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A literature review on smart tourism technologies

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Abstract
Today, technology affects not only the tourism sector but also other sectors. As a result of this impact, various developments have occurred in the tourism sector. As a result of these developments, guests' perspectives and expectations of businesses have begun to change. These changes in businesses have led to the adoption of the term "smart tourism" in tourism terminology and to the integration of businesses with technology. This study aims to examine the current status of the concept based on studies and application examples related to smart tourism technologies. Identifying examples of smart tourism technologies is essential because it provides insights into how hotel businesses can benefit from these applications, the different application methods, and their advantages. For smart tourism technologies to flourish in the tourism sector, various incentives should be supported, thus ensuring their increased use in businesses. Furthermore, several recommendations are offered to businesses for the use and widespread adoption of smart tourism technologies.

Keywords: Tourism, smart technology, hotel businesses

Introduction
With technological advancements, the tourism sector, which traditionally operated in a uniform manner, has changed significantly through the elements technology provides. Integrating technology has enabled businesses to perform tasks more quickly and easily, thereby enhancing their competitiveness. The concept of smart tourism, now widely recognised, has also influenced businesses and helped them utilise technological innovations to improve guest experiences. The technologies used in businesses not only enhance their image and prestige but also contribute to their revenue and profitability.

The concept of smartness has been integrated with developing technology, and its increasing use in products and services has also found application in the tourism industry, and the concept of 'smart tourism' has emerged with the use of technologies for tourism purposes (Yılmazer, 2020: 106) [58]. The concept of smart tourism was put forward by Gordon Philips in the early 2000s as a holistic, long-term, and sustainable approach to the development, operation, planning, and marketing of tourism products and businesses (Hazarhun, 2022: 27) [23]. In 2009, UNWTO Deputy Secretary-General Geoffrey Lipman defined this concept as maintaining environmental, ethical, and quality standards throughout all stages of the service chain during the first UNWTO Tourism Resilience Committee meeting (La Rocca, 2014: 273; Duran and Uygar, 2019: 2; Özışık Yapıcı, 2022: 2; Yalçınkaya *et al*., 2018: 88) [38, 14, 45, 55]. In 2015 and 2017, with the inclusion of information and communication technologies, the Internet of Things (IoT), big data, and smart destinations in its definition, smart tourism began to appear in the literature with various definitions (Aydınbaş, 2023: 28) [4].

Smart tourism is a comprehensive concept that uses on-site experiences and business value-propositions to improve efficiency, sustainability, and the quality of experience in the tourism sector by analysing and applying data collected from physical infrastructure elements, social connections, public institutions and organizations, and individuals' mental and physical activities through the use of advanced technologies (Gretzel *et al*., 2015a: 181) [20]. Another definition describes smart tourism as a comprehensive tourism approach that involves building management processes in smart destinations on digital foundations, improving guest experiences, offering rational solutions to destination problems, and using visitor feedback to enhance service quality (Femenia-Serra and Neuhofer, 2018: 129) [19]. The most distinctive feature of smart tourism is that it is an infrastructure that integrates various information and communication technologies, and the analytical information

Provided by These technologies enables guests to make informed decisions about which services to use and how to use them during their travels (İçöz, 2021: 146) [26]. Within the concept of smart tourism, smart technologies such as cloud computing, big data, mobile applications, IoT, sensors, geographic information systems (GIS), virtual reality (VR), and augmented reality (AR) are used to facilitate interaction between all stakeholders.

Tourism has integrated with technology for many reasons, such as insufficient information available to guests about destinations, facilitation of travel planning, the simultaneous management of complaints, requests, and preferences, the maximization of guest satisfaction, the diversification of tourist products, and the ongoing demand for information by guests, tourism businesses, and other stakeholders (Karaçelik, 2023: 65) [30]. Therefore, technology has become essential in today's world. Technologies have become the most critical infrastructure of smart tourism and have been shaped by the internet, social media, and mobile applications (İçöz, 2021: 145; Özışık Yapıcı, 2022: 3) [26, 45]. This is because the use of smart technologies in the tourism sector allows for better understanding guests and providing them with better service and response, improving service quality, gaining a competitive advantage by reducing costs, offering a personalized tourism experience, and increasing profitability (Neuhofer *et al*., 2012: 43; Wang *et al*., 2016) [43, 54]. In addition, the used technologies have enriched tourism experiences and services, fostering the development of new, innovative business models (Wang *et al*., 2012: 374) [53]. In hotel businesses, smart technologies not only increase the operational efficiency, but also present innovative models that shape guests' perceptions of the hotel, country, and city, ultimately improving the overall guest experience (Kabadayı, 2020: 12; Konak and Özhasar, 2021: 18) [28, 36]. For this reason, hotel businesses employ smart technologies to maintain sustainable competitiveness both currently and in the future. Table 1 presents the historical development of smart technologies used in hotel businesses from the past to the present.

Table 1: Historical Development of Smart Technologies Used in Hotel Businesses

1862	The world's first hydraulic elevator was installed at the Grand Hotel in Paris, and this development is considered the beginning of technological advancements within the hospitality industry.
1880	The Sagamore Hotel was the first hotel in New York to supply electricity to all its rooms.
1894	The Grand Hotel was the first in Italy to have an independent power source.
1927-1934	The Statler Hotel was the first to offer free radio broadcasting for its guests and, in 1934, to introduce air conditioning to its common areas.
1947	The Roosevelt Hotel in New York was the first to equip all guest rooms with televisions.
1947	The Westin Hotel introduced the first reservation system, known as "Hoteltype," and, in the same year, enabled instant reservation confirmations through teletype machines.
1957	The Hilton Hotel made history as the first hotel to install telephones in guest rooms.
1958	The Sheraton Hotel was the first to implement a reservation system.
1960	In 1960, the Sheraton Hotel introduced the first minibar in guest rooms.
1965	The Sheraton Hotel implemented the first computerized reservation system, named "Holidex."
1969	Beginning in 1969, chain hotels increasingly regarded swimming pools as an essential service tool in their profit-boosting strategy.
1972	Hotels began accepting credit cards to guarantee reservations.
1973	The Sheraton Anaheim Hotel was among the first hotels to offer complimentary in-room movies for its guests.
1981	The world's first boutique hotel concept emerged.
1986	The Teledex company developed telephones specially designed for use in accommodation establishments.
1990	In the United States, legislation was enacted to protect the rights of individuals with disabilities, and accommodation establishments began offering various services to ensure accessibility for individuals with disabilities in their guest rooms and facilities.
1991	The Westin Hotel was the first to offer voicemail services to guests.
1994	The Hyatt Hotel launched its first official website.
1999	Choice Hotel International was among the pioneers to trial a computer application for guest use in their rooms.
2001	After the September 11 attacks, accommodation establishments implemented new counterterrorism and security measures.
2007	The adoption of smartphones and mobile applications has provided numerous benefits for both guests and employees in accommodation establishments.
2008	The use of LED televisions became prevalent in accommodation establishments.

Source: Hazarhun, 2022 [23]

The integration of advanced technology into the hotel industry enables hotels to offer a broader range of services (Taşçı, 2022) [47]. In the past, hotel businesses primarily aimed to provide guests with clean, well-maintained rooms, offer high-quality food and beverage services, and enhance guest satisfaction through well-organized entertainment. Today, with technological advancements, delivering higher-quality and more attentive service has become paramount. Developing technologies are making a difference in the smart technologies that businesses globally use. Hotel businesses have begun using advanced technologies such as robots, drones, chatbots, smart rooms, kiosks, wristbands, virtual and augmented reality, and the metaverse to increase guest satisfaction, solve problems faster, reduce operational costs, streamline processes, and deliver personalized services (Çeltek, 2023: 3688) [11]. Marriott Hotels in Irvine, California, uses technology that allows guests to use a section of the shower door glass as a drawing board and to transfer their drawings or notes to a paired tablet or phone via Bluetooth while showering (Erdem, 2021: 38) [18]. The Hotel Particulier de Montmartre in Paris has installed a voice recorder on room walls, allowing guests to leave messages for future guests (Durna and Babür, 2011: 83) [16]. BetUVerse is the first fully licensed metaverse facility to offer casino, entertainment, and hotel services, and it features a gym, bar, hotel, and NFT museum, where players can participate as NFT avatars and use BetU cryptocurrency (Çeltek, 2023: 3691) [11]. The Wynn in Las Vegas has

equipped 4,700 rooms with Amazon Alexa smart devices, allowing guests to control lighting, select music, turn on TV and select TV channels, and adjust the curtains and temperature using voice commands (Balakrishnan, 2016) [7]. Hotel 1000 in Seattle uses infrared sensors to detect guests' body temperatures and notify housekeeping staff when guests have left their rooms (Karaman *et al*., 2019: 55) [31]. The Fleming Hotel in Hong Kong offers rooms tailored to meet the needs of male and female guests. Men's rooms feature amenities such as game consoles (PlayStation 3, Xbox 360, and Wii), iPod charging stations, and magazine and DVD collections for men (Durna and Babür, 2011: 82-83) [16]. Thematic hotel rooms, designed to meet the gender-specific needs and expectations of female guests, offer personalized services and amenities including beauty products, jewellery boxes, iPod stations, herbal tea selections, facial steamers, and leg massagers (Mil, 2014: 24) [42]. The Choice Hotel was the first to use mobile applications in 2009, and many hotels have since made mobile applications available to their guests (Akmaz and Kale, 2020: 164) [2]. In late 2010, the Bellagio Hotel and Las Vegas Resort began using mobile applications for ticket reservations, concierge assistance, and room service orders (Kwon *et al*., 2013) [37]. At City Hub Amsterdam, guests stay in capsules and access their rooms with smart wristbands (Çeltek, 2023: 3694) [11].

Opening in 2015, the world's first robot hotel, Henn-na Hotel in Japan, used 243 robots that were capable of speaking multiple languages across all departments of the hotel for positions such as front desk personnel, room service attendants, material carriers, and vacuum sweepers (Ivanov *et al*., 2017: 1505-1506) [25]. At this hotel, robots identify guests with a facial recognition system, and guests can access their rooms easily with this system without the need for cards or keys (Erçetin, 2023: 51) [17]. In addition, in 2014, Starwood aloft Hotels started to use a robot called Botler (robotic butler) to assist guests. These robots can move around the hotel, call guests when they approach their rooms for room service, and deliver orders (Tung and Law, 2017) [49]. In 2016, Hilton Hotels launched a robot concierge named 'Connie'. It can communicate with guests, answer their questions, and provide information about activities in the immediate vicinity of the hotel (Yılmaz, 2019) [57]. M. Social Singapore introduced a robot named Aura to use in room service in 2016. Thanks to IoT technology, the robot detects missing items in rooms, uses elevators to go to the right room, and delivers small items such as bottles, water, banquet supplies, and towels (Karaman *et al*., 2019: 54) [31]. Furthermore, when guests approach their room doors, a notification is sent to their phones, and they can obtain missing items in the room via the robot named Aura (Okatan and Yıldırım, 2021: 179) [44]. The Ausca chef robot, which operates in the hotels of the Millennium Hotels and Resorts group, was introduced in 2017 (Ayyıldız and Eroğlu, 2021: 1107) [5]. Ausca can currently only make scrambled eggs and omelettes for guests (Yalçınkaya *et al*., 2018: 93) [55]. Yotel New York uses robots to carry and place guests' belongings (Okatan and Yıldırım, 2021: 60) [44]. The robots used in hotel businesses are mostly service robots classified as social robots (Akmaz and Kale, 2020: 163) [2].

Businesses in our country also use smart technologies. The Cloud 7 Hotel in Istanbul stands out for its reception-free lobby concept, where check-in and check-out are handled entirely through smartphone applications (Yalçınkaya *et al*., 2018: 94) [55]. Divan Istanbul Hotel, in collaboration with Arçelik, uses the smart assistant Asista, which was developed by Arçelik, in 191 rooms. Guests can control lights and curtains, air conditioning, and TV using voice commands (Karaman *et al*., 2019: 55) [31]. In addition to providing guests with real-time information such as weather, traffic conditions, exchange rates, and time, Asista can also provide information about services including the city's best restaurants, tourist attractions, and nearby shopping malls (Yalçınkaya *et al*., 2018: 95) [55]. Adam & Eve Hotel in Belek, Antalya offers customised colour lighting in rooms and transforms each room, and even each jacuzzi, into a light therapy centre by adjusting lighting to sound frequencies. This practice prioritises guests' personal experiences and emphasises comfort and an innovative service approach (Mil, 2014: 24) [42]. Hilton Antakya Museum Hotel has adopted environmentally friendly smart applications, such as Energy Saver cards for lighting systems and room access, to support energy conservation (Yalçınkaya *et al*., 2018: 95) [55].

High-tech applications in hotels will offer guests technology-based options (Erçetin, 2023: 49) [17]. As a result, traditional hotels will be replaced by smart hotels utilising automation and artificial intelligence. Advancing technology can offer certain situations to guests such as robots replacing hotel staff, neurotechnology enabling guests to program their dreams, personalized service experiences based on guests' DNA analysis, hotel room doors opening with facial recognition technology, interactive walls creating soothing scents and music in rooms considering the guest's emotional state, and personalized pillows and mattresses using neurofeedback technology (Taşcı, 2022) [47]. Robotic technologies and automation systems in hotel businesses are likely to become a significant part of accommodation services in the future, and services such as spa treatments, airport transfers, and dinner reservations are expected to be offered through personalised interactions that take into account guests' individual preferences, rather than automated emails. Some identity protection systems, particularly biometrics (personal biological characteristics), will be developed to keep guests safer. Robots will bring breakfast to guests, and drones will serve hamburgers. Robots are even estimated to make up 25% of the workforce in hotel businesses by 2030 (Bowen and Moroson, 2018) [8].

With VR technology, guests will be able to stay in hotel rooms with different themes, and rooms that can be customised to their needs and preferences will become more common (Bağçı and İçöz, 2019) [6]. The eco-hotel model is also projected to gain popularity and become more widespread (Durmaz and Güneş, 2020) [15]. A new product expected to appear in hotel businesses soon is the Glo-Pillow, which has an adjustable timer. It is designed to gradually illuminate the pillow 40 minutes before the set time to gently wake the user (Durna and Babür, 2011: 79) [16]. This concept, which can also be described as an eco-hotel, is an accommodation model that saves electricity, water, and energy, prevents food waste, and manages waste through a system of reducing, recycling, and reusing (Kıvılcım, 2023: 166) [35]. The mobile hotel, intended for travellers, is a future concept in which accommodation is self-constructed on wheels, eliminating the need for guests to search for hotels and allowing the hotel to travel with

them (Kıvılcım, 2021) [34]. Collins (2006) [10] predicted that polar orbit hotels, co-orbital hotels, elliptical orbital hotels, lunar orbit hotels, and lunar pole hotels will be built in space in the future (Kıvılcım, 2023) [35]. Although no space hotels have been built yet, they are expected to become a trend in the future (Strickland, 2012) [46]. Furthermore, three-dimensional printing is anticipated to play a significant role in future hotels. Thanks to three-dimensional printers, people will no longer need suitcases when going on vacation; clothing, shoes, pharmaceuticals, and even computers can be produced for guests using these printers (Carton, 2016; Turdubaeva, 2022) [9, 50]. Dr James Carton, in his research on the future of hotel rooms by 2060, proposed that digital hotels could be equipped with a broad range of smart and technical equipment (Carton, 2016) [9]. These features include (Canton, 2016; Turdubaeva, 2022; Kıvılcım, 2023) [9, 50, 35] ab

- Room access through facial recognition systems,
- Talkback feature on televisions,
- Touch-sensitive, reactive, and interactive surfaces throughout the room,
- Mirrors and smart bathrooms providing real-time news feeds,
- Walls that alter the room's atmosphere with various aromatic scents in response to stress levels,
- A comfortable sleep experience,
- Nanotechnology towels,
- Automatic wireless temperature control,
- Beds and pillows equipped with nanotechnology,
- Holographic music events,
- 3D printers,
- Cooking and massage methods based on DNA structure,
- Rooms that change on demand and beds enabling dream selection,
- Travel avatars,
- Eco-hotels,
- Hotels offering augmented and VR technologies,
- Themed hotels.

Furthermore, there are various academic studies on smart tourism technologies conducted from 2015 to 2024. The table below reviews these studies.

Table 2: Research on Smart Tourism Technologies between 2015 and 2024

Author\ Authors	Year	Purpose of the study	Findings of the study
Gretzel	2015 [20]	This theoretical study aims to clarify the basic components of the smart tourism concept.	The primary elements of smart tourism are identified as smart destinations, smart business ecosystems, and smart experiences. Additionally, the research comprehensively examines current trends in smart tourism and explores their potential benefits and drawbacks.
Jaremen *et al*.	2016 [27]	The objective is to identify the advantages of smart hotels and their distinguishing features compared to traditional hotels.	Findings indicate that smart technology enables automation, reduces employment, lowers operating costs, and increases product and service delivery. Additionally, the online reservation system sends automatic confirmation messages, supports energy savings, reduces error rates, enhances customer satisfaction, improves staff productivity, facilitates information and document sharing, decreases staff workload and allows more time for process improvement, and facilitates archiving.
Melian-Gonzalez and Bulchand-Gidumal	2016 [41]	A model was developed to examine the relationship between information technologies and hotel performance.	Findings show that information technologies are effective across various dimensions and sub-dimensions determined for hotel performance. The use of information technologies has enabled service delivery with fewer staff thanks to operational efficiency, increased staff turnover, energy savings, and reduced food waste. The study also indicates results such as faster resolution of customer issues, reduced congestion through shorter check-in and check-out wait times, and increased sales resulting from personalized service.
Kırlar Can *et al*.	2017 [33]	The study aims to assess the mobile application usage status among local hotel chains in Turkey and to determine the content and features of the mobile applications used.	Findings reveal that in 2014, only 15% of hotels utilised mobile applications, increasing to 22% in 2016. While these rates have increased over the years, they remain relatively low. For hotels with mobile applications, the most common mobile application features used to reach users are communication categories, such as address, phone number, and email. Furthermore, the most commonly used categories are room information, food and beverage options, and photo galleries. In contrast, the least frequently utilized mobile applications are those providing destination information, campaigns and offers, in-hotel use, and mobile reservations.
Lai and Hung	2017 [39]	This study outlines the development process of the smart room control service and virtual housekeeping services at the Fleur de Chine Hotel in Taiwan.	The smart room system comprises two main technologies: RFID and Room Master. Additionally, when virtual housekeeping and hotel services are integrated, staff can monitor their work processes and provide guidance to guests.
Ünsal	2018 [52]	The study examines the smart technologies used in tourism and their contributions to enriching tourists' experiences.	The findings indicate that people are increasingly opting for mobile applications, in line with technological innovations, rather than traditional methods for vacation purchases or reservations. In addition, tourists with extensive travel experience throughout the year are more likely to adopt smart technologies during their travels.
Leung	2019 [40]	The study, conducted with nine hotel stakeholders in Taiwan, seeks to define the	The results reveal inconsistencies in stakeholders' views on smart hotels. They defined the concept of smart hotels using concepts such

		concept of smart hotels, outline expectations for smart hotel applications, and identify barriers to implementing smart technologies.	as revenue boost, operational efficiency, in-room automation, and personalized services. However, it has been determined that elements such as big data, social media monitoring, robotics, and artificial intelligence are not addressed in the implementation of smart technologies. The findings also indicate that smart technologies face several bureaucratic barriers during implementation.
Atay *et al*.	2019 [3]	The study aims to evaluate the services provided to tourists during their stay based on smart hotel applications with technological advancements.	The study concludes that smart hotel applications are implemented in two themes: mobile applications and personalized services. Mobile applications encompass 'one-touch applications', online check-in, and online check-out services, while personalized services involve 'user profile notes' and customised room service. Furthermore, the results indicate that due to the high costs of automation infrastructure for smart hotel applications, only a limited number of smart hotel criteria have been implemented in the hotels included in the study.
Akar *et al*.	2019 [1]	To examine the digital transformation of hotel businesses, a content analysis was conducted utilizing data collected from three general managers and one assistant manager at three hotels in Antalya. The hotels are part of a group that operates 25 hotels across seven countries.	The findings indicate that digital transformation practices including mobile applications, personalized services, smart hotel automation, asset and staff tracking, and performance management systems are implemented in these businesses. These practices aim to enrich guest experiences, enhance operational efficiency, manage reputation, improve security, conserve energy, and establish a sustainable business model.
Karamustafa and Yılmaz	2019 [32]	The study evaluates accommodation managers' perceptions of the potential benefits of smart tourism technologies.	The results suggest that business managers have the perception that smart tourism technologies will significantly increase room sales and enhance the image of the business, as well as enable the business to save a great deal of time.
Tekin	2019 [48]	The study identifies the benefits that web- and cloud-based applications provide to hotel businesses.	The findings indicate that web-based hotel management systems using cloud technology reduce costs, simplify management, expand promotional opportunities and awareness in social media and the global market, increase the number of reservations, facilitate front office process management, and improve customer relations and loyalty management.
Yılmaz	2019 [57]	The study aims to determine the extent of smart tourism technology adoption in hotel businesses and to examine whether the benefits of these technologies differ across specific demographics and professional factors of participants and certain organizational characteristics.	The findings show that mid- and senior-level managers in accommodation businesses are knowledgeable about Internet of Things and artificial intelligence technologies yet have no intention of implementing them in their businesses, while currently utilizing mobile communication and cloud computing technologies. Additionally, managers believe that smart tourism technologies will significantly increase room sales, enhance the business image, and save considerable time. Also, participants' perceptions of the benefits of smart tourism technologies vary by their department, position, and the type and class of business.
Zencir and Emir	2019 [60]	The study aims to investigate the extent to which hotels in Eskişehir use smart hotel applications, as well as hotel managers' perspectives and recommendations on these technologies.	The findings indicate that hotel managers believe that the cost of transition to smart hotel applications is high. This high cost constitutes a significant barrier to the widespread adoption of smart technologies. Furthermore, although hotel managers acknowledge the long-term benefits of smart hotel applications, they stress the need for a comprehensive cost-benefit analysis before implementation.
Çolak and Karakan	2020 [12]	The study aims to determine the extent to which hotel businesses in Gaziantep implement smart technologies and to assess managers' perceptions of the importance of these applications.	The findings reveal that smart hotel applications are adopted in a limited number of hotels in Gaziantep and at a basic level. The reasons for this have been identified as high implementation costs, inadequate technological infrastructure, and feasibility challenges.
Kafa *et al*.	2020 [29]	The study explores the perspectives of managers in tourism businesses in Eskişehir regarding smart tourism applications.	The results indicate that business managers consider smart tourism technologies essential to the sector and believe they enhance business competitiveness. Additionally, it was found that although almost all businesses have modules and applications supported by smart systems, their use in these businesses remains underdeveloped. The primary obstacles to development stem from economic constraints, insufficient infrastructure, and market conditions.
Yazıcı Ayyıldız and Ayyıldız	2020 [56]	The study aims to examine the smart tourism potential of Kuşadası and find out the opinions and evaluations of tourism stakeholders on the applicability of the smart tourism model in Kuşadası.	The findings conclude that Kuşadası remains in the early stages of adopting smart applications, but smart tourism applications are used by hotel businesses and travel agencies.
Türkay	2021 [51]	This study investigates changes in consumer perceptions of trends and consumption during the digital transformation process, as well as the impact of smart tourism technologies on hotel businesses.	Managers place the highest value on mobile technologies and applications, sensors, big data management, contactless guest processes, RFID technology, artificial intelligence technology, Wi-Fi, and security systems. Additionally, digital technologies are found to provide hotels with benefits including energy savings, sustainability, competitive advantage, increased profitability, enhanced guest satisfaction, improved tracking systems, image

			creation, ease and speed of processes and applications, competitor analysis, and rapid feedback.
Hazarhun and Yılmaz	2021 [24]	This study provides an in-depth analysis of guests' perspectives on smart tourism technologies that are currently used in accommodation businesses or expected to be used in the future.	Guests in accommodation establishments have indicated that they prefer to receive service with a hybrid (human and technology) system, and that the widespread adoption of smart tourism technologies in accommodation establishments will increase employment across various professions. Reported benefits of smart tourism technologies in accommodation establishments include the widespread use of smart tourism technologies, reduced costs, fewer operational errors, and more personalized guest services. In contrast, the drawbacks of smart tourism technologies include unemployment, loss of elderly customers, and increased energy dependency these technologies create in accommodation establishments.
Demir	2021 [13]	This study assesses the advantages and disadvantages of technologies by reviewing the literature on artificial intelligence technologies and smart hotel applications in the business processes of accommodation establishments.	The findings indicate that AI technologies and smart hotel applications are prevalent in chain hotels and 4- and 5-star hotels, and this is associated with financial resources. Furthermore, AI technologies and smart hotel applications have been found to offer advantages, including enhanced guest satisfaction, increased revenue, and streamlined business operations. However, disadvantages include challenges in ensuring data security and workforce reductions.
Hazarhun	2022 [23]	This study explores the level of use and experience with smart tourism technologies among employees and managers in tourism enterprises.	Commonly used tourism technologies in accommodation establishments include online software and e-applications such as cloud technologies, big data, websites, QR codes, mobile applications, social media, e-invoicing, human resources software, e-accounting receipt applications, ledger declaration systems, e-statements, and electronic notification systems.
Turdubaeva	2022 [50]	The study examines the extent to which smart tourism technologies are used in hotels in Bishkek and identifies the types of smart applications employed to provide guest services.	The majority of managers believe that using smart tourism technologies increases room sales, service quality, and customer satisfaction, while saving time and providing a competitive advantage. However, they also report increased operating costs. The results indicate differences in participants' perceptions of the potential benefits of smart tourism technologies based on gender, age, education, sector experience, and hotel star rating.
Güleryüz	2022 [21]	The study examines the perspectives and perceptions of smart tourism among managers working at a five-star hotel in central Izmir, Turkey.	The findings indicate increased awareness of the concept of smart tourism; however, hotels have not yet been fully digitized, and a completely unmanned hotel may lack emotional engagement, which is not considered a desirable outcome. It has been found that convenience, speed, technology, and customer satisfaction are emphasized regarding the perception of smart tourism,
Zengin and Bayhan	2023 [61]	The study examines the perceptions of tourism stakeholders regarding the benefits derived from using smart technologies and identifies potential obstacles to their implementation.	The findings conclude that tourism stakeholders have positive perceptions that smart technologies reduce overall costs, enhance customer satisfaction, streamline business processes, strengthen business image, and provide a competitive advantage. However, potential barriers to implementing smart technologies include high initial investment costs, insufficient qualified personnel, inadequate infrastructure, security concerns, and the need for human labour in the service sector.
Yılmazer and Çakmak	2023 [59]	The study aims to determine the perspectives on smart technologies and smart hotel applications used in accommodation businesses at a conceptual level.	The findings indicate that smart tourism tools and applications are not widely used in accommodation businesses, primarily due to high costs. However, the study also predicts that accommodation establishments will experience significant changes in the near future.
Gürsoy and Çalhan	2024 [22]	The study examines digital applications for both guests and employees across different departments.	The findings conclude that digital transformation in accommodation establishments accelerates industry change, reduces costs and enhances competitive advantage, increases operational efficiency and performance, and creates personalized guest experience. Additionally, digital applications facilitate payment and reservation processes, provide orientation training for staff, and employ facial recognition and smart key systems for room check-in and check-out to make guests feel more secure within the establishment.

Conclusion and Recommendations

Today, hotel businesses have evolved beyond being places that merely meet guests' basic needs; they utilize technology to become places that offer comfortable accommodation services with attention to every detail. Through technology, businesses increase efficiency, gain a competitive advantage, and improve their image and prestige, thus differentiating themselves from competitors. Businesses can offer higher-quality services by selecting technologies that are compatible with their technological infrastructure and integrating these technologies into the systems used within the hotel. It is preferred to provide information about the technologies used in businesses and hotel services to help guests make informed decisions and take advantage of hotel facilities more easily. Furthermore, robots, artificial intelligence-based services, and virtual and augmented reality technologies, now available in hotels, not only enhance the guest experience but also maintain image and

sustainability by offering personalized services and utilizing numerous technological features.

Based on the findings of this study, the recommendations for the sector are as follows.

- Smart tourism technologies used in hotel businesses often have infrastructure problems and require significant investment, so investment decisions should be made with careful consideration of the hotel's circumstances.
- Smart tourism technologies used in hotels can increase their revenue by enhancing the business image and improving guest experiences.
- Thanks to smart tourism technologies, hotel businesses can achieve greater sustainability and savings by utilising technological systems.
- Excessive use of smart tourism technologies in hotel establishments and a fully technology-based approach may cause third-age tourism guests to prefer the establishment less.
- The use of robotic technologies in hotel establishments and the inability to convey emotional states to guests may result in guest dissatisfaction and potential client loss.

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