise that this type of analytics is referred to as a post-festum (post-mortem) analytics and is based mainly on the usage of descriptive statistical techniques. Authors reinforces that, today, most of business analytics still belongs to this analytics type.

By analyzing historical data, organizations can identify areas of improvement, optimize operations, and enhance worker safety and satisfaction. This leads to improved overall performance and a better working environment for employees (Kaur et al., 2018).

In addition, descriptive analytics plays a vital role in providing the raw data necessary for performing descriptive statistics and regression analysis. By utilizing descriptive analytics, accounting departments can effectively carry out their planning and control functions. It reduces reliance on traditional financial statements, sales reports, and internal documentation for measuring past performance. This, in turn, enhances the effectiveness of performance measurement and evaluation within accounting processes (Uyar, 2021).

2.2.3.2 Predictive Analytics

According to Delen & Ram (2018), predictive analytics comes right after the descriptive analytics in the three-level analytics hierarchy. They state that organizations that have advanced in descriptive analytics progress to a higher level where they shift their focus from understanding past events to predicting future outcomes. They seek to answer the question of "What will happen?" by utilizing predictive analytics techniques. Prediction is a crucial process that involves making informed estimates or forecasts about future values of certain variables. It utilizes intelligent and scientific techniques to anticipate factors such as customer demand, interest rates, stock market movements, and more. By leveraging historical data and applying statistical models or machine learning algorithms, prediction aims to provide valuable insights into future trends and patterns, enabling organizations to make proactive decisions and strategies.

Predictive analytics aims to forecast future outcomes and behaviors based on historical data patterns. It involves the use of statistical modeling, data mining, machine learning algorithms, and predictive modeling techniques to make predictions and identify potential future trends (Chee Sun Lee & Sharon, 2022). This level of analysis also involves the application of various analytical and multidimensional techniques, such as regression analysis, mathematical modeling, decision trees, scenario analysis, game theory, and probability modeling. It goes beyond the traditional and financial weighted applications like ratio analysis, comparative table analysis, percentage analysis, and profitability analysis. These advanced methods enable

organizations to gain deeper insights, make more accurate predictions, and explore complex relationships within their data, leading to enhanced decision-making capabilities and strategic planning. Forecasting and probability models use historical data collected over time to understand possible future events. Descriptive analytics is strongly related to the use of predictive analytics, this type of analytics refers to using knowledge extracted from descriptive analytics to realize what will happen in the future (Ben Rabia & Bellabdaoui, 2020; Soldić-Aleksić et al., 2020; Uyar, 2021).

Saxena et al. (2021) pointed out that predictive analytics involves predicting the probabilities of future events or outcomes, but it does not provide certainty about their occurrence. It focuses on the likelihood of events happening rather than when, how, where, or if they will happen. One notable application of predictive analytics is sentiment analysis, which analyzes human emotions related to individuals, events, or objects. According to the authors, to effectively implement predictive analytics, companies need skilled data scientists who can work with machine learning algorithms and models to extract valuable insights from data.

2.2.3.3 Prescriptive Analytics

According to Delen & Ram (2018), prescriptive analytics is the highest level in the analytics hierarchy and aims to determine the best course of action among multiple alternatives. It builds upon the insights provided by predictive and descriptive analytics and utilizes advanced mathematical models and involves that application of mathematical or computational techniques to determine the best possible outcome in each scenario, aiming to improve the performance of a corporation. It goes beyond descriptive and predictive analytics by providing recommendations and actionable insights. the focus is to answer the question of "What should I do?", by employing techniques such as optimization, simulation, and decision modeling.

By analyzing historical data, predicting future outcomes, and considering various constraints and objectives, prescriptive analytics helps organizations make informed decisions and take optimal actions to achieve their desired results. It helps in maximizing efficiency, optimizing resources, minimizing risks, and ultimately enhancing the overall performance and competitiveness of the corporation.

Uyar (2021), believed too that prescriptive analytics goes beyond descriptive and predictive analytics by leveraging their data to the next level to uncover potential solutions and recommendations. It takes the analysis a step further by offering actionable insights and suggesting possible courses of action based on the data. He pointed that prescriptive analytics

goes beyond predicting future outcomes and provides recommendations or actions to optimize decision-making. It combines historical data, predictive modeling, optimization techniques, and decision algorithms to suggest the best course of action to achieve desired outcomes.

To Baron (2021), the goal of prescriptive analytics is to recommend interventions that can enhance system performance. He states that the ultimate grail of analytics and its ultimate objective is to discover novel interventions that can lead to improvements. He also pointed out that to achieve this, prescriptive analytics utilizes inductive reasoning to predict outcomes under different interventions that are not part of the original dataset. By effectively using prescriptive analytics, decision-makers can make recommendations based on a thorough understanding of the influential factors affecting performance measures. This reduces the need for blind trust in implementing the recommended interventions, as decision-makers have considered and comprehended the key factors involved.

Figure 2.5 – Taxonomy for Analytics

Source: A Simple Taxonomy for Analytics (Delen & Ram, 2018)

2.2.3.4 Diagnostic Analytics

Revisions in the field of analytics have expanded the categorization of analytics into four dimensions, with the addition of a diagnostic component. Diagnostic analytics evaluates '*why'*

something happened (Banerjee et al., 2013). The goal is to identify the root causes or factors that contributed to a particular problem or outcome. Later Soltanpoor & Sellis (2016) also refers this kind of analytics which reports the past, but tries to answer questions like "*Why did this happen?*", assisting organizations in comprehending the factors and reasons behind past events. They regard that provides enterprises with the ability to understand the relationships and connections among various types of data, enabling them to gain insights into the underlying causes of specific outcomes or occurrences.

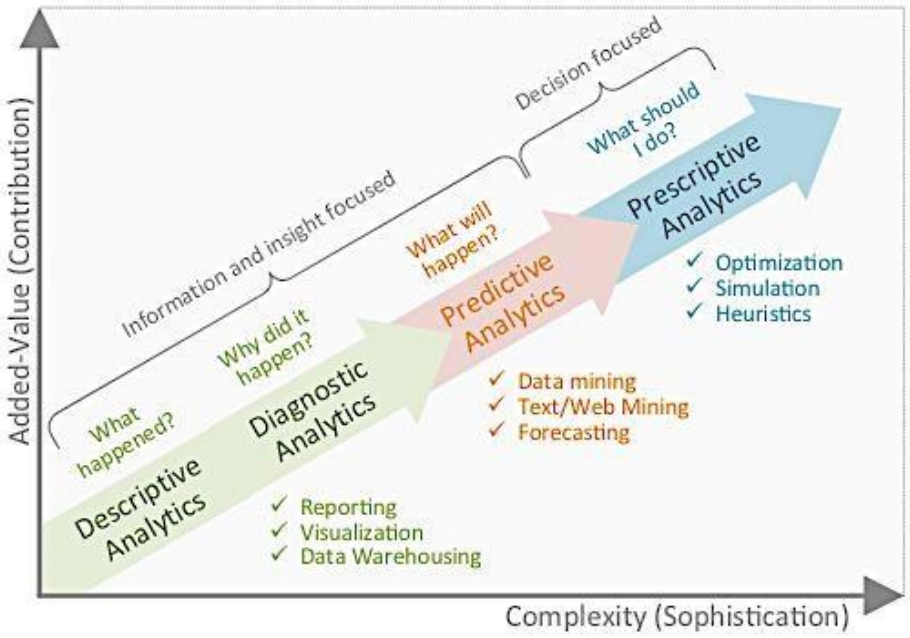
Delen & Zolbanin (2018), refer to diagnostic analytics as an extension of descriptive analytics, focuses on analyzing data or content to provide insights into the reasons or causes behind specific events or occurrences. The main objective is to answer the question "*why did it happen?*" by delving deeper into the data and uncovering the underlying factors or relationships that contributed to the observed outcomes. Diagnostic analytics focuses on understanding the reasons behind certain events or outcomes. It involves conducting exploratory data analysis using various tools, such as visualization techniques, to delve into existing data or collect additional data if necessary.

Sometimes the data available in the prescribed formats is not enough and one needs to move beyond the data visible to the naked eye. The data scientist must drill deep into the world of data and discover new things which will make sense. The existing situation demands precision and accuracy. Data will be unevenly distributed, may be found in chunks that do not make any sense, but when the puzzle is completed by mining all the data chunks, the diagnostic can be performed. Diagnostic analytics makes use of probabilities, that is, the likelihood of occurrence of events. Diagnostic analytics goes beyond surface-level analysis and delves deep into understanding the root causes of events, providing valuable insights into existing problems and opportunities for improvement. It is particularly effective in examining time-series data and can forecast future sales by analyzing trends and patterns. By uncovering the underlying factors influencing outcomes, diagnostic analytics enables organizations to make informed decisions and take proactive measures to address challenges and optimize performance. (Saxena et al., 2021).

Lepenioti et al. (2020), in line with other research studies Šikšnys & Pedersen (2016); Krumeich et al. (2016), categorize diagnostic analytics as part of descriptive analytics. This classification ensures consistency across the three stages of analytics mentioned above, with each stage addressing the questions of "*What?*" and "*Why?*". Descriptive analytics encompasses

both the understanding of past events ("*What has happened?*") and the current situation ("*What is happening now?*").

Figure 2.6 – Taxonomy for Analytics



Source: Different Types (sophistication levels) of Business Analytics (Delen & Zolbanin, 2018)

2.2.4 Techniques of Analytics

In one of the early descriptions of analytics, the term was used interchangeably with data mining, and it was defined as the overall process of exploring and analyzing data to uncover novel and significant patterns. This definition emphasizes the core objective of analytics, which is to extract valuable insights and identify meaningful patterns from data through exploration and analysis. By applying various techniques and tools, analytics enables the discovery of hidden knowledge and the generation of actionable insights to support decision-making and problem-solving (Delen & Zolbanin, 2018).

2.2.4.1 Data Mining

According to Osman (2019) , data mining techniques involve the identification of patterns and trends within large datasets to extract valuable information and facilitate decision-making. By applying various algorithms and statistical models, data mining helps uncover hidden insights and knowledge that may not be readily apparent. These techniques enable organizations to analyze vast amounts of data efficiently and effectively, allowing them to make informed

judgments and decisions. The goal is to derive meaningful information from complex datasets and utilize it to gain a competitive advantage, improve operations, and drive business success.

Data mining involves extracting valuable insights and patterns from large datasets. It utilizes techniques such as clustering, classification, association rules, and anomaly detection to discover hidden patterns, relationships, and trends in the data. The primary goal of data mining tools is to uncover significant patterns and unknown correlations within data that can be utilized to inform business decisions (Delen & Zolbanin, 2018). These tools enable organizations to delve deeper into their data, identify hidden insights, and discover valuable relationships that may not be apparent through traditional analysis methods. Data mining holds great potential in the field of analytics, as it offers the opportunity to extract valuable knowledge and gain a deeper understanding of business processes, customer behavior, and market trends. It continues to evolve and expand as a field, offering promising possibilities for organizations seeking to leverage data for strategic decision-making (Banerjee et al., 2013).

Data mining encompasses a range of techniques used in projects to extract valuable insights from data. These techniques include association, classification, clustering, decision trees, prediction, and Neural Networks, among others. Each technique has its own set of rules and methods that determine the specific problem it addresses. These techniques are employed to analyze and interpret data, uncover patterns, make predictions, and classify data into meaningful categories. By understanding and utilizing these techniques, organizations can gain a deeper understanding of their data and make informed decisions based on the insights derived from them (Osman, 2019).

2.2.4.2 Machine Learning

Nguyen et al. (2019), defines Machine Learning (ML) as a branch of Artificial Intelligence (AI) that focuses on enabling computer systems to learn and improve their performance based on previous experiences or data observations. ML techniques encompass a wide range of algorithms and methods, including Support Vector Machines (SVM), decision trees, Bayes learning, k-means clustering, association rule learning, regression, neural networks, and more (Obogo & Adedoyin, 2021). These techniques allow machines to analyze data, identifypatterns, make predictions, and make informed decisions without explicit programming. ML algorithms are trained on large datasets and iteratively improve their performance over time, leading to more accurate and efficient outcomes in various tasks and domains (Nguyen et al., 2019).

Machine learning algorithms enable systems to automatically learn from data and improve their performance without being explicitly programmed. It involves techniques such as regression, decision trees, neural networks, and support vector machines, which enable models to learn patterns and make predictions or classifications based on new data (Jahan, 2021; Mathew & Abdulla, 2021).

2.2.4.3 Text Analytics

Asudani et al. (2023), state that text data is a significant part of the information available on the internet, but it is predominantly unstructured and scattered. This means that it lacks a predefined format and is not organized in a systematic manner. Unstructured text data includes a variety of content and text analytics focuses on extracting insights from those unstructured textual data, such as customer reviews, social media posts, emails, and surveys. Due to its unstructured nature, extracting meaningful insights and knowledge from text data can be challenging (Xiang et al., 2015; Yuan et al., 2016). However, with the advancements in natural language processing (NLP) and text mining techniques, it has become possible to analyze and extract valuable information from unstructured text sources. These techniques enable the processing, organization, and interpretation of text data, leading to improved understanding, sentiment analysis, topic modeling, and other text-based applications. (Asudani et al., 2023).

2.2.4.4 Optimization Techniques

Optimization techniques are used to find the best solution or course of action that maximizes or minimizes a specific objective function. These techniques involve mathematicalprogramming, linear programming, integer programming, and other optimization algorithms to optimize resource allocation, scheduling, inventory management, and other decision-making processes (Uyar, 2021).

2.2.5 Business Analytics in Hospitality

Digital transformation has been observed in various industries such as healthcare, finance, retail, media, and entertainment, but the tourism industry has experienced a remarkable shift in recent years. The extent of digital transformation in tourism has been substantial, as technology-driven changes have revolutionized the way businesses operate and interact with travelers. This transformation has resulted in significant advancements in areas such as online booking systems, personalized marketing, virtual experiences, and data-driven decision making, fundamentally altering the landscape of the tourism industry (Imtiaz & Kim, 2019).

Tourism is an expanding industry, with millions of tourists worldwide visiting various destinations each year, often staying for at least one night. The habits and preferences of today's tourists have significantly evolved compared to those of tourists from two or three decades ago. The 21st-century tourist exhibits different behaviors and expectations, influenced by technological advancements, changing travel patterns, and evolving societal trends. These changes have prompted the tourism industry to adapt and innovate in order to meet the needs and demands of modern travelers (Jimenez-Marquez et al., 2019). In today's information-rich world, the tourism sector has become increasingly dependent on technology to attract and acquire new clients. With the abundance of information available to travelers, technology plays a vital role in helping tourism businesses stand out from the competition and reach their target audience. Whether it's through online booking platforms, social media marketing, personalized advertising, or interactive websites, technology enables tourism companies to showcase their offerings, engage with potential clients, and create unique experiences that capture attention in a crowded marketplace. By leveraging technology effectively, businesses in the tourism sector can enhance their visibility, connect with a wider audience, and ultimately drive growth in an industry that thrives on attracting and satisfying travelers (Sakas et al., 2022).

The internet has revolutionized the way tourism companies operate and conduct business. It has transformed various aspects of the industry, including marketing, communication, customer acquisition, and service delivery. With the internet, tourism businesses have access to a global audience and can reach potential customers through various online platforms and channels. Online booking platforms and travel websites have made it easier for travelers to research and book their trips, eliminating the need for traditional travel agents in many cases. Communication with customers has also been streamlined through email, social media, and instant messaging, allowing for quicker and more efficient interactions(Leung et al., 2013). Overall, the internet has empowered tourism companies to deal with amount of data to expand their reach, improve customer experiences, and adapt to the changing landscape of the industry and the literature review highlights a significant correlation between big data and innovation in the field of tourism research. The analysis indicates that the utilization of large volumes of data can lead to novel insights, improved decision-making processes, and the development of innovative approaches within the tourism industry. This connection suggests that harnessing the power of big data and analytics can drive advancements and transformative changes in the way tourism research is conducted and applied (Li et al., 2018; Masril et al., 2020).

The hospitality industry has historically been slower in embracing and implementing emerging technological advancements compared to other industries. While sectors such as finance, healthcare, and retail have readily, as mentioned earlier, embraced new technologies, the hospitality industry has faced challenges in keeping pace. Factors such as the complexity of operations, legacy systems, and concerns about guest experience have contributed to this lag in technology adoption. However, in recent years, there has been a growing recognition of the importance of technology in enhancing operational efficiency, improving guest experiences, and staying competitive in the market. As a result, the hospitality industry is increasingly focusing on catching up and integrating innovative technologies to meet the evolving needs and expectations of modern travelers (Nadkarni et al., 2020). When it comes to data management solutions, business intelligence software and business analytics programs are considered to be among the most widely implemented options in the industry. These tools offer organizations the ability to gather, analyze, and interpret data to gain valuable insights and support informed decision-making processes. Business intelligence software enables businesses to collect and organize data from various sources, transforming it into meaningful reports and visualizations. On the other hand, business analytics programs go a step further by using advanced statistical and predictive modeling techniques to uncover patterns, trends, and future outcomes from the data. Both these solutions play a crucial role in helping businesses harness the power of data and derive actionable insights for improved performance and competitiveness (Lee et al., 2020).

According to INFORMS (2019), based on a case study in the hospitality sector, Marriott International, a global hotel and resort firm, has a strong emphasis on fact-based decision making and analytics, which is deeply ingrained in the company's corporate culture and history. According to a senior executive within the organization, this focus on data-driven insights is integral to Marriott's operations and decision-making processes and claims that "*Everything is based on metrics here.*".

Marriott International's commitment to fact-based decision making and analytics can be traced back to its early days. In the 1950s, the company's founder, J. Willard Marriott, would personally monitor the occupancy of cars entering the parking lot of his motel. This hands-on approach allowed him to determine the appropriate rate to charge for a double room based on the demand observed. This early practice demonstrated Marriott's recognition of the value of data and its influence on pricing decisions, setting the foundation for the company's future focus on analytics-driven decision making (Cochran, 2019).

Business Analytics encompasses the extensive use of data and quantitative analysis techniques, including data mining and statistical analysis, to gain new insights and improve understanding of business performance. Its primary objective is to leverage these analytical approaches to extract valuable information that can inform and guide decision-making processes within organizations. By utilizing Business Analytics, businesses can make data-driven decisions that drive their operations, enhance efficiency, identify opportunities, mitigate risks, and optimize overall performance. The application of these analytical methods enables organizations to harness the power of data and transform it into actionable insights for strategic and operational benefits. (Chen et al., 2012c; T. H. Davenport, 2010) (Che et al., 2012b). In its essence, business analytics involves the application of analytics techniques to address various business problems. It encompasses the use of data analysis, statistical modeling, and predictive analytics to extract insights and make informed decisions in a business context. By leveraging business analytics, tourism organizations and hotels can uncover patterns, trends, and relationships within their data to gain a deeper understanding of their operations, customers, and market dynamics. This enables to identify opportunities, optimize processes, mitigate risks, and drive overall business performance. Ultimately, business analytics serves as a powerful tool for extracting valuable insights from data and translating them into actionable strategies and outcomes. (D. Power et al., 2018). However, Research has underscored the importance of developing a clearly defined strategy and implementing an appropriate organizational structure to maximize the benefits of business analytics (Daradkeh, 2023).

2.2.6 Business Analytics Trends

According to Ajah & Nweke (2019), Big Data and Business Analytics (BA) are transformative trends that are having a positive impact on the business world. Pantano & Romagnano (2022), states that Business Intelligence (BI) and BA are highly beneficial trends within the field of Data Science because they provide organizations with competitive advantages by offering precise insights into their current status (BI) and enabling them to forecast market behavior and take proactive actions based on predictive and prescriptive analysis (BA). They regard that these concepts are not new, they are gaining significant popularity and recognition in recent times. Their proper utilization empowers organizations to make data-driven decisions, enhance operational efficiency, and stay ahead in a highly competitive business landscape.

The rapid growth of the tourism industry has led to a significant increase in data for companies and hotels. In this fast-paced business environment, making timely and well-informed decisions is more important than ever. To stay competitive, businesses need to efficiently handle and analyze large amounts of data, allowing them to gain valuable insights, streamline operations, and adapt to the changing dynamics of the tourism industry (Chen et al., 2012b).

According to Rodrigues et al. (2020), in their systematic literature review on hospitality analytics, identified three significant trends related to the exploration of the relationship between the success of Business Analytics implementation, organizational culture, and decision-making. These trends highlight the importance of understanding how organizational culture influences the success of BA implementation and its impact on decision-making processes in the hospitality industry.

(1) In recent years there has been a significant rise in the adoption of Business Intelligence (BI) systems by organizations, with a notable increase in the number of firms investing in these technologies (Gartner, 2017). The growing dependence on BI systems for decision making has been observed over the past two decades, as businesses recognize their potential to enhance decision-making effectiveness. This trend is fueled by advancements in technology, which have made BI technologies more accessible and affordable for companies of all sizes, enabling them to leverage the benefits of BI in their decision-making processes (Gartner, 2017).

Consequently, BI systems have evolved into sophisticated IT solutions designed to manage a wide variety of data and to provide analytical tools to assist management in decision-making. The financial risks associated with IT use by both large and small enterprises are of greater relevance not only due to direct technology acquisition costs but also due to the high implementation expenses associated with time away from productive work in the form of downtime or training (Lippert & Swiercz, 2005). As such, understanding the factors that impact successful implementation has economic implications regardless of organizational size.

(2) The integration of Business Analytics functionality into full-service software technologies introduces additional challenges for personnel in terms of learning and incorporating the diverse range of functions available within these systems. This expansion requires individuals to familiarize themselves with the various BI features and understand how to effectively utilize them within their day-to-day operations. This increased complexity places

additional burdens on personnel, necessitating training and support to ensure they can leverage the full potential of BI within the integrated software technologies.

(3) The emergence of trust implications accompanies the implementation of BI systems. With these systems, organizational members at all levels gain the ability to access data quickly and efficiently. This accessibility empowers managers and supervisors to utilize the information for decision-making purposes. However, it also raises concerns about the trustworthiness and integrity of the data. Establishing trust in the accuracy, reliability, and security of the data becomes crucial to ensure that individuals throughout the organization have confidence in using the information for decision-making processes (Rodrigues et al., 2020).

Begins to be commonly used the term Big Data which represents a massive volume of structured and unstructured data and it is increasingly difficult processing this huge volume through the use of traditional software techniques or by using traditional statistical methods (Baggio, 2016). Big Data has also started to be a source for Business Intelligence activities. The tradition of BI analytics is longer, but the field is susceptible to all data and information sources that can provide a better return on the investment (Liebowitz, 2013). Therefore, both subjects are highly complementary.

2.3 Big Data and Analytics in Hospitality

According to Baggio (2016), the term "Big Data" has gained common usage and refers to a vast amount of structured and unstructured data. Processing such a massive volume of data has become increasingly challenging using traditional software techniques or statistical methods. The sheer scale and complexity of Big Data require innovative approaches and advanced technologies to extract meaningful insights and derive value from the data. Big Data has emerged as a valuable source for Business Intelligence activities, complementing the longer tradition of BI analytics. The field of Business Intelligence is open to leveraging all available data and information sources that can yield a better return on investment. As a result, the integration of Big Data and Business Intelligence has become highly complementary, allowing organizations to gain valuable insights and make informed decisions by harnessing the power of diverse data sources (Liebowitz, 2013).

According to literature, we cannot talk about business analytics without talk about Big Data and Analytics. Big data and analytics are emerging as key drivers of digital transformation

across various industries, including the tourism and hospitality sector. These technologies enable organizations to gather, process, and analyze vast amounts of data to derive meaningful insights and drive greater effectiveness and efficiency in their operations. By leveraging big data and analytics, companies in the tourism and hospitality industry can gain a deeper understanding of customer behavior, preferences, and trends, allowing them to tailor their offerings and services accordingly. Furthermore, these technologies empower organizations to define new business models, optimize processes, and adapt to the evolving needs of their customers, ultimately facilitating successful transformative change within the industry (Evans, 2020; Yallop & Seraphin, 2020).

The field of Business Analytics encompasses the extensive utilization of Big Data in decision-making processes. It leverages various data processing methods to support effective decision-making, including Optimization, Forecasting, Predictive Modeling, and Statistical Analysis. These techniques enable organizations to make informed decisions by extracting valuable insights from data, identifying patterns, and predicting future outcomes. Optimization helps optimize resources and processes, while Forecasting assists in predicting future trends and demand. Predictive Modeling employs statistical algorithms to make predictions, and Statistical Analysis provides a deeper understanding of data through descriptive and inferential techniques. Together, these methods form a comprehensive toolkit within Business Analytics, enabling organizations to harness the power of data and drive informed and effective decision-making (Silva et al., 2021).

In the tourism and hospitality sector, the utilization of big data is particularly relevant and impactful. For example, revenue management practices involve leveraging big data by combining internal data such as occupancy rates and current bookings with external data like local events, school holidays, and flight information. This integration enables accurate demand forecasting and facilitates the optimization of revenue generation. Market research and strategic marketing efforts benefit from big data as it allows businesses to identify customer trends and preferences, enabling targeted and effective marketing campaigns. Additionally, big data plays a crucial role in customer experience and reputation management, as it encompasses monitoring social media conversations, online reviews, service usage data, and customer surveys. This comprehensive analysis helps organizations improve their services, enhance customer satisfaction, and manage their reputation in the digital landscape. Overall, the effective utilization of big data in the tourism and hospitality industry enables businesses to make data-

driven decisions, boost revenues, and provide exceptional customer experiences (Evans, 2020; Guttentag, 2019).

Over the past decade, and especially in the last five years, the tourism and hospitality industries have witnessed a significant increase in the adoption of Big Data and Analytics. This surge in usage has propelled a heightened emphasis on research within these fields. The recognition of the potential value that Big Data and Analytics can bring to the tourism and hospitality sectors has spurred a growing interest among researchers and practitioners alike. This increased focus on research aims to explore and understand the various applications, challenges, and benefits associated with utilizing Big Data and Analytics in these industries. By delving into these areas, researchers aim to enhance industry practices, develop innovative solutions, and unlock the full potential of data-driven insights for improved decision-making and performance in the tourism and hospitality sectors (Mariani & Baggio, 2022; Mariani & Borghi, 2020).

2.3.1 Big Data Definitions

The definitions of Big Data vary significantly, reflecting the diverse perspectives and the evolving nature of the field. The lack of a universally accepted definition indicates the dynamic and rapidly changing state of the art in Big Data. Different definitions emphasize various aspects, such as the volume, velocity, variety, and value of data. Some definitions focus on the technical challenges of managing and processing large datasets, while others highlight the potential insights and business value that can be derived from Big Data. Overall, the array of definitions reflects the complex and multifaceted nature of Big Data and the ongoing exploration and development of this field (De Mauro et al., 2016).

Table 2.3 – Big Data and Analytics Definitions

Definitions	Authors
"Big Data Analytics (BDA) is described, as the process by which one seeks to manage data, store, use and analyze it, according to business needs, in order to extract knowledge and actions that can be used by decision-makers."	Ben Rabia & Bellabdaoui (2020)
"A new generation of technologies and architectures, designed to economically extract value from very large volumes of a wide variety of data, by enabling high velocity capture, discovery and/or analysis. "	Mikalef et al. (2019)
"BDA can be defined as a holistic process that involves the collection, analysis, use, and interpretation of data for various functional divisions	Akter et al. (2019)

with a view to gaining actionable insights, creating business value, and establishing competitive advantage. "	
"BDA describe huge data sets requiring advanced and unique data storage, management, analysis, visualization technologies as well as statistical analysis,"	Chen et al. (2012c)
"Big data represents the information assets characterized by such a high volume, velocity and variety to require specific technology and analytical methods for its transformation into value."	Misirlis & Steenhoven (2022)
"Big Data is the Information asset characterized by such a High Volume, Velocity and Variety to require specific Technology and Analytical Methods for its transformation into Value."	De Mauro et al. (2016)
"Big data is data that exceeds the processing capacity of conventional database systems. The data is too big, moves too fast, or doesn't fit the strictures of your database architectures. To gain value from this data, you must choose an alternative way to process it."	Dumbill (2013)

Source: Own Production based on literature

2.3.2 From 3Vs to 5Vs Big Data Models

The advent of the big data era has witnessed the widespread application of various types of data, accompanied by conceptual and technological advancements, across numerous fields suchas science, engineering, healthcare, management, business, tourism, and more. Despite its significance, as mentioned before, there is no universally accepted definition of big data, leading to a multitude of definitions provided by different researchers. This lack of a uniform definition highlights the complexity and evolving nature of big data and the diverse perspectives surrounding it. As the field continues to evolve, it is essential to recognize and accommodate the varied interpretations and definitions of big data that emerge from different contexts and disciplines (Li et al., 2018). Indeed, a uniform definition of big data has yet to be established, leading to a wide range of definitions provided by various researchers. Chen et al. (2012c), states that Big Data and Big Data Analytics are widely used to refer to large-scale data sets that necessitate advanced and specialized technologies for storage, management, analysis, visualization and statistical analysis.

One well-known and original definition of Doug Laney (2001) is the 3V model, which characterizes big data based on its Volume, Variety, and Velocity. These three dimensions provided a foundational understanding of the challenges and opportunities associated with big data also defined for other researchers (Chern et al., 2015; McAfee et al., 2012) . Volume refers to the vast amount of data generated and collected, in the context of big data refers to the massive scale of data generated from diverse sources, including mobile devices and digital platforms. Variety denotes the diverse types and formats of data that are generated and

collected, and Velocity pertains to the speed at which data is generated, processed and analyzed (Bumblauskas et al., 2017; McAfee et al., 2012). This 3V model has been instrumental in understanding the unique challenges and opportunities associated with big data. However, it is important to note that other researchers have proposed additional dimensions, such as Veracity and Value, highlighting the evolving nature of big data and the ongoing exploration to capture its complexity (Li et al., 2018).

The original 3V model of big data (Volume, Variety, and Velocity) was later refined to incorporate additional dimensions. Two crucial aspects that were introduced are Value and Veracity, resulting in the formulation of a 5Vs framework (Bumblauskas et al., 2017). Value represents the process of extracting valuable insights and knowledge from the vast amounts of data available from data. It emphasizes the importance of deriving meaningful outcomes and actionable intelligence from the vast amount of data available. Veracity, on the other hand, addresses the governance of data and its reliability. It focuses on ensuring the accuracy, quality, and trustworthiness of data, considering factors such as data source, integrity, and validity. By incorporating Value and Veracity, the 5Vs framework provides a more comprehensive understanding of the complexities and considerations involved in working with big data (Bello Orgaz et al., 2015; Bumblauskas et al., 2017).

2.4 Common Operational Systems in Hospitality

In the past, numerous hotel operators have primarily relied on specialized software packages designed specifically for the hotel industry. Many of these software solutions originated from the introduction of personal computers in the 1980s and the subsequent development of software systems for various industry sectors (Wynn & Jones, 2022). According to the authors, historically, the hotel industry has encountered difficulties in aligning its IT and business strategies, even though it has been progressively embracing digital technologies across different operational aspects in recent times. However, the hospitality industry is continuously exploring novel and innovative approaches to enhance the customer experience (Thomas Krabokoukis, 2023).

Operational systems in the hospitality industry are essential for the smooth functioning of daily operations and the effective management of various functions. They are specifically designed to optimize processes, improve guest experiences, and enhance overall operational efficiency within hotels, restaurants, and other hospitality establishments. These systems

automate tasks, streamline workflows, and enable accurate and timely information management. By leveraging operational systems, businesses in the hospitality industry can achieve greater productivity, better resource allocation, and enhanced guest satisfaction (Moyeenudin et al., 2018; Wynn & Jones, 2022).

Operational systems in the hospitality industry are designed to be integrated with one another and with external systems, enabling seamless data flow and facilitating efficient operations within the establishment. This integration allows for the synchronization of information across various departments and functions, such as front desk operations, reservations, housekeeping, inventory management, and point-of-sale systems. By ensuring smooth communication and data sharing, these integrated systems contribute to enhancing guest satisfaction by providing personalized services, optimizing resource utilization by efficiently managing inventory and staffing, and driving revenue growth through improved operational efficiency and targeted marketing strategies. In the highly competitive hospitality industry, the effective implementation of integrated operational systems is crucial for achievingoperational excellence and maintaining a competitive edge (Moyeenudin et al., 2018; Wynn &Jones, 2022).

Understanding the foundation of operational software is crucial because it provides the fundamental raw data necessary to evaluate and establish a Business Analytics structure. Operational software systems capture and store essential information about various business processes, transactions, and customer interactions. This data serves as the building blocks for conducting data analysis, deriving insights, and implementing effective business analytics strategies. Without a solid understanding of the operational software and its data, it becomes challenging to develop a robust and meaningful Business Analytics structure that can drive informed decision-making and generate valuable business insights.

Here are some key operational systems commonly used in the hospitality industry:

2.4.1 Property Management System (PMS)

According to Kasavana (2016), a PMS is the core operational system used by hotels and is defined as "*a set of application programs that directly relate to hotel front office and back office activities e.g. revenue management, reservation management, room and rate assignment, check-in and out management, guest accounting, folio management, account settlement and room status management*". It centralizes data and enables effective management of room inventory, rates, and guest services. Most of these hotel industry software packages are now

accessible through the Cloud, offering a multitude of functions and features. These software packages, hosted on remote servers, provide convenient and flexible access to essential tools and resources for managing various aspects of hotel operations. The cloud-based approach enables seamless collaboration, scalability, and cost-effectiveness, making it a popular choice among hoteliers for their software needs. PMS are the prevailing information systems utilized in the hotel industry and with their widespread availability and global reach, PMS solutions have become integral to the efficient functioning of hotels worldwide (Wynn & Jones, 2022).

2.4.2 Point of Sale (POS) System

According to Moyeenudin et al. (2018), the Point of Sale accepts transaction other than accommodation. POS systems, in the context of the hotel industry, are used in restaurants, bars, and other food and beverage outlets to process orders, manage menus, track sales, and facilitate payment transactions. They streamline order taking, kitchen communication, and inventory management. In a hotel POS serves as a central hub for processing guest orders and payments. It includes features such as menu management, order taking, billing, payment processing, inventory management, and reporting. With a POS system, hotel staff can efficiently manage F&B operations, track sales, monitor inventory levels, and generate reports for analysis and decision-making. Modern POS systems are often cloud-based, offering flexibility and scalability. They can be accessed from various devices, such as tablets or smartphones, allowing staff to take orders and process payments directly at the table or in different areas of the hotel (Jayanti et al., 2020).

Overall, a POS system in the hotel industry plays a vital role in managing F&B operations, providing a seamless and efficient transaction process, and enhancing the overall guest experience.

POS systems in hotels are often integrated with other operational software, such as the Property Management System, to ensure seamless data flow and synchronization between different departments. This integration enables efficient management of guest charges, automatic updates of room bills, and accurate reporting of F&B revenue (Moyeenudin et al., 2018; Putra et al., 2022).

2.4.3 Enterprise Resource Planning (ERP)

According to Samarasinghe et al. (2021), ERP systems is defined as a *''seamless integration of processes across functional areas with improved workflow, standardization of various business*

practices, improved order management, accurate accounting of inventory and better supply chain management'' and have emerged as a solution for automating and improving the efficiency of repetitive business processes. These systems are used across different industries, including the hotel industry, to streamline and automate business processes, improve efficiency, and enhance decision-making offering managers a comprehensive view of operations and enable timely responses to ongoing business activities. Additionally, ERP systems address the challenges of fragmented and disjointed information by integrating various data sources and ensuring data consistency across the organization (Lamiaa, 2015).

In the context of the hotel industry, ERP systems provide functionalities that go beyond the capabilities of Property Management Systems. They integrate different departments and functions within a hotel, such as finance, human resources, inventory management, purchasing, sales, and customer relationship management. By centralizing data and processes, ERP systems enable better coordination, communication, and collaboration across the organization. ERP systems in the hotel industry offer features like financial management, budgeting and forecasting, payroll management, procurement, inventory control, revenue management, and reporting and analytics. They provide a comprehensive view of the hotel's operations, allowing managers to monitor performance, identify trends, make informed decisions, and optimize resources (Samarasinghe et al., 2021).

The implementation of an ERP system in a hotel requires careful planning, customization, and training to align with the specific needs and processes of the establishment. It can improve operational efficiency, facilitate data-driven decision-making, and enhance the overall management and control of hotel operations. However, sometimes these solutions, provided by specialized suppliers, may not be seamlessly integrated with the back office systems and the implemented ERP system (Azevedo et al., 2014b).

Figure 2.7– Module Packages Example

BACK OFFICE		
Financial Applications	**Materials Management**	**Other Applications**
- Accounts Receivable - Accounts Payable - General Ledger - Integrated Receipt - Order Management	- Inventory - Fixed Assets - I-Procurement	- Human Resources Processes - Tax obligations - Cashier

FRONT OFFICE Interface	FOOD & BEVERAGE Interface
Property Management System (PMS)	Point of Sale (POS)

Source: Module packages (PMS, POS and ERP) interfaces example *(Vianna et al., 2014)*

2.4.4 Revenue Management System (RMS)

RMS software assists hotels in optimizing room rates and maximizing revenue. It analyzes historical data, market demand, and competitor rates to recommend optimal pricing strategies for different periods and market segments. It ensures that the right capacity is available at the right time and place to effectively meet customer demand. By analyzing data and employing analytical techniques, RM enables businesses to make informed decisions regarding pricing, inventory management, and distribution channels. The ultimate objective is to achieve the ideal balance between supply and demand, leading to increased revenue and profitability (Bodea & Ferguson, 2014; Vives et al., 2018).

2.4.5 Inventory / Stock Management System

This system tracks and manages inventory levels of various supplies, including food, beverages, linens, and guest amenities. It helps maintain adequate stock levels, streamline procurement processes, and minimize wastage (O'Fallon & Rutherford, 2015).

2.4.6 Housekeeping Management System

Usually is integrated on the Property Management System. Housekeeping systems assist in managing and tracking housekeeping tasks, including room cleaning schedules, maintenance requests, and inventory of cleaning supplies. They help ensure timely room turnover and efficient allocation of housekeeping staff (Kasavana, 2016).

2.4.7 Customer Relationship Management (CRM) System

According to Phillips-Wren & Hoskisson (2014) , CRM is *"a multi-perspective business paradigm that is composed of people, process and technology."* CRM systems enable hotels to manage guest relationships by storing guest profiles, preferences, and communication history. They facilitate personalized marketing campaigns, loyalty programs, and guest feedback management (Khatri, 2019).

2.4.8 Central Reservation System (CRS)

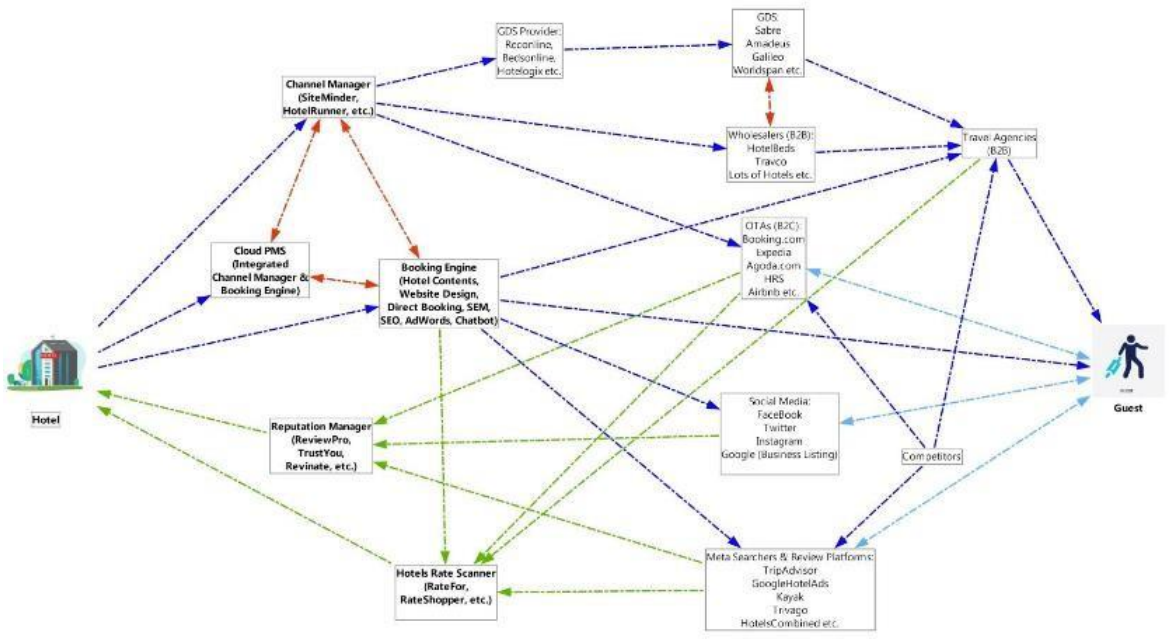
CRS systems manage and distribute hotel room inventory across various distribution channels, including online travel agencies (OTA), internet distribution systems (IDS), global distribution systems (GDS), and direct booking platforms. They enable real-time availability and rate updates, reservation management, and reporting (Moyeenudin et al., 2018). Nowadays, hospitality calls CRS systems as channel managers. In terms of the distribution function, both

the Channel Manager and the Central Reservation System serve the same purpose. They enable an efficient distribution of hotel room inventory across various channels, including popular platforms like Booking.com, Expedia, Trivago, and HotelBeds. These systems provide a centralized platform for managing prices and availability across multiple channels, allowing for quick and accurate updates in a single transaction. Additionally, the synchronization of data between numerous online travel agencies and global distribution systems, as well as the hotel website, ensures ease of use and streamlined operations (Yurtlu & Göral, 2022).

In Portugal Hospitality, the most common software used in independent hotels and hotel chains are Host Hotel Systems, Newhotel, Oracle Hospitality, Protel, Sihot and ITBase.

Understanding the fundamentals of operational software is vital for evaluating and establishing a Business Analytics structure. Operational software systems play a significant role in capturing and storing crucial data related to various business processes, transactions, and customer interactions. Leveraging this data allows organizations to extract valuable insights and make informed decisions, leading to improved operational efficiency, optimized resource allocation, and enhanced overall business performance. By harnessing the power of operational software, businesses can unlock the potential of their data and drive strategic growth.

Figure 2.8 – Functioning of Digital Distribution Channels



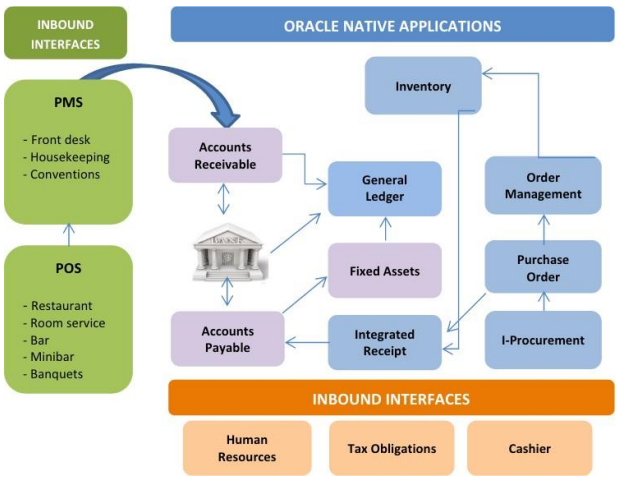
Source: Functioning of Digital Distribution Channels Software *(Yurtlu & Göral, 2022)*

2.5 Technology Integration in Hospitality Industry

According to Wynn & Jones (2022), software vendors in the hospitality industry are increasingly offering integrated information systems that meet the functional requirements of hotel operators. These systems also incorporate advancements in digital technology, which improve data capture, processing, and reporting capabilities. This trend is positive and reflects a growing emphasis on providing comprehensive solutions that cater to the evolving needs of the hotel industry. Integrated systems play a crucial role in the efficient operation of a hotel. They bring together various components and functions within the hotel, allowing for seamless communication, data sharing, and process automation (Ali et al., 2020).

According to Wynn & Jones (2022), the hotel industry is witnessing a growing integration of digital technologies alongside core information systems, often hosted in the Cloud. These information systems serve as central databases for storing and retrieving transaction data generated within the system and through additional digital technology applications. Some of these applications are built into the information systems packages themselves, such as mobile apps and analytics capabilities. However, there are also standalone devices and technologies, including robotics and the Internet of Things (IoT), that require connectivity and integration. Hotel operators face the challenge of aligning their evolving business needs with the most suitable combination of these technologies in a fast-paced technology and business environment. It is crucial for them to navigate this landscape effectively to stay competitive and meet customer expectations (Ali et al., 2020).

Figure 2.9 – Oracle Applications



Source: Oracle Application Integration example *(Vianna et al., 2014)*

In recent years, there has been significant research interest in the integration of technology and tools within the hospitality industry. This has led to the implementation of digital solutions such as mobile apps and smart systems, driven by the desire to enhance the guest experience and improve operational efficiency in hotels and other accommodation providers (Thomas Krabokoukis, 2023). When selecting a Property Management System or other operational system for hotels, several factors are considered to ensure successful evolution for business analytics. These factors include suitability and functionality, cloud-based capabilities, user-friendliness, flexibility, and seamless integration with other products and devices. In the case of PMS, meets these criteria can provide a solid foundation for implementing business analytics initiatives and extracting valuable insights from the data generated by the system. By choosing a PMS that aligns with these requirements, hotels can enhance their ability to leverage data for strategic decision-making and drive success in their business analytics activities (Commey et al., 2023).

An often overlooked aspect in the current literature on digital transformation is the importance of an IT strategy. This strategy should be centered around a core of integrated information systems, such as a Property Management System, Enterprise Resource Planning, or similar package. These systems should possess the necessary functionality and communication capabilities to support hotel operations and enable seamless integration with other digital technologies (Wynn & Jones, 2022).

According to Imtiaz & Kim (2019) , the digital revolution in the tourism industry has introduced innovative solutions such as cloud-based booking, information sharing, and experience sharing through digital platforms. Through the integration of smart devices, customers now have the convenience of managing various tasks, including checking in,ordering room service, and even unlocking their room door, all through their smartphones.

Davenport (2013), states that companies must acknowledge and address various challenges related to data management and analytics, requiring the development of new capabilities, positions, and priorities. This involves handling multiple types of data that are often combined. Organizations will need to integrate large and small volumes of data from both internal and external sources, encompassing structured and unstructured formats. This integration is essential for deriving new insights and constructing predictive and prescriptive models.

As technology advances, large datasets are becoming more accessible in operating businesses. These datasets encompass various sources of data, including CCTV – Closed-

Circuit Television – cameras, uploaded photos and videos on social media, digital texts, and user-generated content (UGC). These diverse data sources serve as valuable inputs for analysis and provide significant insights for businesses (Mousavian et al., 2023). The adoption of technology in the context of big data requires a new skill set that may be unfamiliar to many IT departments. Efforts must be made to effectively integrate various internal and external data sources. While technology alone is not enough, it remains a crucial element of a comprehensive big data strategy (McAfee et al., 2012). Another challenge lies in integrating distributed social networks, as users are increasingly engaging with multiple social networking services and accumulating a vast amount of information, such as Facebook statuses and Twitter tweets. To effectively analyze social media data, traditional analytic techniques and methods (such as data analysis) need to be adapted and integrated into the new big data paradigms that have emerged for processing vast amounts of data (Bello Orgaz et al., 2015).

The availability of vast data sets can sometimes lead companies to make broad statements or generalizations, assuming that they can analyze any type of data. This is often made possible by advanced analytical capabilities offered by computer applications and technology. However, the challenge lies in the collection and analysis of diverse data from various sources. While traditional data is typically structured in columns, rows, and tables like spreadsheets and databases, the scope of data has expanded to include unstructured formats such as text data from social media, video, and audio. Analyzing such diverse data requires a shift in mindset and adopting new approaches to effectively extract insights and make informed decisions (Bumblauskas et al., 2017).

2.5.1 Infrastructures for a Business Analytics Thinking

Infrastructure for business analytics implementation encompasses various components, including hardware, software, and data management systems. Some key elements of this infrastructure include robust servers and storage systems, high-performance computing capabilities, advanced analytics software, data integration and cleansing tools, secure data storage, and effective data governance frameworks. These components work together toprovide a reliable and scalable foundation for implementing business analytics, enabling organizations to effectively collect, process, analyze, and visualize data for actionable insightsand informed decision-making (Abai et al., 2017).

Yazici (2020), pointed out that Business Analytics combines various data management techniques such as database systems, data warehousing, data mining, distributed file systems, and cloud and analytic modeling. It also incorporates visualization, descriptive and predictive modeling, text analytics, network analysis, optimization, and statistical analysis. BA professionals need to possess a diverse skill set that includes analytical skills, IT knowledge and skills, and business knowledge and communication skills. The IT skills required include expertise in relational databases, massive data file systems, Web services, semi-structured and unstructured data management, and data/text/Web mining techniques (Soldić-Aleksić et al., 2020). Analytical skills encompass statistical analysis, optimization and simulation, econometrics, network analysis, and similar areas. Business knowledge and communication skills involve a solid understanding of business functions like accounting, finance, operations/supply chain management, and the ability to effectively communicate with business teams (Al-Edenat & Alhawamdeh, 2022; Uyar, 2021; Yazici, 2020).

2.5.2 Data Storage and Management

According to Dumbill (2013), the volume of data presents significant challenges to traditional data storage infrastructure, requiring scalable systems and distributed querying capabilities. Moreover, traditional databases face difficulties in handling the scale and complexity, especially in terms of parallel processing and managing unstructured data. These challenges highlight the need for advanced technologies that can effectively handle massive data volumes and support efficient data processing and indexing methods.

According to Brock & Khan (2017), the presence of a large amount of data places constraints on storage technologies, processing capabilities, and the way databases are structured. They argue that significant volume of data presents immediate challenges to traditional data storage infrastructure, necessitating scalable systems and distributed querying. Additionally, traditional databases may struggle with massively parallel processing and unstructured indexing. Computational power is also a crucial aspect in handling big data analytics. Duan & Xiong (2015), regards that, in the present day, big data primarily consists of unstructured data rather than structured data. Other authors pointed that unstructured data encompasses various types such as text data, graph data, and time-series data. Handling these unstructured data poses challenges not only in terms of data storage techniques, but also in the realm of data analytics techniques (T. Davenport & Harris, 2017; L. Duan & Xiong, 2015; Grover et al., 2018).

A robust infrastructure for business analytics implementation necessitates efficient data storage and management systems. This includes the utilization of databases, data warehouses, and data lakes capable of handling large volumes of data while ensuring data quality and integrity. These systems provide the necessary foundation for storing and organizing data in a structured manner, enabling effective data retrieval, processing, and analysis (L. Duan & Xiong, 2015). With proper data storage and management, organizations can access relevant and reliable data for their analytics initiatives, facilitating accurate and insightful decision-making processes (Nacarelli & Gefen, 2021). They argue that the vast amount of disparate data in different formats has presented a challenge for analytical professionals and existing tools to convert this data into actionable information that managers can comprehend, interact with, trust, and effectively utilize to enhance decision-making processes.

2.5.3 Data Integration and ETL (Extract, Transform, Load)

Literature shows us that data integration tools and processes are essential for combining data from various sources and transforming it into a usable format for analysis. Davenport (2014), regards that while business intelligence and analytics technology addresses data integration and management challenges, organizations now demand advanced technology that can systematically manipulate data. Prior research has primarily focused on the implementation of business intelligence for performance management and business analytics as separate entities. However, this approach has resulted in limited impact on strategy formulation and overall organizational performance improvement. Therefore, there is a need for a more integrated approach to BI implementation that effectively aligns with strategic goals and enhances overall performance outcomes (T. Davenport, 2014; Delen, 2014).

This requirement stems from the need to gain deeper insights, uncover hidden patterns, and extract valuable knowledge from complex and diverse data sets. In practice, the integration of existing data and information into a data warehouse requires a process known as Extract, Transformation, and Loading (ETL) (Runtuwene et al., 2018). ETL involves extracting data from various sources, transforming, and converting it into a consistent format, and loading it into the data warehouse for further analysis and reporting. This process ensures that the data is cleansed, standardized, and organized in a way that facilitates effective data analysis and decision-making. ETL processes help in extracting data, applying transformations, and loading it into the analytics environment (Ashok et al., 2020; Chen et al., 2012a).

The shift towards a data discovery architecture has overshadowed the trend of cloud-based BI and analytics, but there are notable similarities between the two. Both cloud-based BI/analytics and data discovery incorporate the key phases of BI and data warehouse architectures, including data integration through ETL, data storage and management in databases, and a presentation layer for reporting and analysis (Gartner, 2013). Further ahead, Gartner (2016), states that BI platforms are deployed, a shift towards self-service tools enables business users and analysts in organizations to have access to data preparation capabilities for analysis. This empowers them to independently prepare and transform data without heavy reliance on IT or technical expertise. Recently Gartner (2023a), regards that Analytics and business intelligence (ABI) platforms enable less technical users, including business people, to model, analyze, explore, share and manage data, and collaborate and share findings, enabled by IT and augmented by artificial intelligence (AI).

2.5.4 Computing Resources

Business analytics relies on mathematical and statistical models, as well as machine learning algorithms, to analyze and interpret data. These models and algorithms help uncover patterns, trends, and insights from the data, enabling businesses to make informed decisions. In some cases, implementing business analytics systems may also require the support of hardware infrastructure to handle the computational requirements (Saxena et al., 2021).

Adequate computing resources are necessary to handle the processing and analysis of large datasets. This may involve high-performance servers, clusters, or cloud computing services that can scale based on the analytical workload (Brock & Khan, 2017). Data and databases play a crucial role as valuable resources for business units and organizations across various industries, including the tourism and hospitality sector. They provide a foundation for storing, organizing, and managing relevant information that is essential for effective decision-making, strategic planning, and operational management within these sectors. By harnessing the power of data and databases, businesses in the tourism and hospitality industry can gain valuable insights, improve customer experiences, optimize operations, and drive overall business success (Stylos & Zwiegelaar, 2019).

Big Data and Analytics literature relates to the specific technological issues that come hand in hand with the utilization of extensive amounts of data. Dealing with Big Data at the right speed implies computational and storage requirements that an average Information Technology system might not be able to grant (De Mauro et al., 2016).

Hotel operational systems, such as PMS or other operational system, can be delivered through cloud-based servers, eliminating the need for an initial investment cost. Users can access the cloud-based PMS service through mobile devices and computers via an internet connection. Additionally, hotels can avoid expenses related to servers, server licenses, backup systems, and virus software renewal. Cloud-based PMS services offer a wide range of functions like classical hotel management systems. These functions often include integrated online reservation modules and channel manager software, playing a crucial role in the digital distribution of hotels (Yurtlu & Göral, 2022).

In the recent "*Magic Quadrant for Analytics and Business Intelligence Platforms*", Gartner (2023b) pointed out that Analytics and Business Intelligence (ABI) platforms empower non-technical users, such as business professionals, to effectively model, analyze, explore, share, and manage data. These platforms leverage IT infrastructure and are enhanced by the capabilities of artificial intelligence (AI). They enable users to collaborate and share their insights, making data-driven decision-making accessible to a wider audience.

2.5.5 Analytics Tools and Software

Computer science plays a vital role in the field of business analytics and serves as a foundation for the development of various business analytics applications. With its focus on algorithms, programming, data structures, and computational techniques, computer science provides the necessary tools and frameworks for data processing, analysis, and modeling. It enables the design and implementation of software systems that support data integration, data mining, machine learning, and statistical analysis, which are essential components of business analytics. By leveraging computer science principles and methodologies, organizations can unlock the full potential of their data and derive meaningful insights to drive informed decision-making and gain a competitive edge in the business landscape (Liu et al., 2023).

Gartner (2013), defines the business intelligence and analytics platform market as a software platform that delivers all capabilities across three categories: integration, information delivery and analysis. Implementing business analytics requires specialized software tools for data analysis, statistical modeling, data visualization, and reporting. These tools help analysts and data scientists extract insights and make informed decisions based on the data.

Figure 2.10 – Magic Quadrant for Analytics and Business Intelligence Platforms

Source: Magic Quadrant for Analytics and Business Intelligence Platforms (Gartner, 2023)

2.5.6 Data Security and Governance

According to Liu et al. (2023), the emergence of Big Data has introduced complexity and challenges in data analysis and application management. The growing volume of data highlights the importance of data security and privacy protection. They state that it is difficult to achieve complete data security unless the infrastructure is isolated and disconnected from all other networks. Delen & Ram (2018), states that security is one of the most commonly raised concerns and criticisms regarding data and analytics and the increasing significance of data security has led to information assurance becoming one of the most popular concentration areas in information systems departments worldwide. According to Chen et al. (2012a), security issues are a major concern for most organizations and Business Intelligence and Analytics (BI&A) have substantial contributions to make in the emerging field of security informatics.

To ensure the privacy and security of data, infrastructure should include measures such as data encryption, access controls, and data governance policies. Compliance with data protection regulations is crucial in handling sensitive customer information (Bulusu & Abellera, 2020).

The adoption of cloud-based hospitality software will have several advantages. Firstly, it will enhance data security, ensuring that sensitive information is protected. Secondly, it will offer user-friendly interfaces, making it easier for hotel staff to navigate and utilize the software effectively. Additionally, the installation process will be simplified, saving time and effort. Lastly, this transition to cloud-based solutions will lead to cost savings by reducing the need for manpower and technical support, as the software will be managed and maintained by the vendor (Moyeenudin et al., 2018).

From a technical perspective, Business Analytics is an advanced technique that is essential for handling large volumes of data, either in the cloud or in physical structure. The variability in the results of individual studies regarding the use of big data can be attributed to differing data protection and security regulations between countries. Organizations in developing countries may have an advantage in utilizing big data due to less stringent regulation and legislation compared to developed countries. Compliance with data protection and privacy regulations has been identified as a significant source of competitive advantage for organizations (Oesterreich et al., 2022).

2.5.7 Scalability and Flexibility

Just as owners and general managers need to exhibit great flexibility to meet the needs of available markets, so does technology (Shin et al., 2019). Turban et al. (2014), definesscalability as *"the ability to construct a prediction model efficiently given a rather large amountof data"*. Scalability is a crucial aspect of a data warehouse (huge databases), alongside flexibility. To address scalability, several factors need to be considered. These include the sizeof the data warehouse, the expected growth rate, the number of concurrent users, and the complexity of user queries. A scalable data warehouse should be able to handle increasing datavolumes and accommodate the expansion required to support new business functionalities. Scalability is achieved through both horizontal and vertical scaling, allowing the data warehouse to grow as needed and meet the evolving demands of the organization.

Organizations, both private and public, are accumulating and storing vast amounts of data, information, and knowledge in computerized systems. Managing and utilizing these resources has become increasingly complex, particularly due to scalability challenges. This constant

influx of data and the expanding user base create significant challenges in terms of storage, processing, and ensuring efficient access to the stored information (Turban et al., 2014). The increasing volume of data presents challenges to storage technologies, processing capabilities, and database modeling. Traditional data storage infrastructure may struggle to handle the sheer volume of data, necessitating the adoption of scalable systems and distributed querying. Additionally, traditional databases may face difficulties in managing massively parallel processing and unstructured indexation, which are essential for handling large data sets (Brock & Khan, 2017; Dumbill, 2013).

Business Analytics (BA) technical resources form the foundational components of BA, encompassing the essential software, hardware, and infrastructure needed to support the analytical processes. These resources include specialized software tools for data analysis, predictive modeling, and visualization, as well as the hardware infrastructure to handle large datasets and perform complex computations. The infrastructure should be scalable to accommodate growing data volumes and evolving analytics needs. It should also be flexible to adapt to changing technologies and analytical requirements over time (Oesterreich et al., 2022).

2.5.8 Integration with Business Systems

The integration of multiple BI and Analytics (BIA) projects, both internally and with external IT systems, is a crucial factor for the success of BIA implementation. Effective integration allows for seamless data flow and collaboration between different BIA initiatives, as well as with other systems within the organization and its business partners. This integration ensures that data from various sources and departments can be consolidated and analyzed holistically, enabling comprehensive insights and informed decision-making. It also facilitates the exchange of information and reports between different BIA projects, fostering a cohesive and unified approach to data analytics. By integrating BIA projects with other IT systems, organizations can leverage the full potential of their data assets and create a synergistic ecosystem that supports the overall business objectives and strategic initiatives (Turban et al., 2014). Integration with existing business systems, such as enterprise resource planning (ERP) or customer relationship management (CRM) systems, is important to leverage data from multiple sources and enable seamless data flow between systems (Azevedo et al., 2014b). The absence of data integration in certain business areas during a guest's stay at a hotel can have a detrimental effect on timely invoicing, leading to negative impacts on the quality of guest service. Without seamless data integration, the guest account may not be updated automatically, resulting in delays and inaccuracies in the invoicing process. This can cause frustration for guests and lead

to a poor customer experience. To ensure efficient and effective service delivery, it is crucial for hotels to have robust data integration mechanisms in place, enabling real-time updates and synchronization of guest information across various systems and departments. This integration streamlines the invoicing process, enhances guest satisfaction, and contributes to overall operational efficiency within the hotel (Lamiaa, 2015).

According to Ben Rabia & Bellabdaoui (2020),The integration of big data analytics into the decision-making process continues to be a challenge. Despite the potential benefits and insights that big data analytics can offer, organizations face hurdles in effectively incorporating these analytics into their decision-making workflows. Some of the challenges include the complexity of managing and processing large volumes of data, ensuring data quality and accuracy, integrating disparate data sources, selecting appropriate analytical techniques, and aligning analytics outputs with decision-making needs. Additionally, there may be resistance or lack of understanding among decision-makers regarding the value and utilization of big data analytics. Overcoming these challenges requires a comprehensive approach that includes technological advancements, organizational readiness, skill development, and a clear understanding of the strategic goals and objectives that can be supported by big data analytics (Ben Rabia & Bellabdaoui, 2020).

2.5.9 Data Visualization and Reporting

According to Gartner (2023a), the reporting capability of business analytics offers pixel-perfect and paginated reports that can be scheduled and distributed to a wide user community. This feature allows for the generation of highly customized and formatted reports that cater to specific user requirements. These reports can be automatically scheduled and distributed to a large number of users, ensuring timely and efficient delivery of relevant information. By leveraging this reporting capability, organizations can effectively disseminate insights and information to a broad user base, enabling informed decision-making and facilitating collaboration within the organization. Gartner (2016), states that in many organizations, the existing enterprise reporting systems play a critical role in day-to-day business processes. These systems are deeply ingrained and intertwined with various operations and workflows. Attempting to recreate these processes in a modern platform can introduce unnecessary risks and disruptions to the organization. Therefore, it is important to carefully assess the impact and potential consequences before making any changes to the existing reporting systems.

Organizations should prioritize a seamless transition and ensure that the new platform aligns with the needs of the business while minimizing disruptions to ongoing operations.

Business Analytics (BA) enables managers to move beyond traditional Business Intelligence (BI) reporting. It is characterized as the process of delivering timely decision support to the appropriate individuals. BA goes beyond technology and encompasses all organizational processes, aiming for continuous improvement and sustainable development. It involves the study of skills, technologies, and practices used to evaluate strategies and operations across the entire organization. By leveraging BA, businesses gain insights that inform their planning and guide decision-making, ultimately driving success and growth (Ben Rabia & Bellabdaoui, 2020).

Leveraging analytics as a key success factor empowers businesses to gain a competitive advantage in the market. As investments in digital transformation continue to rise, the volume of data has grown exponentially, making manual approaches to analytics and insights generation increasingly difficult. To address this challenge, advanced techniques for managing, analyzing, and visualizing big data have become crucial and have garnered significant attention. These techniques enable organizations to extract valuable insights from the vast amount of data and uncover meaningful patterns that can drive informed decision-making. By adopting advanced analytics, businesses can uncover hidden opportunities, optimize operations, enhance customer experiences, and ultimately stay ahead in today's data-driven business landscape (Alghamdi & Al-Baity, 2022).

Business analytics provides the opportunity for more formal reporting in the decision-making process. However, it appears that this advantage is not fully utilized by many companies, as they may not even employ strategic process reporting. This suggests that there is untapped potential for organizations to leverage business analytics in their decision-making practices and incorporate strategic reporting into their operations. By embracing these capabilities, companies can gain valuable insights and improve their overall decision-making processes, leading to better outcomes and enhanced performance (Klatt et al., 2011).

Infrastructure should support data visualization and reporting capabilities to present insights and findings in a meaningful way to stakeholders. This may include dashboard tools and reporting modules for interactive visualizations and real-time reporting.

2.5.10 Training and Skills Development

To effectively utilize the analytics infrastructure, organizations need to invest in training and skill development for their employees. This includes providing training on analytics tools, data analysis techniques, and data interpretation. According to Castillo et al. (2021), firms encounter the challenge of attracting, hiring, developing, and retaining business analytics talent to effectively leverage social data and derive valuable insights for supporting their business activities. Gartner (2016), has emphasized that the majority of business users lack the required training to effectively conduct or interpret analysis. Business analytics software effectively manages the complexity of analysis while ensuring ease of use. It achieves this balance by incorporating automated advanced analytics and intelligent pattern detection. The software generates explanatory narratives that highlight important insights and relationships between graphs. It also alerts users to potential hidden factors that may influence visually striking patterns. Furthermore, it helps users make statistically sound decisions, addressing the skill gap identified by Gartner where many business users lack the necessary training for accurate analysis and interpretation (Gartner, 2016).

The field of business analytics requires professionals with a diverse skill set, including expertise in data analysis, statistical modeling, machine learning, and data visualization. Recruiting and retaining such talent is essential for organizations to harness the potential of social data and utilize it for strategic decision-making, marketing campaigns, customer insights, and operational improvements. Firms must invest in talent acquisition, training, and creating a supportive work environment to maximize the value derived from social data and drive business success. Lack of effective training in using business analytical tools contributes to employee turnover in organizational culture. Therefore, the management has the responsibility to utilize business analytics tools in the organization and provide proper training to employees. This enables effective forecasting and decision-making, leading to a competitive advantage in the target market (Aljumah et al., 2022).

Yazici (2020), regards that business schools have introduced new programs and courses in business analytics to address the growing demand for data-science and analytical skills. However, there is still a skills gap that needs to be addressed. Educators face the challenge of effectively preparing learners with a combination of analytical skills, IT knowledge, and business-domain knowledge. These skills are not typically covered in undergraduate business degree programs. Also, Pan & Kirkpatrick (2023), pointed out that in response to industry demand for business analytics skills, business schools have been designing analytics curricula.

These curricula typically encompass a range of crucial subjects, including statistics, spreadsheets, databases, data visualization, predictive analytics, and machine learning. By incorporating these topics into their programs, business schools aim to equip students with the necessary skills to excel in the field of business analytics.

Rialti et al. (2019), pointed that Big Data Analytics (BDA) has the potential to transform traditional business practices. However, the precise impact of BDA capabilities on a company's performance is still not completely comprehended. These capabilities encompass the flexibility of the BDA infrastructure as well as the skills possessed by management and personnel within the organization. According to Hartzel & Ozturk (2022), over the past decade, data analytics has emerged as an integral part of numerous industries and businesses. Consequently, there is a growing demand for individuals with strong analytical skills in the job market. Many firms are actively looking to recruit and hire professionals who possess expertise in data analytics. This trend highlights the increasing recognition of the value that analytics brings to organizations and the need for skilled individuals who can leverage data effectively to drive informed decision-making and business success. Stanton & Stanton (2020), reinforce that the objective of analytics is to utilize data to address the requirements of a company and, more significantly, to position the company for future growth, sustainability, and competitive advantage. Extracting insights and gaining a competitive edge from vast amounts of data collected from various sources may seem promising. However, companies face challenges in finding employees who possess the skills and capabilities to effectively apply advanced analytics techniques to the abundance of data that awaits analysis. This skills gap poses a barrier to fully capitalizing on the potential of data analytics for business success.

2.6 Business Environment

In today's rapidly changing globalized business environment, coupled with unprecedented technological advancements, firms are compelled to embrace innovation and agility to identify and address the evolving needs and preferences of their customers. The ability to respond to the complex dynamics of the global marketplace accurately and efficiently is crucial for success and even survival in this competitive landscape. Businesses must adapt swiftly to stay relevant and meet the demands of their customers in a timely manner (Aydiner et al., 2019). Many businesses are facing challenges in determining the optimal ways to utilize Business Analytics to attain a significant return on investment. They grapple with questions surrounding how, where, and when to apply analytics effectively in their operations. The complexity lies in

identifying the most relevant data sources, selecting appropriate analytical techniques, and determining the appropriate timing and context for implementing analytics initiatives. The goal is to ensure that the utilization of Business Analytics generates tangible value and aligns with the overall strategic objectives of the organization (Y. Duan et al., 2020).

Ashrafi & Zareravasan (2022), states that Business Analytics plays a crucial role in helping firms adapt to complex business environments and gain a competitive advantage. Companies recognize the value of data analytics as a primary asset and seek innovative ways to leverage it to differentiate themselves from competitors. BA solutions enable organizations to harness the power of data by transforming raw data into meaningful insights and actionable information. By adopting a data-driven discovery approach, businesses can uncover valuable patterns, trends, and correlations that drive strategic decision-making and create tangible business value. The ability to translate data into actionable insights gives organizations a competitive edge by enabling them to make informed and timely decisions that drive growth and success.

Mikalef et al. (2019), found that firms that invest in their Big Data and Analytics Capabilities (BDACs) gain several advantages. First, they can accelerate the generation of insights, allowing them to quickly respond to changing market dynamics. Second, BDACs enable firms to navigate complex and fast-paced environments by providing the tools and technologies to analyze large volumes of data in real-time. This empowers them to make informed decisions based on up-to-date information. Third, BDACs offer real-time monitoring capabilities, allowing firms to track and understand their customers' behaviors and preferences, as well as stay informed about their competitors' activities. Fourth, BDACs help identify operational inefficiencies and bottlenecks, enabling firms to optimize their processes and improve overall performance. Lastly, BDACs facilitate the detection of shifts in the economic and business environment, allowing firms to proactively adapt their strategies and stay ahead of the competition. Overall, investing in BDACs equips firms with the necessary tools to gain insights, improve decision-making, and drive competitive advantage in today's data-driven business landscape.

The structured adoption of Big Data and Analytics Capabilities (BDACs) has demonstrated the potential to go beyond enhancing human decision-making. It can also automate processes and resource allocations, leading to significant changes in how businesses operate. By leveraging advanced analytics and machine learning algorithms, BDACs enable organizations to automate repetitive tasks, optimize resource allocation, and streamline operations. This can result in increased efficiency, cost savings, and the ability to scale operations. Furthermore,

BDACs have the potential to drive innovation and create new business models by uncovering patterns and insights that were previously inaccessible. As a result, businesses can explore new opportunities, disrupt traditional markets, and gain a competitive edge. However, it's important to carefully consider the ethical and social implications of relying solely on automated decision-making and ensure that human oversight and intervention are maintained when necessary (Mikalef et al., 2019). The transformative impacts of digital technologies have revolutionized various industries, including tourism and hospitality. Information technology has disrupted traditional operational techniques and paved the way for more advanced operational models based on big data. These models leverage large volumes of data to enhance decision-making, improve customer experiences, and drive operational efficiencies in the tourism and hospitality sector (Alrawadieh et al., 2021; Sigala, 2018).

According to (2021), the adoption of predictive analytics in the business environment has emerged as a valuable tool for managers. It assists them in identifying patterns, trends, and behaviors that can be used to predict outcomes. By leveraging predictive analytics, managers gain access to faster and higher-quality data, enabling them to make more informed decisions and improve overall business performance. The use of advanced analytics further enhances the effectiveness of predictive analytics, enabling managers to gain deeper insights and drive better results in their organizations.

2.6.1 Business Adaptation

The tourism industry has demonstrated remarkable adoption of the latest technologies. However, the pace of technology adoption varies among organizations, and many have struggled to implement business intelligence and analytics strategies and embrace digital listening initiatives at the same level as others (Imtiaz & Kim, 2019).

In order to deliver valuable insights and support decision-making, professionals in the field of Business Intelligence and Analytics need to possess the ability to comprehend business challenges and develop suitable analytical solutions. Their expertise lies in understanding the intricacies of the business environment and utilizing analytical techniques to address the specific needs of the organization (Chen et al., 2012c).

Business analytics leverages statistical techniques, such as regression, factor analysis, multivariate statistics, and machine learning, to extract valuable insights and knowledge from enterprise data. By enabling informed decision-making, BA empowers business executives to utilize data strategically for improved outcomes. This requires careful planning and

organization to integrate various internal and external data sources effectively. (Daradkeh, 2023).

To effectively implement a business analytics strategy, it is crucial to comprehend the cognitive and collaborative aspects of individuals within an organization. Conducting an analytics readiness assessment can be advantageous in gauging the organizational culture and level of preparedness for Business Analytics technologies and strategies (Brooks et al., 2015).

A Business Analytics readiness assessment involves assessing more than just the technology infrastructure. It involves a comprehensive examination of governance, policies, organizational culture, and business processes. This comprehensive approach allows for a thorough understanding of the organization's readiness to implement BI initiatives. BI goes beyond being a mere technology; it encompasses the understanding of how various organizational, technological, and people-oriented processes interact within an organization (Brooks et al., 2015).

Business analytics offers companies the opportunity to unlock the potential value of historical data by utilizing statistical and mathematical models, as well as advanced techniques like artificial intelligence algorithms. These powerful tools enable enterprises to integrate diverse data sources, facilitating trend prediction, decision optimization, and other valuable insights. The field of business analytics is constantly evolving, leading to an expansion of its applications (Liu et al., 2023).

2.6.2 Business Knowledge

According to Castilho et al. (2021), knowledge exploration involves the process of acquiring or creating new knowledge, sharing it with others, and storing it for future use. It encompasses activities such as research, experimentation, information gathering, collaboration, and knowledge management. Through knowledge exploration, individuals and organizations can expand their understanding, discover new insights, and uncover innovative solutions to challenges. It is a vital component of continuous learning and improvement, enabling individuals and organizations to adapt, innovate, and stay competitive in a rapidly evolving world. Wang et al. (2018), argue that business analytics enables organizations to generate detailed reports on various subjects, including market trends. This knowledge empowers firms to make timely and informed decisions for product development and enhances their ability to effectively commercialize innovative ideas into new products. By leveraging BA, organizations gain valuable insights into market dynamics, consumer preferences, and emerging trends,

enabling them to align their product strategies with market demands and capitalize on opportunities for growth and competitive advantage (Ashrafi & Zareravasan, 2022).

According to Sousa e Rocha (2019), various technological infrastructures such as social media, forums, blogs, and virtual networks are commonly used for knowledge management. However, knowledge portals also play a significant role in strategic knowledge management. These portals enable people to access, create, organize, share, and utilize knowledge. They argue that knowledge portals serve as an effective means of providing open access to relevant information. Organizations can extend knowledge access to their business partners and customers through these portals, although certain areas may need to be restricted.

Castillo et al. (2021), states that the presence of social media capability within firms can facilitate the exploration and exploitation of knowledge. By leveraging social media platforms, firms can access a vast amount of information, insights, and expertise from diverse sources. This enables them to gather and analyze data, identify patterns and trends, and gain valuable knowledge for decision-making and innovation. Additionally, firms with a greater pool of talented individuals skilled in business analytics can enhance the relationship between social media capability and knowledge exploration. These individuals possess the expertise to effectively utilize social media data, extract meaningful insights, and transform them into actionable knowledge, thereby maximizing the benefits of social media for knowledge exploration within the organization. Duan et al. (2020), argue that one way to achieve competitive differentiation through BA, product/service innovation can be achieved through the utilization of business analytics to gain new insights and knowledge. By analyzing data and extracting valuable information, organizations can uncover patterns, trends, and customer preferences that drive innovation. BA enables businesses to identify market gaps, understand customer needs, and develop new products or enhance existing ones based on data-driven insights.

According to Daradkeh (2023), organizations that foster a knowledge-oriented culture, characterized by a questioning attitude and a willingness to challenge existing ideas and models, are well-positioned to leverage the benefits of business analytics. In a knowledge-oriented culture, there is a strong emphasis on continuous learning, exploration, and the generation of new insights. This mindset encourages employees to actively seek out data-driven solutions, embrace innovative approaches, and challenge conventional thinking.

By cultivating a culture that values knowledge exploration and disruptive innovation, organizations can create an environment that is receptive to the insights and opportunities that BA provides. Employees are more likely to adopt BA tools and techniques, collaborate across departments, and embrace data-driven decision-making. This enables organizations to identify emerging trends, uncover hidden patterns, and make informed strategic choices. Moreover, a knowledge-oriented culture fosters an environment of continuous improvement and adaptation. Organizations are more open to experimenting with new ideas, iterating on existing processes, and adapting to market changes. This flexibility allows them to respond effectively to the insights and recommendations derived from BA, leading to improved operational efficiency, enhanced customer experiences, and sustained competitive advantage (Daradkeh, 2023).

Upadhyay & Kumar (2020), found that there are two main categories of knowledge: explicit knowledge and tacit knowledge. Explicit knowledge refers to knowledge that can be documented, stored, and easily understood. It is typically in the form of written or coded information and is commonly found in business firms and knowledge-intensive organizations. Another important form of knowledge for business firms is tacit knowledge. Unlike explicit knowledge, tacit knowledge is not easily documented or codified. It is embedded in processes, culture, and the internal analytical knowledge of employees. Tacit knowledge is difficult to define precisely because it is deeply ingrained and often implicit in the way business processes are carried out and employees' individual expertise and experiences.

2.6.3 Organizational Culture

Organizational culture has been defined in various ways by different researchers and scholars. The definitions of organizational culture often highlight its influence on the behavior, values, and norms within an organization (Monteiro et al., 2020). Schein (2010), one of the most cited authors in multidisciplinary studies in this matter, defines Organizational Culture (OC) as the organizational norms, expectations, and shared behavioral patterns that shape the way people behave and carry out tasks within an organization. For the author, it includes both explicit and implicit norms, values, and assumptions that guide the actions of individuals and work units. OC influences the core values of the organization, its services, or products, and influences how individuals and groups interact and treat each other within the organizational context. Organizational cultures, like other cultures, emerge as groups of people grapple with understanding the world they inhabit. When faced with disorder and meaninglessness,

individuals experience anxiety and strive to alleviate it by establishing a coherent and predictable perception of reality and the desired situation (Schein, 2010).

Alves et al. (2020), states that the charter of principles and values is the key element of an organizational culture. Effective management of these values fosters emotional commitment by aligning employees with the organization's brand when they identify with its values were also, they perception and acceptance of organizational culture significantly influence their behavior. Upadhyay & Kumar (2020), states that to achieve positive outcomes, firms should prioritize aspects such as organizational culture and the alignment of business processes. The authors pointed out that to ensure competitive and sustainable financial performance, it is crucial for firms to focus on developing and incorporating analytical capabilities within their internal resources, particularly among employees. The success of this capability building process relies on the commitments made by the organization's strategic management. This includes adopting an inclusive and conducive organizational culture that supports and facilitates the returns on investments made in big data initiatives.

Knowledge orientation plays a vital role in developing a knowledge-based organizational culture. By fostering an environment that values and promotes the creation, sharing, and utilization of knowledge, companies can effectively harness knowledge as a key driver of growth. For emerging companies, the ability to generate and leverage knowledge enables them to stay innovative, adapt to changing market dynamics, and seize new opportunities. A knowledge-based organizational culture empowers employees to continuously learn, collaborate, and contribute their expertise, leading to enhanced performance and sustainable growth (Daradkeh, 2023).

2.6.4 Business Analytics and Organizational Culture

Business analytics (BA) should not be viewed solely as a technical development but also as a component of organizational culture. While BA can provide valuable insights, it is crucial for organizations to act upon those findings to drive innovation. Simply generating findings without acting will not lead to meaningful outcomes. It is through the proactive utilization of BA insights that organizations can make informed decisions, implement changes, and ultimately gain a competitive advantage. The ability to leverage BA findings effectively demonstrates an organization's commitment to leveraging data-driven insights for strategic decision-making and achieving positive outcomes (Y. Duan et al., 2020). They state that it is evident that a data-driven culture plays a crucial role in the era of Big Data. This emerging

organizational culture enables leaders to rely less on intuition and more on leveraging data-driven insights. By cultivating a data-driven culture, organizations can make informed decisions and harness the power of data to drive innovation and success.

Adequate and competent human resources play a crucial role in preparing technology and data for effective utilization. They ensure that the necessary technology infrastructure is available and ready to support data analysis and management. This includes assessing data availability, ensuring data is properly prepared and cleaned, verifying data completeness, implementing security measures to protect data, and establishing governance frameworks for data management. Competent human resources are responsible for addressing technical challenges, maintaining data quality standards, and adhering to ethical and legal considerations. By having skilled professionals in place, organizations can optimize the use of technology and data, leading to more accurate and reliable insights for decision-making (Ibrahim & Handayani, 2022).

To Daradkeh (2023), establishing a knowledge-oriented organizational culture is essential for companies to recognize the value of Business Analytics. While BA introduces new thinking, development concepts, resources, production factors, and business opportunities, their true value can only be realized within a culture that values and promotes knowledge sharing and utilization. A knowledge-oriented culture fosters an environment where employees are encouraged to acquire, create, and share knowledge, enabling them to effectively leverage BA tools and insights. By embracing a knowledge-oriented culture, companies can fully harness the potential of BA and drive innovation and growth in their organizations.

Oesterreich et al. (2022), examined the contextual factors such as organizational culture and external pressures that also influence the successful implementation and utilization of BA. A supportive organizational culture that values data-driven decision-making and fosters a learning mindset can enhance the effectiveness of BA initiatives. External pressures, such as market competition and regulatory requirements, may also drive the adoption and utilization of BA within organizations. Overall, the combination of BA resources and capabilities, data quality, and contextual factors plays a significant role in creating business value from BA and improving firm performance. According to the authors, organizations that effectively harness these factors are more likely to derive strategic insights, gain a competitive advantage, and achieve positive outcomes from their BA initiatives.

Upadhyay & Kumar (2020), found that organizational culture exerts a significant positive effect on the relationship between big data analytics capability and firm performance. They found that in the big data analytics capability (BDAC) model, proposed by Wamba et al. (2020), where the concept of knowledge in the context of business analytics encompasses three dimensions. The first dimension is explicit knowledge, which includes data and technology. It refers to the tangible and codified knowledge that can be easily documented, stored, and transferred. The second dimension is tacit knowledge, which involves aspects such as culture and organizational learning. Tacit knowledge is more intangible and embedded in individuals experiences, insights, and ways of thinking. It is often acquired through practical experience and difficult to articulate explicitly. The third dimension is human knowledge, which encompasses the skills and capabilities of individuals within the organization. This includes managerial skills, technical skills, and other expertise that individuals bring to the table. Human knowledge plays a crucial role in effectively utilizing data and technology to derive insights and make informed decisions. By considering all three dimensions of knowledge — explicit, tacit, and human — organizations can develop a comprehensive approach to business analytics. This involves leveraging data and technology, fostering a culture of learning and knowledge sharing, and ensuring that employees possess the necessary skills and competencies to apply analytics effectively. By integrating these dimensions, organizations can harness the full potential of knowledge and drive successful business analytics initiatives (Upadhyay & Kumar, 2020).

2.7 Theoretical Foundation

As discussed earlier, the application of business analytics has the potential to enhance the quality, effectiveness, and efficiency of decision-making to management, in the scope of this study, for hotel managers and hotel administrators. It can also contribute to the overall improvement of the hotel culture by promoting the use of analytical information to hotel culture. The research questions focuses on understanding how business analytics can specifically contribute to enhancing decision-making in the hospitality industry, particularly among top-level hotel management.

To realize the conceptual model derived from the literature review, the objective of this study was to establish an empirical model that illustrates the role of business analytics in supporting analytical knowledge and decision-making within hotel management. In this current research, several theoretical models have served as inspiration, drawing from their wide

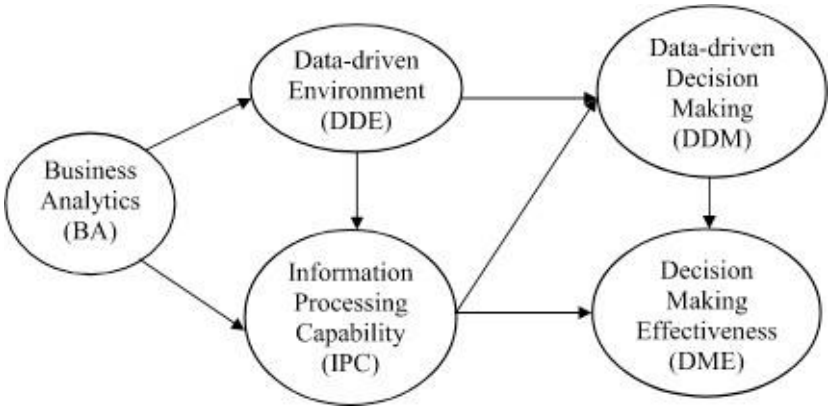
recognition among scholars and the strong explanatory power demonstrated by many empirical studies. These models have been reviewed extensively in the literature and provide a solid foundation for the present study. According to Ariyarathna & Peter (2019), many models have been developed to consider both the business and technical aspects of Business Analytics, including Business Analytics and Business Intelligence maturity models. However, despite the existence of these models, there is still a lack of an integrated model that encompasses both technical and business aspects, grounded in a theoretical foundation. None of the existing models fully capture all the relevant factors related to Business Analytics assessment. The framework introduced here is based upon a few basic concepts: analytic models, analytic infrastructure, operations, and organizational culture.

2.7.1 Linking BA to Organizational Decision-Making Effectiveness Model

Cao et al. (2015), highlights the limited research on how business analytics can enhance decision-making effectiveness (DME) at the organizational level, despite its growing popularity as a tool for data-driven insights in decision-making. Authors develop the follow research model and the key findings of the study indicate that business analytics, when facilitated by a data-driven environment, has a positive impact on the capability to process information. This, in turn, leads to an improvement in decision-making effectiveness and contributes to the business analytics literature by offering valuable insights into the applications of business analytics and its role in facilitating data-driven decision making.

Previous studies, such as those by Davenport et al. (2001) and Lavalle et al. (2011), served as a foundation for the development of this model. They state that by prioritizing desired insights, organizations can concentrate on specific areas of interest and employ available data in initial analytic models. These models offer valuable insights that reveal gaps in data infrastructure and business processes. This approach empowers organizations to allocate resources towards addressing targeted data requirements and implementing process improvements based on the insights gained. Through iterative refinement, organizations can enhance the value derived from their data and analytics efforts.

Figure 2.11 – Linking Business Analytics to Organizational Decision-Making Effectiveness

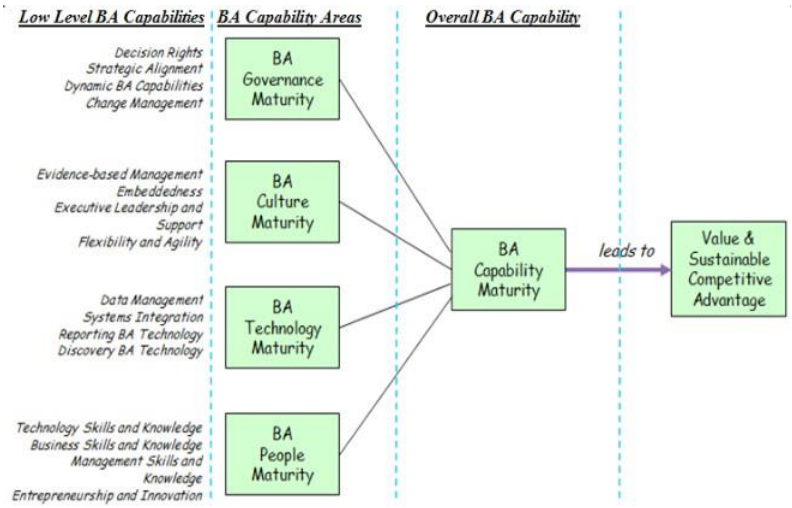


Source: Cao et al. (2015)

2.7.2 Business Analytics Capability Maturity Model

According to Cosic et al. (2012), business analytics (BA) systems are regarded as vital strategic investments for organizations, with the potential to significantly contribute to firm performance. They highlight that establishing strong BA capabilities is currently a major concern for chief information officers. In their study, they discovered the existence of more than 130 Information Systems (IS) maturity models in both academic and practitioner literature, with Watson's (2002) model being one of the early-stage models. They also identified fourteen distinct BA maturity models in the BA literature, with Davenport & Harris (2007) presenting a staged, prescriptive BA maturity model consisting of five stages.

Figure 2.12 –Business Analytics Capability Maturity Model



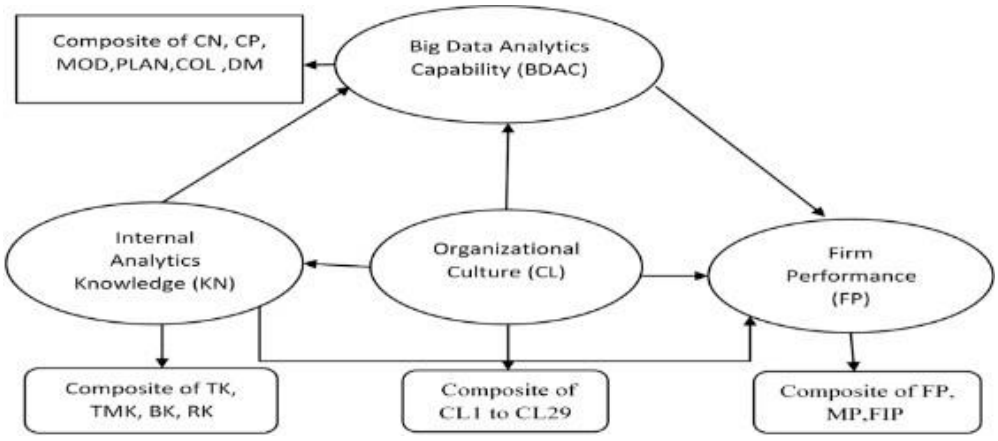
Source: Cosic et al. (2012)

2.7.3 Big Data Analytics Capability Model

Upadhyay & Kumar (2020), extends the Big Data Analytics Capability Model (BDAC) by investigating the mediating effects of organizational culture (OC) between internal analytical knowledge and BDAC. Additionally, the authors explore the mediating effects of BDAC between OC and firm performance. By incorporating these mediatory relationships, they aim to provide a deeper understanding of the interplay between internal analytical knowledge, organizational culture, big data analytics capability, and firm performance.

The Big Data Analytics Capability Model, initially proposed by Wamba et al. (2017), draws upon the literature on big data analytics, information system success, and the business value of information technology. This model seeks to examine the direct and indirect effects on firm performance. It provides a framework for analyzing the impact of big data analytics capabilities on organizational outcomes.

Figure 2.13 – Big Data Analytics Capability Model



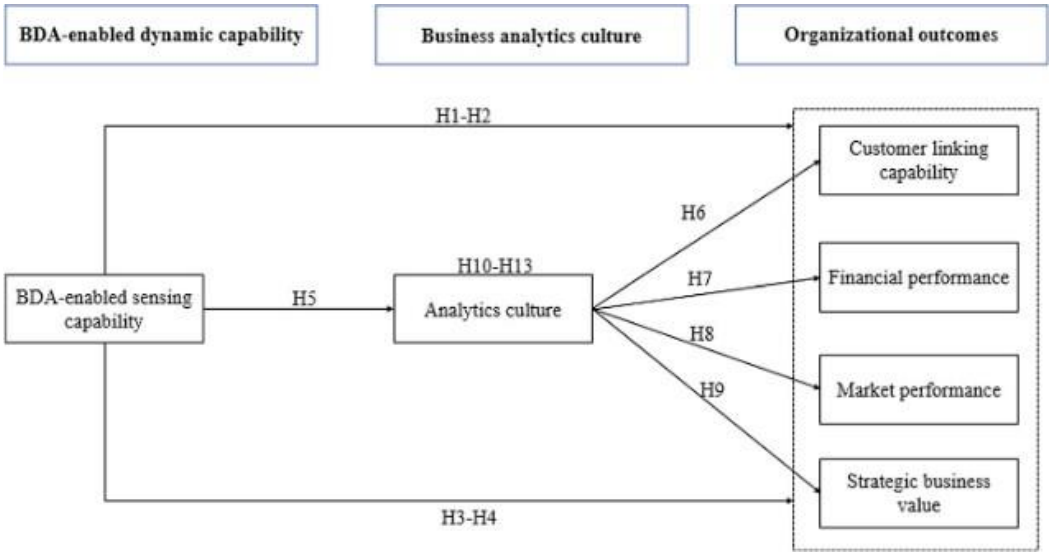
Source: Upadhyay & Kumar (2020)

2.7.4 Wamba et al. (2020) Big Data Capability Model

Wamba et al. (2020), developed a conceptual model that is supported by the concepts of dynamic capabilities, big data analytics (BDA), and analytics culture. This model aims to provide a framework for understanding the interplay between these factors and their influence on organizational performance and competitiveness. By considering the dynamic capabilities of organizations, the utilization of BDA, and the fostering of an analytics culture, the model offers insights into how organizations can leverage these elements to enhance their decision-

making processes, innovation capabilities, and overall performance in the context of data-driven environments.

Figure 2.14 – Big Data Analytics Capability Model



Source: Upadhyay & Kumar (2020)

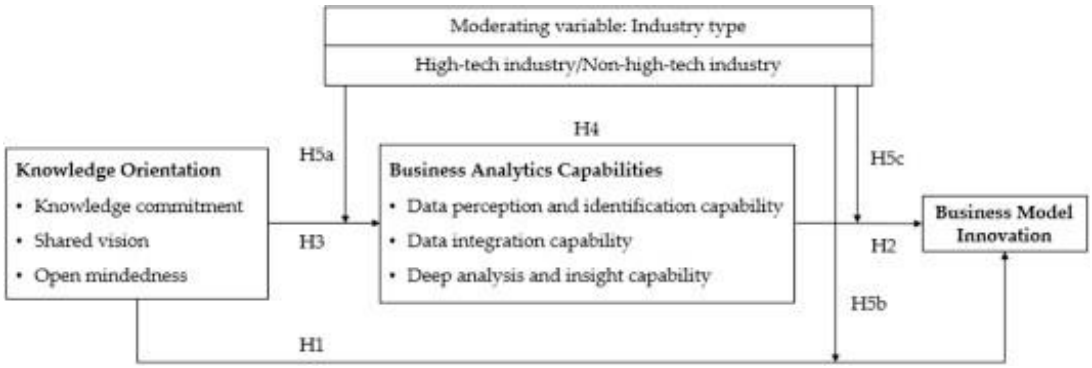
2.7.5 Interplay Between Knowledge Orientation and BA Capabilities in Driving Business Innovation Model

According to Daradkeh (2023), empirical research on the relationship between knowledge orientation and business analytics capabilities in driving business model innovation remains scarce. Drawing on the knowledge-based view and dynamic capabilities theory, the author presents a model that explores the relationship between knowledge orientation and business analytics capabilities in facilitating business model innovation. The model aims to examine how organizations' knowledge orientation influences their BA capabilities, which in turn drive the innovation of their business models. By integrating these theoretical perspectives, the study offers insights into the strategic role of knowledge and BA capabilities in fostering innovation within organizations.

Daradkeh (2023), study concludes that business analytics (BA) capability plays a mediating role in the relationship between knowledge orientation and business model innovation. Specifically, the path mechanism identified is knowledge orientation leading to BA capability, which further leads to business model innovation. The study also finds that the type of industry has a moderating effect on the relationship between knowledge orientation and BA capability. However, industry type does not have a direct effect on the relationship between knowledge

orientation and business model innovation. These findings highlight the importance of BA capability in facilitating business model innovation and emphasize the contextual influence of industry type on the relationship between knowledge orientation and BA capability.

Figure 2.15 – Interplay Between Knowledge Orientation and BA Capabilities in Driving Business Model



Source: Daradkeh (2023)

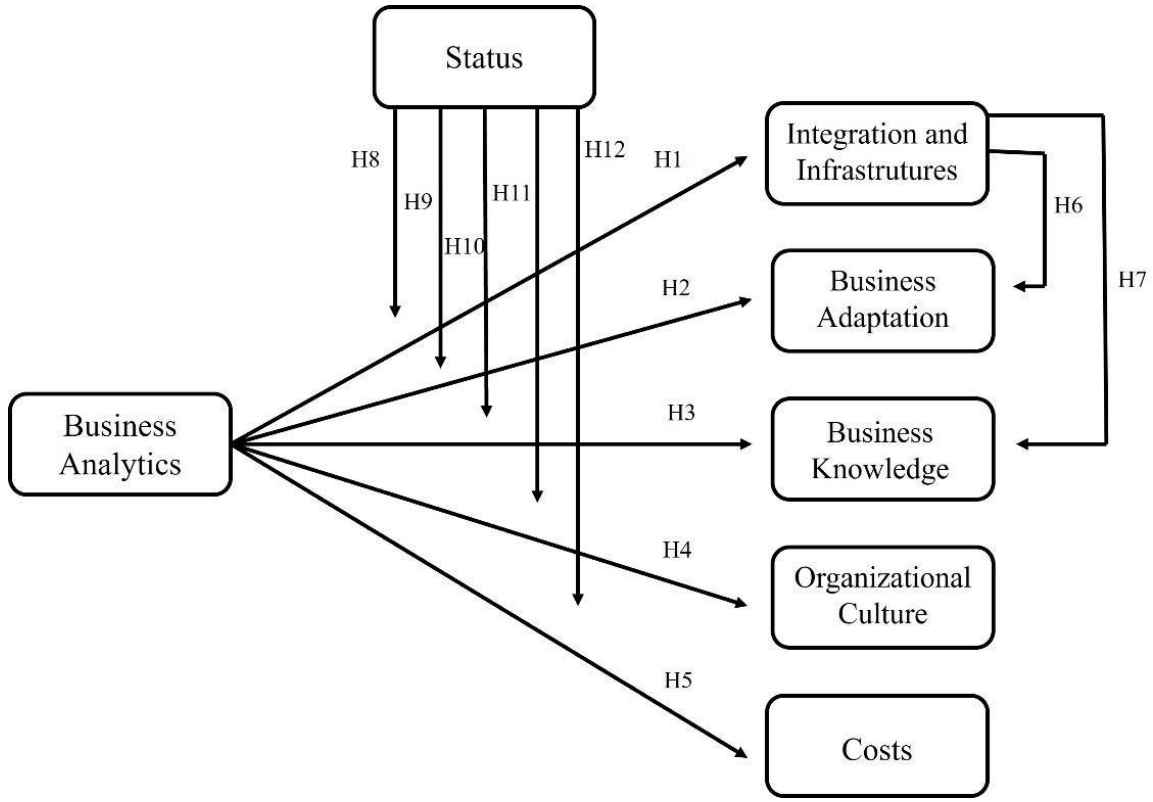
2.8 Theoretical Model of the study

Davenport & Kim (2013), emphasize that a model serves as a simplified representation of a specific problem. They state that the process of modelling involves formulating hypotheses about the relationship between various variables and their impact on the outcome. This modelling and hypothesis formulation are crucial steps in effectively solving a problem and gaining a deeper understanding of the underlying dynamics.

According to Duan et al. (2020), the advancements in Business Analytics during the era of Big Data have presented organizations with unparalleled opportunities for innovation. Through the insights derived from Business Analytics, companies can create new or enhanced products and services. Based on a comprehensive literature review on Business Analytics, Integrated Information Systems, Organizational Culture, Business Knowledge, and Business Adaptation, a theoretical model was developed. This model and the study aim to contribute to a comprehensive examination and definition of the core variables, establish the interrelationships among these variables, and formulate relevant theoretical hypotheses. Drawing on the concepts and key perspectives of Business Analytics and Business Environment theories, as well as previous research findings, a theoretical model framework is constructed through logical reasoning.

The figure shows the proposed Theoretical Model:

Figure 2.16 – Theoretical Model of Business Analytics Knowledge from Status



Source: Own source

2.9 Research Hypothesis

Hypothesis 1: Business Analytics is positively and significantly associated with integration and infrastructure.

Hypothesis 2: Business Analytics is positively and significantly associated with business adaptation.

Hypothesis 3: Business Analytics is positively and significantly associated with business knowledge.

Hypothesis 4: Business Analytics is positively and significantly associated with organizational culture.

Hypothesis 5: Business Analytics is positively and significantly associated with costs.

Hypothesis 6: Integration and infrastructure is positively and significantly associated with business adaptation.

Hypothesis 7: Integration and infrastructure is positively and significantly associated with business knowledge.

Hypothesis 8: Status moderates the relationship between business analytics and integration and infrastructure.

Hypothesis 9: Status moderates the relationship between business analytics and business adaptation.

Hypothesis 10: Status moderates the relationship between business analytics and business knowledge.

Hypothesis 11: Status moderates the relationship between business analytics and organizational culture.

Hypothesis 12: Status moderates the relationship between business analytics and costs.

CHARPTER 3

3 Research Method

This study adopts a multi-method research approach, combining normative analysis, empirical analysis, qualitative research, and quantitative research methods. The research process entails an extensive review of existing literature and theoretical analysis to establish a solid foundation of knowledge (Bryman, 2016). To support empirical research, a large-scale questionnaire survey will be conducted to gather data from a diverse sample (Joshi et al., 2015). This approach allows for the exploration of business analytics knowledge, specifically focusing on the perspectives of hotel managers and recent graduate professionals. The research design emphasizes a rigorous logical framework and a comprehensive structure to ensure a thorough investigation of the topic. By employing a combination of methods, this study aims to provide valuable insights and contribute to the understanding of business analytics in the hotel industry (Bryman, 2016).

3.1 Quantitative Methods

3.1.1 Population and Sample Procedure

This study aims to establish a clear and scientifically sound understanding of the research problems by defining the overall situation. To ensure the representativeness of the research findings, the number and distribution of samples will be determined based on statistical principles. A rigorous and scientifically grounded sampling procedure will be followed to obtain samples that effectively reflect the broader population (Bryman, 2016).

By adhering to a scientific sampling procedure, this study seeks to minimize potential biases and enhance the reliability and validity of the empirical research. The selected samples will undergo careful consideration to ensure their suitability for addressing the research hypothesis. This approach enables the empirical research conducted in this paper to serve as a robust and scientifically valid verification of the research hypothesis.

The use of a scientific sampling procedure and a rigorous research design strengthens the credibility of the study's findings. By aligning with established scientific principles, this research strives to provide meaningful insights and contribute to the existing body of knowledge in the field.

3.1.2 Population

In the process of conducting the literature review and the initial exploratory study, several relevant studies were identified. These studies were examined to gain insights into the target audience or publics to be observed in the current research. The aim was to identify specific groups or areas that would be the focus of observation and analysis.

Upon reviewing the identified studies, it was observed that only a few of them utilized a consistent set of questions or criteria when studying different publics. This approach allowed for a comparative analysis across different groups or publics. By employing a standardized set of questions, we can gather comparable data and draw meaningful conclusions. This highlights the importance of ensuring consistency in the research methodology when studying various publics. By using the same questions or criteria, researchers can effectively compare and analyze the findings across different groups. This approach enhances the reliability and validity of the research results and enables a comprehensive understanding of the research topic (Bryman, 2016).

Therefore, in the present study, a similar approach will be adopted, whereby a set of consistent questions or criteria will be used to analyze the identified publics. This approach will enable a comprehensive examination of the research subject and facilitate meaningful comparisons between different groups or areas of interest in hotel management industry.

By adopting this approach, the research will aim to conduct a comprehensive examination of the research subject within the context of the hotel management industry. It will allow for the exploration of various groups or areas of interest within the industry and enable meaningful comparisons to be made. The diverse nature of the hotel management industry necessitates a careful examination of different groups, such as hotel managers and recent graduate professionals, to gain a comprehensive understanding of their perspectives on business analytics knowledge. Using consistent questions and criteria, the research will be able to analyze and compare the responses and insights gathered from these different groups.

This approach will provide valuable insights into the current state of business analytics knowledge in the hotel management industry, shedding light on similarities, differences, and potential areas for improvement. By facilitating meaningful comparisons, the research will contribute to the existing body of knowledge and provide actionable recommendations for hotel management professionals and stakeholders.

Overall, this comprehensive examination and comparative analysis will enhance our understanding of business analytics knowledge in the hotel management industry, offering valuable insights for practitioners, researchers, and policymakers alike. The publics chosen were:

3.1.2.1 Final-year Students and Recently Graduated Professionals

In this study, students are recognized as important stakeholders in the hotel industry due to their various roles and potential impact on the industry. Firstly, as future workers in the hotel industry, their expectations and perceptions of the industry are influenced by their interactions as interns and their contact with professionals. Their experiences during internships and interactions with industry professionals shape their understanding of the industry and influence their career aspirations.

Secondly, students are recognized as both present and future clients of the hotel industry. As consumers, their hotel experiences and perceptions play a significant role in shaping their expectations and influencing their future preferences. The firsthand experiences they gain as students and interns in hotels can profoundly their future decisions and choices as customers. Lastly, students are the future employers in the hotel industry. Their education and training within school programs and hotels serve as a model for their future leadership and management roles. The knowledge and skills they acquire during their studies, as well as their experiences as interns, can shape their approach to managing and operating hotels in the future.

Given the significance of students' perspectives and experiences, this study focuses on last-year students. By including this specific group, who have already completed their studies and gained practical experience through internships, the research aims to gain insights into their perceptions, expectations, and potential contributions to the hotel industry. Their unique position as both students and interns provides valuable perspectives on the intersection between academic knowledge and industry practice. By focusing on last-year students, the study acknowledges the importance of their experiences as students and interns in hotels, considering them as a key group of stakeholders whose insights can contribute to the understanding and development of the hotel industry.

In addition to last-year students, this study also includes recently graduated hotel professionals as another important group of stakeholders. These professionals have recently transitioned from being students to actively working in the hotel industry, bringing with them

their knowledge, skills, and firsthand experiences gained through internships and early career experiences.

Including recently graduated hotel professionals provides valuable insights into the practical application of their education and the challenges and opportunities they encounter in their early professional careers. Their perspectives as new professionals in the industry offer a unique viewpoint on the alignment between academic preparation and real-world practice.

By considering the perspectives of recently graduated hotel professionals, this study aims to capture a comprehensive understanding of the hotel management industry from both the student and professional standpoint. This inclusion allows for a broader examination of the experiences, expectations, and potential contributions of individuals who have recently entered the industry, shedding light on the transitional phase from student to professional and the ongoing learning and development in the field.

By encompassing both last-year students and recently graduated hotel professionals, this study seeks to provide a comprehensive analysis of the hotel management industry, considering the perspectives of individuals at different stages of their educational and professional journey. This approach ensures a more holistic and nuanced understanding of the subject matter and supports meaningful comparisons between these two important stakeholder groups.

3.1.2.2 Hotel Directors and Hotel Administrators

In addition to above mentioned, last-year students and recently graduated hotel professionals, this study also includes hotel directors and hotel administrators as key stakeholders. Hotel directors and administrators play a critical role in shaping the strategic direction and operational management of hotels. Including hotel directors and administrators in the study allows for a comprehensive examination of the industry from the perspective of senior management. These individuals possess extensive experience and expertise in hotel operations, decision-making, and industry trends. Their insights provide valuable information on the challenges, opportunities, and best practices within the hotel management industry.

By involving hotel directors and administrators, the study aims to capture the perspectives of those responsible for shaping organizational culture, setting policies, and driving the overall success of hotels. Their input will contribute to a deeper understanding of the industry's current landscape, the factors influencing decision-making, and the strategies employed to address emerging issues.

By considering the viewpoints of last-year students, recently graduated hotel professionals, hotel directors, and hotel administrators, this study adopts a multi-stakeholder approach to provide a comprehensive analysis of the hotel management industry. By including these diverse perspectives, the study aims to capture a holistic view of the industry, considering the expectations, experiences, and insights of individuals at various levels of the organizational hierarchy.

This comprehensive examination of the hotel management industry will facilitate a better understanding of the interplay between different stakeholder groups, their roles, and the dynamics within the industry. The inclusion of hotel directors and administrators ensures that the study captures a broad range of perspectives, contributing to a more robust and well-rounded analysis.

To understand the Portuguese reality, the following table presents the total number of registered hotels based on statistical information from the government entity responsible for data, INE (Instituto Nacional de Estatística), and PORDATA.

Figure 3.1 – Tourist Accommodations: total and by type of establishment

Anos	Alojamentos turísticos							
	Total	Hotéis	Pensões	Estalagens	Pousadas	Motéis	Hotéis-apartamentos	Aldeamentos turísticos
2004	1.954	563	874	89	42	19	127	31
2005	⊥2.012	⊥607	⊥878	⊥97	⊥42	⊥18	⊥127	⊥33
2006	2.028	622	877	100	42	22	132	31
2007	2.031	634	874	100	42	22	134	28
2008	2.041	659	847	100	42	22	132	33
2009	1.988	681	804	94	41	23	128	33
2010	2.011	771	737	85	40	20	137	38
2011	2.019	873	656	67	39	16	144	40
2012	2.028	988	551	51	36	12	150	45
2013	⊥3.345	⊥1.039	⊥//	⊥7	⊥35	⊥//	⊥145	⊥44
2014	3.578	1.121	//	8	35	//	145	46
2015	4.339	1.164	//	8	36	//	141	45
2016	4.805	1.237	//	8	36	//	143	52
2017	5.840	1.309	//	10	36	//	145	55
2018	6.868	1.400	//	//	46	//	152	56
2019	6.833	1.449	//	//	46	//	157	56
2020	5.183	1.205	//	//	19	//	119	55
2021	6.271	1.407	//	//	36	//	137	60

Source: INE, PORDATA (last update 2023-04-06)

3.1.3 Sample Procedure

The sample procedure for this study will involve a systematic and rigorous process to ensure the selection of appropriate participants (Wilson, 2007). The sample will consist of three main groups: last-year students, recently graduated hotel professionals, and hotel directors/administrators.

First, a list of last-year students from relevant hospitality management programs will be obtained from participating educational institutions. The students will be invited to participate voluntarily in the study, and their consent will be obtained.

Second, a separate list of recently graduated hotel professionals will be compiled. These professionals will be selected based on their employment history in the hotel industry and their availability to participate in the study. They will be contacted and invited to take part in the research.

Third, hotel directors and administrators will be identified through various sources, such as professional networks and industry associations. These individuals will be approached and invited to participate in the study, considering their role and expertise in hotel management.

The sample size for each group will be determined based on statistical principles and the desired level of representation. Efforts will be made to ensure a diverse and representative sample, considering factors such as gender, age, educational background, and professional experience.

A sampling survey methodology has been chosen for this research due to the size of the target population and different groups. Conducting a comprehensive survey of the entire population is not feasible, hence a sampling approach is employed. This involves selecting a representative subset of the population to gather data and draw conclusions about the larger group. The use of sampling allows for efficient data collection while still maintaining a degree of accuracy and generalizability in the findings (Wilson, 2007).

The sampling procedure will adhere to scientific principles to ensure the validity and reliability of the study. Confidentiality and anonymity of participants will be strictly maintained, and ethical considerations will be followed throughout the research process.

3.2 Qualitative Methods

To consolidate the study, seven interviews were conducted specifically with hotel managers and administrators, with a specific emphasis on exploring their knowledge and experiences related to business analytics in the context of the hotel industry. As key stakeholders within the industry, hotel managers play a vital role in driving business success through effective data-driven decision-making.

In this part of the methodology, the data source was qualitative, applying in-depth interviews through comprehensive discussions with hotel managers. This research aims to uncover insights into the specific knowledge of business analytics within the hotel industry. The interviews were conducted using a semi-structured approach, allowing for a flexible exploration of topics related to business analytics in the hotel industry (Bryman, 2016). The questions posed to the hotel managers covered a range of areas, including their understanding of business analytics, the resources and infrastructure available for analytics implementation, the challenges encountered in data collection and analysis, and the organizational culture and support for data-driven decision-making. Semi-structured interviews are characterized by a flexible and open-ended questioning approach, which enables interviewers to delve deeper into interesting responses while maintaining some structure. This method combines pre-defined and spontaneous questions, making it valuable for gathering detailed and rich qualitative data (Bryman, 2016).

As we have seen previously in this study, in today's competitive business landscape, the integration of business analytics has become increasingly important for organizations across various industries, including the hotel sector. Business analytics refers to the systematic exploration, analysis, and interpretation of data to uncover valuable insights that can inform strategic decisions, optimize operations, and enhance overall performance.

By conducting interviews with hotel managers, this research seeks to gain a comprehensive understanding of their knowledge, perceptions, and experiences regarding the utilization and impact of business analytics in their day-to-day operations. These interviews aim to explore how hotel managers perceive the value of business analytics, the challenges they encounter in implementing and leveraging analytics tools, and the potential benefits they derive from data-driven decision-making.

The findings from these interviews with hotel managers will contribute to the existing body of knowledge on business analytics in the hotel industry. By incorporating the perspectives and

experiences of these key stakeholders, this research aims to provide valuable insights that can inform future research, industry practices, and managerial decision-making regarding the effective implementation and utilization of business analytics.

Throughout the research process, strict adherence to ethical considerations ensured the confidentiality and anonymity of the participating hotel managers. The research approach and interview protocols were designed to respect the privacy of the participants and maintain the integrity of the data collected (Bardin, 2018).

The results of these interviews with the hotel managers, in relation to the business analysis, will be presented and discussed in chapter five. The analysis of these findings will contribute to a deeper understanding of the model under study associated with business analytics in the hotel industry.

In conclusion, the interviews conducted with hotel managers provide valuable insights into their knowledge and experiences related to business analytics in the hotel industry. By incorporating the perspectives of these key stakeholders, this research aims to response to the initial request questions and try to justify the adopted model, and contribute to the advancement of knowledge and practices in utilizing data-driven approaches to enhance decision-making and drive business success in the hotel industry.

3.2.1 Sampling

The sampling method used in this study was non-probabilistic purposive sampling. This approach was chosen due to the ease of access to potential participants and their availability for the research. While it allowed for a more convenient data collection process, it's essential to acknowledge that the sample may not fully represent the entire population, and generalizations should be made with caution.

According to Bryman (2016), non-probabilistic purposive sampling is a type of sampling technique where researchers select participants based on their easy accessibility and availability. The author stresses the importance that this method is not based on random selection and may not represent the entire population. Instead, it focuses on choosing individuals who are convenient to reach or readily available, making the data collection process more feasible and efficient for the researcher.

The chosen non-probabilistic purposive sampling aiming to gather the opinions of experts in the hotel sector. The sample comprised seven respondents, including three general managers

of hotel groups, two general managers of independent hotels, one owner and administrator of a small hotel group, and one CEO (Chief Executive Officer) of a large hotel group aged between 33 and 59 and with professional experience between 10 and 40 years.

3.2.2 Data Collection and Processing

The data collection process involved sending requests for interview participation through email and phone calls. During these interactions, the participants were informed about the aims and objectives of the research study. The informed consent form (see Appendix V) was also provided, either digitally or in person, where the privacy of all interviewees was guaranteed.

The participants were given the option to choose between face-to-face interviews or conducting them via Microsoft Teams. Two of the participants chose to be interviewed in their respective hotels where they worked, while the rest preferred video conferencing.

All the interviews were recorded to facilitate later transcription and content analysis. According to Bryman (2016), transcribing interviews is a very time-consuming process and requires many hours to get as much information out as possible with an average interview duration of 32 minutes.

After conducting, recording, and transcribing the interviews, they were subjected to content analysis, which divided the analysis into two distinct parts. One to answer the starting questions and the other to confront the final model.

For a better understanding of the content analysis, the variables of the final model were categorized according to the table 3.1:

Table 3.1 - **Categories**

A. Data Integration and Infrastructure
B. Business Adaptation
C. Business Knowledge
D. Organizational Culture
E. Costs
F. Business Analytics

Source: Own production

Based on content analysis, the answers collected from the interviewees were grouped into subcategories based on the themes of the answer that was given.

To answer the starting questions, five tables were constructed based on the categories and subcategories mentioned above and are shown below:

Table 3.2 - **RQ1:** Is the organizational culture of hotels ready to embrace Business Analytics systems?

Category	**Subcategory**
D- Organizational Culture	D1.RQ Preparing for Business Analytics
	D2.RQ Training and Knowledge
	D3.RQ Organizational culture

Source: Own production

Table 3.3 - **RQ2:** Do hotel managers and newly graduated professionals have a true understanding of their business (from all departments)?

Category	**Subcategory**
C- Business Knowledge	C1.RQ Interconnection of Operational Departments
	C2.RQ Professional Experience
	C3.RQ Integrated business vision
	C4.RQ Business Knowledge

Source: Own production

Table 3.4 - **RQ3:** Is there awareness on the part of hotel managers and newly licensed professionals of the needs for systems integration and infrastructure to embrace analytical systems?

Category	**Subcategory**
A- Data Integration and Infrastructure	A1.RQ Need for Infrastructure Upgrade
	A2.RQ Data Integration
	A3.RQ Business Knowledge
	A4.RQ Outsourcing
	A5.RQ Hotel Size

Source: Own production

Table 3.5 - **RQ4:** Are hotel managers and newly graduated professionals aware of the costs involved when adopting analytical systems?

Category	**Subcategory**
E- Costs	E1.RQ Cost Awareness
	E2.RQ Organizational Culture

Source: Own production

Table 3.6 - **RQ5:** Hotel managers and newly graduated professionals, will have adequate training and knowledge to understand analytical systems?

Category	**Subcategory**
F- Business Analytics	F1.RQ Knowledge of Analytical Systems
	F2.RQ Analytics training

Source: Own production

Furthermore, to confront the variables and hypotheses of the final model, based on the content analysis, the answers collected from the interviewees were also grouped into subcategories based on the themes of the answers given to be used further in the conclusions.

CHARPTER 4

4 Data Collection

According to Walter (2012), data collection is a crucial component of a research project, as it involves the systematic gathering of information to address the research objectives. The researcher must define the scope of the study and design appropriate research instruments to collect the necessary data and obtain the required knowledge.

Upon completion of the study, a model will be developed to examine the effects of Business Analytics tools in the hotel industry. This model aims to enhance our understanding of how these tools influence decision-making processes, enhance managerial knowledge, and ultimately determine whether the investment in resources, finances, and time is worthwhile. By analyzing the collected information, the model will provide valuable insights into the benefits and potential drawbacks of utilizing Business Analytics in the hotel industry. This analysis will contribute to a deeper understanding of the impact and value of these tools for hotel managers and assist in making informed decisions regarding their implementation.

4.1 Preparing the Questionnaire

In this study, the target respondents were the final-year students, recently graduated professionals, hotel managers and hotel administrators acting in Portugal. In this regard, a five-point Likert scale questionnaire was prepared to collect the quantitative data from the target respondents.

The Likert scale is a measurement tool that assesses attitudes using a five-point scale, with each point representing a specific level of agreement or disagreement. The scale typically includes anchors at the endpoints, such as "strongly agree" and "strongly disagree," and a neutral midpoint. The third point on the scale is considered the neutral or neutral point, indicating a lack of agreement or disagreement. This middle point allows respondents to express a neutral stance or lack of strong opinion on the statement or item being measured. The Likert scale's structure and the inclusion of a neutral midpoint provide a balanced and nuanced approach to capturing respondents' attitudes and perceptions (Chyung et al., 2017; Joshi et al., 2015).

In the present study, the research questionnaire was specifically designed to be administered to four distinct target groups: final-year students, recently graduated professionals, hotel managers,

and hotel administrators in Portugal. Prior to conducting this study, no significant literature was found that focused on surveying these populations, which served as a motivating factor for undertaking this research. The questionnaires were specifically designed to capture the distinct perspectives and experiences of these persons group, with the goal of gathering valuable insights and expanding the current understanding of business analytics in the hospitality industry.

4.2 Data Collection Process

In this study, a structured survey questionnaire was utilized to gather responses using a five-point statements Likert scale. In this technique, values ranging from ONE to FIVE were assigned to each of the five positions on a five-point scale. The negative end of the scale was represented by ONE, while the positive end was represented by FIVE. The Likert scale allowed respondents to express their opinion about a particular topic in terms of both direction and strength (Likert, 1932). The questionnaire was designed in a closed-ended questions format, meaning that respondents were provided with predefined response options and did not need to articulate their answers (Roopa & Rani, 2012). The same questionnaire was administered to all the different target populations in a consistent manner.

The questionnaire in this study was administered in two different manners. Firstly, an internet-based Google Forms questionnaire was used, which required respondents to answer questions continuously. This approach aimed to enhance the efficiency of data collection and reduce response errors. Secondly, paper versions of the questionnaire were hand-delivered to respondents, enabling a more personal interview-style interaction. These two approaches were implemented to accommodate the preferences and convenience of different respondents, ensuring a diverse and comprehensive dataset for analysis (Roopa & Rani, 2012).

The entire questionnaire was pretested by requesting a small group of business analytics managers and to a database of recent graduate students, totaling 250 records, to complete the survey and provide feedback on their interpretation of each item. The survey was launched on October 25th, 2022, and remained open until November 5th, 2022. Invitations were sent using a free Email Marketing tool, which included a link to the Google Form Questionnaire. However, only 59 surveys were completed. The responses provided valuable insights for analysis and prompted some adjustments to the questionnaire. However, the responses provided valuable insights for analysis and prompted some adjustments to the questionnaire.

The final questionnaire was sent on November 7th, 2022, to:

(i) A database containing 1.454 records of recent graduate students.

(ii) A database of professional contacts of hospitality managers with 454 records.
(iii) ADHP (Associação Diretores de Hotel de Portugal) network associates, which includes 873 directors.
(iv) Shared with schoolteachers, coordinators, and directors of major schools with hospitality and tourism courses to additionally request students to respond to the questionnaire.
(v) Shared through LinkedIn and other social media platforms.

To control responses, an email marketing platform was utilized. This approach involved resending the questionnaire to individuals who had not opened or responded to it initially. In cases where the response rate remained insufficient, follow-up emails or phone calls were conducted, if possible, to further encourage participation.

A substantial number of paper versions of the questionnaire and interviews were collected from hotel managers and hotel administrators during the BTL - Feira Internacional de Lisboa. BTL is the primary fair dedicated to the hospitality and tourism sectors in Portugal, held annually in Lisbon. This venue provided an excellent opportunity to gather responses from professionals in the industry and obtain valuable insights for the study.

To ensure that respondents had a clear understanding of the study's purpose, a brief introduction was included along with the questionnaire. This introduction provided an overview of the study and its objectives, helping participants to comprehend the context and significance of their participation. By providing this information, was possible to enhance the respondents' understanding and engagement with the questionnaire, ultimately improving the quality and reliability of the data collected.

CHARPTER 5

5 Empirical Analysis and Hypothesis Test

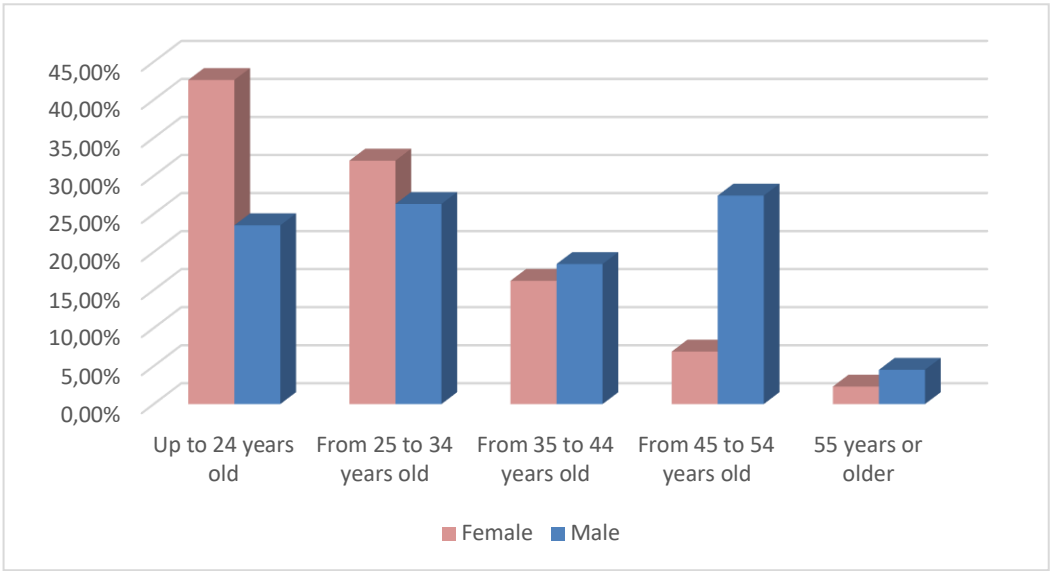
In this chapter, the collected questionnaire data is analyzed using SPSS Statistics 29 software and the multiple linear regression analysis method. The study's research model assumptions are empirically tested, starting with descriptive statistics and correlation tests on the data. Analysis of variance is then used to further examine the data. The chapter concludes with confirmatory statistical analysis of the research hypotheses, followed by a comprehensive analysis and summary of the hypothesis test results.

5.1 Participants

The sample of this study is composed of 482 participants, 303 (62.9%) female and 179 (37.1%) males. About age, 171 (35.5%) are up to 24 years old, 144 (29.9%) are between 25 and 34 years old, 82 (17%) are between 35 and 44 years old, 70 (14.5%) are between 45 and 54 years old, and 15 (3.1) are 55 years old or older.

When we cross the gender with age, we see that the percentage of female participants in the groups up to 34 years old is higher than that of male participants, but after 35 years old, the situation is inverted.

Figure 5.1 – Participants: cross the gender with age

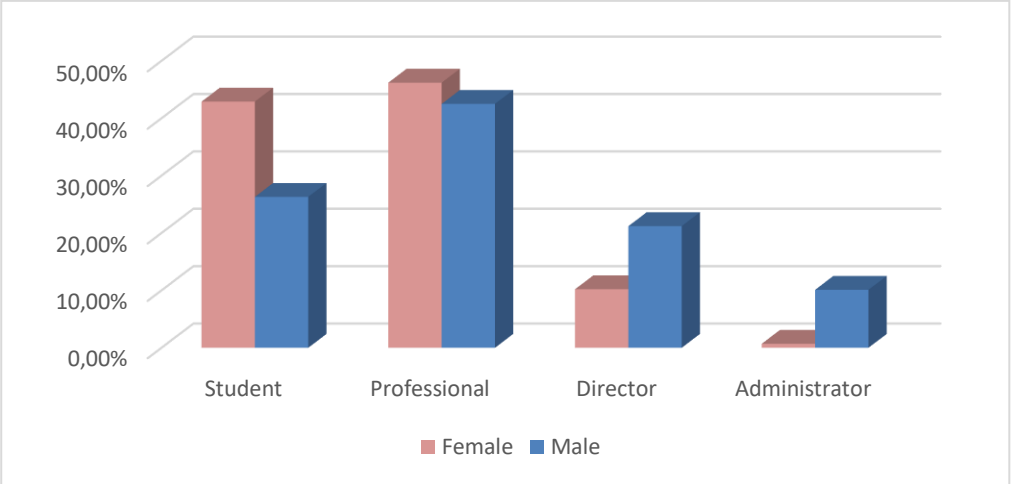


Source: Own Production

As for status, 177 (36.7%) are students, 216 (44.8%) are professionals, 69 (14.3%) are directors, and 20 (4.1%) are administrators.

When we cross-reference the status with the gender of the participants, we find that female participants show a higher percentage than male participants in the student and professional categories. However, for the director and administrator positions, the male participants show a higher percentage.

Figure 5.2– Participants: cross-reference the status with the gender

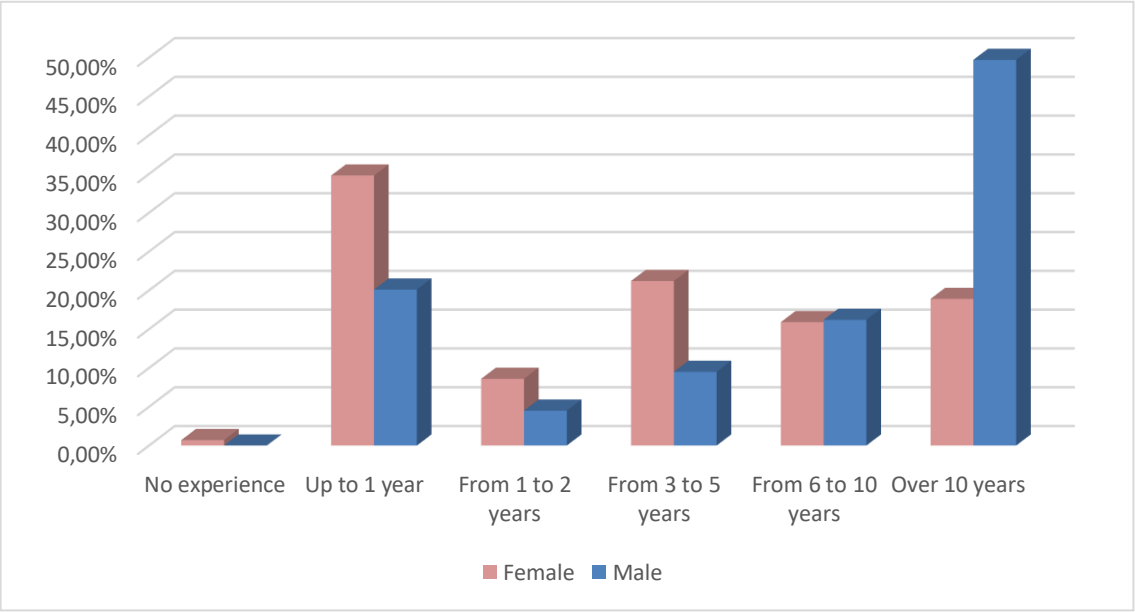


Source: Own Production

Regarding professional experience, 2 (0.4%) participants have no experience, 141 (29.3%) have less than one year of experience, 34 (7.1%) have between one and two years of experience, 81 (16.8%) have between 3- and 5-years' experience, 77 (16%) have between 6- and 10-years' experience and 146 (30.3%) have more than ten years' experience.

When we cross-reference professional experience with the gender of the participants, we find that up to 5 years, the percentage of female participants is higher. However, after six years, the percentage of male participants becomes higher.

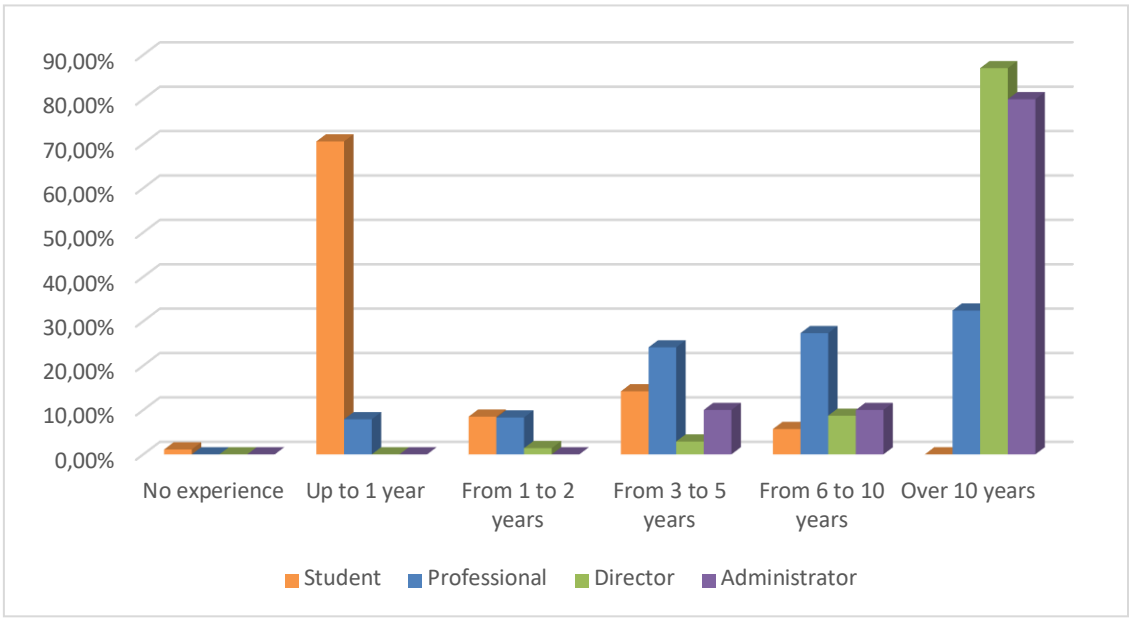
Figure 5.3– Participants: cross-reference professional experience with the gender



Source: Own Production

As for the intersection between professional status and professional experience, up to one year of experience, the majority are students, and between 3 and 10 years are professionals with a higher percentage. With more than ten years of professional experience, directors have the highest percentage, followed by managers.

Figure 5.4– Participants: Cross professional status and professional experience

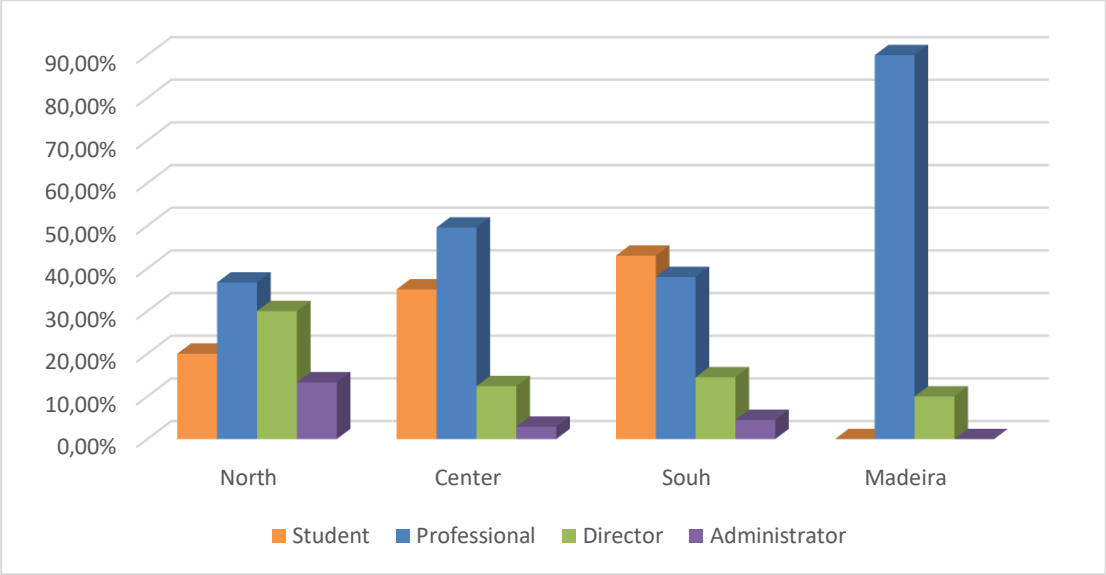


Source: Own Production

Regarding the geographical zone where the hotel units where the participant's work are located, 30 (6.2%) participants work in hotel units that are in the northern region, 242 (50.2%) in the central region, 200 (41.5%) in the southern region, and 10 (2.1%) in the autonomous region of Madeira.

When we cross-reference the status with the geographical area where the hotel unit is located, we find that we have the highest percentage of students in the south, the highest percentage of professionals is in the autonomous region of Madeira, and the highest percentage of directors and managers is in the north.

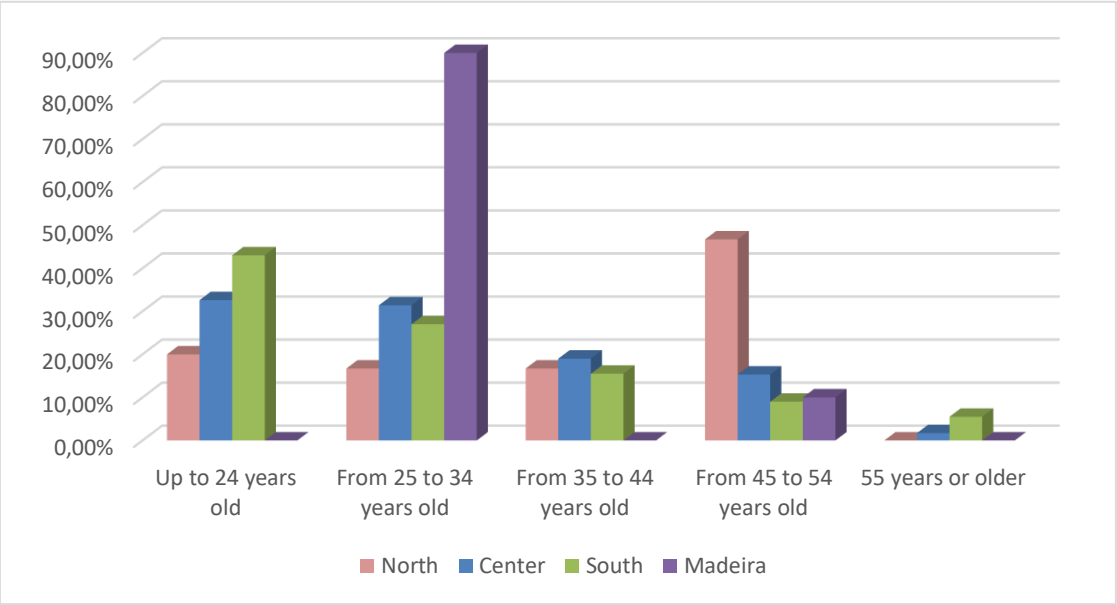
Figure 5.5– Participants: cross-reference the status with the geographical area



Source: Own Production

When we cross the geographic zone where the hotel unit is located, we verify that it is in the southern zone where we find the highest percentage of younger participants and the highest percentage of older participants. In the autonomous region of Madeira, nine of the 10 participants in this study are between 25 and 34 years old.

Figure 5.6– Participants: cross-reference the age with the geographical area



Source: Own Production

Concerning the course attended or to be attended by the participants of this study, it is found that 245 (50.8%) participants have or are attending the hotel management course, 131 (27.2%) the tourism course, 50 (10.4%) the hotel management and tourism course, 44 (9.1%) are course and 11 (2.3%) another course.

The largest percentage of the student participants are in the hotel management course. As for the professionals, most have a degree in hotel management or tourism. Directors mostly have a degree in hotel management or management. As for the administrators, most have a degree in management.

Figure 5.7– Participants: cross-reference the status with the degree

Source: Own Production

Finally, among the participants of this study, 442 (91.7%) are of Portuguese nationality, and 40 (8.3%) are of foreign nationality.

5.2 Data Analysis Procedure

Data were imported from Google Forms into SPSS Statistics 29 software. An exploratory factor analysis (EFA) was initially performed since this is a new instrument built for this study. This procedure was intended to ascertain the correlations between the original variables and estimate the common factors and the structural relationships that link them to the variables.

The main purpose of the EFA is to assign a score (quantification) to constructs or factors that are not directly observable, producing a score that weights highly correlated responses. This new score is a parsimonious representation of the information present in the different variables, being able to summarize the information present in many variables in a reduced number of factors not directly observable. These factors allow identifying structural relationships between variables that would go unnoticed in the vast set of original variables (Marôco, 2021).

The test for factor extraction requires that the variables show the multivariate normal distribution and is very sensitive to violations of this assumption. The most widely used method

is the "Kaiser-Meyer-Olkin measure of sampling adequacy". The KMO is a measure of the homogeneity of variables, which compares the simple correlations with the partial correlations observed between the variables. In organizational studies, the KMO value should be greater than .70 (Sharma, 1996).

Some rules must be used together that allow the researcher to decide on the most appropriate number of factors, such as Kaiser's criterion, that is, the rule of "eigenvalue greater than 1", which says that the factors that explain more information (variance) than the standardized information of an original variable, whose value is 1, should be retained. This was the criterion followed in this study.

However, the factorial solution found in the EFA model can only sometimes be interpreted adequately because the factorial weights in the common factors are such that it is impossible to assign an empirical meaning to the extracted factors. For this reason, the Varimax Rotation Method is used, which aims to obtain a factor structure in which one and only one of the original variables is strongly associated with a single factor and weakly associated with the remaining factors (Marôco, 2021).

After the EFA, a six-factor Confirmatory Factor Analysis (CFA) was performed using the AMOS for Windows 29 software.

The design of the variables in the path diagram to be recognized by Amos is as follows: ellipses represent latent variables or errors; rectangles represent observable variables; the single-ended arrow represents the path or causal relationship between two variables; the seven-ended curve between two variables represents a covariance (Arblucke, 1982). The graphical interface programming method (AMOS Graphs 28) was used.

The procedure was according to a "model generation" logic (Jöreskog & Sörbom, 1993), considering in the analysis of their fit, interactively the results obtained: for the chi-square ($\square^2$); for the Tucker Lewis index (TLII); for the goodness-of-fit index (GFI); for the comparative fit index (CFI); for the root mean square error o approximation (RMSEA); and the Standardized Root Mean Square (SRMR). After the AFC, construct reliability, convergent validity and discriminant validity were calculated for each instrument.

To analyse the other metric qualities of the instruments used in this study, the SPSS Statistics 29 for Windows software was used.

Concerning the study of item sensitivity, the different measures of central tendency, dispersion and distribution were calculated for all items.

Subsequently, descriptive statistics of the variables under study were performed using Student's t-tests for a sample. The next step was to study the association between the variables through Pearson's correlations. Finally, the formulated hypotheses were tested.

The hypotheses formulated in this study were tested by performing linear regressions after the respective assumptions were verified. The Macro Process developed by Hayes (2013) was used to test the hypotheses that assume a moderating effect.

5.3 Instrument

The instrument used in this study to measure business analytics and associated variables were explicitly built for this study. It consists of 22 items rated on a five-point Likert rating scale (from "1" strongly disagree to "5" strongly agree). As mentioned earlier, an EFA was initially performed.

We obtained a KMO value of .77 which can be considered acceptable (Sharma, 1996), and Bartlett's test of sphericity was significant at $p < .001$, being an acceptable value to continue the analysis, as well as an indicator that the data came from a multivariate normal population (Pestana & Gageiro, 2003). It was found that the factor structure of this scale is based on six factors, which explain 67% of the total variability of the scale. Item 14 was removed because it had a low factor weight. The remaining items have factor weights above .50.

After semantic analysis of the items, it was decided to assign the following names to the respective dimensions: (1) business analytics (items 17, 18, 19, 20, 21 and 22); (2) integration and infrastructures (items 9, 10, 11 and 13); (3) business adaptation (items 3, 4 and 8); (4) business knowledge (items 1, 2 and 5); (5) organizational culture (items 12, 15 and 16); (6) costs (items 6 and 7).

Next, a six-factor AFC was performed. The values obtained in the three-factor model indicate an acceptable adjustment since the adjustment indexes are within or very close to acceptable values: $\chi^2/gl = 4.23$; GFI = .89; CFI = .91; TLI = .87; RMSEA = .082; SRMR = .051. As for construct reliability, the following values were obtained: .89 for the business analytics dimension; .65 for integration and infrastructures; .70 for business adaptation; .72 for business knowledge; .69 for organizational culture; .60 for costs. Only the costs dimension presents low construct reliability. Concerning convergent validity (AVE), the following values were obtained: .63 for the business analytics dimension; .37 for integration and infrastructures;

.46 for business adaptation; .47 for business knowledge; .45 for organizational culture; .45 for costs. The integration and infrastructure dimension shows poor convergent validity. As for divergent validity, the square root of the AVE of each factor is lower than the correlation between them, so we can say that the dimensions diverge from each other.

As for the sensitivity of the items, none of the items has a median close to one of the extremes. All items have absolute skewness values and kurtosis below 3 and 7, respectively, so not grossly violates normality.

Table 5.1 – Factor and factor loadings of the items

Itens	Factor Loadings					
	1	2	3	4	5	6
1. The information coming from reports from these operational systems is enough to effectively manage a hotel unit.				.54		
2. With operational reports, there is a deep knowledge of the entire operation of the hotel.				.58		
3. There are sufficient and adequate Business Analytics products in the market for the hospitality industry.			.60			
4. There are people with adequate knowledge to provide Business Analytics level support for the hospitality industry.			.74			
5. There is good value for money in implementing Business Analytics systems in hospitality?				.79		
6. Business Analytics systems are too expensive.						.74
7. Cloud-oriented Business Analytics products are more accessible.						.66
8. Hospitality facilities can easily interconnect all the data sources needed to feed an analytics system			.61			
9. Hotels have a technological infrastructure designed to set up Business Analytics processes.		.59				
10. There is a good relationship between the analytical integrations involved and the business reality.		.70				
11. Hotels evaluate the entire surrounding structure before moving on to implement analytical systems in the hotel.		.79				
12. An Hotel unit's organisational culture should be prepared to adopt an analytical system.					.58	
13. Human resources in a hotel unit have the qualifications to work with analytical systems.		.56				
15. An Hotel unit should have a well-defined management structure to incorporate analytical systems.					.66	
16. An hotel unit should fully comply with legal requirements, the legislation, and its restrictions on data use.					.70	
17. Using Big Data Analytics could help increase the effectiveness and efficiency of a hotel unit's operations.	.88					
18. Using Big Data Analytics could help increase the effectiveness and efficiency of top management.	.89					
19. Using Big Data Analytics could guarantee better management strategies.	.90					
20. Using Big Data Analytics could help increase occupancy rates.	.83					
21. Using analytical systems could bring better results in terms of profit, productivity, and quality.	.80					
22. Using analytical systems could promote better services.	.68					

5.4 Results

5.4.1 Descriptive statistics of the variables under study

The first step was to perform descriptive statistics of the variables under study to understand the position of the answers given by the participants of this study. For this purpose, we performed several t-student tests for one sample.

Table 5.2– Descriptive statistics of variables

Variable	t	df	p	Mean	SD
Business Analytics	33.88***	481	< .001	3.93	.60
Integration and Infrastructures	2.11*	481	.018	3.06	.65
Business Adaptation	7.33***	481	< .001	3.22	.64
Business Knowledge	5.65***	481	< .001	3.18	.70
Organizational Culture	34.92***	481	< .001	3.97	.61
Costs	21.70***	481	< .001	3.55	.56

Note. * p < .05; *** p < .001

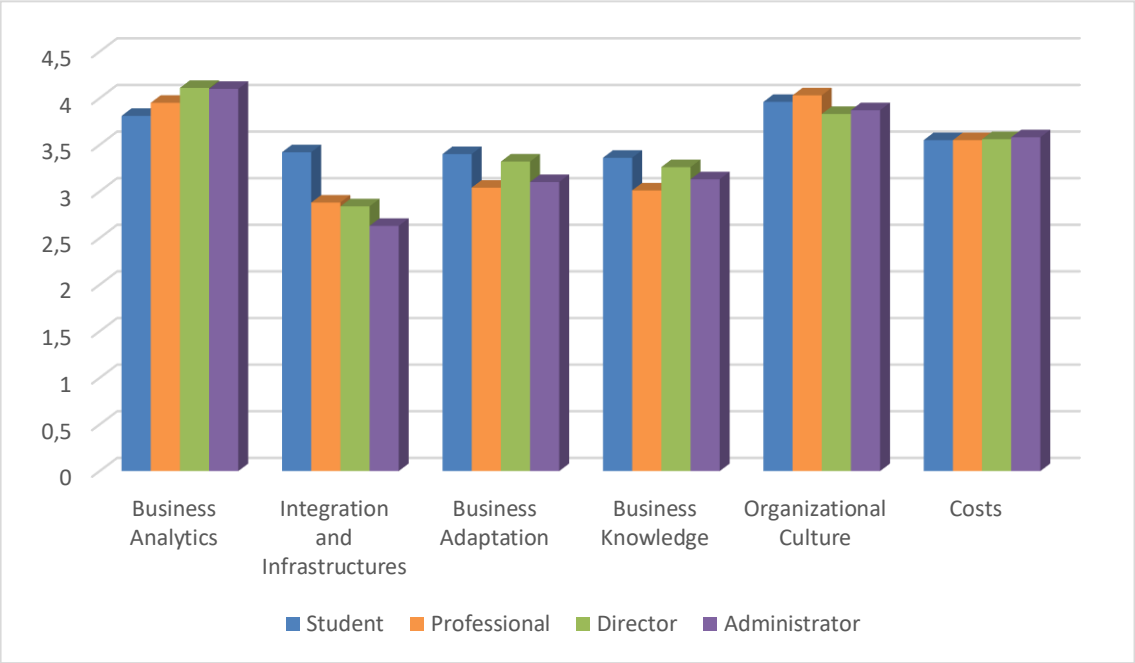
Source: Own production

The participants have a high perception of the variables under study since the average of all of them is significantly above the central point (3) (table). The variable the participants had the highest perception of is organizational culture, and the lowest perception is integration and infrastructures (table).

5.4.2 Effect of sociodemographic variables on the variables under study

We then tested the effect of socio-demographic variables on the variables under study. For this purpose, t-Student tests for independent samples and One-Way ANOVA tests were performed. Whenever statistically significant differences were found between at least two of the study groups, Tuckey's post hoc test was used. Regarding the Student's t-test for independent samples, whenever the assumption of variance homogeneity was not verified, the student’s t-test with Welch correction was used.

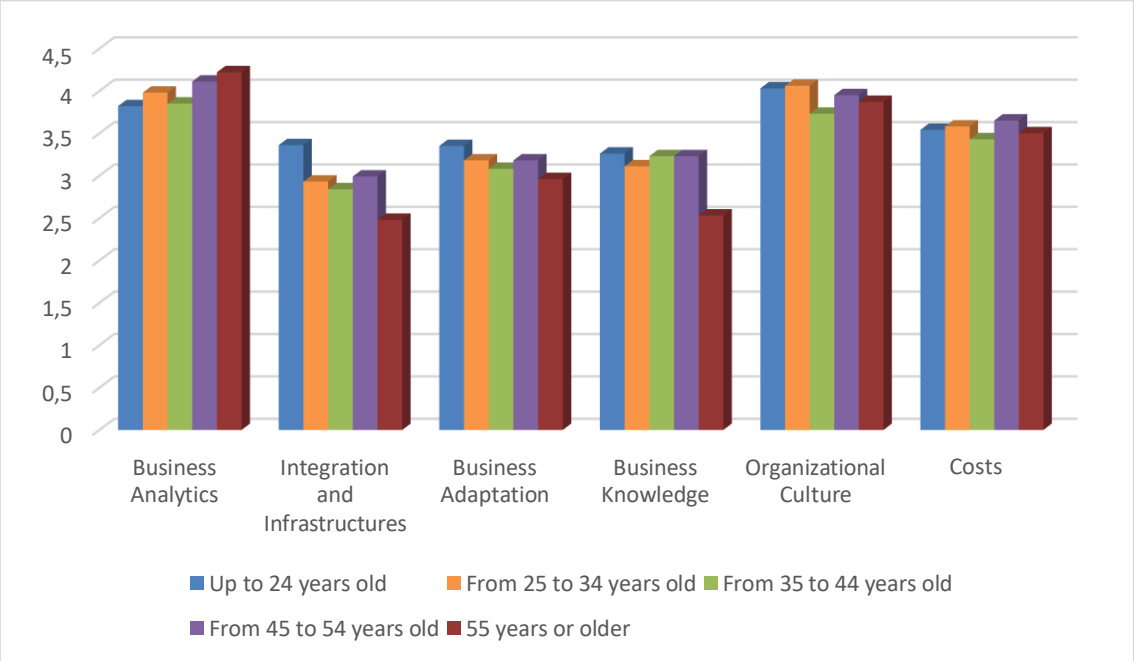
Figure 5.8– Effect of status on variables under study



Source: Own Production

The results indicate that status has a statistically significant effect on business analytics ($F(3, 478) = 4.92$; $p = .002$), integration and infrastructure ($F(3, 478) = 34.64$; $p < .001$), business fit ($F(3, 478) = 12.17$; $p < .001$), and business knowledge ($F(3, 478) = 8.90$; $p < .001$). Concerning business analytics, directors ($M = 4.11$; $SD = .55$) have a significantly higher perception than students ($M = 3.81$; $SD = .56$). For integration and infrastructure, it is students ($M = 3.41$; $SD = .54$) who have a significantly higher perception than professionals ($M = 2.88$; $SD = .58$), directors ($M = 2.84$; $SD = .68$), and administrators ($M = 2.63$; $SD = .68$). In business adaptation, it is the professionals ($M = 3.04$; $SD = .64$) who have a significantly lower perception than the students ($M = 3.40$; $SD = .58$) and the directors ($M = 3.32$; $SD = .61$). In business knowledge the situation is repeated, with professionals ($M = 3.01$; $SD = .65$) having a significantly lower perception compared to students ($M = 3.36$; $SD = .70$) and directors ($M = 3.26$; $SD = .76$).

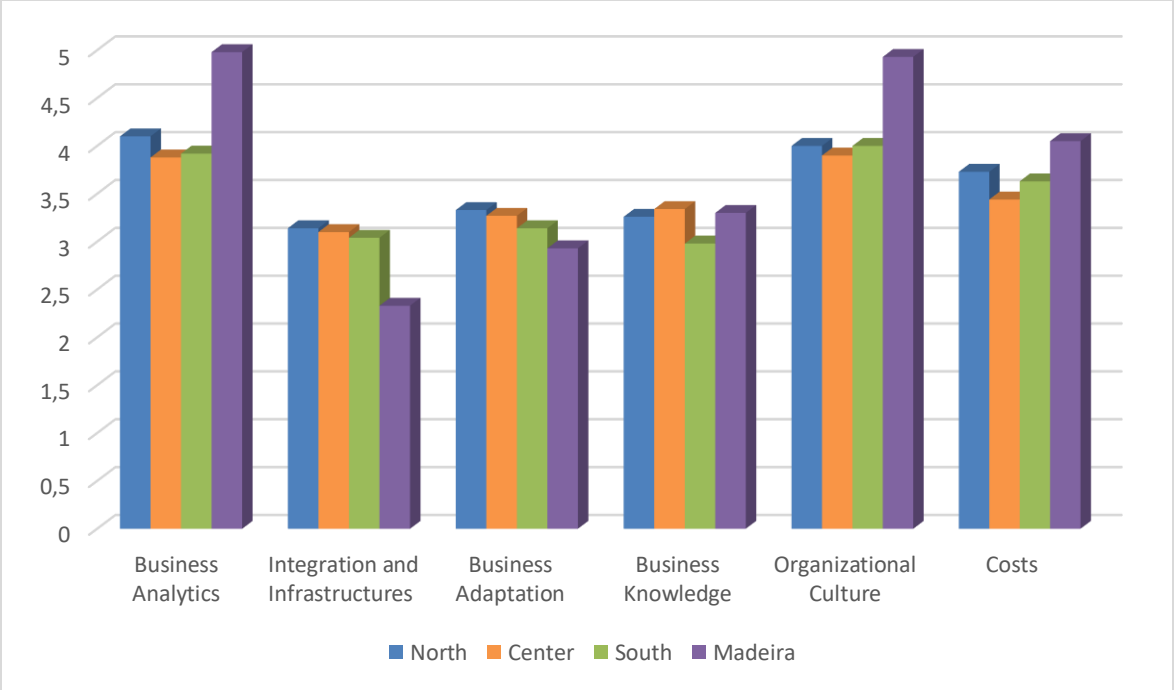
Figure 5.9– Effect of age on variables under study



Source: Own Production

The age group to which the participant belongs has a significant effect on the perception of business analytics (F (4, 477) = 4.59; p = .001), integration and infrastructure (F (4, 477) = 17. 87; p < .001), business adaptation (F (4, 477) = 3.52; p = .008), business knowledge (F (4, 477) = 4.39; p = .002), and organizational culture (F (4, 477) = 4.46; p = .002). Regarding business analytics, it is participants aged 45 to 54 (M = 4.11; SD = .52) who have a significantly higher perception than participants who are up to 24 (M = 3.82; SD = .58) and those aged 35 to 44 (M = 3.85; SD = .58). on the perception of integration and infrastructure it is participants aged up to 24 (M = 3. 35; SD = .57), who have a significantly higher perception than participants who are 25 to 34 years old (M = 2.93; SD = .61), those who are 35 to 44 years old (M = 2.84; SD = .63), those who are 45 to 54 years old (M = 2.99; SD = .66), and those who are 55 years old or older (M = 2.48; SD = .56). On adaptation to the business, participants aged up to 24 years (M = 3.35; SD = .52) have a significantly higher perception than participants aged 35 to 44 years (M = 3.08; SD = .78). In business knowledge it is participants aged 55 and older (M = 2.53; SD = .81), who have a significantly lower perception than participants aged up to 24 (M = 3.26; SD = .66), aged 25 to 34 (M = 3.11; SD = .66), aged 35 to 44 (M = 3.23; SD = . 81) and betweenthe ages of 45 and 54 (M = 3.23; SD = .67). Participants who are between the ages of 35 and 44 (M = 3.73; SD = .53) have a significantly lower perception of organizational culture than participants who are up to 24 (M = 4.03; SD = .61) and those between the ages of 25 and 34 (M = 4.05; SD = .66).

Figure 5.10– Effect of geographical area on variables under study

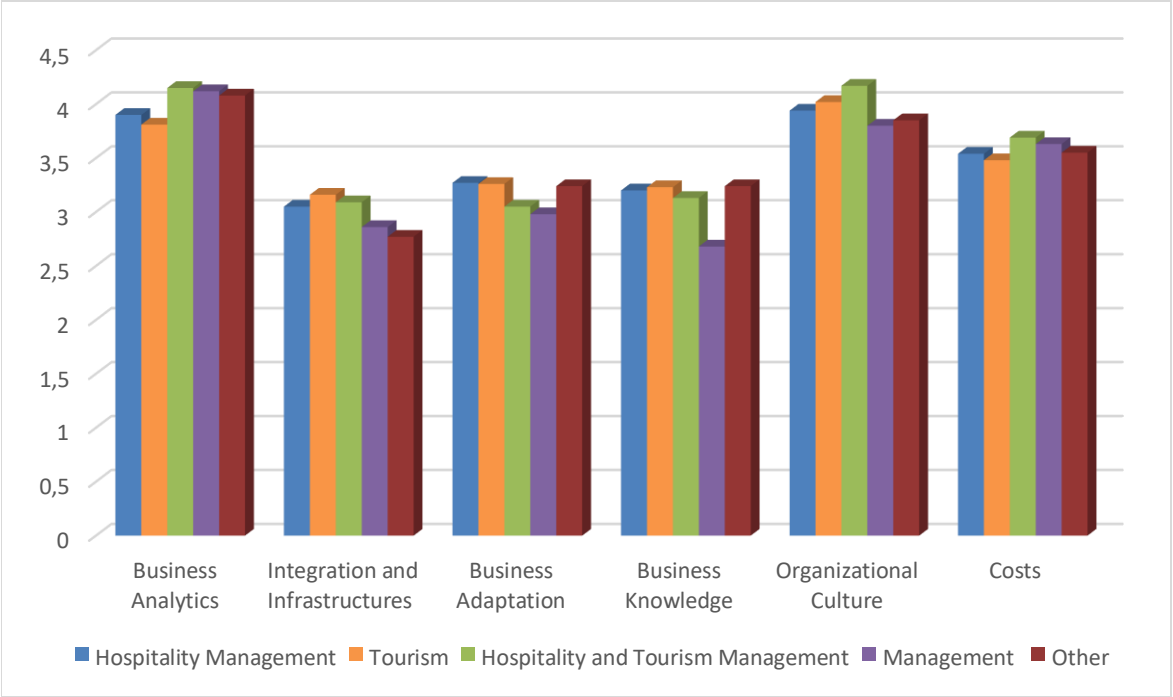


Source: Own Production

The region where the hotel unit is located has a significant effect on the perception of business analytics (F (3, 478) = 12.54; p < .001), integration and infrastructure (F (3, 478) = 4. 95; p = .002), of business knowledge (F (3, 478) = 10.47; p < .001), of organizational culture (F (3, 478) = 10.02; p < .001), and of costs (F (3, 478) = 8.27; p < .001). Participants working in hotels located in the autonomous region of Madeira (M = 4.98; SD = .05) have a significantly higher perception of business analytics than participants working in hotels located in the northern region (M = 4.10; SD = .37), the central region (M = 3.88; SD = .63) and the southern region (M = 3.92; SD = .56). Regarding integration and infrastructures it is the participants who work in hotel units located in the autonomous region of Madeira (M = 2.34 SD = .62) that have a significantly lower perception than the participants who work in hotel units located in the northern region (M = 3.14; SD = . 78), the central region (M = 3.10; SD = .63) and the southern region (M = 3.04; SD = .62). Participants working in hotel units located in the central region (M = 3.34; SD = .68) have a significantly higher perception of business knowledge than participants working in the southern region (M = 2.98; SD = .68). Participants working in hotel units located in the autonomous region of Madeira (M = 4.93; SD = .21) have a significantly higher perception of organizational culture than participants working in hotel units located in the northern region (M = 4.00; SD = .38), the central region (M = 3.90; SD = .61), and the southern region (M = 4.00; SD = .61). Participants working in hotel units located in the central

region (M = 3.44; SD = .50) have a significantly lower perception of costs than participants working in hotel units located in the northern region (M = 3.73; SD = .63), the southern region (M = 3.63; SD = .58), and the autonomous region of Madeira (M = 4.05; SD = .50).

Figure 5.11– Effect of course on variables under study



Source: Own Production

The participants' course has a significant effect on the perception of business analytics (F (4, 476) = 4.32; p = .002), and organizational culture (F (4, 476) = 2.80; p = .026). Participants with the hospitality and tourism management course (M = 4.15; SD = .59) and management (M = 4.12; SD = .54), have a significantly higher perception of business analytics than participants with the tourism course (M = 3.81; SD = .60). About organizational culture, participants with the hospitality and tourism management course (M = 4.17; SD = .65) have a significantly higher perception than participants with the management course (M = 3.80; SD = .54).

Table 5.3 – Gender effect on variables under study

Dependent Variable	t	df	p	Female		Male	
				Mean	SD	Mean	SD
Business Analytics	-3.92***	480	< .001	3.85	.59	4.07	.59
Integration and Infrastructures	4.86***	480	< .001	3.17	.61	2.88	.67
Business Adaptation	-.95	480	.171	3.19	.62	3.25	.68
Business Knowledge	-.30	480	.383	3.17	.71	3.19	.70
Organizational Culture	-2.02*	480	.022	3.93	.59	4.04	.64
Costs	1.30	410.71	.098	3.57	.58	3.51	.51

Source: Own production

As for the effect of gender on the variables under study, we found statistically significant differences in the perception of business analytics, integration and infrastructures, and organizational culture (table). Female participants have a significantly higher perception of business analytics and organizational culture than female participants (table). On the other hand, female participants have a significantly higher perception of integration and infrastructurethan male participants (table).

Table 5.4– Nationality effect on variables under study

Dependent Variable	t	df	p	Portuguese		Other	
				Mean	SD	Mean	SD
Business Analytics	-2.71***	480	.003	3.95	.60	3.68	.60
Integration and Infrastructures	1.79***	480	.037	3.05	.64	3.24	.73
Business Adaptation	1.64	480	.051	3.20	.64	3.38	.64
Business Knowledge	1.98	480	.024	3.16	.70	3.19	.69
Organizational Culture	-.11	480	.457	3.97	.60	3.96	.72
Costs	.45	480	.327	3.55	.55	3.59	.63

Source: Own production

Whether the respondent is of Portuguese, or another nationality significantly affects the perception of business analytics and integration and infrastructures (table). Compared to Portuguese participants, participants of foreign nationality have a significantly lower perception of business analytics and a significantly higher perception of integration and infrastructures (table).

5.4.3 Association between the variables under study

The next step was to study the association between the variables under study using Pearson's correlations.

Table 5.5 – Association between variables

		1	2	3	4	5	6
1.	Business Analytics	--					
2.	Integration and Infrastructures	-,07	--				
3.	Business Adaptation	-,07	,46**	--			
4.	Business Knowledge	,02	,41**	,47**	--		
5.	Organizational Culture	,56**	,06	,03	,07	--	
6.	Costs	,41**	,01	,06	,03	,29**	--

Source: Own production

The results indicate that business analytics is only positively and significantly associated with organizational culture and costs. Business adaptation is positively and significantly associated with business knowledge. Integration and infrastructure are positively and significantly associated with business adaptation and knowledge. Finally, organizational culture is positively and significantly associated with costs.

5.4.4 Hypothesis Tests

Finally, the hypotheses formulated in this study were tested. Hypotheses 1, 2, 3, 4, 5, 6 and 7 were tested through multiple linear regressions. As control variables we considered the age group, the status of the participant and the geographic area where the hotel unit is located.

H1: Integration and infrastructure is positively and significantly associated with business analytics.

Table 5.6 – Results of multiple linear regression (H1)

Independent Variable	Business Analytics	
	β Step 1	β Step 2
Age	.07	.07
Status	.13*	.13*
Geographic Area	.09*	.09*
Integration and Infrastructures		.01
F	6.41***	4.80***
R^2_a	.03	.03

Note. * $p < .05$; *** $p < .001$

Source: Own production

The results indicate to us that only the control variables, status (β = .13; p = .048) and the geographical area where the hotel unit is located (β = .09; p = .042), have a positive and significant effect on business analytics. Both model 1 (F (3, 478) = 6.41; p < .001) and model

2 (F (3, 478) = 4.80; p < .001) are statistically significant. The model explains 3% of the variability in the dependent variable. The results do not support hypothesis 1.

H2: Business adaptation is positively and significantly associated with business analytics.

Table 5.7– Results of multiple linear regression (H2)

Independent Variable	Business Analytics	
	β Step 1	β Step 2
Age	.07	.07
Status	.13*	.13*
Geographic Area	.09*	.09
Business Adaptation		-.04
F	6.41***	4.96***
R^2_a	.03	.03

Note. * $p < .05$; *** $p < .001$

Source: Own production

The results indicate that only one control variable, the geographical area of the hotel unit (β = .13; p = .047), have a positive and significant effect on business analytics. Both model 1 (F (3, 478) = 6.41; p < .001) and model 2 (F (3, 478) = 4.96; p < .001) are statistically significant. The model explains 3% of the variability in the dependent variable. The results do not support hypothesis 2.

H3: Business knowledge is positively and significantly associated with business analytics.

Table 5.8– Results of multiple linear regression (H3)

Independent Variable	Business Analytics	
	β Step 1	β Step 2
Age	.07	.08
Status	.13*	.13*
Geographic Area	.09*	.10*
Business Knowledge		.06
F	6.41***	5.16***
R^2_a	.03	.03

Note. * $p < .05$; *** $p < .001$

Source: Own production

The results indicate that only the control variables, status (β = .13; p = .037) and the geographical area where the hotel unit is located (β = .10; p = .025), has a positive and significant effect on business knowledge. Both model 1 (F (3, 478) = 6.41; p < .001) and model 2 (F (3, 478) = 5.16; p < .001) are statistically significant. The model explains 3% of the variability in the dependent variable. The results do not support hypothesis 3.

H4: Organizational culture is positively and significantly associated with business analytics.

Table 5.9– Results of multiple linear regression (H4)

Independent Variable	Business Analytics	
	β Step 1	β Step 2
Age	.07	.14**
Status	.13*	.10*
Geographic Area	.09*	.03
Organizational Culture		.57***
F	6.41***	66.88***
R^2_a	.03	.35

Note. * $p < .05$; *** $p < .001$

Source: Own production

The results indicate that, age (β = .14; p = .006), status (β = .10; p = .041) and organizational culture (β = .57; p < .001) has a positive and significant effect on business analytics. Both model 1 (F (3, 478) = 6.41; p < .001) and model 2 (F (3, 478) = 66.88; p < .001) are statistically significant. The model explains 35% of the variability in the dependent variable. The results support hypothesis 4.

H5: Costs are positively and significantly associated with costs business analytics.

Table 5.10– Results of multiple linear regression (H5)

Independent Variable	Business Analytics	
	β Step 1	β Step 2
Age	.07	.07
Status	.13*	.12*
Geographic Area	.09*	.04
Costs		.41***
F	6.41***	29.50***
R^2_a	.03	.19

Note. * $p < .05$; *** $p < .001$

Source: Own production

The results indicate that, only status (β = .12; p = .032) and costs (β = .41; p < .001) positively and significantly affects business analytics. Both model 1 (F (3, 478) = 6.41; p = .085) and model 2 (F (3, 478) = 29.50; p < .001) are statistically significant. The model explains 19% of the variability in the dependent variable. The results support hypothesis 5.

H6: Integration and infrastructure is positively and significantly associated with business adaptation.

Table 5.11– Results of multiple linear regression (H6)

Independent Variable	Business Adaptation

	β Step 1	β Step 2
Age	-.13*	-.09
Status	-.05	.12*
Geographic Area	-.14**	-.07
Integration and infrastructure		.48***
F	6.57***	35.94***
R^2_a	.03	.23

Source: Own production

The results indicate that, in step 1, age (β = -.13; p = .045) and the geographical area where the hotel unit is located (β = -.14; p = .002) negatively and significantly affects business adaptation. In step 2, status (β = .12; p = .046) and integration and infrastructure (β = .48; p < .001) have a positive and significant effect on business adaptation. Both model 1 (F (3, 478) = 6.57; p < .001) and model 2 (F (3, 478) = 35.94; p < .001) are statistically significant. The model explains 23% of the variability in the dependent variable. The results support hypothesis 6.

H7: Integration and infrastructure is positively and significantly associated with business knowledge.

Table 5.12– Results of multiple linear regression (H7)

Independent Variable	Business Knowledge	
	β Step 1	β Step 2
Age	-.05	-.02
Status	-.09	-.05
Geographic Area	-.20***	-.14***
Business Analytics		.41***
F	8.74***	28.01***
R^2_a	.05	.18

Source: Own production

The results indicate that, in step 1, only the geographical area where the hotel unit is located (β = -.20; p < .001) negatively and significantly affects business knowledge. In step 2, only the geographical area where the hotel unit is located (β = -.14; p < .001) has a negative and significant effect on organizational culture, while the effect of integration and infrastructure (β = .41; p < .001) is positive and significant. Both model 1 (F (3, 478) = 8.84; p = .007) and model 2 (F (3, 478) = 28.01; p < .001) are statistically significant. The model explains 18% of the variability in the dependent variable. The results support hypothesis 7.

H8: Status moderates the relationship between integration and infrastructure and business analytics.

Table 5.13– Results of moderator effect (H8)

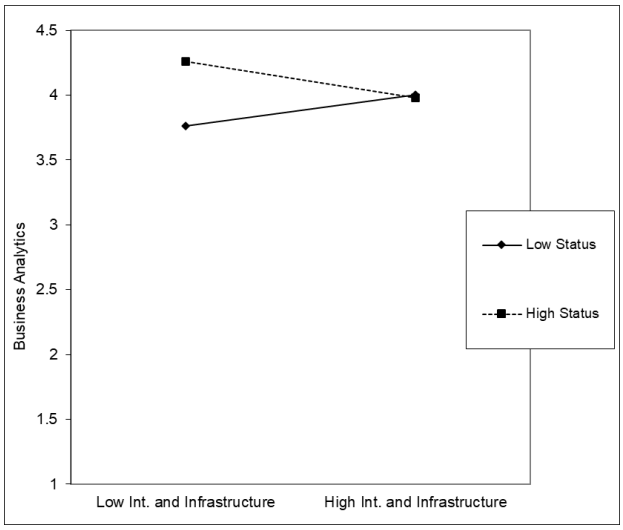
Variable	B	SE	t	*p*	95% CI
	Integration and Infrastructure → Business Analytics (R^2 = .04; p < .001)				
Constant	3.90***	.02	136.11***	< .001	[3.85, 3.96]
Integration and Infrastructure	-.01	.05	-.05	.958	[-.09, .09]
Status	.12	.04	3.29***	.001	[.05, .19]
IInf*Status	-.13	.05	-2.62*	.009	[-.23, -.03]

Source: Own production

We find a moderating effect of status on the relationship between business analytics and integration and infrastructure (B = -.13; p = .009). The model is statistically significant (F (3, 478) = 7.01; p < .001). The model explains the variability in integration and infrastructures by 4% (table). The results support hypothesis 8.

For low-status participants, compared to high-status participants, the perception of integration and infrastructure becomes relevant to enhance their perception business analytics (graph).

Figure 5.12– Interaction Business Analytics x Status on Integration and Infrastructures



Source: Own Production

H9: Status moderates the relationship between business adaptation and business analytics.

Table 5.14– Results of moderator effect (H9)

Variable	B	SE	t	*p*	95% CI
	Business adaptation → business analytics (R^2 = .04; p < .001)				
Constant	3.92***	.03	144.64***	< .001	[3.87, 3.98]

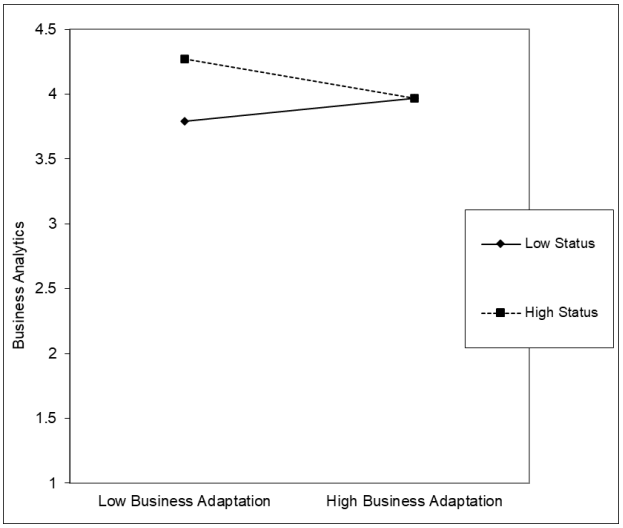
Business Adaptation	-.04	.04	-.88	.379	[-.12, .05]
Status	.13	.03	3.85***	< .001	[.06, .19]
BAdap*Status	-.12	.05	-2.33*	.020	[-.21, -.02]

Source: Own production

We find a moderating effect of status on the relationship between business analytics and business adaptation (B = -.12; p = .020). The model is statistically significant (F (3, 478) = 6.94; p < .001). The model explains the variability in business adaptation by 4% (table). The results support hypothesis 9.

For low-status participants, compared to high-status participants, the perception of business adaptation becomes relevant to enhance their perception of business analytics (graph)..

Figure 5.13– Interaction Business Analytics x Status on Business Adaptation



Source: Own Production

H10: Status moderates the relationship between business analytics and business knowledge.

Table 5.15– Results of moderator effect (H10)

Variable	B	SE	t	*p*	95% CI
	Business knowledge → business analytics (R^2 = .03; *p* = .002)				
Constant	3.93***	.03	144.23***	< .001	[3.87, 3.98]
Business Knowledge	.03	.04	.74	.458	[-.05, .10]
Status	.13	.03	3.81***	. < .001	[.06, .19]
BK*Status	.02	.05	.32	.713	[-.11, .07]

Source: Own production

Status was found not to moderate the relationship between business analytics and business knowledge (B = .03; p = .751). The model is statistically significant (F (3, 478) = 4.87; p = .002) (table). The results do not support hypothesis 10.

H11: Status moderates the relationship between organizational culture and business analytics.

Table 5.16– Results of moderator effect (H11)

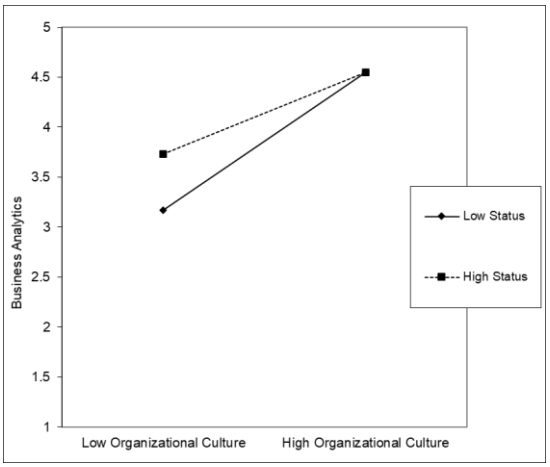
Variable	B	SE	t	*p*	95% CI
	Organizational culture → Business Analytics (R^2 = .36; *p* < .001)				
Constant	3.93***	.02	177.84***	< .001	[3.94, 4.03]
Organizational culture	.55	.04	15.21***	< .001	[.51, .66]
Status	.14	.03	4.98***	< .001	[-.16, -.05]
OC*Status	-.14	.05	-2.76***	.006	[-.29, -.09]

Source: Own production

We find a moderating effect of status on the relationship between business analytics and organizational culture (B = -.14; p = .006). The model is statistically significant (F (3, 478) = 89.20; p < .001). The model explains the variability in organizational culture by 36% (table). The results support hypothesis 11.

For low-status participants, compared to high-status participants, the perception of organizational culture becomes relevant to enhance their perception of business analytics (graph).

Figure 5.14– Interaction Business Analytics x Status on organizational culture



Source: Own Production

H12: Status moderates the relationship between business analytics and costs

Table 5.17 – Results of moderator effect (H12)

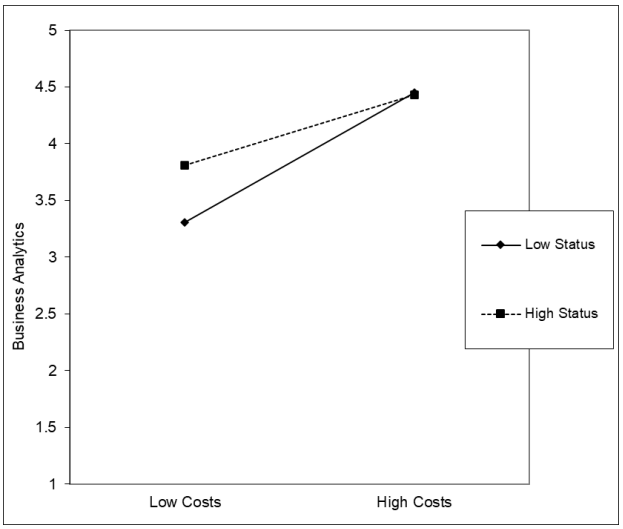
Variable	B	SE	t	*p*	95% CI
	Costs → Business Analytics (R^2 = .20; p < .001)				
Constant	3.93***	.02	160.01***	< .001	[3.51, 3.61]
Costs	.44***	.04	9.94***	< .001	[.30, .46]
Status	.12	.03	4.04***	< .001	[-.09, .02]
Costs*Status	-.13*	.05	-2.29*	.022	[-.22, -.02]

Source: Own production

We find a moderating effect of status on the relationship between business analytics and costs (B = -.13; p = .022). The model is statistically significant (F (3, 478) = 40.63; p < .001). The model explains the variability in costs by 20% (table). The results support hypothesis 12.

For low-status participants, compared to high-status participants, the perception of costs becomes relevant to enhance their perception of business analytics (graph).

Figure 5.15– Interaction Business Analytics x Status on perception of costs



Source: Own Production

The following is a table where all the results of the hypotheses formulated in this study are summarized:

Table 5.18 - Hypotheses Results

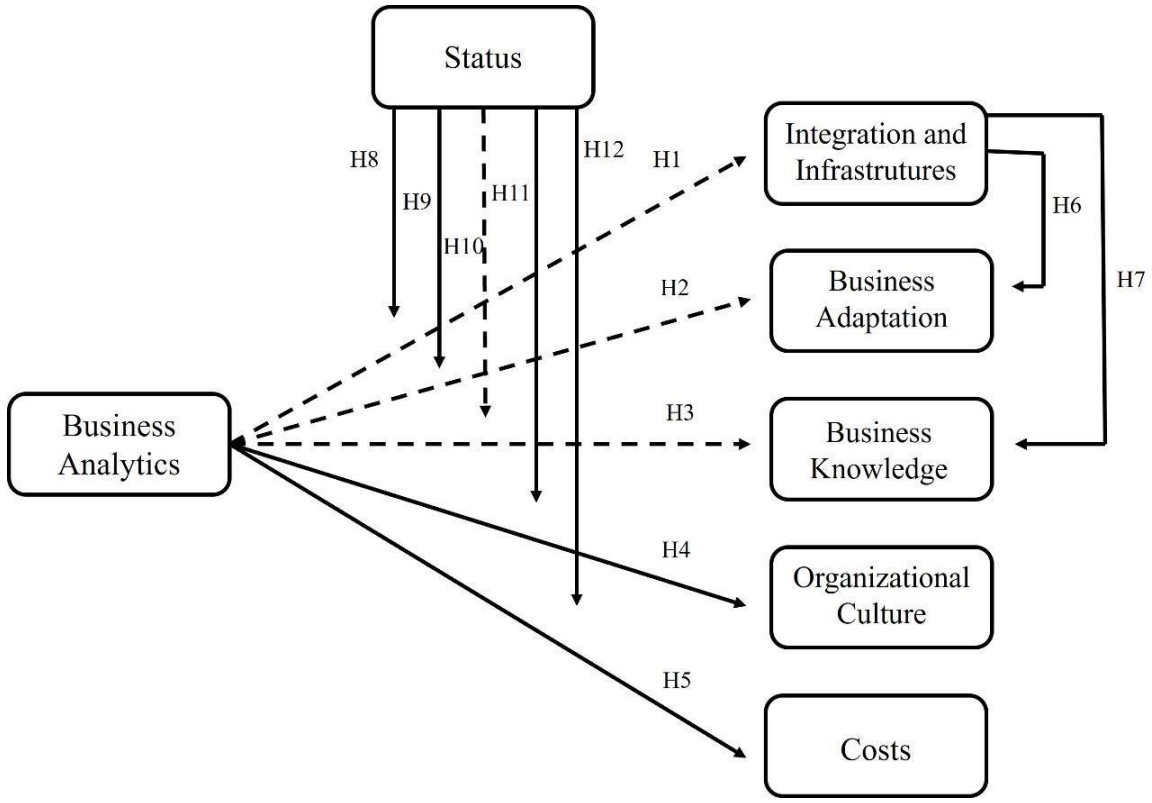
Hypothesis		Results
1	Integration and infrastructure are positively and significantly associated with business analytics.	Not supported
2	Business adaptation is positively and significantly associated with business analytics.	Not supported
3	Business knowledge is positively and significantly associated with business analytics.	Not supported
4	Organizational culture is positively and significantly associated with business analytics.	Supported
5	Costs is positively and significantly associated with business analytics.	Supported
6	Integration and infrastructure are positively and significantly associated with business adaptation.	Supported
7	Integration and infrastructure are positively and significantly associated with business knowledge.	Supported
8	Status moderates the relationship between integration and infrastructure and business analytics.	Supported
9	Status moderates the relationship between business adaptation and business analytics.	Supported

10	Status moderates the relationship between business knowledge and business analytics.	Not supported
11	Status moderates the relationship between organizational culture and business analytics.	Supported
12	Status moderates the relationship between costs and business analytics.	Supported

Source: Own production

Finally, the final model is presented:

Figure 5.16 - Final Model



Source: Own Production

5.5 Results from hotel managers interviews

5.5.1 Insights uncovered from interviews to answer the starting questions.

In response to question RQ1, the Organizational Culture category was framed. Three major subcategories emerged from the responses obtained from the interviewees.

Table 5.19 - **RQ1:** Is the organizational culture of hotels ready to embrace Business Analytics systems?

Category	Subcategory
D- Organizational Culture	D1.RQ Preparing for Business Analytics
	D2.RQ Training and Knowledge
	D3.RQ Organizational culture

Source: Own production

Regarding the preparation for business analytics, in general, all interviewees understand the importance of moving quickly towards a culture linked to data analysis, although most of them have not incorporated yet it into their hotels. According to Daradkeh (2023), creating a knowledge-oriented organizational culture is crucial for companies to realize the significance of Business Analytics.

In response to the question, one of the interviewees states:

> *Not yet. We are not ready. What can I say is that we still need to grow or be part of the development of a more consistent bet on the training of human resources (...) to embrace more seriously the aspect of Business Analytics* (R7).

Another interviewee thinks that "(...) the organization is motivated, but don't know if we would have the ideal structure or the right profile, but I think so. I think we could embrace Business Analytics, also because it will be a thing of the future" (R4). Regarding teams in general, "(...) from middle management to secondary management or employees, I don't think they are all prepared for a business analytics culture, due to lack of technological literacy or issues of deficient academic training in some areas" (R1).

As for Training and Knowledge, the interviewees consider that there is still some lack "(...) it is not prepared, because we have a very old operating culture, we do not have people prepared to manage these platforms" (R3). However, they insist that "(...) it may make sense to embrace

Business Analytics Systems, even to have much more information, and much more basis for analysis" (R4).

Finally, regarding Organizational Culture, there is not much consensus. 57% of respondents say they are not prepared and 43% say they are already prepared. "The organizational culture of the hotel is not all prepared in the same proportion to receive or adopt Business Analytics systems" (R1). Another interviewee says: "(...) of the hotel where I am director, no. It is not prepared" (R3). On the other hand, other interviewees states:

> *Yes, it is. In fact, we already have some Business intelligence tools and, because more and more this intelligence is important and can give us information at a speed that we cannot do manually, neither near nor far. So yes, it is essential, and of course the organization and the organizational culture are also completely geared towards the use of these tools* (R5).

In response to question RQ2, the Business Knowledge category was framed. From the responses obtained from the interviewees, four major subcategories stood out.

Table 5.20 - **RQ2:** Do hotel managers and newly graduated professionals have a true understanding of their business (from all departments)?

Category	**Subcategory**
C- Business Knowledge	C1.RQ Interconnection of Operational Departments
	C2.RQ Professional Experience
	C3.RQ Integrated business vision
	C4.RQ Business Knowledge

Source: Own production

This question is important to assess whether both newly licensed professionals and directors master the knowledge of all sections involved in a hotel as well as interdepartmental relations. According to Daradkeh (2023), in a knowledge-oriented culture, there is a focus on continuous learning, exploration, and generating new insights. It encourages employees to seek data-driven solutions, embrace innovation, and challenge conventional thinking.

Regarding the Interconnection of Operational Departments, a great imbalance was detected between newly graduated professionals and hotel directors. In response to the question, one of

the interviewees states that the "(...) new graduates know some operational tasks performed by other departments, but they are far from knowing their interconnection and how a certain department involves the collaboration of other departments" (R1).

Regarding professional experience, the interviews also reveal that, in the case of hotel managers, "...the "One Man Show" policy is still being lived in Portugal. we must know how to do everything and must pay a director well if you think he knows how to do everything. I think that never happens" (R4). Another interviewee considers that "(...) only with a lot of personal sacrifice can you succeed and make a career" (R7). Also says "our life is given over to the profession and this is not in line, neither near nor far, with the new generations" (R7).

Regarding the integrated vision of the business, one of the interviewees states:

> *Hospitality is an industry that is still very segmented, and people follow either the accommodation route, the commercial route, or the F&B route. Some professionals are interested in the various areas and end up knowing how they work and even in internships they try the various sectors, but I believe that the vast majority focus only on the area where they are inserted* (R2).

Regarding recent graduates, most interviewees consider "... that they do not have a deep knowledge of the business" (R3), they consider that "... they have basic notions, now deep knowledge of the business I think they do not have" (R4). There are even those who are more radical, stating that "In the vast majority, both directors and recent graduates do not have a deep knowledge" (R6). Another interviewee states:

> *New graduates are those who in their first employment contracts or internships lack knowledge in important areas such as purchasing, stock management, waste management and allocation of responsibilities. This indicates a lack of organizational understanding in terms of human resources, making it difficult to perceive their role in the overall vision of the organization* (R1).

In response to question RQ3, the Data Integration and Infrastructure category was framed. From the responses obtained from the interviewees, five major subcategories were highlighted.

Table 5.21 - **RQ3:** Is there awareness on the part of hotel managers and newly licensed professionals of the needs for systems integration and infrastructure to embrace analytical systems?

Category	**Subcategory**
A- Data Integration and Infrastructure	A1.RQ Need for Infrastructure Upgrade
	A2.RQ Data Integration
	A3.RQ Business Knowledge
	A4.RQ Outsourcing
	A5.RQ Hotel Size

Source: Own production

Data integration tools and processes are vital for combining data from diverse sources and converting it into a usable format for analysis, as supported by the literature. To provide valuable insights and support decision-making, professionals in the field of Business Intelligence and Analytics must understand business challenges and develop suitable analytical solutions (Chen et al., 2012c).

Regarding the need for infrastructure upgrades, one of the interviewees mentioned a lack of resident technicians in the hotels, "(...) on average, there is no technician in the hotel park to do a good analysis or have an awareness of what is needed for integration and infrastructure" (R1). Two other responses corroborated the fact that there is little awareness, and one respondent mentioned: "I think at the infrastructure level we are not sensitized to what is needed relatively for the adoption of analytical systems" (R3). another interviewee also mentions that "regarding technological infrastructure and what it implies in terms of investment, I think there is little awareness of the technological, technical, physical and financial needs to have these issues" (R1).

In relation to data integration, one interviewee said: "...I started doing farm maps in Excel in 1998. And although it's very much what is still done in the big chains, it doesn't make sense anymore!" (R7). The interviewee also argues that it no longer makes sense "(...) the work it gives, the human wear and tear, with the erratic component it has, because it is done by hand, by data entered by hand to be crossed later in formulas (...) it makes perfect sense to integrate these systems (...)" (R7).

An administrator of a hotel group mentioned that:

> *The hotel director is probably not aware, because he does not have as much visibility on all kinds of tools (...) Directors will make decisions based on information, yes, but they will not get to the point of understanding the whole source, or what Big Data is, they will not, and probably will not even be stimulated to do so in the coming years* (R1).

As for the newly graduated professionals, some of the interviewees share the idea that they bring fresh know-how from the faculties. One of them stated: “I even think that recent graduates are much geekier than us and for them the digital part will be a subterfuge. The operational part, they will realize later with reality” (R4). Another interviewee even mentions having put a trainee in charge of the process and refer that “(...) they are aware of the existence of various data sources, what needs to be done for integration and the infrastructure needed, the one who is doing that for us is an intern (...)” (R5).

On the other hand, there are directors who are more resistant and report that “(...) students are not aware of the need to integrate systems for Business Analytics. Most of the time they are not even aware of the integration of operational systems with an ERP” (R2).

Regarding the knowledge of the hotel business, one interviewee mentioned that “My experience with students who have recently graduated is very poor indeed (...)” (R6), and another reinforces the idea by saying that “(...) I never had contact with any recent graduate or graduate who brought me news from the academic side” (R7).

As for hotel managers, they are aware that they don't know everything, but they are always looking to evolve, as one interviewee said: “I don't know everything, I'm learning every day. It's been like that for thirty years” (R7).

Most hotel managers praise the importance of outsourcing. “In the vast majority of cases, companies always use specialized technicians to carry out the work and to make all the necessary interfaces (...)” (R6). One interviewee mentioned that “normally, the ones who bring the news are the technology developers and the stakeholders involved (...) Those are who come to me with news from time to time about my profession, but not those who come from universities” (R7).

Finally, the size of the hotels was also highlighted from one interviewee:

This also has to do with the size, in a small hotel it ends up being easier to rotate functions, and in my opinion, (...) the hotel industry is changing, those little farms we had, each with his own, no longer make sense (R5).

It was also mentioned that in small hotel structures, it may be easier to integrate systems: "The integration of infrastructures is justified on a certain scale, obviously. Currently, with a very small scale, it is already easy to integrate many things" (R1).

In response to question RQ4, the Costs category was framed. From the answers obtained from the interviewees, two major subcategories were highlighted.

Table 5.22 - **RQ4:** Are hotel managers and newly graduated professionals aware of the costs involved when adopting analytical systems?

Category	**Subcategory**
E- Costs	E1.RQ Cost Awareness
	E2.RQ Organizational Culture

According to Puangpontip and Hewett (2022), costs can be high during model formation and application, emphasizing the significance of selecting the right model for the company.

Under the heading of costs, according to the answers given, most hotel directors are not aware of the costs involved. One administrator replied "No, they are not. They are not aware that things have a certain cost. There is no knowledge of what it is to run a hotel and the context costs, there is no knowledge (...)" (R1). He even went further, stating that "here we are talking about a larger scale than Business Analytics. Even if we talk about normal activity costs, they don't really have that knowledge either" (R1).

In this area of costs, the interviews reveal a barrier between administrations and senior management. Regarding cost awareness, one interviewed director was peremptory in his response: "I don't think so. I don't have any notion of the costs. Neither the students, nor by other directors" (R2). Other directors confirmed the same: "No. For example, I have no idea about costs" (R3); "(...) I have no idea how much it might cost and what financial impact it might have on an operation" (R3). Another interviewee states:

I feel you have no idea. No, I don't know how else to say this. At the level of recent graduates, I don't think they have any notion (...) Hotel directors either, for the reasons

I have already explained earlier since decisions are usually made at the level of head-offices (R6).

Only one interviewee, due to his relevant position in a hotel group, mentioned that "As a hotel director, I understand most of the costs involved. Especially the tools that have already passed through the hand, currently or in the past" (R7). However, this interviewee is aware that:

(...) in the current reality of this hotel, the detail still does not reach everyone, because not all the details also reach me. I know that the details exist, and I am going after them little by little and with that some things are being shared (R7).

Through the interviews, it is evident that the availability of cost information varies significantly based on the organizational culture and the type of hotels. One of the interviewees mentioned that in some hotels, managers with access to monthly P&L reports may become aware of them.

The directors probably then in the monthly P&L, they can see some cost allocations there, when there is a hotel P&L, based on USALI, because otherwise they are not even aware of what the IT and technology cost allocations are in their P&L (R6).

Another interviewee reveals that:

The reality that I had in a previous big hotel chain, where even the price of the screw we had to know, and I'm not exaggerating. To the point that we were almost audited from time to time to know if we knew the price at which we had bought something the week before (R7).

and reinforces that different organizational cultures and types of hotels can make a difference.

In response to question RQ5, the Business Analytics category was framed. From the answers obtained from the interviewees, two major subcategories stood out.

Table 5.23 - **RQ5:** Hotel managers and newly graduated professionals, will have adequate training and knowledge to understand analytical systems?

Category	Subcategory
F- Business Analytics	F1.RQ Knowledge of Analytical Systems
	F2.RQ Analytics training

Source: Own production

The literature emphasizes the importance of investing in training and skill development for employees to effectively utilize the analytics infrastructure. Gartner (2016), highlighted that a significant number of business users lack the necessary training to conduct or interpret analysis effectively.

Regarding knowledge to understand analytical systems, one interviewee states that “Here I think there has already been a great evolution (...) At the level of hotel managers, I think that more and more, in management positions, people are self-taught and also want to regenerate themselves” (R1).

Another interviewee, generalizes and says: “I would say that as for hotel directors, the ones I know, I would say that, in general, yes? (...) I believe and I am convinced that yes, they have some understanding about analytical systems” (R7). However, another interviewee contrasts by claiming that “They don't either. (...) I don't think we're even prepared to deal with that, either in negotiating or interpreting the new systems and the results that they might bring? I don't think so. I'm not.” (R4).

As for recent graduates, they reveal that depending on the universities they came from, some recent graduates “partially demonstrate to have information, at least theoretical, to understand analytical systems” (R7).

In relation to training on Analytics, there is no such basic training. “No, specifically directed to the analytics area, no one in the hotel has ever had specific training” (R1).

They even reveal that they don't know specifically what it is. “I don't know just by seeing what it is. I don't know how to answer” (R2). “Hotel managers do not have the adequate knowledge to know or to use the systems (...) I am not prepared, for example, I would have to

deepen knowledge with specific training for that purpose" (R3). Another interviewee also supports the lack of training in analytics:

> *I don't think so, I don't think they have adequate training either. I don't think they have a basic preparation for that kind of analysis at all (...) obviously there are people who already have these natural skills of analytical skills, etc. So, these then more easily understand and analyze* (R6).

It appears from the interviews that only if there is an implementation of new systems, some employees will be trained by the installing companies themselves. "There is usually internal training, when the products are installed, there is training, and I follow up. I follow up with those who installed the products and I train people in-house" (R5).

As for new graduates, another interviewee states that:

(...) whether the university prepares them or whether the professional world prepares them, I think it prepares them in a very basic way. So, maybe they don't have enough capacity to be able to deal with the sophistication of technology that exists today, especially the outputs that come out of that technology" (R6).

Another interviewee agrees with this "as for the students, if they have had a related subject in college, possibly yes, otherwise they have not" (R2).

5.5.2 Insights uncovered from interviews to confront hypotheses of the final model

According to the variables and the hypotheses of the model, interviewees answered some questions to reinforce the investigation.

Table 5.24 - **Variables**
Data Integration and Infrastructure
Business Adaptation
Business Knowledge

Organizational Culture
Costs
Business Analytics
Source: Own production

H1. Integration and infrastructure are positively and significantly associated with business analytics.

In relation to this hypothesis the following question was presented: How do you consider the effect that integration and infrastructures have on the implementation of business analytics systems?

In business analytics, data integration tools are crucial for combining data from different sources into a usable format for analysis, as highlighted by Davenport (2014). Additionally, the infrastructure for business analytics implementation encompasses hardware, software, and data management systems. Key components of this infrastructure include robust servers, high-performance computing capabilities, advanced analytics software, data integration and cleansing tools, secure data storage, and effective data governance frameworks (Abai et al., 2017).

When confronted with the question, respondents showed that they understood the association and importance of integration and infrastructures associated with business analytics. One respondent stated the following when asked:

> *As I see it, I think it is essential (...) I would say that one does not live without the other. That is, without proper integration and infrastructure, Business Analytics does not exist (...) with solid Business Analytics principles and specific definitions of what is needed, it can only be done with good integration and adequate infrastructure (...) That is, you must define in a certain way the hat of what you are going to integrate and infrastructure, this must be defined strategically. So, I think there is a great interdependence"* (R1).

Cloud-based infrastructures offer advantages for hotels, as highlighted by Moyeenudin et al. (2018). They enhance data security, streamline processes with user-friendly interfaces, and lead to cost savings by reducing the reliance on specialized technicians. These solutions enable hotels to leverage external resources and technologies, optimizing their operations and improving overall efficiency. The interviews provided further support for this matter, as illustrated by the following statement from one of the interviewees:

> *Talking about infrastructure. Often, it's not just computers inside the hotel. Especially because when we look at it this way, sooner or later the project will go wrong. I need partners, whose core business is just that, to support information and Business Analytics applications outside our hotel structure and that allow access to information safely and reliably. It is important that the connection does not drop if the power goes out and should always be always accessible, regardless of the location or device we are using* (R7).

The importance of organizational change and the need for specialized staff members was highlighted during the interviews. One interviewee specifically emphasized this point. “Not looking at the more technical part of the adaptation, I think that, in a first phase, a new adaptation of a specialized team would have to be created in the organizational culture itself” (R4).

H2. Business adaptation is positively and significantly associated with business analytics.

In relation to this hypothesis the following question was presented: How do you consider the effect of business adaptation on Business Analytics?

According to Imtiaz & Kim (2019), The adoption of technology varies among organizations, and some have faced challenges in implementing business intelligence and analytics strategies and adopting digital listening initiatives at the same pace as others.

When confronted with the question, respondents showed that they understood the link between business adaption and business analytics. One of the interviewees considers that “with more information, data crossing, and all the knowledge and study that will be done with

business analytics, there will probably be changes in the way of acting. I see with this the business adapting to business analytics" (R2).

Another interviewee stresses the importance of having good business processes.

> *Form processes by thinking processes. I think the principle is there. If we know that we have, or we are going to have a tool, or we can integrate a tool, that will give us the possibility to have access to information A, B, C or D in a certain useful time, a previous process that was being used, will now have to be adapted according to this new reality. So, we can reap the rewards of this new tool* (R7).

Another interviewee states that "analytical views often must be prepared in terms of tools and answers to give complexity that the business requires" (R1). The same interviewee said "that Business Analytics generates knowledge. It is important that the knowledge generated is very adapted (...)" (R1).

H3. Business knowledge is positively and significantly associated with business analytics.

In relation to this hypothesis the following question was presented: How does business knowledge influence an implementation of business analytics systems?

Wang et al. (2018), highlight that business analytics enables organizations to generate detailed reports on market trends and other subjects. This knowledge empowers firms to make informed decisions for product development and effectively commercialize innovative ideas into new products.

One of the interviewees mentions that starting from "business knowledge, business analytics (BA) should extract what is needed for the business (…) That is, that information and the analysis that we would like to extract from this process and get the best that BA can give" (R4).

Another interviewee considers that the influence of business knowledge "is huge. That is, basically we currently, given the tools we have, without business analytics tools, we end up being a bit blind" (R5). "Therefore, these tools and outputs are extremely useful for managing" (R6).

H4. Organizational culture is positively and significantly associated with business analytics.

In relation to this hypothesis the following question was presented: How do you consider the effect that organizational culture has on Business Analytics?

Business analytics (BA) is more than just a technical development; it's a part of organizational culture. BA offers valuable insights, but organizations must take action on those findings to drive innovation (Y. Duan et al., 2020).

When confronted with the question, respondents are aware of the importance that organizational culture has on business analytics, but they believe they are not well prepared for it. One of the interviewees mentioned that "at the moment, the Organizational Culture is not prepared for Business Analytics. It would have to be much more molded for technology, much more knowledgeable, much more trained, something that we are not prepared for at all" (R3).

Another interviewee considers that "if there is no culture linked to data analysis and decision making based on data, it will end up with the use of Business Analytics" (R2). Also mentioned by one interviewee was the need to have "... a technical interlocutor in this area, who can give information, who can speak regularly, who can give explanations, and who is on top of this business area (...)" (R4).

H5. Costs is positively and significantly associated with business analytics.

In relation to this hypothesis the following question was presented: How do you consider the effect that costs have on a Business Analytics implementation?

Through the interviews, it was discovered that investment in technology in the hospitality industry is still considered a taboo subject. There is limited investment, and many are hesitant to take risks without assurance of a sufficient return on investment.

Puangpontip and Hewett (2022), emphasize the importance of carefully selecting the best model during the formation and application stages, as costs can be high in this process.

One of the interviewees is in line with the literature in considering that "there will have to be investment and costs will increase based on that investment. However, we should benefit from the investment" (R2). Another interviewee takes a two-way view of the issue and claims that there are "two sides to it. Regarding the cost of the tools, it would be worth it. We would have costs, but we would also save on operational costs and have real-time information to decide" (R3).

On the cost side, the responses highlight the significance of organizational culture and the decision-makers' perspective on investing in these tools. For example, “it can be implicit, in a motivation, in a will to want and in a clear cunning of the management to want and spend money” (R4). Another interviewee reinforces the importance of management in decisions, stating that “in terms of costs, it will be more concentrated in the administration. They will be the ones making these kinds of decisions” (R2). One of the interviewees also mentions that “the part of the costs is centralized in the headquarters and not in the hotels” (R5).

In addition to the issues mentioned regarding investment decisions, there is also another factor related to the age of the hotels, as mentioned by one of the interviewees.

> *So, the issue of additional costs must happen in many hotels, old hotels. There will be hotels that are more than 20 years old that are not ready to adapt and that are not even willing to invest more in this area to be adapted to receive these new technologies* (R4).

H6. Integration and infrastructure are positively and significantly associated with business adaptation.

In relation to this hypothesis the following question was presented: How can technological infrastructure and integration of various system types influence the adaptation to the business?

A Business Analytics readiness assessment involves evaluating technology infrastructure and other crucial aspects such as governance, policies, organizational culture, and business processes (Brooks et al., 2015). Also, having skilled professionals enables organizations to maximize technology and data usage, resulting in accurate and reliable insights for better decision-making (Ibrahim & Handayani, 2022).

Regarding this issue, an interviewee indicates that “it is a very difficult process, but it is possible that with well qualified human resources there is a good preparation of the model and with that they can also feed the machine until good operational reports are generated” (R1). Another interviewee reinforces the idea by stating that “with good infrastructure and with quality integration of the various systems, there should be a more efficient adaptation to the business” (R2).

However, one interviewee mentions that “(...) to have integrations, we have to have state-of-the-art or up-to-date software (…) that could be a handicap for those who don't have it. But

also, those who are not willing to spend money on this, it is because they are not interested either" (R4).

The difficulty of integrating everything and adapting to the reality of the business is also visible when one of the interviewees mentions that "sometimes putting all these pieces together and putting it all together is an extremely complicated puzzle. It can take much longer than we imagine, because there are always a few stones in the way" (R6).

H7. Integration and infrastructure are positively and significantly associated with business knowledge.

In relation to this hypothesis the following question was presented: How can technological infrastructure and integration of various system types, can influence business knowledge?

According to Daradkeh (2023), organizations with a knowledge-oriented culture, characterized by a questioning attitude and a willingness to challenge existing ideas and models, are well-equipped to harness the advantages of business analytics.

To answer this question, one of the interviewees states that "(...) the knowledge of the business is to be what I want and for the business to give me new things, I have to be prepared for it to be fully integrated into our structure" (R4). This interviewee goes further by stating: "(...) if I want to get new things, new knowledge, new ways of looking at things, I think that is related to integration and with this I have to be receptive to making that investment" (R4).

Overall, the interviewees believe that business knowledge will increase, with one of them explicitly stating that "knowledge will increase. With a good integration of the various systems, the knowledge of the business will increase and will improve decision making" (R2), and in the affirmative answer of another interviewee, when he says: "Yes, I think that a good integration of the data coming from all the systems involved, can greatly increase the knowledge of the business" (R1).

One interviewee, who is highly knowledgeable about the hotel industry and has extensive experience in the area, raised an important issue during the discussion. He pointed out that the hotel industry is lagging other sectors in terms of adopting new technologies, as demonstrated in the following example:

> *In this new group, we have a level of sophistication that is well above average. In fact, I've never worked in a company with so much IT sophistication, even in terms of*

> *cybersecurity (...) But, all this sophistication that I was talking about is more for the other companies in the group. In the hotel industry, it's a relatively recent thing. So, we are now going to start setting up analytical systems, but this Power BI that we set up for the hotels is extraordinary, super practical and we get all the information we want in real time* (R6).

For the next five hypotheses, we have the status influence. For the status, 36.7% are students, 44.8% are hotel professionals, 14.3% are hotel directors, and 4.1% are administrators.

H8. Status moderates the relationship between integration and infrastructure and business analytics.

In relation to this hypothesis the following question was presented: How does status influence the adaptation of technological infrastructure and the integration of various types of systems in a Business Analytics implementation?

To answer this question, one of the interviewees states that "Decision-makers have an important role here, because people are often not aware for what purposes, at the end of the day, we are implementing analytics, what we gain from it, as well as what we must do to improve it" (R1). On the other hand, the same interviewee states that "people with little professional experience, such as recent graduates, do not have the capacity" (R1). Another interviewee mentions that as a director, he influences mainly on Integration, but also on infrastructure and adaptation to the business. however, if we talk about costs, it is more with the administration. Another interviewee reinforces this by claiming that:

> *The status can influence positively, because there is no one more than who has this kind of status, whether it is a director, whether it is an administrator to see the importance that it can bring to the business. I don't see that influence on professionals' recent graduates* (R5).

H9. Status moderates the relationship between business adaptation and business analytics.

In relation to this hypothesis the following question was presented: How can status influence business adaptation In a Business Analytics system implementation?

In response to this question one interviewee states that "the director can have an influence on the adaptation to the business (...) At the level of the directors, I think so. They can have that influence if they also have persuasion and argumentation skills" (R6). Another director considers that:

> *(...) the status of the director general is to be able to demand, to oblige, to teach, or even in the part of the service culture to say that this tool is useful, and we must use it every day, or we have to analyze it in this way (...)* (R4).

On the other hand, an interviewee mentions that everything:

> *(...) depends a lot on the people and the knowledge that these people involved have, because if we have an extremely solid team, even without having management or administration positions, but has a lot of technical business knowledge, it can influence a lot without needing much intervention from the administration (R1).*

H10. Status moderates the relationship between business knowledge and business analytics.

In relation to this hypothesis the following question was presented: How can status influence business knowledge in a Business Analytics system implementation?

In response to this question one interviewee states that "the hotel manager or director, are much better trained to understand what it takes to know the business" (R1).

On the other hand, another interviewee states that the "new graduates with more specialization can better adapt the tools to the business" (R3). Another interviewee reinforces that:

> *(...) these young graduates can be a driver for this to happen, first, because they will find it easy to work with the tools and can serve as support, then we have that Vision of*

> *the younger is more creative and more spontaneous, and the more experienced, which will usually be the one who has more status, has more knowledge and that junction between youthfulness, that is, youthful knowledge and experience is very beneficial* (R5).

H11. Status moderates the relationship between organizational culture and business analytics.

In relation to this hypothesis the following question was presented: How can status influence organizational culture in a business analytics implementation?

According to Upadhyay & Kumar (2020), firms must prioritize building analytical capabilities among employees, driven by strategic management commitments and supported by an inclusive organizational culture to maximize returns on big data and analytics investments. One interviewee, in response to the question states that: "A director or administrator can influence the organizational culture through their vision of the business. If we talk about newly graduated professionals, only if they bring a very large knowledge from academies, otherwise they do not enter the process" (R2). Another interviewee also states that a hotel director:

> *can completely influence. However, the degree of influence can vary based on the extent to which an individual is empowered within an organization. If an individual is limited in opportunities for visibility, explanation, and demonstration, their role in integrating Business Analytics within the organizational culture may be restricted* (R7).

Also, another director, states that "not only the directors but essentially the management, must be the engines to make everything work, this is important to change the mindset of the employees" (R3). Another interviewee mentions that "from the moment those who have the status defend and understand these tools, the whole organization goes for it. Unfortunately, often what happens is the opposite, is the person who has a statute who blocks this type of situation" (R5).

H12. Status moderates the relationship between costs and business analytics.

In relation to this hypothesis the following question was presented: How can status influence costs in a Business Analytics system implementation?

One interviewee, in response to the question states that “on a financial level and on a cost level, the decision-maker can influence a lot. I think it is important. I don't think I can have any other answer” (R1). Another director interviewed reinforces that “here it has to do with status, which is what I really want for the business, because it is easy to buy when you manage other people's money” (R4).

Some directors state that they do not have autonomy for this type of decisions, as one of the interviewees states “in relation to costs, I think it is a problem in relation to the capacity of directors to intervene in this matter” (R6). Another interviewee goes further and states that:

> *In the beginning, it will have to be the director who is the biggest influencer. Now for him to be the biggest influencer, he must know the business. He must be able to get the message across to management that if he can get the system working with Business Analytics processes, the hotel will be more likely and more likely to have processes that will allow it to cut costs, that will enrich the result of the operation and that it will be able to compensate for this investment* (R7).

Another director states that the status is very important because “in terms of costs, it will be more concentrated in the administration. They will be the ones who make these kinds of decisions” (R2). In relation to professionals recently coming from universities, most argue that they do not enter much into the equation, but can help influence the administration, as one of the interviewees suggests when stating:

> *Again, if it is a recent graduate who already has some preparation, together with the theoretical academic knowledge he has had, but who has already had some preparation or some contact with reality, who already has the minimum domain on the business, has great arguments and can be a strong link for the application of the processes that the*

data that are obtained through Business Analytics indicate that they should be better to achieve the objectives (R7).

CHARPTER 6

Conclusion and Prospect

6 Main research conclusions

Stimulating the knowledge of business analytics within the hospitality industry in Portugal has emerged as a crucial concern in the field of research. This study aims to address this issue by targeting both hotel professionals and managers, as well as finalists or recent graduates in relevant areas. By enhancing their understanding and proficiency in business analytics and big data analytics, the study seeks to contribute to the advancement of knowledge and expertise in these domains, ultimately benefiting the hospitality industry in Portugal.

The main purpose of this research was to study the effect of business analytics onintegration and infrastructure, business adaptation, business knowledge, organizational culture,and costs and to test whether these relationships are moderated by participant status.

The first step was to create an instrument specifically for this study. This instrument initially consisted of 22 items, but there was a need to remove one item (item 14) because it hada low factor weight. The exploratory factor analysis initially carried out suggested the existenceof 6 factors, which were confirmed through the confirmatory factor analysis subsequently carried out. The six dimensions were assigned the following names: business analytics,integration and infrastructures, business adaptation, business knowledge, organizational culture, and costs.

As for the descriptive statistics of the variables under study, all are above the scale's center point. The dimension with the highest mean is organizational culture, followed by business analytics. These results align with the literature since business analytics should be seen as a technical development and a component of organizational culture (Y. Duan et al., 2020).

Regarding the association between the sociodemographic variables and the variables under study, it appears that directors and administrators have a higher perception of business analytics, which aligns with the literature. From the perspective of Duan et al. (2020), leaders currently adopt a more data-driven culture, relying less on intuition and more on data-based knowledge. However, students have a higher perception of integration and infrastructures, business adaptation and business knowledge. Professionals have a higher perception of organizational culture. Regarding costs, there are no differences depending on the position held.

Concerning the age group, older participants have a higher perception of business analytics and a lower perception of integration and infrastructure, business adaptation and business knowledge. In turn, younger respondents have a higher perception of integration and infrastructure, business fit and business knowledge. Participants aged between 25 and 34 have the highest perception of organizational culture.

Participants working in hotels in the autonomous region of Madeira have the highest perception of business analytics, organizational culture, and costs. At the same time, they are the participants with a lower perception of integration and infrastructures and business adaptation. Participants working in hotel units in the center region have the highest perception of business knowledge and those working in the south region have the lowest perception.

Regarding training (course), the participants trained in management have a lower perception of integration and infrastructure, adaptation to the business, knowledge of the business and organizational culture.

The hypotheses formulated in this study were then tested. Against what was expected, integration and infrastructures do not have a positive and significant association with business analytics, which indicates that the results do not support hypothesis 1. These results go against what the literature tells us because, the perspective of Turban et al. (2014), organizations, by integrating BIA projects with other IT systems, can harness the full potential of their data assets and create a synergistic ecosystem that supports overall business objectives and strategic initiatives. However, we know that there is a lot of resistance, which may be the case for the participants in this study.

The results also do not support hypothesis 2 since there is no positive and significant association between business adaptation and business analytics. These results are not in line with what the literature tells us. However, some authors, such as Imtiaz and Kim (2019), state that the pace of technology adoption varies between organizations, with many having difficulty implementing business intelligence and analytics strategies and adopting digital listening initiatives at the same level as other organizations.

As for the association between business knowledge and business analytics, hypothesis 3 was not proven since this association was not significant. Once again, the results are not in line with what the literature tells us because, for Wang et al. (2018), business knowledge allows companies to make timely and informed decisions for product development, increasing their ability to commercialize innovative ideas, which will be facilitated by leveraging BA.

On the other hand, the results of the interviews are in line with the literature and contradict the results obtained from the previous hypotheses, h1, h2 and h3, as can be seen in section 5.6.2, corresponding to the results of the interviews. However, a lack of knowledge regarding the implementation of business analytics systems should still be highlighted.

As expected, hypothesis 4 was proven, i.e., a positive and significant association exists between organizational culture and business analytics. The results of the interviews also reinforce these findings. These results are in line with what the literature suggests. In Daradkeh's (2023) perspective, organizations that promote a knowledge-oriented culture are well-positioned to take advantage of the benefits of business analytics. In a knowledge-driven culture, there is a strong emphasis on continuous learning, exploration and generating new knowledge. This mindset incentivizes employees to actively seek data-driven solutions, adopt innovative approaches and challenge conventional thinking. By cultivating a culture that values knowledge exploration and disruptive innovation, organizations can create an environment that is receptive to the ideas and opportunities that BA provides. Employees are more likely to embrace BA tools and techniques, collaborate across departments, and adopt data-driven decisions. Duan et al., (2020) state that a data-driven culture plays a crucial role in the era of Big Data.

Hypothesis 5 was proven, as expected, with a positive and significant association in the relationship between business analytics and costs. The results of the interviews also reinforce these findings. These results are also in line with what the literature tells us, as costs are significant in implementing BA. According to Puangpontip and Hewett (2022), costs can be high during the formation and application of the model, and the selection of the best model is essential for the company.

Regarding the association between integration and infrastructure and adaptation to the business, a positive and significant association was also found, with results that align with the literature. The interview results further support these conclusions. Adequate and competent human resources should ensure that technological infrastructure is available to support data analysis and management, address technical challenges, maintain data quality standards, respect ethical and legal considerations, and adapt to the business (Ibrahim & Handayani, 2022).

There was also a positive and significant association between integration and infrastructure, and business knowledge. Also here, the results of the interviews further support these conclusions. These results align with what the literature suggests since, according to Sousa and

Rocha (2019), various technological infrastructures, such as social media, forums, blogs, and virtual networks, are commonly used for knowledge management.

Status moderates the relationship between integration and infrastructure, and business analytics. The moderating effect indicated that for low-status participants when compared to high-status participants, integration and infrastructure becomes relevant to enhance their perception of business analytics, which is natural as students and professionals (low status) have a higher perception of integration and infrastructure.

According to hypothesis 9, there was a moderating effect of status on the relationship between business adaptation and business analytics, with business adaptation becoming relevant for low-status participants compared to high-status participants in terms of enhancing their business analytics. These results are possible because the students (low status) have a higher perception of business adaptation.

There was no evidence of a moderating effect of status on the relationship between business knowledge and business analytics. Strangely, the moderating effect was not found, but although students (low status) are the participants with a higher perception of business knowledge, professionals (low status) have a lower perception.

As expected, there was a moderating effect of status on the relationship between organizational culture and business analytics. Organizational culture was relevant in enhancing the perception of business analytics in low-status participants compared to high-status participants. These results are also natural since students and professionals (low status) are the participants who have a higher perception of organizational culture.

Finally, a moderating effect was found in the relationship between business analytics and costs. When compared to high-status participants, business analytics becomes relevant for low-status participants to boost their perception of costs. This case is strange since low-status and high-status participants have an identical perception of costs.

Regarding the interview results related to the hypotheses where status acts as a moderator, only experienced professionals, administrators, CEOs, and general managers of hotels were interviewed, making direct result comparison challenging. Nevertheless, the interviews underscore the significant moderating effect of status in decisions regarding the implementation of analytics systems. The interviews reveal that newly licensed professionals are rarely involved, and even hotel directors often have limited input. Furthermore, the interviews

highlight the significant influence of the hotel or hotel chain's organizational structure and culture.

7 Limitations and future research

By adhering to scientific rigor and research standards, this study investigates the influence of business analytics on the hotel industry. The research aims to provide valuable insights into the application and effects of business analytics within the hospitality sector. Through meticulous data collection, analysis, and interpretation, the study seeks to contribute to the existing body of knowledge and enhance our understanding of how business analytics can shape and improve hotel operations, decision-making processes, and overall performance.

The hospitality industry is diverse, encompassing various types of accommodations, ranging from small boutique hotels to large resort chains. This heterogeneity can pose challenges in obtaining a comprehensive understanding of industry practices and limit the generalizability of the findings.

7.1 Research limitations

One of the major limitations of this research is the inherent challenge of accessing proprietary information within the hospitality industry. The industry is known for its protective stance towards proprietary practices and data, making it difficult to obtain detailed insights into certain aspects of operations or technologies.

Another significant limitation is the limited availability of time from hospitality top managers and administrations. Their busy schedules and numerous responsibilities often make it challenging to secure their participation in research studies, hindering the collection of primary data and potentially affecting the depth and accuracy of the findings. This limitation can affect the sample size and potentially bias the results if only a subset of the industry is represented.

Additionally, despite efforts to gather data through questionnaire surveys, obtaining enough responses can be challenging. Even with the use of hospitality databases to target potential participants, there may still be difficulties in eliciting questionnaire replies, which can impact the representativeness and reliability of the collected data. Also, when collecting data through self-reporting methods, such as surveys or interviews, there is a risk of response bias. Hospitality professionals may have subjective interpretations or biases when providing

information, which can impact the accuracy and reliability of the data. All of this can result in a low response rate, potentially affecting the representativeness and generalizability of the findings.

The main limitation of the quantitative part of this study was that it was a cross-sectional study, and therefore relationships could not be tested. In order to test for relationships, a longitudinal study would have to be conducted. However, the methodological and statistical recommendations proposed by Podsakoff et al. (2003) were followed to reduce the impact of common method variance.

Another limitation of this study was the data collection process and the fact that the questionnaire used for the quantitative study consisted of self-report instruments with closed questions, which may have conditioned the answers given by the participants.

These limitations underscore the need for careful consideration and alternative approaches when conducting research in the hospitality industry. Requires careful planning, establishing trust with industry stakeholders, and employing various data collection methods to ensure a comprehensive and representative sample. Researchers should explore strategies to build trust and rapport with industry stakeholders, employ diverse data collection methods, and adapt to the time constraints and information sensitivity that are prevalent in the field.

7.2 Future research

Future research in the field of hospitality and tourism can focus on several areas to further enhance the understanding and application of Business Analytics tools. Here are some potential avenues for future research:

(i) **Adoption and Implementation:** Investigate the factors that influence the adoption and successful implementation of Business Analytics tools in hotels. This could include studying organizational readiness, managerial attitudes and perceptions, and the role of top management support in driving adoption.

(ii) **Impact on Performance:** Examine the direct and indirect effects of utilizing Business Analytics tools on various performance metrics in the hospitality industry. This could involve measuring the impact on operational efficiency, guest satisfaction, revenue generation, and overall business performance.

(iii) **Data Management and Integration:** Explore strategies and best practices for effectively managing and integrating data from multiple operational systems within hotels. This could

involve studying data governance frameworks, data quality assurance techniques, and the integration of diverse data sources for more comprehensive analytics.

(iv) **Advanced Analytics Techniques:** Investigate the application of advanced analytics techniques, such as machine learning, predictive modeling, and text mining, in the context of the hospitality industry. This could include exploring the potential for using these techniques to enhance demand forecasting, customer segmentation, personalized marketing, and revenue management.

(v) **Organizational Culture and Change Management:** Examine the role of organizational culture in fostering a data-driven decision-making culture within hotels. Investigate the challenges and strategies for managing organizational change associated with the adoption and integration of Business Analytics tools.

(vi) **Ethical and Privacy Considerations:** Investigate the ethical and privacy implications of using Business Analytics tools in the hospitality industry. Explore frameworks and guidelines for ensuring responsible and secure data usage, protecting guest privacy, and complying with relevant regulations.

(vii) **Comparative Analysis:** Conduct comparative studies to analyze the differences and similarities in the adoption and utilization of Business Analytics tools across different segments of the hospitality industry, such as luxury hotels, resorts, and budget accommodations.

(viii) **Industry Collaboration and Knowledge Sharing:** Explore opportunities for collaboration and knowledge sharing among industry practitioners, researchers, and technology providers to promote the effective implementation and utilization of Business Analytics tools in the hospitality sector.

By addressing these areas of research, scholars and practitioners can further advance the understanding of Business Analytics in the context of the hospitality industry and contribute to its ongoing development and application.

8 Expected Outcomes

It is hoped that this study will provide answers to the proposed objectives, as well as to obtain a good perception of the current practices of use of Business Analytics tools in the hotels and to verify the level of interest of the hotel managers in the implementation and use of this type of systems.

Looking to the near future, it is easy to see that the hospitality and tourism industry is experiencing tremendous and exciting challenges. They are exciting because of the future capabilities of the latest technologies and the possibilities that await the industry because of the implementation of these new technologies. Investing in technology can not only be seen as an expense but rather as an essential investment in future competitiveness. The sooner this is realized, the sooner the hotel industry will begin to take great strides in its quest to become technologically advanced.

Given that everything in our environment spins at the speed of light and frequently distorts our perception, predicting the future can be a tremendously terrifying undertaking. Even if it is unsettling and dangerous, it must be viewed as a necessity to exist in this difficult and very competitive world.

Foresight is not something that the hospitality industry has done exceptionally well in the past, as the industry is more reactive than proactive. Developing skills in the vision of the future is essential today for tomorrow's survival.

Beyond technology, the biggest challenge lies in people and in their way of thinking, acting, and making decisions. The hotel industry, by tradition, does not excel in investing heavily in technology but will have to do so to gain some competitive advantage.

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Appendix A: Characterization of the Respondents (R)

Code	Hotel Position	Hotel Type	Age	Professional Experience (years)
R1	Administrator	Group	36	12
R2	General Manager	Group	56	36
R3	General Manager	Group	46	22
R4	General Manager	Independent	46	27
R5	General Manager	Group	33	10
R6	CEO	Group	58	40
R7	General Manager	Independent	49	31

Appendix B: A Systematic Literature Review on Hospitality Analytics

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A Systematic Literature Review on Hospitality Analytics

João Paulo Rodrigues, Universidade Europeia, Portugal

Maria José Sousa, Instituto Universitário de Lisboa, Portugal

Ana Brochado, Instituto Universitário de Lisboa, ISCTE-IUL, Portugal & Centre for Socioeconomic and Territorial Studies, DINÂMIA'CET – IUL, Portugal

ABSTRACT

With the growth of data generated by all systems involved in a hotel, terms like big data and business analytics (BA) gain strength within the hotel industry. Business analytics can be used in hospitality management to increase business knowledge and to improve the decision-making process. This study's main questions are: RQ1 – Which are the main research attributes studied in the past two decades related to analytics in the hospitality sector? RQ2 – What are the main differences between business intelligence and business analytics? RQ3 – What are the main trends in business analytics? RQ4 – Which are the main business intelligence perceptions and beliefs? To answer these research questions, this article provides a literature review to systematize the research made in business analytics information systems in the hospitality industry. The results can help identify different research attributes and the most relevant theories developed in the past two decades related to business analytics tools.

KEYWORDS

Analytics, Business Analytics, Hospitality, Hotels, Literature Review

1. INTRODUCTION

Nowadays, there is a wide variety of information systems in which the tourism and hotel industry have not stayed behind. With the accelerated growth of the Internet, everything has been boosted, where new apps of all types and genres arise all the time. This growing digital economy has attracted the attention of computer engineers and hotel managers, either by for the confusing choice for new operating systems and how they will all integrate to be able to extract information as a whole or how can managers be able to analyze volumes of information generated by these systems. Last year has witnessed significant changes, such as the transformation from non-digital services to digital services (Abbasi, Ahmed; Sarker, Suprateek; and Chiang, 2016).

Also, the data type is no longer merely text-structured data, but rather images, audio, video, and social media content, referred to as unstructured data (Lam, Sleep, Hennig-Thurau, Sridhar, & Saboo, 2017). With modern technology, new types of data and advanced analytical tools provide firms both opportunities and challenges (Raguseo, 2018).

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The challenge for hotel managers is to be able to store these significant volumes of data in a way that, through analytics tools, provides information that adds value to the business and helps, based on the analyzed patterns, on a better decision making and in the best knowledge of their business.

As hotels operate in a competitive and dynamic environment, hotels need to utilize information effectively in order to improve hotel performance and compete with other hotels (Berezina, Bilgihan, Cobanoglu, & Okumus, 2016). The hotel sector, although not one of the sectors of activity that most embraces the use of analytical technologies, has begun to realize its value and importance in identifying usage trends and decision making (Korte, 2013) Through the literature it is possible to realize that companies that have implemented analytical systems can obtain better performances through wiser, more accurate and quicker decisions.

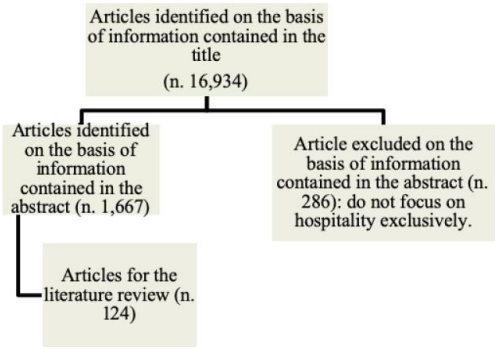
To understand analytics, we need to focus first on the various types of systems that a hotel can have and how they integrate and next in how analytical systems can help define strategies and improve decision making based on analytical models and key performance indicators. To achieve this goal, it is essential to approach the theme of integrating the various information systems used in a hotel, since it is difficult to achieve the objective, which is to have all the information gathered and compiled to know the business better and take with these better decisions.

This paper is structured as follows: the next section frame business intelligence (BI) and analytics and discuss business analytics trends.

2. MATERIALS AND METHODS

A systematic search of online scientific databases using the platform Ebsco-host, a scientific information research tool, was conducted at the beginning of April 2019. The search was made using several queries containing the keywords "Data Analytics" and "Hospitality." The first results were 16,934 articles. The inclusion of the time criteria "2000-2019" and "Scientific Reviews" 1,667 articles were listed. Only the articles reporting precise empirical data and a scientific methodology were considered for a more in-depth review (286) (Figure 1), and after exclusion of the articles which

Figure 1. Flowchart outlining the literature review



do not focus exclusively in Hospitality was listed 124 articles. The articles selected for this systematic review are presented in Annex 1, containing information regarding the bibliographical reference of the publication, the primary attributes researched, and the key findings.

Table 1 is shown with the summary of the research attribute referred in the articles analyzed at least ten times.

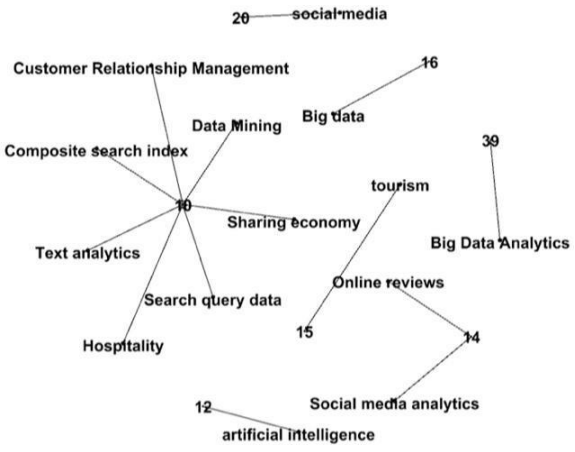
This analysis answers to the first research question (RQ1) What are the main research attributes studied in the past two decades, related to analytics in the hospitality sector? Being the answer: Big Data Analytics, Social media, Big data, Tourism, Social media analytics. Online reviews, Artificial intelligence, Sharing economy, Customer Relationship Management, Text Analytics, Data Mining.

Table 1. Research attributes

Research Attribute	n
Big Data Analytics	39
Social media	20
Big data	16
Tourism	15
Social media analytics	14
Online reviews	14
Artificial intelligence	12
Sharing economy	10
Customer Relationship Management	10
Text analytics	10
Data Mining	10

The analysis of the network of the articles can be found in Figure 2, which summarizes the research attributes for this analysis.

Figure 2. Network of the research attributes



3. LITERATURE REVIEW ON BUSINESS ANALYTICS IN HOSPITALITY – INSIGHTS FROM THE RESEARCH

When we have the right technology at your disposal, and it is entirely available and properly applied, a top manager can take visible and meaningful organizational benefits and thereby be able to promote the company's growth in line with market developments (Rodolfo, 2015).

Business intelligence and analytics are contextualized in terms of exchange because it is identified that various exchange activities take place within the BI environment throughout the BI process, like processes to transform raw data into useful information for insights and decision-making (Duan & Xu, 2012).

3.1. Business Intelligence and Business Analytics

The term business intelligence and analytics emerged in 1990 and has been gaining strength in the community of IT professionals and academia over the past decades. Since the last 20 years, we have seen a significant focus on technology but nothing like after the year 2000, where we have witnessed the genuinely transformative effect of communication technologies (Azevedo, Azevedo, & Romão, 2014). The importance of information and, as a consequence, business analytics has become latent and has gained focus in these recent years. Turban, Sharda, & Delen, (2011) states that business intelligence is an umbrella term that combines architectures, databases, analytical tools, methodologies, and applications to aid in decision-making processes.

Emerges then the second research question (RQ2) What are the main differences between Business Intelligence and Business Analytics?

According to (Vajirakachorn & Chongwatpol, 2017), business intelligence and business analytics have drawn attention in both academic and business communities over the past decades. (Power, Heavin, McDermott, & Daly, 2018) refers to business analytics as a compound noun, and one would expect its meaning to be anchored in the two independent concepts of "business" and "analytics." They designate analytics as a broad umbrella term that includes business analytics and data analytics. Analytics is the progenitor concept for the compound word phrase "Business Analytics."

(Chen, Chiang, & Storey, 2012) outlines that organizations view both BI and BA in different ways, from tools, techniques, technologies, and systems to practices, methodologies, and applications that help enterprises make better and more timely decisions by analyzing critical business data (Cooper M., Thai L.Q., Claster W., Vafadari K., 2015). According to (Power et al., 2018), at some level of generalization, business analytics is the application of analytics to business problems.

Stubbs (2014), refers to business analytics as an application of relevant, measurable knowledge to strategic and tactical business objectives through data-based decision making. (Goes, 2014) adds that analytics refers to the higher stages in the data–knowledge continuum and is directly related to decision support systems and define business analytics as "the generation of knowledge and intelligence to support decision making and strategic objectives"(Goes, 2014).

Business analytics refers to the extensive use of data and quantitative analysis, usually grounded in data mining and statistical analysis, to develop new insights and understand business performance (Chen et al., 2012; Davenport, 2010).

The tourism sector is also data-hungry, for having the right information at the right time provides businesses with knowledge about customers, buying behavior, and market trends (Cooper, 2006) and hotel managers understand the importance of adapting to the changing business environment not only to remain competitive, but merely to survive (Magnini, Honeycutt, & Hodge, 2003). However, given the importance and complexity of data analytics and Business Intelligence analyses, senior hotel managers report a low level of understanding about those systems capabilities, how it works, and what value this technology contributes.

According to Hallin & Marnburg (2008), analytical systems have had a strong presence in the management concepts debate in the last decade; however, in the hospitality industry, this subject has

not yet reached the same dimension. The practice and study of Business Intelligence have proliferated in most industries, except the tourism and hospitality sector (Cooper, 2006; Yun, 2004; Ruhanen & Cooper, 2004). In the hotel industry, only a small number of hotels have implemented analytical systems and knowledge management. Yun (2004), argues that the tourism and hospitality industry adapts slowly to Business Intelligence strategies.

3.2. Business Analytics Trends

With the accentuated tourism grow, companies and hotels need to deal with a large amount of data, and today the business environment has to make quicker decisions than ever (Chen et al., 2012). In this section then studies the third research question (RQ3) topic: What are the main trends of Business Analytics? To answer that question, the literature review concludes that three critical trends are linked to the investigation of the relationship between BI implementation success, organizational culture, and decision making.

First, the number of firms investing in BI has dramatically increased in recent years (Gartner, 2017). Over the last two decades, organizations have grown increasingly dependent upon BI systems to increase the effectiveness of decision making. New technologies and reduced costs have enabled companies, regardless of firm size, to purchase BI technologies (Gartner, 2017).

As a consequence, BI systems have evolved into sophisticated IT solutions designed to manage a wide variety of data and to provide analytical tools to assist management in decision-making. The financial risks associated with IT use by both large and small enterprises are of greater relevance not only due to direct technology acquisition costs but also due to the high implementation expenses associated with time away from productive work in the form of downtime or training (Lippert & Swiercz, 2005). As such, understanding the factors that impact successful implementation has economic implications regardless of organizational size.

Second, the inclusion of BI functionality within full-service software technologies places additional burdens on all personnel on how to learn and integrate the full range of functions embedded within these systems.

The third is the emergence of trust implications. Organizational members at all levels can quickly and efficiently access data while managers and supervisors can use the information for decision making.

3.3. Business Intelligence Perceptions and Beliefs

Business Intelligence is highly promoted and praised, yet not all expectations are realized. Instead, numerous reports of failed BI implementations and challenges prevail (Clavier, Lotriet, & Van Loggerenberg, 2012). Strong beliefs are set for BI and are systematically ranked as a top priority globally. Unfortunately, not all organizations are well succeeded in realizing superior business value from their BI investments. BI has failed to become widely pervasive (Gartner, 2008).

In this context, the fourth research question emerges (RQ4), which are the leading Business Intelligence Perceptions and Beliefs?

According to Magnini et al. (2003), hotel managers understand the importance of adapting to the changing business environment not only to remain competitive but merely to survive. As a result, technology has become massive. Moreover, consequently, technology has become a large and growing expense for many hotel corporations. However, given the importance and complexity of business intelligence and data mining processes, senior hotel managers report a low level of understanding about its capabilities, how it works, and what value this technology contributes (Magnini et al., 2003).

As mentioned by (Fuchs, Höpken, & Lexhagen, 2014), literature only recently emphasizes BI and data management for knowledge creation in travel and tourism (Fuchs, Matthias & Höpken, 2009; Magnini et al., 2003; Min, Min & Emam, 2002; Morales & Wang, 2008; Palmer, José Montaño, & Sesé, 2006 and Wong, Chen, Chung, & Kao, 2006). For tourism destinations, only few BI studies exist (Fuchs, Abadzhiev, Svensson, Höpken, & Lexhagen, 2013; Fuchs et al.,

2011; Law, Rob, 20111; Ricci, 2011; Fuchs, Matthias, 2014; Höpken, W., 2014; Zanker, M., 2014 and Beer, 2014). However, being part of the service sector, tourism has inevitably been associated with developments in new technologies and refreshed by organizational and structural innovations (Stamboulis & Skayannis, 2003).

Nowadays, it begins to be commonly used the term Big Data which represents a massive volume of structured and unstructured data, and it is increasingly difficult processing this massive volume through the use of traditional software techniques or by using traditional statistical methods (Baggio, 2016). Big Data has also started to be a source for Business Intelligence activities. The tradition of BI analytics is more significant, but the field is susceptible to all data and information sources that can provide a better return on the investment (Liebowitz, 2013). Therefore, both subjects are highly complementary.

Hotel managers understand the importance of adapting to the changing business environment not only to remain competitive but merely to survive. As a result, technology has become a large and growing expense for many hotel corporations. Under such a technology framework, business intelligence and data mining is a valuable competitive tool being adopted by hotel corporations to create customer value (Magnini et al., 2003).

BI and data mining can be a powerful and valuable marketing tool. However, merely investing in business intelligence technology may not guarantee success. Finding a database expert who has experience creating models in the hotel industry is a significant benefit. With this, we are facing organizational learning where the processes of creation and acquisition of knowledge can be significantly improved through the application of Business Intelligence methods.

4. CONCLUSION

Hospitality and tourism industry is experiencing great and exciting challenges, because of the future capabilities of the latest technologies and the possibilities that await the industry as a result of the implementation of new technologies. Investing in technology can not only be seen as an expense but rather as an important investment in future competitiveness. The sooner this is realized, the sooner the hotel industry will begin to take great strides in its quest to become technologically advanced.

Guess the future can be a tremendous and frightening challenge, since everything around us spins at the speed of light, often misrepresenting our own vision. Even though it is scary and risky, it has to be seen as a requirement to survive in this complex and super competitive world.

Foresight is not something that the hospitality industry has done especially well in the past, as the industry is more reactive than proactive. Developing skills in the vision of the future is essential today for tomorrow's survival.

Beyond technology, the biggest challenge lies in people and in their way of thinking, acting and making decisions. The hotel industry, by tradition, does not excel in investing heavily in technology, but will have to do so in order to gain some competitive advantage.

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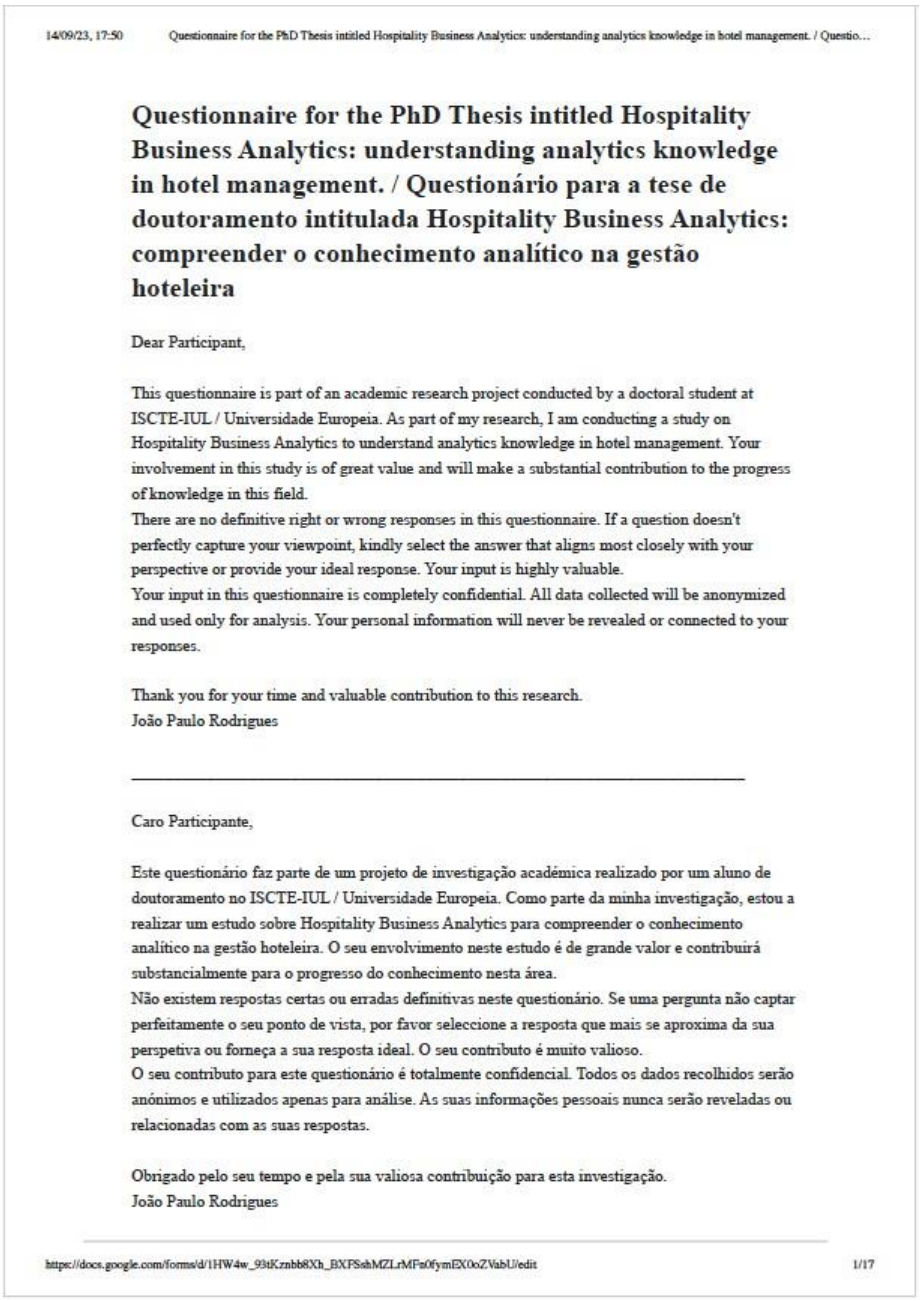
João Paulo Rodrigues is a PhD student in Tourism Management at ISCTE/UE. He has a master degree in Strategic Management of Tourist Companies and a Degree in Information Technology Management. He is a lecturer at the UE - Universidade Europeia since 2010, where he was also recognized as a Specialist Professor in Hotel Management and Computer Science. At UE, he teaches in areas such as Digital Marketing, ERP, CRM, Business Intelligence and technology Applied to Tourism and Hospitality. He is Marketing Director at Host Hotel Systems, where in the last years he took advantage of his IS / IT skills, channeling them into Tourism and Hospitality. In addition to promoting the Host Hotel Systems brand, he has been in charge of managing the main information systems implementation projects for the Hotel Industry. He was a professor at ESTHE - Estoril Higher School of Tourism and Hospitality and at the Lusófona University, in the areas of Computer Systems and Management and Decision Support Systems related to Tourism and Hospitality. He has been invited to participate as a speaker, moderator and mentor in matters related to Tourism, Innovation and Technologies, namely in Tourism of Portugal.

Maria José Sousa (Ph.D. in Management) is a University Professor and a research fellow at ISCTE/Instituto Universitário de Lisboa. Her research interests currently are public policies, information science, innovation, and management issues. She is a best seller author in ICT and People Management and has co-authored over 70 articles and book chapters and published in several scientific journals (e.g. Journal of Business Research, Information Systems Frontiers, European Planning Studies, Systems Research, and Behavioral Science, Computational and Mathematical Organization Theory, Future Generation Computer Systems and others), she has also organized and peer-reviewed international conferences, and is the guest-editor of several Special Issues. She has participated in several European projects of innovation transfer and is also External Expert of COST Association – European Cooperation in Science and Technology and President of the ISO/TC 260 – Human Resources Management, representing Portugal in the International Organization for Standardization.

Ana Brochado is a professor of management at the ISCTE-IUL-Instituto Universitário de Lisboa - Lisbon University Institute and a researcher at DINAMIA'CET-Centre for Socioeconomic and Territorial Studies. She served as the Vice Dean for administrative affairs and Vice Dean for faculty for five years and coordinated the PhD in Tourism Management. She worked for more than one decade as Senior Economist for the Portuguese Competition Authority and the Securities Commission. She joined the Strategic Board of Compete2020. She has a Bachelor of Science in Economics, a Master of Science in Quantitative Methods, and a Doctor of Management. Her main research interests are market research, hospitality and tourism management, Fintech, sustainability management, and innovation. She has authored or co-authored over 50 publications in top international journals in these fields, wrote over 40 book chapter and presented over 200 talks in international conferences. Her research received over 1000 citations.

Appendix C: Questionnaire



Questionnaire for the PhD Thesis intitled Hospitality Business Analytics: understanding analytics knowledge in hotel management. / Questionário para a tese de doutoramento intitulada Hospitality Business Analytics: compreender o conhecimento analítico na gestão hoteleira

Dear Participant,

This questionnaire is part of an academic research project conducted by a doctoral student at ISCTE-IUL / Universidade Europeia. As part of my research, I am conducting a study on Hospitality Business Analytics to understand analytics knowledge in hotel management. Your involvement in this study is of great value and will make a substantial contribution to the progress of knowledge in this field.
There are no definitive right or wrong responses in this questionnaire. If a question doesn't perfectly capture your viewpoint, kindly select the answer that aligns most closely with your perspective or provide your ideal response. Your input is highly valuable.
Your input in this questionnaire is completely confidential. All data collected will be anonymized and used only for analysis. Your personal information will never be revealed or connected to your responses.

Thank you for your time and valuable contribution to this research.
João Paulo Rodrigues

Caro Participante,

Este questionário faz parte de um projeto de investigação académica realizado por um aluno de doutoramento no ISCTE-IUL / Universidade Europeia. Como parte da minha investigação, estou a realizar um estudo sobre Hospitality Business Analytics para compreender o conhecimento analítico na gestão hoteleira. O seu envolvimento neste estudo é de grande valor e contribuirá substancialmente para o progresso do conhecimento nesta área.
Não existem respostas certas ou erradas definitivas neste questionário. Se uma pergunta não captar perfeitamente o seu ponto de vista, por favor seleccione a resposta que mais se aproxima da sua perspetiva ou forneça a sua resposta ideal. O seu contributo é muito valioso.
O seu contributo para este questionário é totalmente confidencial. Todos os dados recolhidos serão anónimos e utilizados apenas para análise. As suas informações pessoais nunca serão reveladas ou relacionadas com as suas respostas.

Obrigado pelo seu tempo e pela sua valiosa contribuição para esta investigação.
João Paulo Rodrigues

* Indica uma pergunta obrigatória

1. **E-mail address (optional) / Endereço de eMail (opcional)**

_____

SECTION I - Socio-demographic factors / SECÇÃO I – Fatores Sociodemográficos

2. **P01- Age / Idade?** *

Marcar apenas uma oval.

- ◯ 17 - 24
- ◯ 25 - 34
- ◯ 35 - 44
- ◯ 45 - 54
- ◯ > 55

3. **P02- Gender / Qual o género?** *

Marcar apenas uma oval.

- ◯ Male
- ◯ Female
- ◯ Other
- ◯ I'd rather not Answer

4. **P3- Nationality / Nacionalidade?** *

_____

5. **P4- Position / Cargo?** *

Marcar apenas uma oval.

- ◯ Owner
- ◯ Director
- ◯ Administration
- ◯ Other

6. **P5- Academic qualifications / Habilitações Literárias?** *

Marcar apenas uma oval.

- ◯ Professional Course
- ◯ Bachelor's Degree
- ◯ Graduate
- ◯ Master's Degree
- ◯ Other

7. **P06- Educational Institution / Instituição de Ensino?** *

_____

8. **P06.1- Course designation / Designação do curso?** *

_____

9. **P07- Hotel where you currently work / Unidade hoteleira onde trabalha atualmente?** *

_____

10. **P08- Geographical location of the hotel unit / Qual o local geográfico da Unidade hoteleira?** *

Marcar apenas uma oval.

- North
- Center
- South
- Madeira
- Açores

11. **P09- Professional Experience / Experiência Profissional?**

Marcar apenas uma oval.

- Less than 1 year
- Between 1 and 2 years
- Between 3 and 5 years
- Between 6 and 10 years
- More than 10 years

SECÇÃO II – Market Environment Factors Sourcing

Knowledge of the main hotel operating systems / Conhecimento dos principais Sistemas operacionais para hotelaria

12. **P10- Do you usually work with a PMS - Property Management Systems in the accommodation area? / Costuma trabalhar com um PMS – *Property Management Systems* – na área de alojamento?** *

Marcar apenas uma oval.

- ◯ Very often
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Never

13. **P11- Do you usually work with F&B - Food and Beverage - systems? / Costuma trabalhar com sistemas de C&B - Comidas e Bebidas?** *

Marcar apenas uma oval.

- ◯ Very often
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Never

14. **P12- Do you usually work with POS (Point of Sales) systems in the F&B sector? / Costuma trabalhar com sistemas de POS – *Point of Sales* na área do F&B?** *

Marcar apenas uma oval.

- ◯ Very often
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Never

15. **P13- Do you usually work with Catering and/or Event Management systems? / Costuma trabalhar com sistemas de Catering e/ou Gestão de Eventos?** *

Marcar apenas uma oval.

- ◯ Very often
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Never

16. **P14- Do you usually work with ERP - Enterprise Resource Planning - systems? / Costuma trabalhar com sistemas de ERP – *Enterprise Resource Planning*?** *

Marcar apenas uma oval.

- ◯ Very often
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Never

17. **P15- Do you usually work with RMS - Revenue Management Systems? / Costuma trabalhar com sistemas de RMS – *Revenue Management Systems*?** *

Marcar apenas uma oval.

- ◯ Very often
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Never

18. P16- **Indicate any other type of IT systems you have used in a hotel unit / Indique outro tipo de sistemas informáticos que tenha utilizado numa unidade hoteleira** *

SECÇÃO II – Market Environment Factors Sourcing

Reporting, products and people / Reporting, produtos e pessoas

19. P17- **Do you usually use operational reports from hotel systems (PMS, POS, ERP, others)? / Costuma utilizar relatórios operacionais vindos de sistemas hoteleiros (PMS, POS, ERP, outros)?** *

Marcar apenas uma oval.

- ◯ Very often
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Never

20. P18- **Do you use or have you ever used analytical systems? / Utiliza ou já utilizou sistemas analíticos?** *

Marcar apenas uma oval.

- ◯ Very often
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Never

21. **P19- If you've ever used analytical systems, which ones? / Se já alguma vez utilizou sistemas analíticos, pode indicar quais?**

22. **P20- Do you agree that information from operational systems reports is enough to effectively manage a hotel? / Concorda ser suficiente a informação vinda de relatórios dos sistemas operacionais para gerir com eficácia uma unidade hoteleira?** *

Marcar apenas uma oval.

- Strongly agree
- Agree
- Neither agree or disagree
- Disagree
- Strongly disagree

23. **P21- Do you think that with operational reports there is an in-depth knowledge of how the hotel works? / Considera que com relatórios operacionais existe um profundo conhecimento de todo o funcionamento do hotel?** *

Marcar apenas uma oval.

- Strongly agree
- Agree
- Neither agree or disagree
- Disagree
- Strongly disagree

24. **P22- Do you think there are sufficient and appropriate Business Analytics products on the market for the hotel industry? / Considera existirem no mercado produtos suficientes e adequados de Business Analytics para a hotelaria?** *

Marcar apenas uma oval.

- ◯ Strongly agree
- ◯ Agree
- ◯ Neither agree or disagree
- ◯ Disagree
- ◯ Strongly disagree

25. **P23- Do you agree that there are people with the right knowledge to provide Business Analytics support to the hotel industry? / Concorda existirem pessoas com conhecimento adequado para dar apoio ao nível de Business Analytics para a hotelaria?** *

Marcar apenas uma oval.

- ◯ Strongly agree
- ◯ Agree
- ◯ Neither agree or disagree
- ◯ Disagree
- ◯ Strongly disagree

26. **P24- Do you think there is good value for money in implementing Business Analytics systems in the hotel industry? / Considera haver uma boa relação qualidade preço na implementação de sistemas de Business Analytics na hotelaria?** *

Marcar apenas uma oval.

- ◯ Strongly agree
- ◯ Agree
- ◯ Neither agree or disagree
- ◯ Disagree
- ◯ Strongly disagree

27. **P25- Do you think Business Analytics systems are too expensive? / Considera os sistemas de Business Analytics muito dispendiosos?** *

Marcar apenas uma oval.

- ◯ Strongly agree
- ◯ Agree
- ◯ Neither agree or disagree
- ◯ Disagree
- ◯ Strongly disagree

28. **P26- Do you think that CLOUD-oriented Business Analytics products are more accessible? / Considera que produtos de Business Analytics virados para a CLOUD são mais acessíveis?** *

Marcar apenas uma oval.

- ◯ Strongly agree
- ◯ Agree
- ◯ Neither agree or disagree
- ◯ Disagree
- ◯ Strongly disagree

SECÇÃO III – Company Environment Factors

Infrastructure, data origin, applications and importance in management / Infraestrutura, origem dos dados, aplicações e importância na gestão

29. **P27- Do you agree that hotels can easily interconnect all the data sources needed to feed an analytical system? / Concorda que as unidades hoteleiras conseguem facilmente interligar todas as origens de dados necessárias para alimentar um sistema analítico?** *

Marcar apenas uma oval.

- ◯ Strongly agree
- ◯ Agree
- ◯ Neither agree or disagree
- ◯ Disagree
- ◯ Strongly disagree

30. **P28- Do you think that hotel units have a technological infrastructure designed to set up Business Analytics processes? / Considera que as unidades hoteleiras têm uma infraestrutura tecnológica pensada para montar processos de Business Analytics?** *

Marcar apenas uma oval.

- ◯ Strongly agree
- ◯ Agree
- ◯ Neither agree or disagree
- ◯ Disagree
- ◯ Strongly disagree

31. **P29- Do you think there is a good relationship between the analytical integrations involved and the reality of the business? / Considera haver uma boa relação entre as integrações analíticas envolvidas e a realidade do negócio?** *

Marcar apenas uma oval.

- ◯ Strongly agree
- ◯ Agree
- ◯ Neither agree or disagree
- ◯ Disagree
- ◯ Strongly disagree

32. **P30- Do you think that hotels assess the entire surrounding structure before moving ahead with implementing analytical systems in the hotel? / Considera que as unidades hoteleiras avaliam toda a estrutura envolvente antes de avançarem para uma implementação de sistemas analíticos no hotel?** *

Marcar apenas uma oval.

- ◯ Strongly agree
- ◯ Agree
- ◯ Neither agree or disagree
- ◯ Disagree
- ◯ Strongly disagree

SECÇÃO IV – Business Environment Factors

Characteristics and organizational culture / Características e cultura organizacional

33. **P31- Do you think the organizational culture of the hotel is prepared to adopt an analytical system? / Considera que a cultura organizacional de da unidade hoteleira está preparada para adotar um sistema analítico?** *

Marcar apenas uma oval.

- ◯ Strongly agree
- ◯ Agree
- ◯ Neither agree or disagree
- ◯ Disagree
- ◯ Strongly disagree

34. **P32- Do you think that the human resources in a hotel unit have the necessary qualifications to work with analytical systems? / Considera que os recursos humanos existentes numa unidade hoteleira reúnem as qualificações necessárias para trabalhar com sistemas analíticos?** *

Marcar apenas uma oval.

- ◯ Strongly agree
- ◯ Agree
- ◯ Neither agree or disagree
- ◯ Disagree
- ◯ Strongly disagree

35. **P33- Do you think that most hotels are large enough to justify investing in analytical systems? / Considera que a maioria das unidades hoteleiras têm dimensão suficiente para justificar um investimento em sistemas analíticos?** *

Marcar apenas uma oval.

- ◯ Strongly agree
- ◯ Agree
- ◯ Neither agree or disagree
- ◯ Disagree
- ◯ Strongly disagree

36. **P34- Do you think a hotel should have a well-defined management structure to incorporate analytical systems into its activities? / Considera que uma unidade hoteleira deveria ter uma estrutura de gestão bem definida para incorporar nas suas atividades sistemas analíticos?** *

Marcar apenas uma oval.

- ◯ Strongly agree
- ◯ Agree
- ◯ Neither agree or disagree
- ◯ Disagree
- ◯ Strongly disagree

37. **P35- Do you think that a hotel should be perfectly compliant with legal requirements and with the legislation and its restrictions on the use of data? / Considera que uma unidade hoteleira deveria estar perfeitamente enquadrada com requisitos legais e com a legislação e suas restrições aos nível das utilizações de dados?** *

Marcar apenas uma oval.

- ◯ Strongly agree
- ◯ Agree
- ◯ Neither agree or disagree
- ◯ Disagree
- ◯ Strongly disagree

38. **P36- Do you think the use of Big Data Analytics could help increase the effectiveness and efficiency of a hotel's operations? / Considera que o uso de Big Data Analytics poderia ajudar a aumentar a eficácia e eficiência dos operacionais de uma unidade hoteleira?** *

Marcar apenas uma oval.

- ◯ Strongly agree
- ◯ Agree
- ◯ Neither agree or disagree
- ◯ Disagree
- ◯ Strongly disagree

39. **P37- Do you think the use of Big Data Analytics could help increase the effectiveness and efficiency of top management? / Considera que o uso de Big Data Analytics poderia ajudar a aumentar a eficácia e eficiência da gestão de topo?** *

Marcar apenas uma oval.

- ◯ Strongly agree
- ◯ Agree
- ◯ Neither agree or disagree
- ◯ Disagree
- ◯ Strongly disagree

40. **P38- Do you think that the use of Big Data Analytics could guarantee better management strategies? / Considera que o uso de Big Data Analytics poderia garantir melhores estratégias de gestão?** *

Marcar apenas uma oval.

- ◯ Strongly agree
- ◯ Agree
- ◯ Neither agree or disagree
- ◯ Disagree
- ◯ Strongly disagree

41. **P39- Do you think the use of Big Data Analytics could help increase occupancy rates? / Considera que o uso de Big Data Analytics poderia ajudar a aumentar as taxas de ocupação?** *

Marcar apenas uma oval.

- ◯ Strongly agree
- ◯ Agree
- ◯ Neither agree or disagree
- ◯ Disagree
- ◯ Strongly disagree

42. **P40- Do you agree that the use of analytical systems could bring better results in terms of profit, productivity and quality? / Concorda que o uso de sistemas analiticos poderia trazer melhores resultados ao nivel do lucro, da produtividade e da qualidade?** *

Marcar apenas uma oval.

- ◯ Strongly agree
- ◯ Agree
- ◯ Neither agree or disagree
- ◯ Disagree
- ◯ Strongly disagree

43. **P41- Do you agree that the use of analytical systems could promote better services? / Concorda que o uso de sistemas analiticos poderia promover melhores serviços?** *

Marcar apenas uma oval.

- ◯ Strongly agree
- ◯ Agree
- ◯ Neither agree or disagree
- ◯ Disagree
- ◯ Strongly disagree

44. P42- **Indicate some of the indicators related to data analysis that you are familiar with (if not applicable, write none) / Indique alguns dos indicadores ligados a análise de dados que conhece (caso não se aplique, escreva nenhum)** *

Appendix D: Matrices of the units of analysis

Appendix D1: Matrix of context units for question 1

Respondents	Context units
R1	"... the teams as a whole, from middle management to secondary management or employees, I don't think they are all prepared for a business analytics culture, due to a lack of technological literacy or poor academic training in some areas…"
	"... on the other hand, at management and middle management level, I think there is more and more openness to processes that are as linear as possible and that save them work and make them take responsibility for themselves."
	"... if the employee has a client culture in very operational aspects, they are in fact capable, if they have good basic training and good experience in terms of internships, they create an impact with a client, which is often very comparable, people with a lot of experience."
	"... it will probably then be other teams that operate these tools, because the hotel managers aren't going to do it, I'd say, or at least they don't have that preparation."
	"...The hotel's organizational culture is not all prepared to the same extent to receive or adopt Business Analytics systems."
	"... There are specific hotel managers in charge of their departments who are very analytical in the way they think and work."
R2	"... Business Analytics is not my strong suit, but I think that in terms of organizational culture, we are prepared. Now we're missing an important element, which was the marketing person who was most qualified for these Analytics issues. But someone will come in and then, with the help of our management and the sales department, we'll try to handle the information better."
R3	"... And I'll tell you why it's not ready, because we have a very old operating culture, we don't have people prepared to manage these platforms."
	"... We're talking about my group, right? We're talking about the hotel where I'm director, so no, it's not ready."
R4	"... I think the organization is motivated, but I don't know if we would have the ideal structure or the right profile, but I think so. I think we could embrace Business Analytics, not least because I think it's something for the future."
	"... I think it might make perfect sense to embrace Business Analytics systems, not least so that we have much more information, so that we have much more of a basis for analysis."
	"... I think it could make perfect sense to embrace Business Analytics systems, not least so that we have much more information and a much better basis for analysis. Whether people are informed or prepared for this context, I don't think so yet. João Paulo, here what I can say is that we have yet to grow or be part of the development of a more consistent commitment to training human resources."
	"... I think so, but I don't know if we'd have the ideal structure or the right profile, but I think so. I think we could, not least because I think it will be something for the future."
R5	"... Yes, it is, in fact, we already have some business intelligence tools, and because this intelligence is increasingly important, it can give us information at a speed that we can't do manually, not even close. So yes, it's essential, and naturally the organization and the organizational culture are also completely geared towards using these tools."
R6	"... the way things have evolved in the world of technology and particularly applied to the hotel industry, and also with the evolution of the skills of the new staff who come to work in the hotel industry, I think it's also a trend in the sector that organizations are progressively more open and receptive to working with these types of business intelligence tools and, therefore, with everything that has to do with new technologies."
	"... So, I would say, as with everything in life, there are people within organizations who perhaps have a less prepared and less receptive mind and are a bit resistant to a certain type of technological dynamic, but others can't even work any other way, can they?"

	"... Probably not. I'd say the culture isn't ready. But I don't think it's a complicated thing either, and as the tools are implemented people start to get used to them. I don't know if it's a good comparison, but when computers started appearing in the hotel industry, I'm still from that time, it wasn't all manual. I remember very well that there was a lot of resistance from the older generations."
	"... Older generations were resistant and didn't want it. On the other hand, the younger generations wanted it and then we all realized that it was more efficient, more practical, that everything was recorded and there was no paperwork, so processes began to be simplified."
	"... But I think in most cases, what happens is that it's the management of the companies themselves, and in most companies in Portugal this is still very fragmented and still very "stand alone", the directors of medium-sized companies themselves are the first to resist this type of tool, why?"
	"... I think that's, definitely, going to be the trend and I think that, currently, the vast majority of corporate cultures are starting to be receptive to these types of tools."
	"... I would say that organizational cultures are tending to become more prepared for this type of tool."
	"... I don't think there's a yes or no answer. Honestly, no. I wouldn't like to give an answer to the effect that, in general, the hotel industry isn't ready. I don't think that would be fair."
	"... Nowadays, we have a lot of data, we even have too much data, and if there isn't a disciplined way of being able to analyze the data and extract qualified information from it so that we can manage our companies, and in this case hotels, in advance, which I think is what a data analyst is for. If we can do that, we're taking a good step towards greater efficiency, higher quality and better management information, etc."
	"... I think it's the future. Now, whether or not companies are prepared for this, are already putting it into practice, I think we're still, in this very particular respect, a little way off, but we'll certainly get there."
	"... Once again, making the comparison, it's the same thing that happened with Revenue Management 20 years ago, which didn't exist, but then when the first Yield Managers started appearing, they said it wasn't useful and it was worth it, and now there aren't any who don't have it, are there?"
R7	"... I would say that the vision comes mainly from the last year. I'd say the last 8 or 9 months have been very much focused on Business Analytics. At least, analyzing and seeing demonstrations of many more tools so that we can look at the business in all its aspects."
	"... there's still internal resistance here, and maybe it's not just the will or the vision of the director, or a director of another hotel of ours, together with the administrators, that's enough to take the steps forward. There are two or three other interlocutors and things haven't been fine-tuned yet, but I believe we're on the way. Those are the expectations. There's nothing to suggest that it's never going to happen, but there's still a long way to go."
	"... So, the structure of the central services has been enriched. We've had a cost controller in the house for two months. The accounts will finally start to be organized, with the Olympic minimum of professionals, I would say, from now on, this month, with a new partner."
	"... There is a desire to move on to other types of tools, including maintenance management and energy management, but these are all steps that are perhaps less rapid than when you're talking about a new structure, recently created by young people and people at the start of their careers, okay."

Appendix D2: Matrix of context units for question 2

Respondents	Context units
R1	"... I think recent graduates know some of the operational tasks carried out by other departments, but they are far from knowing how they are interconnected and how a particular department involves collaboration with other departments."
	"... Sometimes there's still too much of a question of someone saying that it's not F&B that deals with it, or that it's only reservations that deals with it, or that it's only the housekeeper that deals with it, and often it's a matter of sensitivity for four parties, which must be interconnected."
	"... Let's say that through digital or analytical tools, understanding that there are indeed matters where there is a very fine line or there are practically no boundaries between departments is very important."
	"... Distinguishing between recent graduates, who have probably done two operational internships and have very light notions of very important aspects, but who often perform as well or better than people with 5- or 10-years' experience, this is very important."
	"... Distinguishing recent graduates, who have probably done two operational internships and have a very superficial understanding of very important aspects, but who often perform as well or better than people with 5- or 10-years' experience, this is very important."
	"... Recent graduates are those who, in their first employment contracts or internships, lack knowledge in important areas such as purchasing, stock management, waste management and assigning responsibilities. This indicates a lack of organizational understanding in terms of human resources, making it difficult to perceive their role in the overall vision of the organization."
	"... What is missing is the vision of human resources, often when they enter a company, so as not to confuse the employee, it is transmitted in a very basic way."
	"... Sometimes it's more important to understand all aspects of the business, because understanding many aspects of areas where you don't work directly, coupled with a certain naivety, can make it seem that the job of a colleague in another department is much easier or nobler."
R2	"... As for final-year students or recent graduates, I don't think so, I think they have academic notions and theory, but they lack the practice that will take a few more years before they have a deep understanding of the business, and even when they gain experience, they still don't have an integrated view of the business."
	"... Hospitality is an industry that is still very segmented, and people follow either the accommodation route, the commercial route or the F&B route. There are some professionals who are interested in the various areas and end up getting to know how they work and even try out the various sectors during their internships, but I believe that the vast majority focus solely on the area in which they work and don't cover all the knowledge required to obtain an integrated view of the business"
	"... As far as hotel managers are concerned, to be honest, I think my generation has covered more of the various areas of the hotel and has more of a general idea of the hotel, because most of us started at the bottom and went through the various areas of the hotel, and when we got to the position of director we had a greater knowledge of everything, otherwise we wouldn't have been able to manage the hotel"
R3	"... Yes, we know that the analytical system could help to raise information, because then it will bring us new inputs that can allow us to give another type of orientation and lead the teams in another direction, the teams or namely the management, not necessarily the teams (...) I don't think they have a deep knowledge of the business."
R4	"... I don't think they do. I'll start with the managers. I think, João, that the "One Man Show" policy is still very much alive in Portugal. He has to know how to do everything, and you have to pay a director well if you think he knows how to do everything. I don't think that ever happens."
	"... Either way, personally and speaking of myself, since the interview was addressed to me, I'm a bit self-taught, but that's part of me, that is, learning what I don't know and getting involved with things, for example, I love maintenance. It's an area I've always loved and it's a complex area, but I do it because I've always been dedicated to the subject."

	"... I think we should take advantage of the freshness of knowledge, the freshness of mind, the youthfulness of recent graduates and I don't think this is done in Portugal."
	"... There's still the cult of "you start at the bottom, because I started too" and only then do you grow. Here I think it should be done the other way around. We shouldn't put them at the bottom, and we should take advantage of the fresh technical knowledge, new trends, new theories, new vision, new world that the younger ones can bring."
	"... I don't agree that a director general must know everything. That they must know everything about every area in detail, and as João knows, there are several. These eight main areas that exist in the hotel, and I'm not looking at a resort that maybe has Leisure, maybe has Clubs, family Clubs, Golf, etc. And I don't think this knowledge exists."
	"... I think they have the basics, but I don't think they have in-depth knowledge of the business. I don't think they know how a department works from A to Z, and whatever department it is, from housekeeping to Front Office, F&B, maintenance, security, etc. So, I don't think they have any idea of the detail of this operational knowledge."
	"... Now, the great difficulty I feel, and I often feel alone here. Anyway, João knows how these things are, because I'm here alone and I lack a bit of support from. It's always the director who must think and the students, or recent graduates, don't want to think. Thinking takes work."
	"... Having real-time, obviously timely information, I don't know, from a simple marketing campaign to a simple analysis of market results that allows strategic decisions to be made, so thinking a little about the future and beyond, having quality information, can better decide strategically about the future of the organization."
	"... Apart from the fact that I don't think this knowledge exists, I think there should be a diversification of services and then specialized partner companies should be involved in this support for the general manager."
	"... From the point of view of recent graduates, I think we have a big issue. A bit like what we were talking about earlier. I think recent graduates should be seen in a different light from the hotel industry's point of view. On the one hand, through technical skills, in other words, the dryness of concepts, information and skills that they bring because they are new. On the other hand, because of the responsibility that comes with it"
R5	"... More and more, I think I'm understanding the issue. I think that more and more graduates have more training in how the unit's work. How a hotel unit works in general and even all the ways they talked about B. Intelligence, because we try to integrate them into the project, but it depends a lot on the person, some do, and some don't."
	"... Yes, because in our case, we have employees working in various departments, which gives them an openness and a more general knowledge of the hotel, we have more and more cross training and this gives this openness and a general knowledge of the business, because we really put them to work in various departments."
R6	"... I'm a bit more critical here. I honestly think that the vast majority don't. In the vast majority, both principals and recent graduates don't have in-depth knowledge."
	"... I'm completely co-responsible, but the truth is that unfortunately, students don't leave prepared for what the dynamics of hospitality are today, and they don't leave knowing everything that's going on."
	"... I'm completely co-responsible, but the truth is that unfortunately, the students don't leave prepared for what the dynamics of hospitality are today, and they don't leave knowing everything that's going on. It wasn't desirable, and they weren't supposed to know everything in detail, but rather the main pillars and how the hotel business works. But they don't."
	"... Academics, particularly professors, etc., are far removed from the reality of the sector and are not keeping up with trends at all. They're locked in a crystallized box of some set of knowledge, which is probably already outdated, and this doesn't benefit the teaching of students at all."
	"... So, when we look at what a hotel general manager used to be, which was a person who had enormous power over the hotel, who had complete knowledge of everything, of the whole hotel operation from A to Z, nowadays, unfortunately, this reality in most cases doesn't arise."

	"... Speaking of the directors. The directors, obviously, apart from a few exceptions. But nowadays, hotel managers are very much affected by an increasingly common reality, which is that the large hotel groups are beginning to define all the strategies, policies, and operation of the hotels, deciding at a central level."
	"... So, it turns out that directors are merely executors of decisions that have already been made at all levels. And they are and they become a bit, well, I don't want to belittle them here, but what we see a lot is that they become mere executors. They become day-to-day managers and don't have a very strategic role in terms of defining pricing policies, commercial policies, improvements, etc."
	"... Directors are not involved in strategic decisions and end up being very limited in their actions. This doesn't help them grow professionally either."
	"... Therefore, asking if they are prepared for technologies and the advantage of working with qualified information, etc., this happens much more at the "corporate" level, so at the level of hotel head offices."
	"... At the level of small, family-run hotels, where there's a small administration, they're also a long way from all this."
R7	"... It's very difficult. I at least see it as a great challenge to make people believe and to get the message across that it's all worthwhile. Only with a lot of personal sacrifice can you succeed and make a career. Maybe you can do it another way, but I don't know that way yet, nor do I see anyone doing it another way."
	"... To be honest, very few people manage to have an integrated vision of the business. I've been confronted several times, even with people coming into contact with a budget for the first time, with profit and loss accounts, and I ask myself, but didn't they teach this at school? They say they taught theory, about what GOP is, what Food Cost is, what Prime Cost is. I ask them if they've never seen examples, charts, maps? They say they did some exercises."
	"... Therefore, there are very few who have passed through my hands or my knowledge, who really were already a little further ahead and more evolved and more at ease, with more wings in the way of interpreting, manipulating, and handling the tools. I would say that they had already had contact with the profession through their family."
	"... The young people have taken the simple, normal academic route, with no contact with the real world, they are completely out of touch and most of them drop out. Those who stay don't leave, they wait tables or work at hotel reception desks and then end up leaving the profession. This is my perception of the game."
	"... Maybe it's our fault that we've been here a lot longer. Maybe we could have done better and turned it around. Of course, we also have ourselves to blame (...) Now what I think is missing is a lot of interconnections between the academies and the real world."
	"... There's also a lack of openness on the part of companies to work together. So that when the individual goes out into the real world, they don't find such a huge gap between what they've been preparing for over three, four or five years, depending on whether they've only done their bachelor's degree, or whether they've done a master's degree on everything they've done. Then it's a huge disappointment. The amount of information, the lack of involvement and the commitment required to succeed in this profession. It's a very unrewarding profession. I'm sure that João Paulo and my colleagues have said this, and maybe the opposite, but in the end it's not very rewarding because it's highly involving and exhausting to be successful or to succeed."
	"... Our lives are given over to the profession and this doesn't fit in with the younger generations, either, much less with people who have been burning their brains out and spending money for three, four or five years at university."
R7	"... Nobody is available. Maybe in my generation we were. No, maybe we were. In the new generations, no one is willing to work fourteen, fifteen or sixteen hours a day, not knowing when they're going to have the day off, having to change their day off because the clients have changed their arrival times, or because there was a pick-up at short notice that changed all the plans. The new generations aren't used to this."
	"... Right, I would say that the older professionals, or those who have been here for a few years, I have little doubt that they know the business inside out and know when they need to cross-reference information and reach conclusions."

	"... As for recent graduates, from my perspective, to be honest, João Paulo, it's been deteriorating and I'm more pessimistic now than I was five or six years ago (…) My perception of recent graduates is that contact with reality, or with the real world versus a degree, whether in tourism management or hotel management, tends to be a very big shock."
	"... There's a huge gap in realities and knowledge, so, no (…) And my perception, or at least what I have felt, not only in this reality, but even in the previous reality where I spent six years in the second largest hotel chain in Portugal, is that in the early days of a graduate's career there is some fear (…) Most of the time it results in disillusionment and giving up on the career."
	"... Students who went on to do a degree, either from a vocational course or directly from normal education, and then some went on to do a master's degree or not. Those who are already above average in knowledge are usually the ones who take the longest to finish their degree because, in the meantime, they're already doing a lot of things at the same time, including helping their father or cousin or uncle in the restaurant, boarding house, hotel, etc. And they're already in another league, in other words, these are the people who arrive at hotels with a degree at the age of twenty-eight, twenty-nine or thirty, already with a different kind of knowledge, maturity and vision."

Appendix D3: Matrix of context units for question 3

Respondents	Context units
R1	"... The integration of infrastructures is obviously justified on a certain scale. Nowadays, on a very small scale, it's easy to integrate a lot of things."
	"... I believe that the need for software, hardware, etc. is often necessary to enable this integration."
	"... They are also often budgets that a person has, and everything is supposed to go well, and you're not supposed to be thinking about it."
	"... On average, there isn't a technician in the hotel park to make a good analysis or have an awareness of what is needed for integration and infrastructure."
	"... Regarding technological infrastructure and what it entails in terms of investment, I think there is little awareness of the technological, technical, physical and financial needs to have these issues."
	"... We've already had two people who were very involved, without being directors or managers, and they were very involved in this process, but you wouldn't expect a recent graduate to be aware of this, or to have an active voice in any way."
	"... The hotel director is probably not aware of it, because he doesn't have as much visibility over all kinds of tools."
	"... Directors will make decisions based on information, yes, but they won't get to the point of understanding the whole source, or what Big Data is, they won't, and probably won't even be stimulated to do so in the next few years, I think, at least in terms of priority now."
	"... Yes, because there are already Price Party tools, which already collect flight data and search trend data from Google and things like that and cross-reference growth volumes according to the tastes, interactions of each person with the diet they can visualize, and I think this already exists."
	"... There is a certain, realization of the need for these integrations and the relevance in terms of the impact it can have in terms of revenue, sales and customer management and the Guest stay journey, post-stay on the side of students and recent graduates, much less so."
	"... Since nobody makes sales on the Internet with a booking form, I think this need is completely ingrained. So, I think yes, there is a need for integration to be fully realized."
R2	"... I don't think so, students are not aware of the need to integrate systems for Business Analytics. Most of the time they're not even aware of the integration of operational systems with an ERP."
	"... I think there is a need to evolve from what has happened so far, to get more out of the way, we operate."
R3	"... Yes, we are, and this is very much about sharing data, isn't it? I think so. I think we're aware and we know what's needed."
	"... I think that in terms of infrastructure we're not aware of what's needed in terms of adopting analytical systems."
	"... Yes, we are aware of sharing, and this is very much about sharing data, isn't it?"
R4	"... Well, from the point of view of recent graduates, I can't answer what they think because I haven't spoken to many of them."
	"... I think we need access to information. It's going to be increasingly useful to have integration with the services, particularly with the PMS, where we can aggregate all the information, not just about guests, but about what's going on in the city."
	"... I even think that recent graduates are much geekier than us and the digital part will be a subterfuge for them. The operational part, they'll understand later with reality."
	"... With integration, they'll understand what the flows are, whether migratory, market segments, nationalities, clients, and new trends. I think we need to get this information and, as you know, the more connectivity and the more integration you have, the better."
	"... I think it's going to be a trend. We want to be able to analyze everything and be able to look at data in this way and bring us this substance. Above all, that it gives us better information to make better decisions."

R5	"... They are, they are aware of the existence of various data sources, of what needs to be done for integration and of the necessary infrastructure, and the person who is doing this for us is an intern who is being accompanied by a person with a lot of now how."
	"... This also has to do with size, in a small hotel it ends up being easier to rotate functions, and in my opinion, this is my opinion, the hotel industry is changing, those little farms we used to have, each to their own, no longer make sense."
R6	"... My experience with recent graduates is very poor indeed. In this respect, I think they gain this awareness later, in their professional lives, but I don't know if the schools are prepared, with a few honorable exceptions from distinguished teachers. I don't know if they gain these skills at teaching level. I honestly don't think so. I'm really convinced of this answer."
	"... In most cases, companies always use specialized technicians to carry out the work and to make all the necessary interfaces to get the systems talking to each other."
	"... I think managers are aware that to get certain systems up and running, there obviously has to be integration. There must be machines working, there have to be all the logistics behind it, the support and redundancies, and everything that I haven't mastered either, but that I'm more or less getting to know."
	"... I'd say yes, the immediate response. They're aware of it, but I don't know if they're aware of everything it entails, maybe they're not aware of all the details, but it's probably not their competence to know the details of all these technological connections and needs."
R7	"... What I can say, João Paulo, is what I know, I think I have that idea. I don't know everything; I'm learning every day. It's been like this for thirty years. There are probably tools and ways of working, or having access to information that I don't know about, but what I can tell you is that I've never had any contact with a recent graduate or graduate who brought me any news on the academic side."
	"... Normally, it's the technology developers and the stakeholders involved who bring me the news. Those are the ones who come to me with news about my profession from time to time, but not the ones who come from universities. But I may be an isolated case, but that's my perception."
	"... I can see that the new boards are aware. The new management, that is, those who already have their hands in the dough, yes. Even if they're moving at a slower pace, like us, for example. It's assumed, it's felt and it's identified as a necessity in order not to miss the train. You take slower steps, but you have to do it. You have to walk that way."
	"... I started making exploration maps in Excel in 1998, around then. And although it's a lot of what's still done in the big chains, it doesn't make sense! It's a lot of work, it's a lot of human effort, it's erratic because it's done by hand, with data entered by hand and then cross-referenced in formulas. Nowadays, with the tools that already exist and that are available, it makes perfect sense to integrate these systems to optimize information, to optimize processes, to be more productive, that's it at the end of the day."
	"... Maybe we'll eliminate a few jobs in between, maybe we will. But maybe from a certain volume and a certain size we need Revenue Management. Someone who is constantly looking at the Pricing tools, occupancies, and history, to see what's going on and optimize it. We also need a cost controller, who is drinking information from an ERP, such as Primavera or another competing system, and who is cross-referencing it directly with the revenue that the daily invoicing generates, and who then talks directly to the Revenue Manager to understand what is likely to happen to us in the future. So that there can be anticipatory measures to prevent major problems."

Appendix D4: Matrix of context units for question 4

Respondents	Context units
R1	"... No, they're not. They don't realize that things have a certain cost. There's no knowledge of what it's like to run a hotel and the context costs, there's no knowledge and here we're talking about a larger scale than Business Analytics. Even if we're talking about the costs of normal activities, they don't really have that knowledge either."
	"... Business Analytics has a hardware, software and technical component in people, and I would say that they don't really have that knowledge, even the general managers, for example, know about Data Scientist, that's only someone who is dedicated to it, but they don't have that knowledge."
	"... I'd say that even at administration level, it's something that's still ingrained and I'm also talking more, perhaps, about the profile of the Portuguese business fabric, SMEs etc. We are beginning to learn about these needs, but not so much from our own experience."
R2	"... I don't think we have any idea of the costs. Neither the students nor the directors (...) for example, I don't have the slightest idea of costs. I've never bothered to look either because I already know that it's going to be a barrier here."
R3	"... Yes, the Group is not looking at Business Analytics, as the implementation costs would be an obstacle from the outset? The host for example, i.e., the PMS, is a necessity, without it we wouldn't be able to operate, otherwise it wouldn't exist. Anything beyond that is no good, it's out, it doesn't matter, it's no good, because now the people in the operation who are close to the administration don't see it as adding value and when we ask for an investment, we have to give very good reasons."
R4	"... Regarding recent graduates, I can't give them that. Look, João, I speak for myself, I have no idea how much they might like things. I really have no idea. Nowadays, I have some idea that everything is much more expensive and every budget we ask for is a fortune."
	"... Nowadays, I don't even know if the business itself is in providing the service, or if it's in using the service."
	"... I think it's one thing to purchase a product, but it's another to implement it. The labor costs are higher, along with transportation expenses. The emphasis lies more on labor and transport in the business, rather than the product itself. Especially when it comes to maintenance: we might buy a part for 80 euros from the budget, but it ends up costing 500 euros. Assembling the part accounts for 200 euros, and transportation adds another 150 euros."
	"... So I don't believe anyone has a complete understanding, and I certainly don't. I have knowledge of how much it costs to implement a PMS in a new hotel, as I've overseen four openings already. However, when it comes to Business Intelligence, I'm unsure about the expenses involved in implementing the hotel, including integrations and other aspects."
	"... but I'm uncertain about the potential cost and financial impact it could have on an operation."
R5	"... New graduates often lack this knowledge. Firstly, because there isn't much sharing of this information due to its sensitive nature. However, I don't believe that's the only reason. Primarily, they have no idea about the true value in terms of investment."
	"... The directors do; they oversee various areas. For instance, I am responsible for everything related to suppliers. In a small organization, it's common for many responsibilities to be concentrated in one person."
R6	"... The directors likely review cost allocations in the monthly P&L, specifically when it concerns a hotel P&L based on the USALI. Otherwise, they might not even be aware of the IT and technology cost allocations in their P&L. However, I don't believe there's a high level of sensitivity regarding this matter, honestly."
	"... I get the sense that they have no clue. Honestly, I'm not sure how else to put it. When it comes to recent graduates, I don't believe they have a grasp of it."

	"... Hotel directors don't either, for the reasons I've already explained, since decisions are typically made at the head office level."
R7	"... The reality I encountered in a previous large hotel chain was such that we even had to know the price of a single screw, and I'm not exaggerating. There were instances where we were nearly audited periodically to ensure we knew the purchase price of an item from the previous week."
	"... I've been accustomed to a culture of sharing information, including numbers and results, which helps us stay motivated and work towards achieving our goals. Without understanding what lies behind it, it's challenging to strive for results."
	"... The reality I experienced in a previous large hotel chain was such that we were expected to know even the price of a single screw, and I'm not exaggerating. There were times when we were subject to audits to ensure we knew the purchase price of items from the previous week. This level of information was meticulously shared and disseminated, at least up to the top management. This included management, financial management, central services, hotel management, assistant managers, department heads, section heads, restaurant heads, kitchen heads, and purchasing heads. Beyond that level, only high-level results information was shared, lacking the same level of detail. But up until that point, it was detailed."
	"... As a hotel director, I'm familiar with most of the associated costs, particularly those related to tools that have been used in the past or are currently in use. New graduates who have held positions of responsibility for at least a year, such as assistant managers or higher, or those who have worked in the field for at least a year, likely have some understanding of these costs. Over the years, there has been a positive shift in this regard. There's been an increase in the sharing of information with staff, fostering a sense of teamwork, and also the dissemination of results."
	"... In the present situation at this hotel, not all the specifics are disseminated to everyone, including me. I'm aware that these details do exist, and I'm gradually gathering them, leading to the sharing of certain information. I still don't possess all the information that I had, for instance, a year and a half ago in a different context. It's not a matter of me underestimating its importance or not being interested in knowing. It's more a reflection of the evolving nature of the organizational culture."
	"... I recognize that there are realities in other hotels where nothing is shared, even at management level, they're almost in the dark. Basically, they know when there's an invoice, because there's a PMS in front of them, but then they don't know everything else behind it."

Appendix D5: Matrix of context units for question 5

Respondents	Context units
R1	"... Here I think there has already been a great evolution."
	"... Regarding hotel managers, I believe that increasingly, individuals in management roles are self-taught and have a desire for self-improvement. I think there have been various societal tools that facilitate ongoing development. However, it also greatly depends on the encouragement provided by their management or the professional environment in which they operate."
	"... No, specifically in the area of analytics, no one at the hotel has ever had specific training."
	"... Only two people from the marketing department have had training in analytics, more focused on Google Analytics. Not analytics per se, but Revenue Management and the reservations and commercial areas."
R2	"... I can't give a definite answer until I see the specifics of the situation. Regarding the students, if they've covered relevant subjects at university, there's a possibility they might have some knowledge. Otherwise, they likely won't. Once we implement these systems, we'll need to undergo training, and only then will we ascertain whether we already possess knowledge of analytical systems or not."
R3	"... Hotel managers don't have the appropriate knowledge to know or use the systems, but it's not very straightforward, it depends on the training, I'm not prepared, for example, I would have to deepen my knowledge with specific training for that purpose."
R4	"... They don't either. I don't think we're prepared to deal with this, either in negotiating or interpreting the new systems and the results they might bring? I don't think so. I'm not."
R5	"... Yes, I think so (...) I think that the knowledge, how to analyze data, how to analyze KPIs, exists at training level, then the ease of using these tools, that is, the contact we have at the moment with these technologies at all levels, therefore, the combination of the personal part that we work with, computers, tablets out there, with the KPIs that you learn at school throughout your academic career, this combination, allows us to be more prepared, yes."
	"... There's usually in-house training, when the products are installed, there's training and I follow up. I follow up with those who installed the products and I train people in-house. In fact, what happens here is that anyone who wants to know and learn can learn anything they want, so I end up being a bit of a trainer."
R6	"... I don't think so. I don't think they have adequate training either. I don't think they have any basic preparation for this kind of analysis."
	"... Obviously there are people who already have these natural skills, analytical skills and so on. So, they understand and analyze more easily. Now, if the university prepares them or if the professional world prepares them, I think it prepares them in a very basic way. So maybe they don't have enough capacity to be able to deal with the sophistication of the technology that exists today, especially the outputs that come from that technology, right?"
R7	"... I'd say that, based on the hotel directors I know, generally speaking, yes. There may be exceptions, of course. However, in general, I believe and am convinced that they do have some understanding of analytical systems."
	"... Regarding recent graduates, I would say that they exhibit a partial grasp of the information, at least in a theoretical sense, when it comes to understanding analytical systems. As I began to share knowledge, provide training, assign responsibilities, and evaluate them, encouraging them to offer conclusions, solutions, and suggestions, some of them have demonstrated that they've received adequate training, enabling them to comprehend the functioning of these systems to some extent."
	"... There are other traditional administrations like us, but they're managed by building contractors who suddenly ventured into the hotel industry without prior knowledge or experience in the field."

"... When it comes to administrations, it's a different story. I would say both yes and no. Yes, there are managers, some of whom are under fifty or fifty-five. However, especially for those in the older generation, particularly on a national level, it becomes challenging, and I would lean towards no. Individuals from this generation still tend to approach their work in a rather old-fashioned way, often with a diary in one hand and a calculator in the other."

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