JOURNAL OF TOURISM,
SUSTAINABILITY AND WELL-BEING
2024, VOL. 12, NO. 1, 65–86
ISSN: 2795-5044 | https://doi.org/10.34623/hkqk-ht95

The Application of Artificial Intelligence in the Tourism Industry: A Systematic Literature Review Based on Prisma Methodology

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ABSTRACT

Tourism is one of the biggest industries in the world and its contribution to the global economy has continued to grow. Due to the rapid development of technology, tourism has seen some critical changes in how people interact with the industry. By applying artificial intelligence (AI) to different aspects of the tourism business, it is possible to increase efficiency by using resources more effectively. This paper aims to provide insights into how AI technologies can be applied to different aspects of tourism operations and services to improve the customer experience both online and offline and at service providers such as hotels. A literature review is conducted based on the PRISMA methodology by running searches on databases Scopus and Web of Science. This research contributes to providing an overview of how current AI technologies are used in the tourism industry and how they may be used in the future to enhance customers' experiences when interacting with different aspects of tourism. It also examines various concerns that need further investigation before adoption can occur. The review shows that the application of AI technologies can improve numerous facets of tourism operations and services, resulting in numerous advantages.

KEYWORDS

Artificial Intelligence, Hospitality, AI Hospitality Technologies, Robots, Tourism Industry.

ARTICLE HISTORY

Received 30 October 2023 Accepted 23 February 2024

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1. Introduction

AI is beginning to widespread in the most basic and common daily tasks. To investigate this, the authors conducted a systematic literature review of AI's potential applications, benefits, and limitations in the tourism industry. It will examine how AI technologies are being used in the industry and the state of the art. Technology has become a crucial component of the hospitality and tourism industry. The widespread adoption of digital tools and platforms transformed the way guests plan, book, and experience their travel (Kansakar et al., 2019). Similarly, technological advances enabled industry professionals to optimize their operations, increase productivity, and improve profitability (Buhalis & Moldavska, 2022). However, the rapid pace of technological change presents several challenges, such as data privacy and security, the digital divide, and the need for digital skills training. Therefore, examining the latest trends, challenges, and opportunities in hospitality and tourism technology is imperative.

Hospitality and tourism should consider a reasonable layout and carry out digital transformation (Cheng et al., 2023). The tourism industry has been growing rapidly, and technology has played a significant role in shaping the sector's growth. AI has been increasingly used in various industries (Huang & Rust, 2018), and tourism is no exception. AI has the potential to revolutionize the tourism industry, providing significant benefits to tourists and businesses.

The hospitality industry needs to pay attention to personalization and pace with the times in the process of using digital technology and needs to use more digital means and decisions that have a high positive impact on the perception and behavior of customers and employees and pay attention to the impact of the policy (Wirtz et al., 2018). Consumer experience is essential to hospitality and tourism.

During digital transformation, using digital technology to interact with consumers and provide services, enterprises should always pay attention to consumer feedback and adjust the digital transformation strategy (Cheng et al., 2023). As per literature review, there's a consensus that AI can help tourism companies deliver personalized and efficient services, enabling them to stand out in an increasingly competitive market.

The adoption of AI can provide businesses with actionable insights, leading to better decision-making, increased revenue, and customer loyalty. However, implementing AI in tourism comes with several challenges, such as ethical concerns, data privacy, and the lack of human touch in service delivery. Therefore, it is essential to review the current state of AI in tourism to identify the techniques used, benefits, challenges, and potential research directions.

The objective of this research is to synthesize the current state of knowledge on this topic, identify research gaps, and provide insights into future research directions and practical implications. This article is subdivided into five sections, without considering the introduction. The first section presents the theoretical foundations of what is AI, highlighting the most common definitions. The second section discusses the research methodology using the PRISMA model. The third section presents the results of a literature review focused AI based solutions in the tourism industry, the evolution, how can it help T&H operational improvement, financial performance, data analysis and other potentialities. The fourth section highlights the discussion, considering theoretical and practical implications. The last section presents the conclusions, limitations, and future research.

2. Theoretical Foundations

AI refers to the simulation of human intelligence in machines that are programmed to think and learn like humans and perform tasks that typically require human intelligence, such as visual perception, speech recognition, decision-making, and language translation (Buhalis et al., 2019); thus, there is no consensus on AI's definition, and there is no generic definition of AI.

In a recent study, Sheikh et al. (2023) characterized AI as "systems that display intelligent behaviour by analysing their environment and taking actions with some degree of autonomy to achieve specific goals". It involves the development of algorithms and computer applications that can process vast amounts of data, recognize patterns, and make predictions or decisions based on that data. For the extraction of knowledge from acquired and preprocessed data, data analysis employs advanced techniques from data

mining methods, information theory, and AI in diverse industries such as tourism, hospitality, etc. (Sharma et al., 2022).

Some popular types of algorithms used in data processing include machine learning, deep learning, and artificial neural networks. Similarly, data can be structured or unstructured, and it can come from various sources such as social media, sensors, or customer databases. AI is typically defined as a collection of problem-solving technologies that mimic human intelligence (Lai & Hung, 2018). Crafts (2021) assumes that AI in the future will become considered a General-Propose Technology (GPT) like steam or electricity, complementing enabling technologies such Robots or Voice Assistants.

3. Research Methodology

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) model (Haddaway et al., 2022) was used to conduct a comprehensive search for peer-reviewed articles published between 2013 and 2023. The search was conducted in two electronic databases, Scopus and Web of Science, using relevant keywords such as “artificial intelligence” hospitality” AND OR “artificial intelligence” hospitality service” AND OR “guest experience”.

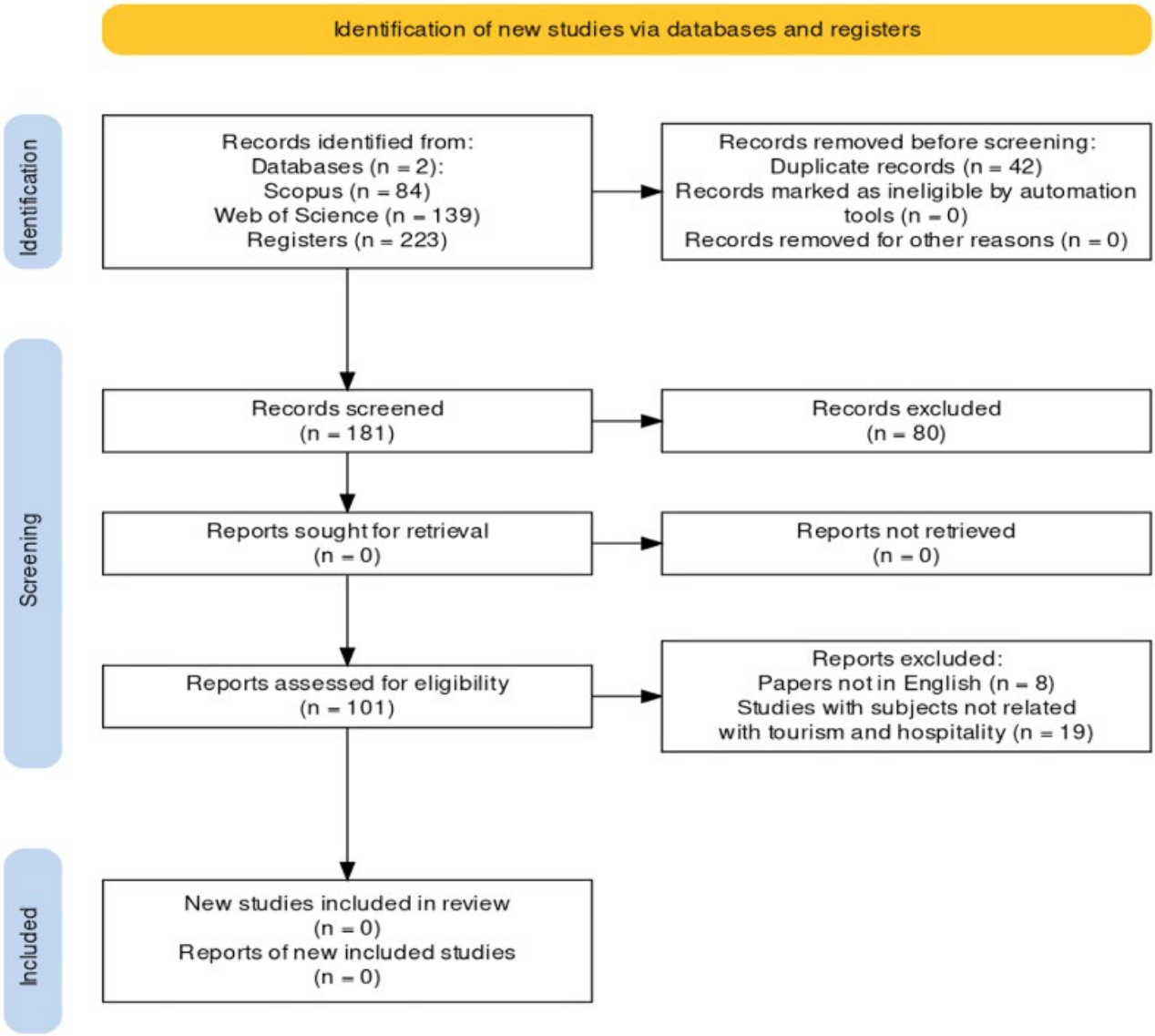
The inclusion criteria were articles written in English, published in peer-reviewed journals, and focused on hospitality and tourism technology. After screening titles, abstracts, and full texts, 74 articles were selected for inclusion in the review. Bellow, inclusion and exclusion criteria are explained. Figure 1 shows the Prisma Flow Diagram. Table 1 shows the inclusion and exclusion criteria.

Table 1. Inclusion and Exclusion Criteria

Inclusion criteria	Exclusion criteria
Papers written in the English Language	Studies with subjects not related with tourism and hospitality
Articles published between January 2013 and March 2023	
The source type is a journal (Web of Science and Scopus)	
Search protocol: “artificial intelligence” hospitality” AND OR “artificial intelligence” hospitality service” AND OR “guest experience”.	

Source: Own Elaboration

Figure 1. Prisma Flow Diagram



Source: Own Elaboration

Due to the recent growing importance of this theme for academics and scholars, it is presented in Table 2, a resume of the number of published articles per year, which justifies the choice of our research. The data search was conducted in May '23.

Table 2. Results per Year

Year	Nº of Articles	Percentage %
2018	1	1,35%
2019	3	4,05%
2020	14	18,91%
2021	20	27,02%
2022	31	41,89%
2023	5	6,75%

Source: Own Elaboration

Table 3 presents the results per author and the number of articles published.

Table 3. Results per Author

Author	Nº of Articles
Buhalis, Dimitrios	4
Bai, Billy	4
Webster, Craig	4
Gursoy, Dogan	4
Ivanov, Stanislav	3
Li, Minglong	3
Choi, Youngjoon	3
Yin, Dexiang	3
Qiu, Hailian	3
Sivathanu, Brijesh	2
Wong, Ip Kin Anthony	2
Oh, Munhyang	2
Shi, Si	2
Pillai, Rajasshrie	2
Chi, Oscar Hengxuan	2
Choi, Miju	2
Kim, Seongseop	2
Other	13

Source: Own Elaboration

Table 4 aggregates the articles per journal and the SCImago ranking of each journal to validate the article's publication's quality.

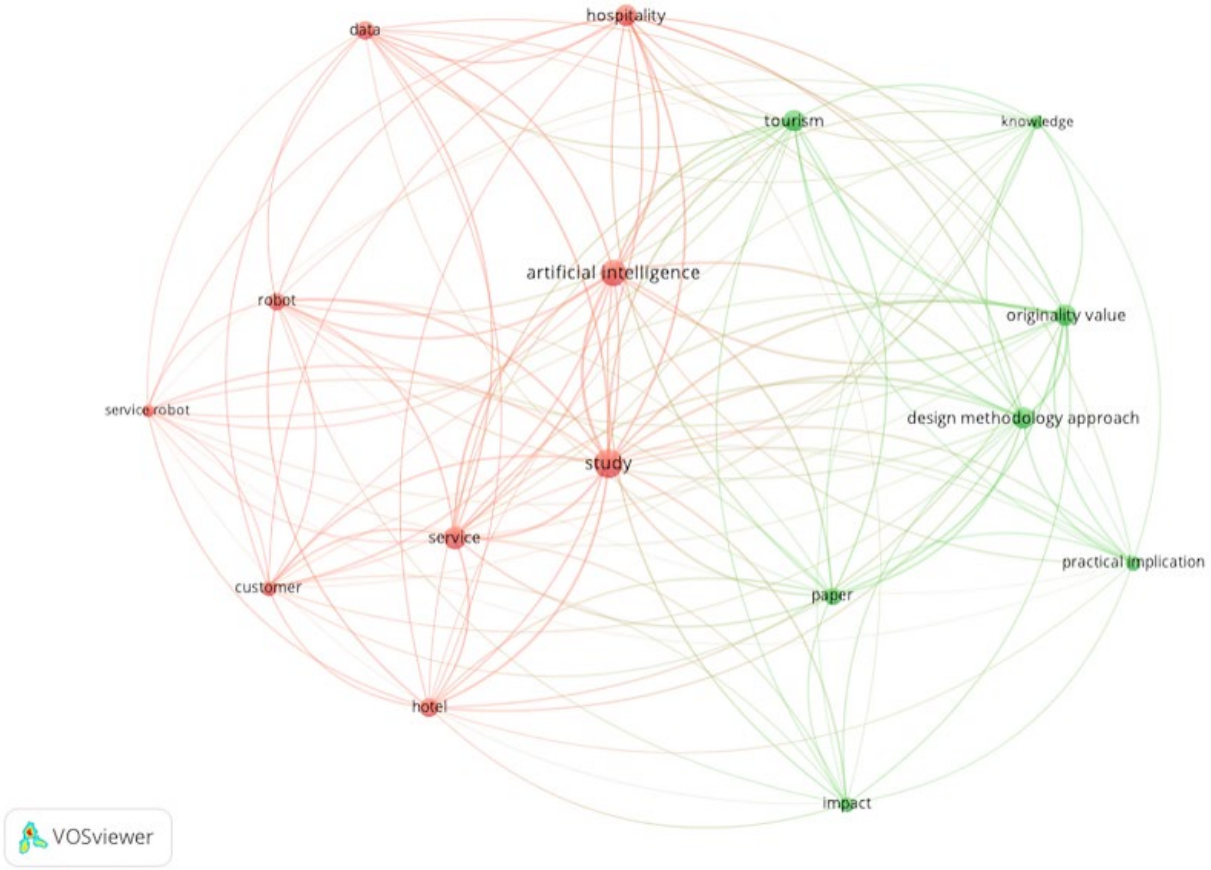
Table 4. Results per Journal

Journal	Nº Articles (%)	SJR Ranking
International Journal of Contemporary Hospitality Management	10 (13,51%)	Q1
International Journal of Hospitality Management	9 (12,16%)	Q1
Journal of Hospitality Marketing and Management	5 (6,75%)	Q1
Tourism Review	5 (6,75%)	Q1
Eletronic Markets	4 (1,68%)	Q1
Journal of Hospitality and Tourism Technology	3 (4,05%)	Q1
Technology In Society	3 (4,05%)	Q1
Journal of Tourism Futures	3 (4,05%)	Q1
Worldwide Hospitality and Tourism Themes	2 (2,70%)	Q2
Other Journals	30 (40,54%)	

Source: Own Elaboration

To justify the correlation between the thematic and selected papers, as an aggregation of articles was done in VOSviewer Software (van Eck & Waltman, 2008) to identify the main topics (Figure 2). Artificial Intelligence, hospitality, and tourism were identified and justified our research topic.

Figure 2. VOSviewer Topic Analysis



Source: Own Elaboration

With Rayyan Software (Ouzzani et al., 2016) keyword research based on the selected articles for literature review was conducted to identify the main keywords present and reinforce our research topic selection. Table 5, lists the main keywords found.

Table 5. Articles' main Keywords Researched with Rayyan Software

Keywords	Nº Articles
Hospitality	55
Artificial Intelligence	51
Service	46
AI	35
Robots	27
Hotel	27

Source: Own Elaboration

To validate the keyword research with Rayyan Software a Machine Learning Text Mining model was applied in Orange Software (Demšar et al., 2013), using a corpus viewer and creating a bag of words. The result in Figure 3 validates the article selection and reinforces the VOSviewer results.

Figure 3. Orange text mining cloud of words from the selected articles

Source: Own elaboration

4. Results of Literature Review

4.1 AI Technologies in the Tourism Industry

Recent AI applications, such as robotics, Augmented Reality/Virtual Reality (AR/VR), and chatbot/virtual assistants (VAs), appear to be transforming the tourism and hospitality (T&H) sectors (Doborjeh et al., 2022). The susceptibility to AI adoption in the hotel and tourism sectors varies depending on the type of AI. Virtual assistants, chatbots, and search/booking engines place highly on the adoption susceptibility scale (Huang et al., 2022).

Accordingly, Buhalis and Moldavska (2022) analysis indicates that VA is becoming increasingly digital assistants. The use of VA technology improves customer service, expands operational capacity, and reduces expenses for hotels. Robot concierges, delivery robots, chatbots, and information assistants are replacing humans in hospitality areas using a range of devices, such as mobile apps and self-service check-in/check-out machines.

Powered by AI algorithms, big data, mobile Internet, and Internet-of-things technologies, the number of inventions supporting a move to social robotics has increased tremendously recently (Kim et al., 2022). Generating positive buzz about innovative services based on RAISA (Robot, AI, and Service Automation) in the hospitality industry can increase the likelihood of a successful promotion by reducing uncertainty (Kim et al., 2022).

Some customers might be resistant to RAISA-based services, as not all customers are eager adopters. Consumers' technological fear is a major worry; therefore, designers and developers must guarantee that chatbots are easily accessible, have a user-friendly interface, are more human-like, and engage with customers in their local languages (Pillai & Sivathanu, 2020). In addition, hotel management could make AI technology more attractive in terms of look, speech, and touch by offering physical forms to make AI visible and by enhancing its acoustic capabilities.

Interactivity and responsiveness have direct and significant effects on the psychological safety, values,

and service quality of customers. To increase service encounters and outcomes, hospitality company managers should enhance the interaction performance of their AI technology, prioritize prompt responses, and simplify the use of services. For instance, it is crucial to enhance the speech and facial recognition systems of AI to make the associated services more responsive and to personalize immersive encounters based on historical consumption data to attract more clients and provide favorable results (Li et al., 2022).

Due to the growing interest in AI and service robotics within tourism and hospitality, Saydam et al. (2022) research study analyzed 123 articles thematically to identify how AI is defined and which themes are most closely related to the phenomenon. Theoretical and conceptual works on AI and service robotics from the perspective of employees and customers (cluster 1), conceptual understanding and a systematic review of the literature on AI and service robotics in the T&H industry (cluster 2), conceptual understanding and a systematic review of the literature on AI and service robotics in the T&H sector (cluster 3) and anthropomorphism in AI literature (in cluster 4) are the focus of this research.

Cho et al. (2022) show that it is possible to use AI in different areas to improve knowledge in T&H. By employing AI technology, it is possible to reduce time and money when classifying tourism pictures and analyzing tourism destinations images (TDI) in detail, compared to a manual technique that is expensive and has restrictions on in-depth analysis. In addition, the analysis of TDI can provide a sense of what pictures DMOs (Destination Management Organizations) should provide to travelers and how to promote the tourism destination by gaining an appreciation of the region's qualities.

Oh et al. (2022) suggest the use of deep learning methodologies based on expectation-confirmation theory to predict customer satisfaction in hospitality services. If the adoption of AI solutions in tourism and hospitality is a no-return point, according to Bhushan (2021), the worldwide potential of AI is exponential; AI development should be effective. However, globally, there are contradictory perspectives regarding the repercussions of AI. Consequently, the balance between humans and AI, protocols, and a global regulatory system must be established as soon as possible to avoid catastrophic outcomes.

4.2 The Evolution of AI in T&H

The use of AI in the tourism and hospitality industry has evolved significantly from the late 1990s to the present. Initially, AI was used to forecast hotel occupancy and tourism demand (Kirtil & Askun, 2021). With the integration of AI, tourism, and hospitality professionals have been able to personalize tourist experiences and provide technology-enhanced tourist experiences through the use of different AI applications (Parvez, 2021), such as search/booking engines, tourism-demand forecasting, virtual agents/chatbots, robots and autonomous vehicles, service automation, kiosks/self-service screens, augmented reality (AR), and virtual reality (VR) devices (Knani et al., 2022).

Recently, AI has also expanded the use of robotics applications in hotels and restaurants and can help tourists find more relevant information to improve their decision-making. The full potential of AI in the tourism and hospitality sector has not yet been realized, but it has already strongly influenced this field (Knani et al., 2022).

AI plays a significant role in the digital transformation of the tourism and hospitality industry. AI technologies offer advantages such as enhancing productivity, operational efficiency, and creating personalized service experiences. AI is predominantly being used for forecasting, demand analysis, and recommender systems in the travel and tourism industry (Kirtil & Aşkun, 2021). AI solutions such as big data analytics, chatbots, and machine learning are used in different settings like sentiment analysis, augmented reality, digital face recognition, robotics in hospitality and service, and intelligent chatbots to improve personalization and accurate recommendations in tourism (Filieri et al., 2021; Cheng et al., 2023).

Due to AI and IoT, unmanned intelligent hotels are emerging and realizing a non-contact accommodation experience for customers without human waiters (Cheng et al., 2023). Moreover, digital transformation helps companies to recover from the COVID-19 pandemic, which leads to a larger number of visitors, higher turnover, and a better reputation (Cheng et al., 2023).

Organizations need to develop multifaceted engagement with their employees and have an enhanced ability and willingness to adopt new AI methods and applications. However, technology may negatively affect employees' well-being, and businesses should address these issues (Knani et al., 2022).

AI technologies can provide multiple benefits for the digital transformation of the tourism and hospi-

tality industry, improving productivity, and operational efficiency, and enhancing customer experiences. Self-service technologies (SSTs) are technology-based systems that eliminate the need for human interaction to complete a business transaction, providing speed and efficiency (Giousmpasoglou & Hua, 2020). In the UK, including budget hotels, SSTs have been increasingly adopted to enhance customer service and create operational efficiencies. Budget hotels are investing in SSTs to increase controlling and operational efficiency and to engage guests in a more intelligent service design.

4.3 How AI Helps T&H Operational Improvement

The Pandemic COVID-19 period has accelerated the adoption of AI technologies in tourism and hospitality. Several scholars and researchers mention that in the examined papers. However, the pandemic period can only be considered the beginning of a new era in T&H technologies.

Webster and Ivanov (2020), predict that the robonomic society by 2100 will vastly differ from that of today. Robots, AI, and automation technologies, and only a small percentage of humans (probably less than 10 percent) will be employed, raising significant demographic, cultural, political, economic, and ethical issues. In one century, robots have transitioned from an abstract concept in science fiction to something real and have a significant role in the economy.

While robots' capabilities to provide goods and services to consumers have improved, industry, government, and consumers have not yet figured out how to fully integrate them into the economy (Webster & Ivanov, 2020). Numerous research questions posed by the introduction of robots by tourism and hospitality companies must be answered by tourism research and tourism economics. We are entering a brave new world of robonomics, and research in tourism economics should reflect this.

According to Filieri et al. (2021), the travel and tourism industry stands to gain the most from AI, which could transform this sector. European AI start-ups are concentrated in the capitals of major tourist destinations (France, UK, and Spain). Learning, Communication, and Services (i.e., big data, machine learning, and natural language processing) received the most funding from Venture Capitals, indicating a strong interest in AI solutions enabling marketing automation, segmentation, and customisation for pre-trip and post-trip tourism planning, such as big data, data analytics, machine learning, and chatbots.

Sharma et al. (2022), identify ten crucial factors for analyzing the impact of AI on a company's competitiveness. AI-readiness, AI-competent workforce, AI policies and regulations, infrastructure, AI-enabled technologies, tourist satisfaction, digital platforms, productivity, AI innovation, and financial performance are identified factors. Whilst Hsu and Tseng, (2022), look to the ten pillar technology competencies required for hospitality practitioners to face the smart era: basic information and communication technology, integration of Intelligent systems and technology, cloud computing, big data analytics, IoT, robots and chatbots, additive manufacturing, XR and simulation, cybersecurity, and AI. Hsu and Tseng (2022) argue that smartness and Industry 4.0 give clients warmth and personalization.

4.4 The AI and the Financial Performance

Before using AI to increase a company's financial performance (competitiveness), it is necessary to have the proper infrastructure, platforms, and skilled workforce. Li et al. (2021) argue that hospitality and tourism firms can appropriately adopt AI technologies that fit their services and tasks. Jabeen et al. (2022) suggest that human knowledge, services, and robotics applications most influence automation and AI implementation.

Organisations in the hospitality and tourism industries all over the world are using automation and AI to gain a competitive edge. AI type affects hospitality and tourism AI adoption. Search/booking engines, virtual agents, and chatbots are high adoption (Huang et al., 2022). All service businesses use Self-service technologies (SSTs). UK hotels, particularly affordable ones, are using this kind of technology to improve customer service and operations. The hospitality business, especially inexpensive hotels, will include AI, robots, and the IoT (Giousmpasoglou & Hua, 2020). However, Leung (2019), referred to Stakeholders who still prioritize cost savings and were unaware that technology may boost strategic planning and financial returns.

Machine Learning (ML) has provided hotels with innovative tools for evaluating and enhancing perfor-

mance, and current tourism is based on technological advancements beginning with the search for information about a certain trip destination (Parvez, 2021). One of the most common uses of ML is in service robots.

Hotels acknowledge the value of AI and robots, and automation often boosts efficiency (Nam et al., 2021). Data analysis based on ML to find patterns that help better decisions is commonly used in demand forecasting (Pereira & Cerqueira, 2022) or text mining using AI techniques to understand customer satisfaction (Kim et al., 2022; Oh et al., 2022; Sharma et al., 2022).

Ten key factors were identified for analyzing the impact of AI on a firm's competitiveness, including AI readiness, workforce, policies, infrastructure, AI-enabled technologies, productivity, innovation, and financial performance (Sharma et al., 2022). The m-TISM methodology helps understand the hierarchical relationship between these factors and their impact on financial performance. Proper infrastructure, digital platforms, and a skilled workforce are prerequisites before implementing AI. For the authors, the use of AI solutions, when well-integrated in tourism operations, has the potential to increase financial performance.

4.5 AI and Data Analysis in T&H

One of the older and main uses of AI in T&H is data analysis. From forecasting demand to sentiment analysis, through classification and satisfaction, several systems are using ML techniques to better performance decisions. Sentiment analysis algorithms, such as the valence-aware dictionary and sentiment reasoner (VADER) and bidirectional encoder representations from transformers (BERT), can be used to evaluate corpus documents by assigning sentiment values to words and phrases based on pre-compiled sentiment terms used to analyze YouTube streaming data (Kim et al., 2022).

Big data can be utilized in various ways in the tourism and hospitality industry. Due to the digital nature of the industry, big data analytics allows for real-time analysis and a more holistic approach to understanding tourism issues (Lv et al., 2022).

The different types of big data used in this industry can be divided into two categories: structured data and unstructured data. Structured data mainly comes from professional databases, government databases, and enterprise databases and has been used for performance analysis and forecasting by researchers. Unstructured data, on the other hand, includes user-generated content (UGC) and device data, providing valuable insights into travelers' preferences and behaviors (Lv et al., 2022).

For instance, deep learning models can support the analysis of social network service data and identify tourist preferences based on their photos (Cho et al., 2022), or the integration of data and technology in smart restaurants to develop intelligent ambient conditions that appeal to the diners' five senses (Wong et al., 2022).

4.6 Other AI in T&H Potentialities

Several literature reviews have already been developed by scholars and researchers regarding AI in T&H. Gaur et al. (2021) focus their research on the use of AI during the pandemic period. AI and robotics have great potential for enhancing the hospitality industry's response to pandemics like COVID-19.

The adoption of service robots in the industry can help reduce operational costs and improve service delivery by providing a technological shield between guests and employees, thereby, minimizing the risk of infection. Yang and Chew (2021) focus on challenges with the adoption of humanoid robots, identifying several risks: the robots creating more problems than they can solve; the need to integrate AI humanoid robots into the industry and avoid incidents; legal restrictions on AI robots in various countries, labor shortages; and a large amount of consumer data, which may require the use of technologies like big data and intelligent robots to continuously stimulate service innovation.

According to the literature on AI research in tourism and hospitality, several key clusters and networks have been identified. These include motor themes such as artificial neural networks and data mining, basic and transversal themes such as big data, robotics, smart tourism, the internet of things, COVID-19 and AI, specialized and peripheral themes such as forecasting tourism models, augmented reality and virtual reality, and biometrics, and emerging themes such as customer experience with service robotics

and automation (Knani et al., 2022).

Additionally, a bibliometric analysis of research progress and trends in AI and tourism identified leading contributors such as institutions and authors, as well as visualizing the evolution of AI through co-occurrence network analysis (Kirtil & Aşkun, 2021). Regarding future perspectives and avenues of research, AI in tourism and hospitality is an area that requires further exploration and analysis. Some proposed areas of study include the impact of AI on workplaces, privacy concerns, information disclosure related to AI use, smart tourism experiences, and the effects of automation and robotics on tourists' experiences (Knani et al., 2022).

Other future research agendas that need to be addressed include identifying and analyzing the most relevant topics related to AI and robotics in the industry, preparing the hospitality industry to face the changes that are certain to come due to the outbreak of COVID-19, and proposing a theoretical framework for the use of AI and robotics in the hospitality industry (Gaur et al., 2021).

4.7 Technology Challenges, Changes, and Preferences in Hospitality

AI in business, society, and the economy is reshaping experiences and relationships among stakeholders and citizens (Loureiro et al., 2021). The fast development of new technologies regarding AI and ML in the T&H industry has created new challenges for practitioners. Speed changes and the innovation processes adopted by the industry face urgent technology adoption. Some of them are likely preferable to others. Some benefits and advantages of adopting AI and robotic solutions are focused on reducing operational expenses and enhancing productivity (Nam et al., 2021). If the level of complexity involved in implementing this solution is perceived as too complex, it may deter hotels from adopting it.

From the literature review, potential challenges are identified, like (i) *perceived risk*: there is concern regarding the risks associated with AI adoption, such as financial losses, data breaches, and privacy infringement (Huang et al., 2022); (ii) *resistance by employees*: some employees may resist the adoption of new AI technologies due to fear of job loss (Nam et al., 2021); (iii) *ethical, moral, and privacy:* concerns surrounding the integration of robots in the industry, considering specific concepts such as power, discrimination, equality, and justice in the context of service robots (McCartney & McCartney, 2020); (iv) *skilled manpower*: there is a lack of skilled manpower in the AI industry, which can affect the successful implementation of AI solutions (Bhushan, 2021).

While perceiving a relative advantage positively influences the intention to adopt robotic technologies among hotel managers, compatibility and complexity have different effects. Understanding these factors can help managers make informed decisions about adopting robotic technologies in their hotels (Pizam et al., 2022). If, for industry, the impact is huge for customers, the challenges are bigger too.

The impact of AI systems adoption can enhance the travel experience through personalized services that enhance the customer experience (Nam et al., 2021). Service quality and customer satisfaction perceptions can change, where AI-based service encounters have a direct impact. The use of robots may alter how services are delivered (Ivanov & Webster, 2020) the customer's perception of them, and whether they meet their expectations. Within AI-infused service encounters, customers have more access to service value creation, which means that customers may perceive increased value in services provided through AI technologies, which can enhance their overall experience (Li et al., 2021).

4.8 Chatbots and Voice Assistants

Chatbots and Voice Assistants have commonly been adopted in the T&H industry (Klaus & Zaichkowsky, 2020). However, to make this technology more user-friendly, it is important to consider certain factors.

Firstly, the design and interface of the chatbot should be intuitive and easy to navigate, making it user-friendly for individuals with varying levels of technological expertise (Pillai & Sivathanu, 2020). Additionally, chatbots should be programmed to understand and respond to user inquiries accurately and efficiently, providing relevant information and solutions. Implementing natural language processing ca-

pabilities can enhance the chatbot's ability to comprehend and interpret user queries more effectively.

Cai et al. (2022) argue that customer perceptions of AI-enabled voice assistants in hotels are influenced by various factors such as brand, perception level, and hotel scale. Perceived usefulness and ease of use are two important factors that influence customers' intentions to use AI-enabled voice assistants.

According, to Buhalis and Moldavska (2022), voice assistants are being used in hospitality to enhance customer service and streamline operations. In hotels, voice assistants, also known as VA-enabled interactions, are implemented in hotel rooms to provide digital assistance to guests. These voice assistants recognize human speech and execute commands given by users. They can perform various tasks such as providing information, setting alarms, controlling room temperature, lights, television, curtains, and even opening doors. Guests can use voice assistants to request in-room services and access personalized amenities.

4.9 Robots

The current trend in the hospitality industry regarding AI and robotics technology is the increasing adoption and implementation of these technologies in various hotel operations. Hotels across the globe are recognizing the importance of AI and robots in improving operational efficiency and enhancing the guest experience (Nam et al., 2021).

Many hotels have already implemented AI and robotics in their operations, such as using robots for the contactless delivery of food and providing information to passengers (Khaliq et al., 2022). These technologies are being used to automate processes, increase productivity, reduce costs, and provide customized and personalized services to guests (Nam et al., 2021).

The rise of service robots in the marketplace is evident, with examples such as restaurants allowing customers to interact with chefs using tabletop tablets or employing robot waiters (van Doorn et al., 2017). This technology will change the nature of customer service experiences, transforming the way customers interact with businesses.

The successful implementation of robots in the hospitality industry requires careful consideration of several important factors. The capability of service robots is crucial for their adoption in hotels. Robots should be equipped with advanced technologies that allow them to effectively communicate with guests and handle exceptional circumstances. This includes the ability to process special requests and provide personalized services (Choi et al., 2020).

Effective leadership and communication are vital during the implementation of service robots. Hotel leaders should provide clear guidelines and training to employees to ensure they understand how to work alongside robots and how their roles may be reconfigured. Including employees in the implementation process can help mitigate resistance and capitalize on the benefits of the technology (Xu et al., 2020).

Finding a balance between human and robotic labor is crucial to catering to different customer groups. Hotel managers should enhance human employees' work performance through robots, rather than replacing them entirely. This approach helps ensure the satisfaction of both high-tech and high-touch customer groups while mitigating operational risks (Ivanov et al., 2018). Accommodation establishments that use robots should emphasize the advantages of using robots in their marketing communications. This includes highlighting the robots' social skills and the unique experiences they can create for guests (Ivanov et al., 2018). Table 6 summarizes the studies and research about robots in T&H.

Table 6. Research Articles about Robots in T&H

Author	Article	Research Focus	Findings
Alma Çallı et al. (2023)	The impact of different types of service robots' usage in hotels on guests' intention to stay	Investigates the impact of service robots on hotel guests' intention to stay. It examines consumer perceptions of using robotic technologies for 12 services using the technology acceptance model (TAM) framework. The study refines the classification of robotic service delivery tasks based on characteristics and perceptions, addressing the need for studies on AI and robot applications in the hospitality sector post-COVID-19.	The findings suggest that perceived ease of use and perceived usefulness significantly influence consumer attitudes towards robotic service delivery tasks in hotels and their intention to stay in robot-staffed hotels
Ayyildiz et al. (2022)	Attitudes of hotel customers towards the use of service robots in hospitality service encounters	Examines hotel customers' attitudes towards service robots in hospitality encounters, examining factors like gender, education, generation, and cultural orientations. It emphasizes the need to explore age and culture's impact on adoption, and considers theoretical and practical perspectives, personality traits, and external factors like the Covid-19 pandemic.	The study indicates that hotel guests have a generally positive attitude towards the use of service robots in hotels. They perceive the service offered by robots at hotels as advantageous and do not see it as a disadvantage. However, they still exhibit a preference for human staff at hotels.
Goel et al. (2022)	Consumers' adoption of AI and robotics in the hospitality and tourism sector: literature review and future research agenda	The literature review studied factors driving and hindering the adoption of AI and robotics (AIR) in the hospitality and tourism sector. It identifies four major barriers: psychological, social, financial, technical, and functional. The integrated antecedent-outcome framework provides insights for academia, practitioners, AI marketers, developers, designers, and policymakers.	The study contributes to the tourism and consumer behavior literature by offering an integrated framework for understanding the adoption of Artificial Intelligence and robots in the hospitality and tourism industry.
Khaliq et al. (2022)	Application of AI and robotics in hospitality sector: A resource gain and resource loss perspective	Observes the relationship between AI and robotics awareness in the hospitality industry and employee turnover intention, influenced by perceived competitive psychological climate and job resources. It presents a theoretical framework for mitigating turnover intentions.	The findings of the study indicate that the awareness of AI and robotics in the hospitality industry leads to increased turnover intention among employees. The adoption of AI and robotics creates a sense of job loss and insecurity for employees, which in turn increases their intention to leave the organization. The study also found that mutual trust and competitive psychological climate play a moderating role in the relationship between AI and robotics awareness and turnover intention.
Kim et al. (2022)	Robots, AI, and service automation (RAISA) in hospitality: sentiment analysis of YouTube streaming data	The research examines customer attitudes towards RAISA applications in the hospitality industry, analyzing YouTube streaming data and identifying factors influencing attitudes. It offers insights on design guidelines for promoting RAISA applications and understanding customer attitudes.	The findings of the research paper reveal that the sentiment of customer responses towards RAISA applications in the hospitality industry is influenced by factors such as the sentiment of video narration and physical interaction.
Samala et al. (2022)	Impact of AI and robotics in the tourism sector: a critical insight	Investigates the impact of AI and robotics in the tourism industry, focusing on technologies like facial recognition, virtual reality, chatbots, robots, and language translators. It highlights the challenges and potential of AI in personalization, tailoring recommendations, and fast response times. AI has transformed the industry into a smart industrial hub, improving customer engagement and enhancing overall customer experience.	The authors argue that while AI enhances tourism experiential services, it cannot completely replace the human touch that is essential in experiential tourism. AI complements the future of tourism by offering automated, customized, and insightful travel services.
Belanche et al. (2021)	Frontline robots in tourism and hospitality: service enhancement or cost reduction?	Examines the impact of service robots on customer-provider relationships in the hospitality and tourism industries. It explores how customers' attributions about firms' motivation impact their intentions to use and recommend technology	Findings suggest that the introduction of service robots should focus on emphasizing the benefits of service improvement rather than cost reduction to enhance customer acceptance and engagement with the technology.
Choi et al. (2021)	Exploring the influence of culture on tourist experiences with robots in service delivery environment	Observes the impact of culture on tourists' experiences with service robots in Japan's robot-staffed hotels. It compares Japanese and non-Japanese online reviews and examines their perceptions of the services. The study emphasizes the significance of cultural perceptions in service robot acceptance.	The study's findings indicate the importance of human-robot interaction in creating a unique experience for tourists in robot-staffed hotels and highlight the role of cultural perceptions in the acceptance and development of service robots in society.

Author	Article	Research Focus	Findings
Gaur et al. (2021)	Role of AI and robotics to foster the touchless travel during a pandemic: a review and research agenda	Explores the adoption of AI and robotics in the hospitality industry as protective measures against the COVID-19 pandemic. It proposes a theoretical framework that extends protection motivation theory to explain guests' intent to adopt these technologies.	The findings of the study highlight the growing importance of AI and robotics in the hospitality industry during the COVID-19 pandemic and suggest that these technologies can play a crucial role in ensuring guest safety and enhancing hotel operations.
Huang et al. (2021)	Customer-robot interactions: Understanding customer experience with service robot	Investigates customer experience with service robots in the hospitality and tourism industries, focusing on sensory, cognitive, affective, and conative aspects. It emphasizes studying real-world settings and user-generated content for a grounded understanding of customer experience and technology acceptance.	The study found that service robots can enhance customer experience and provide new insights on consumer satisfaction and acceptance of the technology. However, the overuse of robots may diminish humanist hospitality and customer experience, potentially impacting customer loyalty and abandonment behavior.
Kim et al. (2021)	Preference for robot service or human service in hotels? Impacts of the COVID-19 pandemic	Examines the impact of robots and AI on hospitality jobs during the COVID-19 pandemic, focusing on travelers' preference for robot-serviced or human-serviced hotels.	The findings highlight the importance of human interaction in hotel service provision, such as developing trust, offering personalized service, and creating positive emotions among guests. However, the adoption of technology, specifically robots, is necessary to meet consumers' increased expectations of novel experiences, efficiency, and reduced labor costs.
Luo et al. (2021)	Understanding service attributes of robot hotels: A sentiment analysis of customer online reviews	Studies the service attributes of AI robots in the hospitality industry and their impact on customer satisfaction. It analyzes online reviews and employs multi-criteria decision-making modeling to evaluate service features' importance.	The findings of the study suggest that the service attributes of AI robots in the hospitality industry have a significant impact on customer satisfaction.
Manthiou et al. (2021)	Man vs machine: examining the three themes of service robotics in tourism and hospitality	Consolidates cross-disciplinary literature on service robots and AI in the tourism and hospitality industry, focusing on deployment, acceptance, and ethical considerations. It discusses their impact on tourists, society, wealth distribution, and employment. The study provides guidelines for implementing and developing service-robot-driven technology.	The research paper focus on three fundamental properties of service robots in the tourism and hospitality industry: deployment, acceptance, and ethical considerations. The study provides a general definition of service robots' role in society and establishes their foundational properties.
Mingotto et al. (2021)	Challenges in re-designing operations and jobs to embody AI and robotics in services. Findings from a case in the hospitality industry	Examines the impact of AI-equipped humanoid robots in the hotel reception, focusing on the evolving roles of frontline employees and customers. It examines factors in customer-robot interaction and motivations for AI adoption.	The article suggest that the use of a humanoid robot equipped with AI can act as an augmentation force in the tourism industry.
Nam et al. (2021)	The adoption of AI and robotics in the hotel industry: prospects and challenges	Investigates factors influencing AI and robotics adoption in the hotel industry. In Dubai-based smart cities, case studies reveal potential benefits such as operational efficiency, cost reduction, revenue increase, and employee satisfaction. However, obstacles like lack of data consolidation, technological complexities, cybersecurity risks, modeling difficulties, and process-based interactions hinder their adoption.	The findings provide insights into the determinants impacting the adoption of AI and robotics in the hotel industry and offer implications for easing the adoption process and achieving successful implementation.
Tuomi and Ascenção (2021)	Intelligent automation in hospitality: exploring the relative automatability of frontline food service tasks	Assesses the potential of intelligent automation in frontline food service in hospitality jobs. It examines the foundational mechanisms and how intelligent automation technology impacts them.	The study highlights the importance of developing systems that can navigate the unpredictable and dynamic environments of food service and suggests that successful implementation of intelligent automation in this industry requires a combination of human and machine capabilities.
Yang and Chew (2021)	A Systematic Review for Service Humanoid Robotics Model in Hospitality	Study the application of humanoid robots in the hospitality industry, addressing challenges, opportunities, legal, ethical, and privacy issues. The study proposes transforming traditional hospitality into an intelligence-driven model to improve customer experience and meet personalized needs.	The findings of the systematic review indicate that introducing service humanoid robots in the hospitality industry presents both challenges and opportunities. The study highlights the legal, ethical, and privacy issues that arise with the use of intelligent robots in this context.

Author	Article	Research Focus	Findings
Choi et al. (2020)	Service robots in hotels: understanding the service quality perceptions of human-robot interaction	Investigates service quality perceptions of human-robot interaction in hotels through focus-group interviews and an experiment. It explores factors like interaction quality, physical service environment, and outcome quality. The research aims to understand the impact of human-robot interaction on service quality and provide insights for the potential adoption of service robots in hotels.	The research provides insights into the service quality perceptions of human-robot interaction in hotels, which could inform the use of service robots in the hospitality industry.
Go et al. (2020)	Machine learning of robots in tourism and hospitality: interactive technology acceptance model (iTAM) – cutting edge	Surveys the acceptance of AI robots in the tourism and hospitality industry using an interactive technology acceptance model (iTAM). It emphasizes the importance of examining perceived interactivity for effective models.	The paper discusses the proposed interactive technology acceptance model (iTAM) and the factors that influence consumer perceptions of advanced robots in the tourism and hospitality industry.
Lin et al. (2020)	Antecedents of customers' acceptance of artificially intelligent robotic device use in hospitality services	Examine factors influencing customers' acceptance of artificially intelligent robotic devices in hotels, focusing on social influence, hedonic motivation, anthropomorphism, performance expectancy, and emotions. It validates the AIDUA model and provides implications for the hospitality industry to improve customer attitudes towards AI service robots.	The study suggests that customers' acceptance of AI devices in hotels is influenced by various factors. These factors include social influence, hedonic motivation, anthropomorphism, performance and effort expectancy, and emotions towards the devices.
McCartney and McCartney (2020)	Rise of the machines: towards a conceptual service-robot research framework for the hospitality and tourism industry	Research service robot acceptance in the hospitality and tourism industry, focusing on factors influencing employee and consumer acceptance, policy, compliance, and corporate decision-making processes.	The findings provide insights into the factors that influence the acceptance and experiences of service robots by both employees and consumers in the hospitality and tourism industry. It also highlights the need for considering ethical and privacy issues when implementing service robots.
Reis et al. (2020)	Service robots in the hospitality industry: The case of Henn-na hotel, Japan	Investigate service robots' impact on the hospitality industry, particularly in fully automated hotels. It addresses privacy, security, dehumanization, and social deprivation, and suggests further research and implications for theory and practice.	Findings of the article are based on a systematic literature review and content analysis. The article explores the pros and cons of using service robots in the hospitality industry, specifically focusing on the case of the Henn-na hotel in Japan.
Webster and Ivanov (2020)	Future tourism in a robot-based economy: a perspective article	Examines the impact of robots, AI, and automation technologies on the tourism industry and society. It discusses the positive and negative impacts of robonomics on work, leisure time, politics, international trade, ownership rights, and customer experiences.	The article suggests that the use of robots, artificial intelligence, and automation technologies (RAIA) in the tourism industry will have significant impacts. It is predicted that by 2100, only 10% of the workforce will be human, leading to a major transformation of society and the political economy.
Xu et al. (2020)	How will service robots redefine leadership in hotel management? A Delphi approach	Considers the impact of service robots on hospitality leadership and human resource management, identifying trends and challenges in the next decade. It highlights the need for hospitality leaders to redefine roles and foster a culture of creativity, collaboration, and support for their workforce.	The study provides valuable insights into the impact of service robots on leadership and human resource management in the hospitality industry. The findings highlight the need for hospitality leaders to rethink their role and create a work environment that embraces change and supports the human workforce in a world with service robots.
Ivanov et al. (2018)	Consumers' attitudes towards the introduction of robots in accommodation establishments	Studies consumers' attitudes towards robots in the hospitality industry, examining tasks suitable for robots and those still conducted by humans. Factors influencing attitudes include recognition of advantages, experience, general attitudes, and social skills. Addressing these attitudes is crucial for promoting growth in the tourism and hospitality industries.	The findings highlight the importance of discussing the attitudes of consumers towards robots in the hospitality industry as technology continues to advance.
Wirtz et al. (2018)	Brave new world: service robots in the frontline	Explores the potential impact of service robots on service industries, focusing on customer concerns, ethical considerations, employee interaction, competitive advantage, economics, employment, and societal implications.	The paper suggests that service robots will dominate routine service encounters and tasks with low emotional or social complexity, while tasks requiring emotional and social intelligence will likely be delivered by human beings supported by robots.

Author	Article	Research Focus	Findings
van Doorn et al. (2017)	Domo Arigato Mr. Roboto: Emergence of Automated Social Presence in Organizational Frontlines and Customers' Service Experiences	Technology's impact on service and customer experiences, introducing the concept of automated social presence (ASP) and a typology of human and automated social presence. It presents a conceptual framework and explores how ASP affects service and customer outcomes through social cognition and psychological ownership.	The document does mention that there are different combinations of automated and human social presence in organizational frontlines, and it proposes a conceptual framework that focuses on the relationship between automated social presence (ASP) and key service and customer outcomes, which is mediated by social cognition and perceptions of psychological ownership.

Source: Own Eaboration

4.10 Hospitality Service

4.10.1 Customer's Impact

AI technology can shape customer perceptions of hospitality influencing their overall experience in a service environment. Yin et al. (2023) have shown that AI's ability to create hospitable experiences has generated controversial results, with both positive and negative customer responses to frontline AI.

The use of AI in the servicescape challenges traditional sources and forms of hospitality, as it involves not only hospitality etiquette and appropriate service behaviors but also the service environment, facilities, and other non-interpersonal factors. Rauf et al. (2023) mention the generational impact as an acceptance factor, Millennials' perceptions of AI in hotel service encounters are influenced by their technological proficiency, desire for authentic experiences, preference for efficiency, and price sensitivity.

Abdel-Hamid et al. (2022), emphasize the importance of adopting advanced technologies and optimizing their utilization to enhance customer satisfaction. On the other hand, Prentice et al. (2020), consider the importance of AI preference as a moderating factor for customer engagement and experience.

Mariani and Borghi (2021) suggest that reviewers are generally satisfied with the presence of mechanical AI in the guise of service robots and perceive it as adding value to their hotel experience. Regarding biometrics solutions, Lehto et al. (2021), showed that the customers were not highly supportive of biometrics-based hotel services, did not find such services highly desirable, or believed that they positively influenced their well-being. In luxury restaurants, some negative feedback is also found. Nozawa et al. (2022), describe how consumers evaluated luxury restaurants more negatively when the service was provided by AI compared to humans. The study found that foods cooked by AI in luxury restaurants had a negative impact on evaluations of food, service, and ambiance quality.

4.10.2 Human Resources Impact

AI adoption in tourism jobs raises concerns about job insecurity for employees, as it can enhance efficiency, reduce costs, and improve the customer experience. AI's ability to mimic human thought processes could replace human tasks in large data-driven tasks (Koo et al., 2021).

Morosan and Bowen (2022) suggest that advanced information technology can alleviate the labor shortage crisis in the hospitality industry by automating tasks and processes, improving staff performance, and streamlining operations. Leung et al. (2023), mention that the adoption of robots in the hotel industry offers physical and cognitive advantages, such as assisting with labor-intensive tasks like delivering guests' requests and supporting employees in cognitive tasks like greeting guests and understanding languages.

These advantages increase efficiency, productivity, time, and effort savings, and enable employees to focus on value-creating, personalized tasks, resulting in enhanced customer satisfaction and fulfilling diverse customer needs.

5. Discussion

5.1 Theoretical Implications

This systematic literature review on the application of artificial intelligence in the tourism industry has multiple theoretical ramifications. It provides a comprehensive overview of the current state of research

in this field, emphasizing the various AI technologies currently in use and their potential impact on several tourism operations and services.

The review identifies research gaps in the field of artificial intelligence in tourism and emphasizes the need for additional research on specific topics, such as the ethical implications of artificial intelligence, its impact on the human workforce (Koo et al., 2021), and the challenges of data privacy and security (Chi et al., 2022).

These identified gaps can direct future research efforts and contribute to the theoretical development of AI in tourism. It focuses on the various AI technologies currently in use and their prospective impact on various tourism operations and services (Huang et al., 2021b; Osei & Cheng, 2023).

The purpose of this literature review is to provide a foundation for future scholarly exploration and development of AI in tourism. The review identifies factors that influence hotel managers' decision to adopt robotic technologies, as well as the significance of perceiving a relative advantage and comprehending the compatibility and complexity of AI technologies in the tourism sector.

This knowledge can help hotel administrators make informed decisions regarding the adoption of robotic technologies. The review highlights the impact of AI systems adoption on enhancing the travel experience through personalised services and the direct impact of AI-based service interactions on service quality and consumer perceptions. It also addresses how the use of robotics may affect the delivery of services and the customer's perception of those services. Recognises the challenges posed by the rapid development of new technologies in the tourism and hospitality industry, as well as the need for practitioners to adapt to these changes and address challenges such as privacy concerns, information disclosure, and the effects of automation and robotics on the experiences of tourists.

5.2 Practical Implications

The practical implications of AI in tourism are substantial for industry stakeholders. The review shows that the application of AI technologies can improve numerous facets of tourism operations and services, resulting in numerous advantages. AI can automate and improve repetitive tasks, such as the management of bookings and reservations, customer inquiries, or housekeeping duties. This automation can increase operational efficiency and avoid staff constraints (Hsu & Tseng, 2022; Morosan & Bowen, 2022).

Due to the AI capability of analysing vast quantities of data from various sources, such as customer reviews, social media, and booking patterns, it allows for determining customer trends and behaviour, that can be used to optimise business strategies and make data-driven decisions (Sharma et al., 2022). Robots and other AI technologies can assist with labor-intensive duties such as delivering guest requests and providing translation services, resulting in time and effort savings, enhanced productivity, and ultimately increased consumer satisfaction (Manthiou et al., 2021; Mingotto et al., 2021; Samala et al., 2022).

By automating certain functions, artificial intelligence enables employees to concentrate on value-generating and personalised tasks that require human interaction and creativity. This can result in more satisfying work for employees and enable them to provide superior customer service.

6. Conclusion

As with all literature reviews, this literature review contains limitations. Literature evaluations can be improved in the future by incorporating more database research and articles in additional languages.

This systematic literature review identifies several knowledge gaps and research opportunities. These gaps can guide future researchers and contribute to the theoretical advancement of artificial intelligence in the tourism industry.

Further research is required to comprehend the ethical concerns associated with applying artificial intelligence in the tourism industry, including data privacy, security, dehumanisation, social deprivation, and the influence on the human workforce; How AI technologies improve consumer experiences in the tourism industry; Identifying and addressing the obstacles and difficulties associated with implementing AI in the tourism industry; How the use of AI technologies, such as predictive analytics, can potentially increase operational efficacy in the tourism industry; Research on the interaction between humans and AI

systems and how can help identify methods to incorporate the human touch while reaping the benefits of AI technologies; Or understanding of how AI can assist employees with their duties and improve customer satisfaction, are some research lines.

ACKNOWLEDGEMENTS

This paper is financed by National Funds provided by FCT- Foundation for Science and Technology through project UIDB/04020/2020.

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