Handbook of Research on Innovation, Differentiation, and New Technologies in Tourism, Hotels, and Food Service

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induced a negative impact on the hospitality industry in Poland in 2020, but with the beginning of 2021 this industry began to recover gradually. Also, COVID-19 quickened digital transformation adoption. The results also indicated that a sound and effective digital transformation reduces costs and improves business' performance; however, digital transformation may encounter several hurdles such as lack of knowledge, poor digital infrastructures, and lack of digital experience.

A new wave of automation known as robotic process automation is revolutionizing company productivity and delivering excellent ROI. This book chapter examines the use of Robotic Process Automation (RPA) in the hospitality, travel, and food service industries. It focuses on how RPA handles routine activities, enhances operational effectiveness, and improves customer experiences. RPA streamlines operations and enables personalized client interactions in the travel and tourism sector. It automates front desk operations, inventory management, and back-office duties in hotels, optimizing resource allocation and enhancing visitor experiences. In the food service sector, RPA automates order processing, inventory management, and supply chain management, improving operational effectiveness and enabling personalized ordering experiences. The chapter covers popular RPA solutions, analyzes implementation difficulties, and emphasizes the future potential of RPA, including integration with cutting-edge technology. By automating mundane tasks and providing a basic framework for implementation, RPA offers significant advantages in industries like aviation, hotels, finance, tourism, and more. This chapter highlights the significance of RPA in enhancing productivity, reducing errors, and shaping the future of these industries.

The main focus of this chapter is to examine the tourism income of Türkiye as a case country, taking into account the structure of the tourism industry and relevant economic and social indicators. Statistical methods are used to investigate the factors that influence tourism income and to demonstrate the impact of these variables. The chapter aims to identify the key factors that should be considered when planning tourism-related activities and to explore the suitability of different models for future predictions. In addition, the chapter explores the use of machine learning models, such as artificial neural networks (ANN) and gradient boosted regression trees (GBRT), to compare their performance with the established multiple linear regression model. Furthermore, the chapter adds to the existing literature on tourism economics and forecasting methods by examining the performance of different models in predicting tourism income and highlighting the importance of factors such as the country's image, safety, and transportation opportunities in shaping tourism income in Türkiye.

A characteristic of rural tourism is the physical distance between supply, which is located in rural areas, and demand, which is located in cities. The role of tourist intermediaries is to connect supply and demand. Tourism distribution channels are seen as a "bridge" between supply and demand and the role of intermediaries is precisely to find ways to facilitate the exchange process. The lack of ICT application can lead to a decrease in demand, a decrease in economic activities, and thus can negatively affect the development of certain areas. The authors will specify the necessary steps which will enable the improvement of business activities and the promotion of rural tourist destinations, both at the micro level, and at the macro level. The expectation is that this approach will increase the income and stop the negative trends burdening the life in rural areas (depopulation, population migration to urban centres, the decline in macroeconomic indicators, etc.) that are present not only in Serbia but also in other countries.

The aim of this chapter is to reveal technology paradox, and technostress concepts' effects in tourism industry. In the research the impact of the technology on the tourism industry employees was determined through qualitative research steps. Descriptive results were obtained using phenomenological research design. 20 participants were interviewed face-to-face and videoconferenced, and the audio and video files obtained were deciphered. Three main themes and seven sub-themes were identified, and the data were classified by content analysis. Analyses performed with percentage values, total and frequency graphs, and descriptive results. It is emphasized that the negative effects of technology on employees are greater. It is a fact that technology creates stress. No matter how competent one is in the use of technology, the unhindered development of technology has a negative impact on employees in the tourism industry, as it is thought to lead to a decrease in the labor force and unemployment.

The tourism industry is rapidly adopting artificial intelligence (AI) to enhance customer experiences and improve service delivery. However, the adoption of AI has raised concerns about concierge chatbots, digital assistance, proactiveness, anthropomorphism, and security, and its impact on overall customer satisfaction. Therefore, the aim of this research is to measure the service quality of AI in the tourism industry, with primary data collected in Pondicherry. This study is a quantitative research study that utilized a survey method to collect primary data. A total of 350 respondents were targeted, with 307 valid responses obtained. The data were analyzed using confirmatory factor analysis and structural equation

and research methodologies are presented. Finally, future research directions for the improvement of the existing literature are explained.

Section 3
Development Dynamics, Governance, and Promotion of Tourism and Hospitality

The increasing wealth and economic development have dramatically driven rapid growth in the tourism industry, making it one of the fastest growing and developing industries worldwide. Tourism entrepreneurship should involve adopting a green business model innovation that is more efficient and leads to low carbon production to balance the needs of the tourists with those of their desired destinations. Despite sustainability being a core concept in current policies and trends in the last decade, most company managers in the tourism industry are yet to incorporate it into the agenda. Based on this research gap, a systematic review of the bibliometric literature was conducted, and data was synthesized from 80 documents identified through the Scopus indexation using. This chapter aims to evaluate the challenges and opportunities of innovation sustainability in tourism entrepreneurship, thus building a clear image of what should be done to overcome the obstacles and increase awareness of the need for sustainable tourism.

Few studies have analysed the accessibility level of information sources used by persons with disabilities when making tourism-related purchases. Consequently, the main objective of this chapter is to gain insights into whether Destination Management Organisations are actively developing inclusive destination promotion and advertising materials. To accomplish this, an exploratory study was conducted, with a specific focus on the tourism of Portugal. Portugal was chosen as the subject of the study due to its recognition by the World Tourism Organisation as the world's first accessible tourism destination. This recognition encompasses various aspects, including the official promotional tourism website (visitportugal.com), which features digital brochures. It is important to note that the exploratory nature of this study limited the ability to make direct comparisons with previous research. However, for future investigations, it is recommended that the framework employed in this study be applied to assess the accessibility of promotional materials from other DMOs and tourism stakeholders.

With a focus on Morocco, this chapter reviews the literature on nation branding and its connection to social media in the context of tourism. The first part gives a foundation for understanding the many tactics used to distinguish one country from another by reviewing the literature on nation branding, social media, and tourism. The use of social media to market travel and to promote cultural and natural assets is examined in the second section. Then, an examination of the significant developments and trends in

Chapter 1
Robotization and Smart Technologies in the Hospitality Industry

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ABSTRACT

New-gen technologies have profoundly impacted all aspects of life and various economic sectors. The tourism industry, known for its inclination towards innovation, has been quick to embrace technological advancements. In response to the global pandemic, tourism businesses such as hotels, food services, and transportation have increasingly utilized robotic systems to ensure social distancing, hygiene, and sanitation measures. However, digitization presents significant challenges for the tourism industry, requiring companies to adapt their operations to stay competitive. Automation has emerged as a highly beneficial trend, simplifying tasks and introducing innovative processes to tourism business models. This enables companies to provide personalized services tailored to the preferences of "digital tourists." Overall, new-gen technologies are reshaping the tourism industry and driving it toward enhanced efficiency and customer satisfaction.

INTRODUCTION

The tourism industry is undergoing great transformation and unprecedented change. Digital processes and innovative solutions driven by new-generation technologies have led to the emergence of new players and models. The industry has gained a new dimension with smart technologies that offer unprecedented

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application opportunities (Neuhofer et al., 2015). Hotels are one of the core structures of the tourism industry and new technologies in this field also encourage the development and innovation of the hotel industry. One important way to differentiate in the hotel industry is by offering added value through technology (Smartvel, 2020).

According to the International Federation of Robotics, a service robot is a type of autonomous robot that performs useful tasks for humans through sensing and adapting to different situations without human intervention (Paral, 2022). Service robots are defined as social intermediaries that can replace human service providers in service trials (Van-Doorn et al., 2017). Bowen and Morosan (2018) defined service robots as "physically embodied, artificial intelligence (AI) agents that can perform actions that have effects on the physical world." According to Ivanov, Webster, and Berezina (2017), service robots are "programmable, intelligent devices with a certain degree of autonomy, mobility, and sensory capabilities designed to perform a specific task" that are useful to humans. The term "social robot" is used to describe service robots that have the ability to interact and communicate with humans and follow social norms (Chi et al., 2020). Service robots are expected to play an increasingly important role in the hospitality and tourism industries, improving the service experience and quality (Mende et al., 2019). The use of robots in tourism and hospitality enterprises has the potential to enhance guest experiences and make them more efficient and enjoyable (Ivanov et al., 2017).

Robotic applications are widely used in manufacturing, military forces, medicine, and home care services. So, these applications are becoming increasingly common in hospitality and tourism (Murphy et al., 2017). The use of robots in the hospitality and tourism industry is one of the most modern, innovative, and advanced ever. The use of service bots ranges from basic AI chatbots to assist with the service process to sophisticated assistant bots that enhance the guest experience and satisfaction. As the number of companies using service bots increases, it is important to understand their impact on both business and customer satisfaction (Belanche et al., 2020). While some of these robots perform basic and routine tasks in hotels and restaurants, such as robotic floor cleaners (Murphy et al., 2017), the potential for their use in the industry is vast and varied.

The topics of AI and robotic technologies are rapidly spreading and widely used around the world, and are being studied by various disciplines in the literature. The field of tourism is also gaining attention as one of the disciplines in which research has been conducted in recent years. In this context, robots play a significant role in the application areas of the tourism sector (Kılıçhan & Yılmaz, 2020). Especially in light of the great developments in the field of information and communication technology, as well as the use of AI techniques in many areas, including tourism, smart technology has gained significant importance in the tourism industry today.

The objective of this chapter of the book is to provide an understanding of the concept of smart hotels and the application of new technologies in this field. It aims to create a discussion platform about the use of new technologies in smart hotels. To achieve this goal, the concept of smart hotels and the new-generation technology components that make up this concept will be explained based on the literature. Finally, a futuristic outlook will be presented in the conclusion chapter using the theoretical information obtained.

BACKGROUND

The hotel industry is putting more emphasis on smart and digital technology solutions and systems, such as AI, that can provide innovative solutions to meet the needs of tourists. As a result, the use of smart technologies is becoming more widespread every day (Kim & Han, 2020). China is a leading country in this field, having followed guidelines to build smart hotels for its tourism market since 2013. Many Chinese tech companies have been contributing to the digital transformation of traditional hotel business models to provide a better and more personalized tourist experience (The Economist, 2021). For instance, Fliggy (Alibaba Group's online travel platform) launched FlyZoo Hotel in Hangzhou in 2019, which offers a wide range of AI services. The hotel is considered a smart hotel because it uses many smart installations offered by Alibaba Group, according to Liang Bo, the hotel's Vice President. Similarly, Andy Wang, CEO of FlyZoo Hotel, notes that smart technologies are transforming the industry, and FlyZoo Hotel bridges the gap between hospitality and technology, inspiring and empowering tourists (Law et al., 2022).

Innovation is one of the key components of success in a competitive industry. However, in order to foster and implement it, it is crucial to be aware of the competition, potential risks, and challenges. Moreover, it can be challenging to predict whether tourism policymakers will support or obstruct investment in the development of innovative programs. For instance, some innovative strategies may clash with the traditional views of institutions, which could require collaboration with various stakeholders. Another factor to consider is crises within the tourism sector itself, as opposed to economic crises affecting a country. In such situations, requests for change from the private sector are often seen by politicians as pressing issues that require special attention and effort. (Rodríguez-Antón & Alonso-Almeida, 2020). Improving the tourist experience is a primary objective of innovative practices. Understanding tourists' perspectives on the use of new technologies in the hospitality industry is crucial in determining how well smart technology services can meet their expectations. The COVID-19 pandemic has accelerated the adoption of new technologies in the industry that help maintain, reduce, or eliminate social distancing (Davari et al., 2022). However, it is important to understand tourists' views on the use of these technologies to ensure that the services provided meet their expectations.

Smart Hotels

Smart hotel studies are derived from the field of global intelligent building studies and rely on advanced computer technologies that are constantly evolving (Frank et al., 2007; Doukas et al., 2007; Buckman et al., 2014; Leung, 2021). Smart hotels are prominent in countries such as the USA, China, Korea, and Singapore (Koo et al., 2013; Xu, 2018). Novotel Ambassador Seoul Dongdaemun in Korea stands out as a notable example of a smart hotel. The hotel is powered by AI from Hotels & Residences in Korea, and it offers AI room service with GiGA Genie, making it a new AI service platform (Gupta et al., 2022). In Singapore, the use of smart hotel technologies is supported by guidelines such as the "Smart Hotel Tech Guide 2018" and the "Technical Guide of The Smart Hotel 2019" published by the Singapore Hoteliers Association. These guides emphasize the importance of using technology in the tourist experience and are used in the hotel industry to provide better experiences. In China, smart hotels are being developed as an extension of smart tourism. The most prominent examples of smart hotels include the Penguin Hotel QQ chain and the FlyZoo Hotel opened by Alibaba Group (Luo & Pan, 2021).

Smart hotels are part of the broader trend in the hospitality industry toward the use of advanced technologies to enhance the customer experience. The concept of a "smart" hotel room involves a microprocessor-operated station that monitors essential parameters for the room's functioning, such as temperature, guest movement, and sensors. These stations are often connected to a central computer, allowing for centralized control of multiple rooms, floors, or even the entire hotel. In addition to room technology, smart hotels also offer guests self-check-in/check-out, mobile key access, remote room control, voice assistants, and digital guest services (Petrevska, 2016). However, technology plays an important role, smart hotels aim to provide a sustainable management model while still prioritizing guests' satisfaction. Ultimately, the hospitality industry is centered around people, and smart hotels aim to enhance the guest experience while maximizing efficiency. A timechart of smart hotel development worldwide can be seen in Table 1.

Table 1. Development of smart hotels

Year	Country	Example	Technology
2006	USA	Cobono Mountain Resort Pennsylvania	RFID system introduced
2009	USA	City Center Hotel Las Vegas	Implemented smart systems to identify personal preferences and improve accommodation experience
2009	China	Dragon Hotel Hangzhou	RFID and connected smart technologies, hotel management system
2013	China	National Tourism Administration	Official guide of "smart hotel construction and service"(LB/T 020-2013). This document provides guidance for hotel investors and operators in China and sets the quality and standards required for hotel construction and services.
2016	China	Smart Hotel Alliance	Celebrating China's Smart Tourism Year and establishing
2017	China	Penguin Hotel QQ	Development smart rooms
2018	Korea	Novotel Ambassador Seoul Dongdaemun	AI room service with GiGA Genie
2018	Singapore	The Singapore Hoteliers Association	"Smart Hotel Tech Guide 2018"
2018	China	FlyZoo Hotel Alibaba Group	It is the first hotel in the world to use a full-face recognition system. This hotel allows guests to check-in/check-out and check-in to their rooms using facial recognition technology. In addition, the hotel uses AI technology to understand guests' needs and provide better service
2019	Singapore	The Singapore Hoteliers Association	"Technical Guide of The Smart Hotel 2019"

The table highlights the development of smart hotels in different countries and the use of various technologies to enhance the customer experience. In China, the Dragon Hotel Hangzhou was the first to adopt smart technologies such as RFID and connected smart technologies, as well as a hotel management system developed by IBM. In Korea, the Novotel Ambassador Seoul Dongdaemun was the first to adopt AI room service through GiGA Genie. In Singapore, the development of smart hotels is supported by the publication of guidelines such as "Smart Hotel Tech Guide 2018" and "Technical Guide of The Smart Hotel 2019" by the Singapore Hoteliers Association. In China, the Penguin Hotel QQ chain and FlyZoo Hotel are examples of the latest smart hotel developments.

Internet of Things (IoT)

IoT, which stands for the "Internet of Things," is a global system consisting of interconnected computer networks that use standard internet protocols (Nunberg, 2012). In recent years, the IoT has enabled the emergence of elements that facilitate life by enabling communication of network-connected physical objects at any time and any place (Kosmatos et al., 2011). The IoT can be thought of as a global network system that provides a unique identity to each object, enabling communication from human to human, human to object, and object to object (Aggarwal & Lal Das, 2012). IoT defines a world in which almost everything can be connected and communicates intelligently, like never before. The term "connected" is often considered in terms of electronic devices such as servers, computers, tablets, and smartphones, but in the system called the Internet of Things, sensors and actuators embedded in physical objects are connected to each other through wired and wireless networks, and usually use the same Internet IP to connect to the Internet. These networks distribute huge amounts of data that flow to computers for analysis. Objects become tools to understand and respond quickly to complexity when they can both perceive the environment and communicate. The revolutionary aspect of all this is that these physical information systems can be coded and networked on the internet by intelligent technologies (Butler, 2020). This situation is considered an important detail that proves the availability of the IoT system by smart hotel systems (Han et al., 2021).

RFID (Radio Frequency Identification)

RFID (Radio Frequency Identification) technology is a crucial part of the IoT system (Liya et al., 2022) and can be applied in various fields such as agriculture, transportation, medical, and tourism where wireless network technology is used. RFID is also utilized in monitoring systems to track changes in the environment or specific geographic areas. It has the capability to reduce the labor required for inventory creation and security management effectively (Kaur et al., 2011). The first implementation of RFID technology in the hospitality industry was introduced at the Cobono Mountain Resort in Pennsylvania, USA in 2006. This technology enables guests to access their rooms and resort services using their keys or cards. USA in 2009, City Center Las Vegas Hotel implemented a smart system to determine their customers' personal preferences. This system allows for automatic check-in/check-out operations, controls heating-cooling systems, and simple functions such as room light curtains and restaurant reservations. The system also records past visits and the preferences of guests to provide more personalized services in future visits. In conclusion, RFID technology provides a convenient and personalized experience for guests in the hospitality industry by controlling simple functions such as room light curtains and making restaurant reservations. Additionally, the technology records past visits and preferences to enhance future customer service (Ren, 2014).

AI (Artificial Intelligence)

AI is a system that is based on large data processing capacities, and algorithms (Bulchand-Gidumal, 2022). John McCarthy organized the Dartmouth Conference in 1956, which was the first event focused on AI, and defined the term AI as "the science and engineering of intelligent machines, where intelligent machines are defined as those that can perform tasks that typically require human intelligence such as perception, reasoning, learning, and language understanding" (McCarthy, 2007). According to another

definition, AI is a branch of computer science or the ability of a machine to imitate human behavior by simulating human intelligence (Webster, 2021). AI today offers services such as image recognition voice-activated search, and chatbots in mobile devices (Boden, 2017). The use of AI technology continues to grow with the advancement of algorithms development, access to new technologies becoming more affordable, and the participation of major technology companies in the tourism industry. Advanced technologies are required to enable smart hotel functions. AI technology is considered an important factor in the innovation of smart hotel services due to its technical advantages (Wang et al., 2020). On the other hand, AI is described as machine technology that understands, learns, and perceives like humans in the hospitality industry. From a practical implementation perspective, it is a smart machine system that has the ability to store and use information in the service process. In this context, it is described as a system that produces alternative solutions to human intelligence to help with the efficient use of all resources and to solve problems (Winston, 1993).

This table provides a high-level overview of the development of AI, including the key events and characteristics of each era. The first wave of AI, often referred to as "birth," refers to the early development of AI and the creation of basic computer programs and systems that could perform simple tasks. This period, which took place in the 1950s and 1960s, saw the creation of early AI technologies such as expert systems and decision trees. The second wave of AI, "development," saw the expansion of AI research and the creation of more advanced AI technologies. This period, which took place in the 1980s and 1990s, saw the creation of new AI technologies such as neural networks and genetic algorithms. The third wave of AI in the 1990s and present, "innovation," is often referred to as the current stage of AI development. This stage is characterized by the integration of AI technologies into a wide range of industries and applications, including healthcare, finance, transportation, and retail. Additionally, this wave is marked by the development of more advanced AI technologies, such as deep learning and reinforcement learning, or practical applications such as Siri, and Alexa, which are now being used to solve more complex problems. On the other hand, Perceptual Intelligence has emerged as a technology that aims to imitate human perception and intelligence in the field of AI. This technology grants machines the capability to perceive and understand sensory input through sound and vision. Perceptual intelligence refers to a type of AI that is designed to understand, interpret, and respond to sensory information from the physical world. It refers to the ability of AI systems to perceive, analyze, and understand data from a variety of sources, including images, videos, audio, and other forms of sensory data (Pentland, 2000). Perceptual intelligence is a key component of many AI applications, such as computer vision and speech recognition. For example, computer vision systems use perceptual intelligence to process and analyze images and videos, while speech recognition systems use perceptual intelligence to transcribe and interpret spoken language. In addition to its applications in specific domains, perceptual intelligence is also a critical component of more general AI systems that require a deep understanding of the sensory world. These systems often rely on machine learning algorithms, such as deep learning and reinforcement learning, to develop their perceptual intelligence over time (Pentland, 2001). However, the capability to comprehend, a crucial aspect of human intelligence, remains to be fully replicated. In a report released in 2020, it was noted that AI technologies in the field of Perceptual Intelligence have reached and even exceeded human standards, but the field of Cognitive Intelligence is still in its developmental stage (Li, 2021)s. In conclusion, the greatest advancements have been made in the field of Perceptual Intelligence, which is now considered the 3rd wave of AI technology development, and it is widely utilized across various industries.

AI Types Based on Approach

AI is usually divided into three approaches;

- Knowledge-based AI: At this level, the machine operates based on predefined knowledge. For example, a chatbot utilized provides pre-determined responses in customer service applications (Rodgers, 2020).
- Learning-based AI: At this level, the machine has learning capabilities in addition to its pre-defined knowledge. For example, a chatbot can learn from customer interactions, as well as from pre-programmed information (Nirala et al., 2022).
- Neural network-based AI: At this level, the machine acquires and performs through neural network algorithms. For example, designed to comprehend and respond to customer inquiries through the use of neural networks in customer service applications (Chen et al., 2022).

AI Types Based on Functionality

AI is usually divided into four basic functionalities. In Table 2, the types of AI based on their capacities are presented as a template:

Table 2. AI classification based on approaches

Category	Ability	Characteristics	Example
Mechanical	Automatically execute repetitive and routine tasks (Sternberg, 1997)	Mechanical AI is developed with restricted learning and application capabilities to ensure consistency. Not particularly smart.	Factory robots.
Analytical	Learning problems from the process in order to provide a solution using process information. (Sternberg, 1984-2005)	Analytical AI is considered "weak AI" as these AI applications can exhibit intelligent behavior, but cannot replicate human intuition.	Executing tasks by using the model created from learning the necessary knowledge and abilities
Intuitive	Thinking and adapting efficiently to new circumstances (Sternberg, 1984, 1999, 2005).	Intuitive AI is considered "strong AI" as it is designed to be more adaptable and function more like a human. Understanding is the most critical aspect.	Capable of producing original solutions to problems by utilizing prior knowledge and algorithms
Empathetic	Emotional (Empathetic) Intelligence (Goleman, 1996)	Empathic AI refers to a machine that can perceive, or at least simulate having emotions.	Robots that interact with humans using emotional intelligence features. Replica is utilized to comprehend human emotional states and provide appropriate responses. The Sophia Hanson robot is able to recognize and comprehend human emotional states by utilizing emotional intelligence technologies during human interactions.

Source: SHA, 2019

- Mechanical AI: AI systems can be used to automatically perform routine and repetitive tasks. For example, robots used in production lines in a factory can automatically carry out repetitive movements. In addition, AI systems can also be used in routine processes such as data entry or data processing (Huang & Rust, 2021). For example, in a call center application, AI system can automatically classify call records or, in a bill processing application, AI system can automatically verify invoice information (Vanneschi et al., 2018). AI systems are well-suited for performing routine and repetitive tasks, as the processes involved in these tasks typically have a fixed and standardized structure. These systems learn and execute operations based on the established model for such tasks (Fischer et al., 2020). This enables AI systems to perform routine and repetitive tasks instead of humans, allowing humans to focus on more valuable tasks.
- Analytical AI: Operational knowledge encompasses the specific knowledge and skillset required to carry out a particular task, such as operating a machine on a production line. The acquisition of operational knowledge and skills is an essential component of the learning process for individuals tasked with performing these types of duties (Friedlander & Zoellner, 2020). AI systems try to decode computing information using the learning process. For example, AI system gains an understanding of the knowledge and skills required to perform a task, and it then performs operations based on the learned model. In this way, AI systems can perform tasks that require processing knowledge instead of humans, so allowing humans to focus on more valuable tasks (Harris & Davenport, 2005). During the learning process, AI system identifies and learns from mistakes. In this manner, AI system continually improves its performance in processing information. This process of acquiring knowledge and skills for task completion can be considered learning.
- Intuitive AI: AI systems adapt effectively to new situations with the ability to think creatively. This process enables AI systems to generate unique solutions and find suitable solutions for new situations by using previously learned information and algorithms. According to Sternberg (1984), the ability to think creatively enables humans and AI systems to solve problems presented to them in ways that have not been solved before. In this process, AI system can produce unique solutions by using previously learned information and using the information learned during the learning process. Sternberg's (1999, 2005) creative thinking enables individuals and AI systems to solve problems in innovative ways, which were not used previously. In this process, AI system uses previously learned information and algorithms, can generate unique solutions, and find suitable solutions for new scenarios.
- Empathic AI: Emotional intelligence enables individuals and AI systems to identify and comprehend the emotions of others. This ability enables AI systems to perform in effective interactions with humans. It enables humans and AI systems to recognize and understand other people's emotions. In this process, AI system can give emotionally appropriate responses by recognizing and understanding other people's emotional states. AI system can influence other people's emotions and improve people's emotional state during these interactions. Empathic AI technologies and algorithms, as described by Goleman (1996), allow AI system to recognize and understand the emotions of others. AI is used in many various applications for example, smart systems can adjust room temperature, lighting, curtains or blinds automatically, leveraging AI technologies in hotels. Moreover, AI technologies can automate hotel booking processes and streamline check-in and check-out procedures.

AI Specific Systems Applies

According to AI Development Report (2011-2020), eight AI systems specifically applied in hospitality are highlighted:

- Machine Learning: It enables systems to learn and use from the data information.
- Robotics: It involves programming robots with AI technologies to automate tasks and improve efficiency. It is widely used for tasks such as transporting heavy materials in hospitality.
- Information Access: It enables systems to retrieve and analyze data to generate insights.
- NLP (Natural Language Processing): It allows systems to process, understand, and generate human language.
- Voice Recognition: It allows systems to recognize voice signals and convert them to text.
- Face Recognition: It allows systems to recognize face or image.
- Emotional Intelligence: It enables systems to detect and interpret human emotions.
- Social Intelligence: It enables systems to understand and engage social interactions.

In this context, AI technologies commonly used in hotels are shown in Table 3 presents a template of the commonly used AI technologies in hotels.

Table 3. Support Technologies and Specific Applications of AI

Technology	Explanation	Example
Robotics	Today's robots have the capability to move independently, execute repetitive and simple tasks, and provide information based on the data obtained from their actions	ServiceBots
Self-service software *	Self-service software is technology designed with user-friendly features that allow users to control their own service experience, providing electronic support without the need for interaction with a service representative. This technology offers limitless possibilities, from how they are used to how they present themselves. * *This technology, which is not technically considered* AI, *is still marketed and used as AI product in the industry due to its advanced capabilities*	Check-in/Check-out
Speech recognition	This technology is capable of recognizing and understanding spoken language. It listens to the speaker's voice to interpret the meaning and intention behind what is being said. To accomplish this, the audio signal is processed using machine-readable technology.	The participant is intelligent
Image Recognition	Video analytics refers to the use of computer algorithms to analyze and extract useful information from video footage. The goal is to use this information to support decision making and improve operations. It's often used to identify objects and detect patterns or behaviors in real-time. For instance, face recognition technology is a type of video analytics that uses unique features in captured images or videos to match them with stored templates for identification or authentication purposes.	Face recognition
Person-computer interaction	Virtual reality is a technology that creates a simulated environment that allows users to experience images, sounds, and sensations as if they were in a real-life setting. For example, virtual reality can be used to preview a hotel room from a distance before making a booking decision. Virtual reality glasses provide a fully immersive experience by putting users inside a 3D digital environment. In this artificial world, users can move around, interact with virtual objects, and experience the environment as if they were physically present.	Virtual reality (VR)

Source: SHA, 2018

Virtual Reality and Augmented Reality

Augmented Reality (AR) is considered a cutting-edge technology that operates through sophisticated algorithms and recognition, offering advanced services and is considered one of the world's leading technological innovations (Ara et al., 2021). AR technology enhances the functionality of mobile applications in industries such as health, tourism, education, and e-commerce with features such as motion tracking.

Virtual Reality (VR), an evolution of AR, is a technology that enables users to immerse themselves in a computer-generated virtual environment. VR technologies utilize multimedia devices and computer simulations to create a realistic experience for the user (Cao, 2016). These technologies typically include a head-mounted display and can display a room-sized virtual environment (Gold & Mahrer, 2018). With the visual experience provided by VR glasses such as Oculus, it is believed that future activities will increasingly take place in virtual environments (Huerta et al., 2019).

The main objective of virtual reality (VR) and augmented reality (AR) is to immerse users in a parallel digital environment that feels as real as possible. This technology has proven especially beneficial in digital marketing, as it allows marketers to bring the tourist experience closer to the consumer before they physically travel. For instance, a high-definition video that shows a picturesque beach with turquoise waters and blowing wind can evoke emotions and increase demand. Although VR and AR are mainly used in digital marketing, they also have practical applications in promoting lesser-known and far-off destinations. With the current travel restrictions due to the pandemic, the interest in virtual travel has been growing steadily.

Nowadays, VR applications in the hospitality industry are used as a support to make tourist activities dynamic and interesting. For example, by using these technologies in guided tours to the ruins, tourists can be immersed in historical events. For hotel chains and accommodation businesses, a virtual visit is offered before booking a room. By launching the Best Western Virtual Experience program in 2018, it aimed to provide immersive experiences to its guests. This allowed guests to better understand the property, its amenities, services and surroundings before booking. Thus, they managed to improve customer trust and communication and reduced the number of complaints by 71%.

Today, VR is utilized in the hospitality industry to enhance the dynamic and engaging nature of tourist activities. For instance, by incorporating VR technology into guided tours of historical sites, tourists can be fully immersed in the experience. In the case of hotels and other accommodation businesses, virtual visits are offered to potential guests before they book a room. In 2018, Best Western introduced its Virtual Experience program to provide an immersive experience for its guests. This program aimed to improve guests' understanding of the hotel's property, amenities, services, and surroundings, thus increasing customer trust and communication and reducing complaints by 71% (Camilleri & Camilleri, 2018).

VR technology is used in two main areas in the travel industry:

- First, it is used to increase the capacity of customers in the process of handling rooms and in the process of collecting information, to enable them to have a better understanding of the rooms and make quick decisions. For example; 360° VR photos can be given, which is a web application that does not require equipment.
- The second is used to provide a personalized and innovative experience during hotel stays. For example; can be given smart landscapes that offer an interactive experience.

Virtual reality technology has two primary applications in the travel industry:

- Enhancing the customer experience in room booking and information gathering, by providing a better understanding of the rooms and enabling faster decision-making. For instance, 360° VR photos can be made available through a web application that doesn't require any special equipment.
- Providing a personalized and innovative experience during hotel stays, such as interactive smart environments.

Examples of VR applications in hospitality are presented in Table 4 as a template.

Table 4. VR application in hospitality

Situation	Example
Before stay	**Information and marketing regarding hotel rooms and facilities**
Length of stay	**To provide additional value to guests:** **- Offer the chance to fully immerse in local experiences from the comfort of their accommodations.** **- Utilize original content created specifically by the hotel, such as the history of the building and local stories, to enhance their stay.**

Source: SHA, 2018

The benefits and considerations for the adoption of VR applications are presented in Table 5 as a template.

Table 5. Benefits and considerations VR adoption for hospitality

Benefits	Challenges
Elevating the overall brand experience. **Boosting customer confidence and promoting quicker sales.** **Decreasing the time and effort required by the sales team for extended property inspections.** **Facilitating more streamlined cross-selling opportunities for travelers. A cutting-edge technology not accessible to all clients.** **Costly for virtual reality glasses with immersive experiences.** **Developing compelling advertising campaigns aimed at consumers.**	**A cutting-edge technology not accessible to all clients.** **Costly for virtual reality glasses with immersive experiences.** **Developing compelling advertising campaigns aimed at consumers. A cutting-edge technology not accessible to all clients.** **Costly for virtual reality glasses with immersive experiences.** **Developing compelling advertising campaigns aimed at consumers.**

Source: SHA, 2018

As the hotel industry falls under the service sector, its offerings are intangible. The benefits and factors to consider when adopting VR in the hotel industry, as stated by Casaló et al. (2015), include:

- Taking experiential marketing to a new level
- Encouraging buyers to make quick decisions by boosting their confidence
- Reducing the time and effort required by the sales team for extended property inspections
- Offering easier cross-selling opportunities to foreign guests

- Limited accessibility for customers without VR viewing equipment
- High cost for VR glasses offering top-notch experiences
- The need for compelling content to captivate the consumer

Nowadays the widespread use of online booking, hotels now have a valuable opportunity to provide customers with panoramic views of their accommodations and food and beverage offerings on their website and through online travel agencies (OTA) platforms. Typically, tourists do not visit the property before making a reservation, as rooms are often reserved before finalizing travel plans. While not all customers have specialized equipment, such as VR glasses, to view VR content, even a limited experience viewed without such equipment is still more engaging than static photos. Additionally, augmented reality (AR) can also be used for entertainment purposes. However, providing a high-quality and private AR experience can be quite expensive, as the necessary equipment is costly.

The restaurant and catering industry is not immune to the use of VR technology. VR can be leveraged to create immersive culinary experiences, although it has yet to achieve realistic simulations of taste and smell. Restaurants can use VR technology to enhance their dining experience, for example, by adding a virtual show during meal service at a Caribbean restaurant. Some restaurants, like Sublimotion in Ibiza, are already utilizing this technology to offer more than just signature cuisine, but rather provide a multi-sensory experience for diners. While VR technology may not be appealing to the majority of the population, it is viewed as a niche with potential for growth and improvement in the future.

AR technology is a critical tool in enhancing the travel experience for tourists, making it easier, more enjoyable, and more empowering. Real-time camera translation systems, access to ratings and reviews of destinations, and software like "Google Lens" for Android phones are among the technologies that are currently in development and have the potential to make travel easier. It is important for the marketing and travel industry to pay close attention to these technologies and make efforts to optimize and improve them.

INNOVATIVE TECHNOLOGIES INTEGRATION INTO SMART HOTELS

Innovative Hotel Management Systems have become increasingly important in the hospitality industry due to the challenges posed by economic globalization and the growing demands of consumers for high-quality services (He, 2019). Traditional hotel service models are often characterized by regionalization and high degrees of commercialization, but they may not be effective in a fiercely competitive market where individual hotels resort to improper means to attract tourists (He, 2019; Xue et al, 2021). In this context, enterprises need to adopt a business attitude of excellence, constantly improving their hardware measures such as enterprise personnel, system, and facilities (Xue et al, 2021). To ensure the normal operation of the enterprise and meet the requirements of the new era, the original system needs to be improved and adapted to the changing information environment. The drawbacks of the old system may gradually appear, necessitating innovative management departments to take preventive measures to reduce the negative impact on enterprise development. In addition, the training of staff members is also essential to continuously upgrade their professional capabilities and knowledge reserves, enhancing their work efficiency and soft power (Feng, 2015). The new innovation mode has proven to be effective in address-

ing the conservative thinking of the old business model, which often leads to a lack of communication among different working layers of the enterprise and reduces work efficiency. The innovative approach promotes internal staff learning and exchange, bringing significant benefits to the enterprise. With the implementation of Innovative Hotel Management Systems, hotels can meet the demands of modern life and consumer preferences, which lays a good foundation for the further improvement of enterprise interests (Xue et al, 2021). In summary, Innovative Hotel Management Systems have become crucial for enterprises to succeed in a fiercely competitive market. The integration of hardware and software measures, the adaptation to the changing information environment, and the continuous improvement of staff members' capabilities and knowledge reserves are critical to the effective implementation of these systems. The innovative approach fosters communication, learning, and exchange among different working layers, bringing substantial benefits to the enterprise.

The Smart World and Smart Cities plan (Abdoullaev, 2011) was created by China as part of the Five-Year Tourism Plan developed by IBM, designed to modernize and enhance the tourism industry (Tu & Liu, 2014; Zhang, 2016). For this purpose, various technological solutions such as data analytics, AI, IoT, and blockchain were offered to tourism organizations and businesses. The aim of the plan was to improve customer experiences and increase the effectiveness of the tourism sector by making the country an attractive tourist destination. In this context, the "Smart Hotel" model was first implemented in 2009 through a partnership between Dragon Hotel Hangzhou and IBM. Under the agreement between the two businesses, the hotel will be expanded and reconstructed, and the RFID and connected smart technologies developed for the Smart Hotel model will be used. This partnership will be carried out within the "Smart World" strategy proposed by IBM and the hotel industry and will be accepted as a guide for the construction and service of smart hotels. This development has increased the use of technology in the hotel industry and provided personalization of hotel services (Zhang et al., 2012).

Automated Services

Generally, service bots are preferred in areas such as customer service, production, and cleaning, as they attempt to enhance human-computer emotional interaction and understand customer emotions through technologies such as self-check-in/check-out, smart assistant, face recognition, voice recognition, and email recognition (Frank et al, 2017).

Self-Check-In/Check-Out

In a traditional hotel, check-in is performed at the reception, while a smart hotel offers two alternative check-in options: through a mobile phone app or kiosks. Face recognition technology is used for identity and visa verification, and automated service software records personal and payment information. Upon completion of all transactions, the guest can unlock their room using either the electronic key in the mobile app or a physical room card from the kiosk. Check-out can be performed in the same way. The specific applications of this technology are detailed in Table 6 based on a guide developed by the Singapore Hotel Association and presented as a template.

Technically, robotic systems connect three essential components for the hospitality industry:

Table 6. Specific application of self-check-in/check-out system

Situation	Example
Before stay	Personal data and accommodation preferences, passport information Credit card information Personalized marketing promotion
Length of stay	Identity and visa verification with optical character and biometric recognition Card activation with electronic access from a mobile phone or automatic distribution of room cards via kiosks (Automatic check-in machine) Remote room control (air conditioning, lights and TV) with the app Direct communication with the application for questions and requests (food-beverage, cleaning and reservation, etc.) Personalized marketing promotion Automatic check-out
Post stay	Lost property, invoice and contact information Personalized marketing promotion Reminder to share experience on social networks

Source: SHA, 2018

- PSB (Police Station Bureau) - a system that facilitates the transmission of guest information to the security office by scanning the guest's ID before their stay in hotels in China.
- PMS (Property Management System) - a system that automates hotel operations such as guest reservations, guest information, and online bookings.
- OTA (Online Travel Agency) - a platform that allows for the booking and payment of rooms through a mobile device.

The specific applications of this technology are outlined in Table 7, based on a guide developed by the Singapore Hotel Association.

Table 7. Benefits of adopting self-check-in system

Benefits	Adoption elements
Reducing the waiting time **Offering more comfort** **Best guest experience** **Personalized experiences** **Encourage consumption** **Ensuring security in the pandemic**	Mobile apps have limited download rates, especially for unconventional customers. There are risks that could lead to a breach of user privacy. User experience interfaces should be appropriately designed to encourage usage. Physical personnel can complement the use of automated service applications.

Source: SHA, 2018

Smart assistant

The smart assistant with voice recognition in hotel rooms is similar to a smart speaker in a home. The smart speaker is a voice-controlled device equipped with a personal assistant that offers a range of services such as information search, music playback, and conversational capabilities (Nakanishi et al., 2020). Table 8 presents examples of smart assistant applications in hotels as a template.

Table 8. Implementation of smart assistant

Topics	Categories
Reception requests	Comments and complaints Cleaning service Sign out Facility reservation Care Transport Wake-up call
Smart room	Temperature Lights Curtains Media devices
Emergency alerts **The weather forecast** **Guest guide** **Calls**	
Linking personal accounts	Calendar notes Shopping list

Source: Buhalis & Moldavska (2021)

Besides all the functions of a smart assistant at home, it also has special functions when used in a hotel room. Rooms are the centerpiece of hotel service and are where guests will spend the majority of their time during their stay. In this sense, the smart speaker enables guests to easily and comfortably contact reception to request services or control all the devices in their room, enhancing their overall experience. Upon returning to their room, they can lie on their beds, close the curtains, turn on the TV, and start to unwind, just as they would at home. Table 9 presents the smart assistant benefits and considerations in hotels as a template.

Table 9. Smart assistant benefits and considerations

Benefits	Adoption elements
The ability to free up human resources and reduce operating costs thanks to the perfect interconnection of workflows **Combining self-updating operating systems** **Better experience for guests**	Guest resistance; • Age/demographic characteristics • Importance of human service • Current habits Complex integrations Staff training requirement

Source: Buhalis & Moldavska (2021)

Its benefits for the hotel also make the hotel's operating system more efficient by freeing up staff with voice recognition technology and providing a personalized experience for guests to enhance their stay. However, incorporating smart assistants into the hotel management system can be a challenging process. The assistant needs to be compatible not only with the hotel's operating system but also with all the smart devices in the room, such as curtains, lights, audio, TV, etc. Additionally, staff must be trained to handle guest requests made through the assistant and to assist customers, especially elderly or technology-resistant guests, in using the assistant effectively.

Face Recognition

Face recognition is widely used in technologies that provide an intelligent experience at the hotel. For example, it plays an important role in features such as the previously mentioned service robots and self-check-in system. The functional aspects of the facial recognition application in the hotel, the benefits it provides and the need to be adopted are presented in Table 10 as a template.

Table 10. Face recognition application

Function	Example
Reception	Fast registration and room lock processes of the guests, Automatic detection of guest arrivals, fast forwarding of guest profiles to reception and personal selling suggestions. Reducing waiting time by directing more staff through video detection of crowds in the lobby
Arrangement	To determine the food and beverage rights of the guests
Security	Reducing the need for intense patrols for human resources and monitoring of CCTV images with a smart security video system. To follow and identify unauthorized or suspicious people. Tracking and managing people more effectively.
Sales & Marketing	To detect guest emotional states, expressions and profiles and increase additional sales opportunities. Tracking and analyzing guests' routes and identifying sales areas

Source: SHA, 2019

These applications can be basically divided into three categories:

- Identification: Facial recognition can be used for identity verification instead of manual checks of identity documents and personal information, such as reservation details.
- Demand Assessment: Facial recognition can be used to assess customer demand and reduce wait times, allowing for actions to be taken to enhance the customer experience. For example, at the FlyZoo Hotel, the system can pre-program elevators when customers leave their rooms and walk towards them, eliminating the need to wait.
- Emotional Perception: Facial recognition can be used to gain a better understanding of a customer's satisfaction and needs, though its technology at this stage is not advanced enough to accurately detect real emotions and satisfaction levels. However, this is a future direction of technology development.

The benefits and considerations of adopting facial recognition technology are presented in hospitality in Table 11 as a template.Formun ÜstüFormun Altı

Face recognition technology, similar to other AI technologies, increases efficiency by performing tasks more rapidly, lowering operational expenses, and improving the customer experience. Additionally, this technology offers a distinct security advantage compared to other AI technologies, as it can prevent fraud. However, it is important to ethical and transparency concerns that arise from the fact that many current AI algorithms are "black box" (Li, 2021), and the process by which data is collected and processed are not transparent. Face recognition technology could infringe on individuals' privacy security without proper adherence to privacy protection laws.

Table 11. Benefits and considerations of adopting face recognition technology

Benefits	Adoption elements
The ability to free up human resources and reduce operating **Increasing operational efficiency by automating manual and labor-intensive work.** **Providing clearer information to better make planning decisions** **Improving tourist safety and experience.** **Reducing operating costs and increasing revenue generation opportunities.** **To reduce losses and theft and increase security.**	The risks of user privacy violations; inform about applicable privacy regulations. High investment budget for hardware such as smart cameras and system components. System reliability, risk of system failure and idle time. It may require high-end hardware and high video storage capacity that improves video analysis and resolution.

Source: Buhalis & Moldavska, 2021

Robotization

Robot refers to autonomous machine systems that perform the task for which it is programmed (Decker, 2008). AI robots aim to create systems capable of human-like thinking and learning through technologies such as machine learning, classification, prediction, and NLP. Robots are the most typical application of AI and often use machine intelligence for routine and repetitive tasks (Frank et al, 2017). Table 12 presents the usage areas of robot technologies in hotels as a template.

Table 12. Application of robots in hotel services

Area	Example
Welcoming, greeting, and transporting customers.	*Cheetah Greetbot*: The Cheetah Greetbot is a robot developed by Xiaomi that is used to greet and serve guests in hotel rooms. It facilitates check-in/check-out procedures, room availability checks, and access to hotel services.
Delivering guest services and food orders to rooms	*Robot Run*: The Robot Run at Henn-na Hotel Nagasaki in Japan employs roboserve robots to fulfill guests' food orders and service needs.
Presenting treats to customers in the restaurant	*Siyanchaoren*: The Siyanchaoren restaurant robot used in China is capable of performing tasks such as food delivery and cooking through the use of sensors, cameras, and robotic arms.
Preparing food, ice cream and drinks	*Purple honor robot*: The Purple Honor robots used in China are capable of performing tasks such as preparing, cooking, and serving food.
Delivering and picking up luggage to rooms.	*Bellhop*: he Bellhop robot used at the Los Angeles San Gabriel Sheraton Hotel uses walking technology within the hotel and takes precautions to avoid obstacles and pedestrians. It delivers guests' luggage to their rooms, making check-in more efficient and comfortable.

Source: SHA, 2019

However, the implementation of robotic systems used is a crucial issue in hotels. Understanding the benefits such as providing uninterrupted customer support, providing fast and accurate answers, reducing the workload, increasing customer satisfaction as a concept, providing cost savings, and collecting and analyzing statistical data will make the use of this technology widespread. Table 13 presents the main benefits and important features of robots as a template in hospitality.

Table 13. Benefits and considerations for adopting service robots in hospitality

Benefits	Adoption Considerations
Using an innovative approach in hotel marketing strategies to increase brand awareness.	Renting robots instead of purchasing them can reduce investment costs
Optimizing business processes to increase efficiency by reducing repetitive manual tasks and freeing staff to focus on more valuable customer interactions and essential business services.	The existing building infrastructure can pose mobility challenges for the adoption of robots, such as uneven floors and narrow aisles.
Improving guest satisfaction through the reduction of wait times and an increase in the factor of innovation.	Systems such as Wi-Fi should be seamlessly integrated with the autonomous robots
Performing tasks with increased accuracy and consistency.	It is recommended that hotel staff receive training in resolving basic problems.
The use of robots for deliveries instead of in-room service by male staff may increase comfort levels for female guests at the hotel.	It is recommended to employ technical personnel as they can quickly repair or recover broken robots without having to wait for suppliers, reducing downtime.

Source: SHA, 2018

Robotic Technology in Hotel Kitchens

As robotic technology continues to advance, it is becoming more common for machines to replace human workers in various industries. These robots are capable of performing tasks such as creating chain learning algorithms and using 3D pointer trajectories to carry out production and service tasks. In order to accomplish these tasks, the robots are programmed with information about the objects and properties that they will be working with. This programming is typically done through the use of targeted training images. One area where robots have become particularly useful is in the food industry. Robots are equipped with autonomous systems that provide cognitive support, allowing them to perform complex tasks with ease. Overall, while the increasing use of robots in the workforce may have some drawbacks, it also presents many exciting opportunities for innovation and efficiency in various industries (Pfau et al., 2019). Examples of the application of robotic technologies in the F&B department in the hotel industry are as follows (Feller, 2021):

Robot in the kitchen: There are many innovations in robotics used in the food industry, including salad robots, automatic pizza robots, fast food machines, bread-making robots, and virtual dark food processors (Feller, 2021). Robot chefs are able to prepare noodles, hamburgers, coffee, sushi, grills, and drinks (Ivanov et al., 2017). One notable example can be found at the Henn-na Hotel in Japan, where a robot chef prepares "ekonomiyaki" pancakes. A visitor who witnessed the robot in action reported that it was able to efficiently mix the dough, cook the pancakes with the use of two spatulas, and even wrap the finished product with mayonnaise and dried green algae without dropping a single pancake (Grey, 2016)

Robot Waiter (Server)/Robot Busser: Keenon Robotics (2022), a leading company in intelligent robotics, has introduced a range of reliable and effective robots in the hospitality industry due to the ongoing shortage of employees and high labor costs caused by the pandemic. One of the applications provided by the company is the server robot, which is specifically designed to serve customers and transport used plates and glasses for a more efficient guest service experience. It is equipped with the latest AI technology, including GPS technology. The use of robots as waiters is becoming increasingly common in the hotel food and beverage industry. Restaurant operators have been known to turn to robotic waiters when staff is unable to keep up with orders or when the number of waiters is limited (Cheong

et al., 2016). Automated waiters and robots can assist restaurant staff during busy times, but excessive use of robots can result in layoffs for some employees (Ivanov & Webster, 2020). The Henn-na Hotel in Japan is the first hotel in the world to use human-like robots to serve its guests (Alexis, 2017). Pizza Hut has also hired the humanoid robot Pepper to take customer orders through voice recognition and AI-based technologies. Pepper not only takes orders and delivers them to the kitchen, but also accepts payments (Ivanov et al., 2017).

Robot Host/Stewardess: As robots are being used to drive sales, the Tanuki Restaurant in Dubai employs a host robot to greet guests upon entering the restaurant (Prideaux, 2019). The robot host can communicate with guests, offer discount coupons, and encourage repeat visits (Ivanov & Webster, 2020). Robot hosts can be seen as an alternative to human hosts for tech-savvy restaurants or those targeting younger customers. Interacting with these robots could be a unique experience for tech-savvy customers, adding an element of fun to their dining experience (Berezina et al., 2019)

Delivery Robot/Robotic Butler: In 2014, the Starwood Group introduced two robotic butlers named ALO at the Aloft Hotel. These butler robots allowed hotel staff to deliver necessary items, such as toothbrushes, towels, and water, directly to guest rooms (Crook, 2014). Instead of receiving cash tips, ALO asks guests to provide feedback and rewards high votes with a dance performance (Trejos, 2014). At the Flyzoo Future Hotel, guest's check-in using passport scans at kiosks and access their rooms with face recognition technology. The hotel's robot butlers also provide in-room services, such as turning on lights and closing curtains (Saiidi, 2019).

Robot Bartender: The Robot Bartender can come in both robotic arm and human form (Tussyadiah et al., 2020). Typically, the robot bartender is equipped with the ability to interact with guests, take and serve beverage orders, and perform its functions at the hotel bar (Giuliani et al., 2013). For example, Swiss bartender "Barney," created by F&P Robotics AG, is a fully automated machine capable of ***preparing*** dozens of cocktails to exact specifications, self-sterilizing, and even cracking jokes while serving food and drinks to customers (Smith, 2021). The bartender typically consists of two robotic arms positioned beneath the bottles at the bar (Berezina et al., 2019)

3D robotic system: 3D printing technology has progressed quickly and has enabled digitization of the entire manufacturing ***process***. It has gained popularity in the food industry due to its digital model that facilitates automation. One of the most widespread applications of 3D printing is food modeling. With the advent of new printing techniques, 3D printing technology is not only used for various food shaping purposes but also for micro-level food shaping (Chunhua & Guangqing, 2020). The primary objective of using the 3D Robotic system in the kitchen is to offer customizable products, optimize food parameters, and ensure precise preparation through 3D printing. Human limitations in the cooking process prevent the food from being prepared under the optimal taste and texture conditions. The implementation of the 3D Robotic system in the food industry addresses all crucial aspects such as proper data input, accurate parameter determination, process control, cooking degree and timing. To this end, Moley Robotics provides robotic tools for use in the kitchen. Established in 2015 with the goal of developing innovative food robot systems and a global taste and unlimited food variety, Moley Robotics stands out with its cutting-edge technology and unique designs in the kitchen. Two of the 3D robotic tools it offers are (Moley, 2015);

- Shadow *Robot* Hand; it all started with the realization that effectors with a three-fingered grip were stabilized at the level. Later, with the advancement of research towards creating a fully functional hand, the design of the robotic hand adopted the biological properties of human muscles. In this direction, the Shadow robot hand can mimic the function of muscles and can execute many

movements in a timely manner (Tuffield & Elias, 2003). Replicating the wrist, which is the most complex structure of the human body, Shadow comprises 20 motors, 24 joints, and 26 microcontroller mechanisms. Shadow is considered one of the closest robotics kitchen tools to human hand sensitivity in countries such as the USA, China, and Japan (Barakazi, 2022).

- Moley Robotic Kitchen; It is a home kitchen-based robotic system designed to assist humans in meal preparation. This system comprises sensors, actuators, and other robotic components and is controlled by software that predicts the user's next action and provides personalized assistance. All these components are interconnected over the network and compare historical data in the database with the current sensor data, thus monitoring the cooking process and significantly simplifying preparation, especially with the use of 3D Robotics systems (Mizrahi & Zoran, 2023)

CONCLUSION

Digitalization and advancements in new-generation technology have had a significant impact on the tourism industry. In terms of tourism demand, it has made it necessary to adopt new technologies that allow for the provision of personalized and interactive services for tech-savvy tourists. Furthermore, success in an increasingly competitive environment is achievable only through the use of smart technologies, by adopting innovative methods and increasing competitiveness. AI, robotics, and new-generation virtual reality technologies have started to be integrated into tourism, leading to the emergence of "smart tourism" and "smart hotels." In the hospitality industry, which is a crucial component of the tourism enterprise, the use of robots can provide a competitive advantage for companies in the future as consumer markets and technology continue to evolve (Ivanov et al., 2017). In service-based industries, the interactions and activities of robots differ greatly and these differences are critical. Robots can perform a range of complex tasks and provide specialized services, completing tasks that take longer for humans to perform.

It is crucial for service organizations to understand and acknowledge the role that robots will play in their businesses and how it will affect their customers, to ensure that everyone is satisfied during this emerging trend (Lukanova & Ilieva, 2019). It is widely believed that tourists are not opposed to new technologies and that any dissatisfaction that may arise will not be due to the acceptance of new technologies, but because the expected smart experiences are not yet available (Murphy et al., 2020). On the other hand, these new technologies are seen as highly intriguing and it is believed that they can bring added value to hotels. The most intriguing and valuable technologies are considered to be robotics, virtual reality, and voice recognition applications, which are among the latest advancements in technology.

Digitalization, robotization, and new technological advancements are developments that can significantly impact the tourism industry's supply chain. In this context, devising strategies to address the following issues will aid in attracting more customers to the tourism supply.

- Digital marketing: The use of digital technologies can enhance the marketing of tourism products and services, thereby reaching a wider customer base.
- Improved service quality: The implementation of robotization and digital technologies can improve the efficiency and service quality of the tourism industry's supply chain.
- Digital reservations: Utilizing digital technologies can simplify the reservation process, making it easier for customers to book tourism services.

- Multi-channel sales: The adoption of digital technologies can enable the tourism industry to sell its products and services through multiple channels, thereby reaching a broader customer base.
- Digital destination management: The use of digital technologies can facilitate the management and planning of tourism services, helping the industry attract more customers.

In the context of smart hotels, new-generation technologies, and robotization can bring about several advancements in the areas of tourism, hotel management, and food services

- Smart rooms: Digital technologies can help make rooms smart and configure them according to customers' wishes.
- Smart energy management: Digital technologies can help reduce costs and reduce environmental impacts by increasing energy efficiency.
- Smart food and beverage service: Digital technologies can help make food and beverage services more effective and efficient.
- Digital check-in/check-out: Digital technologies and robots can help make check-in/check-out faster and more efficient and increase customer satisfaction.
- Smart tourism management: Digital technologies can help make tourism management more effective and efficient.
- Robotic service attendants: Robots can assist customers in food and beverage services, tasks such as cleaning and maintenance, and check-in/check-out.
- Augmented reality and virtual reality technologies: Augmented reality and virtual reality technologies can help increase experiences and increase customer satisfaction in tourism and hospitality

Advancements in next-generation technologies and robotization can enhance the speed, efficiency, and customer-centricity of services in the tourism, hospitality, and food services sectors. The implementation of the smart hotel concept can bring several benefits, including increased customer satisfaction, reduced costs, and a reduced environmental impact through the integration of digital technologies in the fields of tourism, hospitality, and food services. However, it is important to note that these technologies must be effectively managed and integrated with human interaction for optimal results.

The integration of next-generation technologies in the tourism, hotel, and food service industries may have some implications on the operations of these industries and the overall customer experience:

- Improved service quality: Digital technologies and robotization can help businesses across industries improve efficiency and service quality.
- Transformation for workers: Robotization can help workers reduce their workload and focus more on quality and speed, but may also involve the risk of some workers being replaced by robots.
- More opportunities: Digital technologies and robotization can create more opportunities for entrepreneurs looking to invest in the tourism, hotel, and food service industries.
- Digitalization: Digital technologies can help businesses in the tourism, hotel, and food service industries digitize and reach more customers.
- Greater security and privacy: Digital technologies can help keep customers' data more secure and protect their privacy.

These technological advancements can aid in formulating strategies for the future of the tourism, hotel, and food service industries, thereby ensuring their long-term success. The speedy growth of digital technologies offers more efficient and effective service opportunities in hotels and food and beverage services in the tourism industry. In particular, the implementation of smart robots can speed up the check-in and check-out procedures in hotels and provide quicker and more convenient service in food and beverage services, enhancing the competitiveness of the tourism sector and boosting customer satisfaction and loyalty. As a result, there is a need for a better comprehension and progression of the relationship between tourism and digital technologies.

Finally, the contributions of quantum robot technology, another new generation technology, to the tourism sector are also considered among the important changes that will occur in the future. Quantum computers are a technology that combines sensors, the internet, and other tools, which are programmed to process information faster and more efficiently than conventional computers and robots. This technology has the potential to bring many benefits to the tourism industry. For example, quantum computers can help travel and tourism businesses better analyze customer preferences and demands using advanced technologies such as AI and machine learning. This can result in improved service quality and efficiency.

Quantum sensors and the internet have the potential to improve safety and quality in the tourism sector. Furthermore, the use of quantum robots can help businesses to be more efficient and effectively manage their resources in the industry. Although quantum robots are not yet widely adopted in the tourism sector, businesses are starting to recognize the potential benefits of quantum technologies. As these technologies become more advanced and widely used, they are likely to bring even more benefits to the tourism industry. However, it is important to note that quantum technologies are still in their early stages of development and need to be properly regulated. The future development of quantum technologies is expected to bring even more advancements to the tourism sector, leading to more advanced and intelligent tourism systems. The use of quantum robots can also help businesses to optimize the use of time and resources

Quantum robots are still in the early stages of adoption in the tourism industry, but tourism businesses are starting to recognize their potential benefits. The wider use of quantum technologies in the industry may bring additional benefits over time. However, it is important to keep in mind that these technologies are still developing and their implementation needs to be properly regulated. In the future, the continued development of quantum technologies will have a significant impact on the tourism sector, leading to even more advanced and smart tourism systems. The use of quantum robots can help businesses to be more efficient and optimize the use of time and resources. Despite their potential, quantum robots are not yet widely used in the tourism industry, but the recognition of their benefits is increasing

Tourism businesses are beginning to recognize the potential benefits of quantum technologies, and their wider use in the industry may bring additional benefits over time. However, it is important to remember that quantum technologies are still in their early stages of development and need to be properly regulated. The future development of these technologies will greatly enhance the tourism sector, leading to more advanced and intelligent tourism systems. Despite their potential, quantum technologies are not yet widely used in the tourism sector. Nevertheless, tourism businesses are starting to evaluate the potential benefits of these technologies. It should be noted that their implementation needs to be properly regulated to ensure their proper use and development. The development of quantum technologies will continue to contribute to the advancement of the tourism sector, leading to even more sophisticated and smart tourism systems.

SUGGESTIONS

The following suggestions can be made regarding the effects of robotization and innovative technologies on the tourism, hotel, and food service sectors:

- Industry leaders should carefully evaluate the impacts of robotization and digital technologies and strive to understand how these technologies can benefit their businesses.
- Businesses should prioritize investments in up-to-date and effective technologies that meet the needs and expectations of customers
- Employee training should be given priority, and employees should be educated about robotization and the use of digital technologies.
- In addition to robotization and digital technologies, businesses should also invest in sustainable and environmentally friendly solutions.
- The security and protection of customers' privacy should be a top priority for businesses when using robotics and digital technologies

By following these recommendations, businesses in the tourism, hotel, and food service sectors can enhance customer satisfaction by maximizing the advantages of robotization and innovative technologies.

In the future, it may be advisable to conduct the following academic studies on robotization and digital technologies in the tourism, hotel, and food service sectors:

- A comprehensive analysis of the effects of robotization and digital technologies on the tourism, hotel, and food service industries.
- An investigation of how robotization and digital technologies enhance service quality in accordance with customer expectations and needs.
- An examination of the impacts of robotization and digital technologies on employees, particularly focusing on employee training solutions.
- An investigation of how a sustainable tourism and environmentally friendly approach can be integrated with robotization and digital technologies.
- An exploration of how to ensure the security and privacy of customers in the context of digital technologies and robotization processes

Such studies can provide valuable insights and guidance for businesses in the tourism, hotel, and food service industries and can uncover crucial strategies for the future of these industries.

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KEY TERMS AND DEFINITIONS

AI: Artificial Intelligence involves creating computer systems with human-like intelligence capabilities.

AR: Augmented Reality involves overlaying digital information on the real-world environment viewed through a device such as a smartphone or a computer.

Chatbot: A computer program that simulates a conversation with human users using text or voice-based interactions

Next-Gen Technology (NGT): NGT refers to cutting-edge advancements and innovations in various fields that aim to improve efficiency and provide new solutions. It includes technologies such as AI, 5G, IoT, quantum computing, robotics, and others.

SeviceBots: Robots designed to support and serve people through physical and social interactions.

Smart Technologies: Certain products and services that add value to the tourist experience by promoting higher interaction, **co**-creation, and personalization, using technology that enhances the experience.

VR: Virtual Reality is a computer-generated environment that can be interacted with using special equipment such as stereo-imaging goggles.