ROLE OF ARTIFICIAL INTELLIGENCE AND BIG DATA ANALYTICS IN SMART TOURISM: A RESOURCE-BASED VIEW APPROACH

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ABSTRACT

This study examines the use and impact of artificial intelligence (AI) and big data analytics (BDA) in the tourism industry (TI). The digital age has brought a lot of changes transforming the business environment. The extensive use of the internet combined with the recent technological advances have greatly affected tourism companies, which need to face increased competition, changing tourists' needs and quick development of customer services. Furthermore, due to the widespread digitization, the tourism industry is overwhelmed by a huge amount of data that needs to be processed and analysed. AI is a rapidly evolving set of technologies, which can to some extent replace the analytical ability and decision-making capabilities of human beings. It can thus enable the development of innovative services and the intelligent processing of large amounts of data. Although AI is a widely known technology, it is still not widely used in the tourism industry. However, the adoption of AI is accelerated during the last 3 years, which is also reflected in the literature. By conducting an extensive literature review, this study aims to examine the level of adoption of AI applications in different sectors of the tourism industry and to discuss their role in big data analytics and in smart tourism (ST). It also aims to examine under which circumstances the adoption of these applications and technologies could enable tourism companies to obtain a competitive advantage. To explain this, the paper develops a conceptual framework using the resource based view theory. Based on the proposed framework, it shows that the adoption of the above combination may enable tourism companies to increase their business performance, achieve economic results and potentially attain a sustainable competitive advantage. Therefore, this research discusses the strategic role of AI and BDA in ST, makes propositions of implementation and forms the base for future research.

Keywords: artificial intelligence, tourism industry, smart tourism, big data analytics, business performance, competitive advantage.

1 INTRODUCTION

Many countries around the world have turned the tourism industry into a key economic factor, which contributes to their economic development and helps to increase the country's GDP. The use of information technology (IT) in the tourism industry has dynamically started two decades ago, where companies started to understand and realize the tremendous impact that IT could have at the industry, through the automation of many tasks and services [1]. New technologies and information systems provide companies with tools to find partners, offer products and manage better services for tourists [2].

The technological advances and the tremendous increase of IT solutions in the last decade, have been accelerated due to the expansion of the Internet and the development of social media [3]. These advances led to the digitization of tourists' services and companies, changing dramatically the environment of the tourism industry [4]. Moreover, the transition of websites into mobile applications, which enhance the participation of users, known as Web 2.0 applications, have led the entire tourism industry to the "informatization" of the value chain [5] and the increase of the concept of Travel 2.0 [6], which allows tourists to publish their experiences through internet sites about any travel-related content [7].

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Therefore, a huge amount of data is generated on a daily basis inside the tourism industry. The importance of the data and information handling for the entire industry has been documented by both practitioners and academics [8], [9]. The existence and use of information in the tourism sector brought not only many opportunities, but also threats for companies [10].

Artificial intelligence (AI) is identified as a disruptive factor in the current digital era. This paper tries to identify the theoretical and practical benefits that AI could bring in the tourism companies, especially in difficult periods, where companies of the tourism industry face situations leading to an economic stagnation. According to Xiang [11], AI is related to innovations and plays an important role in the tourism industry. It is thus expected to gradually change the services and experience of tourists. According to Tuo et al. [12], there are a few studies which examine the effects of AI in the tourism industry. The majority of studies do not analyse the characteristics of this technology and do not thoroughly analyse its impact. Furthermore, only limited studies analyse if the use of AI could enable companies to improve their position inside their task environment and increase their performance.

All these data which are produced, through the internet or various applications, must be analysed in order to help managers into the decision-making process. Therefore, this significant contribution of big data has led academics to explore the potential of the big data analytics (BDA) in the tourism industry [13]. BDA could help companies to better understand customers´ motivation through conducting online reviews [14] and analysing social media data. Moreover, BDA could contribute to analyse customer value and examine its impact on hotel performance [15]. Hence, big data is an important source of low-cost data, which could lead to trace tourists' movements, preferences, favourite points of interests, behaviours, future trends [16].

It is an undeniable fact that only a few existing studies systematically explain how artificial intelligence and big data analytics could affect the tourism industry and how these technologies could improve the internal operations of the companies in near the future. To address these issues, both from a practical and theoretical perspective, this paper proposes a conceptual framework on how AI and BDA could contribute to the tourism industry.

The current literature on these technologies and on their contribution to the tourism industry have not been thoroughly explored, despite the benefits that could derive by their use, to both managers and customers [17]. The purpose of this paper is to examine the level of adoption of AI applications in different domains of the tourism industry and to discuss their role in Big Data analytics and especially in sentiment analysis. An additional objective is to examine under which circumstances the adoption of AI applications could enable tourism companies to increase their performance or could additionally enable them to obtain competitive advantage.

Therefore, this is a conceptual paper, which aims to analyse the subject of study theoretically. Section 2 examines the concepts of smart tourism, AI and BDA, as analysed in the literature and describes how these technologies could contribute to the tourism industry. Moreover, this section describes the theory which is used as a base for the development of the conceptual framework. Section 3 presents and describes the proposed the framework. Finally, the conclusion and discussion section compares the results of the paper with those of the literature and summarizes the authors' contributions. It reveals the limitations of this paper and gives directions for future research.

2 LITERATURE REVIEW

Many sectors, such as the automotive and financial sectors, are early adopters of new technologies, such as artificial intelligence applications. In contrast, other sectors, such as

education and tourism, are more hesitant to adopt new technologies. Hence, they remain less digitized than others [17]. Information systems and new technologies are very important for companies, as with their implementation, companies can create value and possibly gain competitive advantage. Therefore, information technology must be part of any company's business strategy [18].

Nowadays, the tourism industry produces a huge amount of data due to tourists' opinions, social media, flights information and hotel reservations etc. [19]. Despite this enormous production of data and the existence of new technologies, artificial intelligence has not proved yet its full potential [20], as its use is still not widespread.

This paper aims to clarify and analyse the impact of artificial intelligence technology and big data analytics in the tourism industry. It also aims to examine how the combination of these technologies could boost the tourist companies to increase their performance and/or obtain a competitive advantage.

To better understand and analyse the concepts addressed in this paper, it was necessary to conduct a literature review. The literature review is significant because it can provide information and results of previous research papers, as well as reveal the theories developed or used in the subject under examination. It also helps the researchers to support their argument, while also providing an original contribution [21].

The steps, that were followed in this research, include: searching for articles by keywords, narrowing the article selection by reading the abstracts, clarifying the meanings and the relationship among them, identifying the gap in the literature, discuss the results of this paper in relation to the literature.

The keywords that were used in the search were: artificial intelligence (AI), smart tourism, big data analytics, business performance. The search was conducted mostly in Google Scholar, Scopus and Researchgate databases.

The literature review enabled us to explain the main technologies, concepts and theories related to the subject of study. It also allowed us to develop a conceptual framework that presents the main factors enabling a tourism company to increase its performance.

2.1 Smart tourism

The concept of "smart tourism" was primarily introduced by IBM in 2008. Since then, the tourism industry has gradually started to embody technologies, such as internet applications, Internet of Things, cloud computing and AI technology [22]. According to Gretzel et al. [23, p. 181], smart tourism is defined as "tourism supported by integrated efforts at a destination to collect and aggregate/harness data derived from physical infrastructure, social connections, government/organizational sources and human bodies/minds in combination with the use of advanced technologies to transform that data into on-site experiences and business value-propositions with a clear focus on efficiency, sustainability and experience enrichment".

Smart tourism is a mix of three different elements, which are [23]:

- Smart destinations;
- Smart experience;
- Smart business.

Smart tourism is not only the collection of huge amounts of data, but also the storage, combination, analysis, and usage of them, in order to inform the operators, service providers and customers [18]. The goal of smart tourism is firstly to develop new information substructures by gathering all the information and secondly to improve the procedures of

management, to promote innovation and increase the competitiveness of tourism companies and destinations [24].

As far as the tourism industry is concerned, there are six core resources: physiography, culture and history, tourism superstructure, market ties, mix of activities, and special events [25]. Due to the technological advances of the last decades these resources have changed to smart tourism resources [26]. Smart tourism has the ability to connect the digital world with the physical world during and after travelling [23]. Smart tourism could make the connection by predicting the needs of the customers, by improving the traveller's experience and by convincing travellers to share their experiences with others [23].

Smart tourism is constituted by specific core technologies, such as cloud computing, Internet of things, mobile terminal communication and artificial intelligence [22]. Artificial intelligence is the main technology of smart tourism and the main core of intelligent tourism. Therefore, AI could help tourism companies to use the huge amount of available information resources in order to increase their performance.

2.2 Artificial intelligence

Artificial intelligence is not a new concept and technology, because it was first proposed by John McCullach in 1955 [27], as a science which is able to make the machines smart. Artificial intelligence could be considered as the human intelligence, which is technology materialized by computer programs. So, artificial intelligence is developed and implemented by machines, in contrast to the natural intelligence which derives by humans and animals [22]. According to He [28] artificial intelligence could be classified in three categories: (1) weak AI; (2) strong AI; and (3) artificial super intelligence.

Artificial intelligence can be used to provide customers at any industry with personalized products or with interactive and unique experience. It can also effectively replace the manpower in customers services, manufacturing plants etc.

Despite the fact that artificial intelligence is an old concept, it is a new technological science area, with limited applications in the tourism industry. Digital transformation in the tourism sector is mostly concerned with the development of applications, such as mobile boarding systems and online check-in systems, which facilitate transactions and can be used by many customers and consumers [8]. However, during the last years, artificial intelligence is also gaining the trust of managers and is starting to become part of a company's routine [29]. According to Geisler [30], there are two main types of artificial intelligence, the pure digital ones, and the robots. Both types of artificial intelligence are gradually used in the hospitality and tourism industry [31].

2.3 Artificial intelligence in the tourism industry

The development and adoption of information technology has brought changes in the tourism and hospitality industry [31]. Artificial intelligence, as mentioned above, is a new form of intelligence which is able to synthesize different ideas at the same time [32]. Also, it can respond to any questions posed by customers and at the same time provide valuable information to tour operators and other companies. Moreover, as tourists and customers are becoming more and more demanding, expecting from companies to respond quickly to their needs, artificial intelligence could help companies to deliver immediate responses, without delays caused by the involvement of staff [31].

In this new era, where digitalization plays an important role in every person's life and company's function, artificial intelligence has gained customer's trust by offering convenient

interaction both online and offline. The application of this technology gives customers the potential to obtain a more interactive experience (in terms of marketing) and to have a better shopping or booking experience, which could increase the customer's satisfaction, loyalty and consumption [33]. With these results artificial technology can support companies to increase their efficiency and productivity, as well as their economic performance [34]. So, the application of artificial intelligence will be soon expanded in many sectors and operations of the tourism industry.

There are several benefits, which can derive from the use of AI. As far as the financial results are concerned, AI can decrease the labour costs. Robots, chatbots and self-service kiosks are able to operate during a day, every day, without any physical support. They are also able to serve more customers than human employees, leading to better sales numbers [35].

Apart from the financial results, the use of this technology can also bring non-financial benefits to tourism companies. First of all, AI could provide consumers and travellers with more attractive and interactive applications to increase the level of their engagement [36]. Moreover, as mentioned before, robots, chatbots and kiosks, are able to communicate in any language, unlike humans, who are not able to do that [37]. In addition, these applications could save quality time for employees, who would be able to do more creative and important tasks inside the company. Last but not least, a company adopting this technology, would increase its reputation as one of the most high-tech companies inside the industry [35].

According to Samara et al. [17], apart from the above financial and non-financial benefits, artificial intelligence is also able to offer competitive advantage to a company in the tourism industry. As there is evidence that the adoption of this new technology from other companies inside the industry is limited, this means that any company, which is an early adopter, will be able to create a competitive advantage.

2.4 Big data analytics and smart tourism

According to Chen et al. [38], "big data" is a concept which describes datasets, which are so large, unstructured, and complex that they require advanced and unique technologies, in order to be stored, managed, analysed, and visualized. Nowadays, due to the internet, there is a huge amount of tourism information, such as, pre-trip planning, reservation, booking, reviews, comments, photos, experiences, social media interaction, etc. All this information becomes tourism big data, which need to be captured and analysed so as to uncover tourism trends, correlations and other insights inside the tourism sector [39].

The technological advances and the development of innovative services made tourists to seek for personalized services and products. The data deriving from this search and usage has proved to be one of the most significant steps for the development of smart tourism [40]. Therefore, smart tourism is closely related to the collection of large amounts of data, intelligently stored, processed, and analysed. Consequently, smart tourism relies on big data to ameliorate services and support the decision-making process of managers [41].

Furthermore, as the hospitality and tourism industry are vulnerable to many factors and environmental uncertainties, the use of data collection techniques, methods of statistical analysis and forecasting procedures are truly necessary [34] for their survival. Additionally, big data analysis seems to be the key for the development of smart tourism and the attainment of competitive advantage.

3 THEORETICAL DEVELOPMENT

Resource-based view (RBV) theory is a theory which analyses the internal resources and capabilities of a firm, supporting the creation of competitive advantage [42]. Therefore, RBV theory examines the resources of a company and analyzes their characteristics. It supports that the attainment of a sustainable competitive advantage could be created by the unique combination of resources at the core of the company [43]. Companies could achieve sustainable competitive advantage if they take advantage of their internal resources, such as human capital and information technology [44].

According to the RBV theory, competitive advantage can be additionally created by the development of resources, which have VRIO characteristics [45]. These characteristics include value, rareness, imitability and organization [46]. It can be noted that the VRIO characteristics can be developed beyond the boundaries of an organization, by combining the resources, which are available to different members of the tourism industry [47].

In their research, Stroumpoulis et al. [44], use the RBV theory to examine the impact of information technology on supply chain management. They propose a conceptual framework which shows how the combination of human, IT and other resources of a company could lead to specific capabilities and then to competitive advantage.

So, according to the RBV-theory and the above analysis of the literature, artificial intelligence applications and big data analysis can form unique resources that could enable a company to gain competitive advantage.

3.1 Conceptual framework

As mentioned above, information technology, including AI applications, forms an internal source of the company, which provides companies with important data and information. Moreover, in the tourism industry, if a company implements AI technology, it is considered as an early adopter, being at a beneficial position inside its task environment [17].

As analyzed in Section 2, the applications of AI could allow companies to collect the necessary information of what tourists like and dislike and to reveal the trends of travellers and consumers, so as to proceed to specific marketing strategies to specific target groups [48]. In addition, the analysis of these data, through BDA, could help managers to take the right decisions. Moreover, it could enable companies to design more personalised and customised experiences for each tourist, creating in this way an important value for them.

Therefore, according to the RBV-theory and the proposed framework by Stroumpoulis et al. [44], the implementation of AI technology and big data analytics in the tourism industry could enable companies to develop specific "smart capabilities". According to Debnath et al. [49], the above capabilities should provide companies at the basic levels with the functions of sensing, processing, controlling and communicating and at the advanced levels with the functions of predicting, healing and preventing. So, these capabilities could not be bought or transferred, but could only be gained through time and continuous use.

These capabilities would help companies to develop strategies in order to increase their business performance by improving the cost and time needed for their internal operations and customers' services. Therefore, they could increase their customers' loyalty and improve their economic results. Finally, these results could enable them to strengthen their position inside the industry and potentially obtain a sustainable competitive advantage.

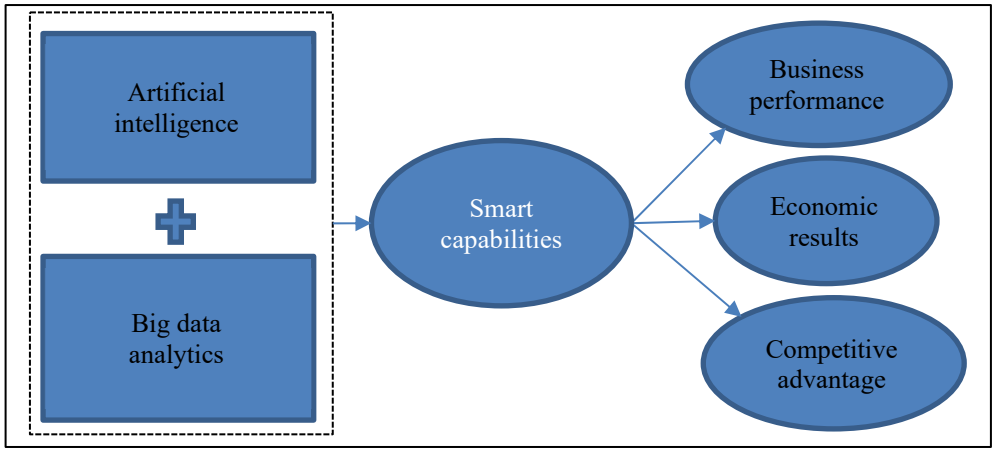

Figure 1: Combining AI and BDA in tourism industry.

4 CONCLUSIONS

The aim of this research was to contribute to the literature, examining the impact of artificial intelligence and big data analytics on the tourism industry. An additional aim was to examine whether their combination could lead to improved business results. Artificial intelligence may provide many benefits both at the business and the customer (tourist) level. It can form the base for the development of applications, leading to services optimization and improved user experience. It can also contribute to the analysis of the large amount of data produced in the industry. Combined with big data analytics it can provide smart capabilities to companies leading them to improved decision making.

To better explain the impact of these technologies on the tourism industry, the paper developed a framework based on the RBV theoretical approach. The analysis showed that the use of these technologies enables tourism companies to increase their business performance, establish better relationships with their customers, achieve better economic results and potentially gain competitive advantage.

So, this paper provides the literature of smart tourism with a conceptual framework to evaluate the impact of AI applications and big data analysis. However, due to the fact that AI is a new technology, the level of adoption in the industry is still very low, apart from specific endeavours, mostly of big companies. Therefore, there is still much room for IT research in smart tourism, which could be used by companies to ensure their benefits in their task environment. Hence, a significant limitation of this area of research, is that academics are still not able to use large scale surveys in the industry, in order to verify their theories and frameworks.

In conclusion, although the potential impact of artificial intelligence and big data analytics is discussed in the literature and presented in the proposed conceptual framework, companies inside the industry have not yet widely adopted these technologies. However, understanding the impact and the full potential of these technologies is of major importance for companies, as their development and adoption will probably be the next big thing in the tourism industry.

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