

Digital Evolution in Tourism Sector: Transition to Industry 5.0 and Integration of Smart Applications to Hotels in Edremit Gulf

Oguzhan Dulgaroglu  ¹
Seznur Avan  ²

1. Balıkesir University, Burhaniye Faculty of Applied Sciences, Department of Tourism Management, Balıkesir, Türkiye

2. Balıkesir University, Institute of Social Sciences, Department of Accommodation Management, Balıkesir, Türkiye

ABSTRACT

Industrial revolutions have transformed economic structures and societal lifestyles significantly. Industry 4.0 has brought digitalization, artificial intelligence, the internet of things, and automation technologies to business processes. On the other hand, Industry 5.0 emphasizes a human-centric approach by integrating human intelligence with technological systems. This study examines the transition of 4- and 5-star hotels in the Edremit Gulf from Industry 4.0 to Industry 5.0 and evaluates the effects of smart applications on hotel operations. Semi-structured interviews have been conducted with hotel managers in the study. Data collected from hotel managers has been analyzed using content analysis technique. The findings show that smart applications enhance customer satisfaction and operational efficiency, while AI-supported customer analytics reduce complaints and increase re-stay intentions. Managers receiving in-house training adapt to digital transformation more effectively. Although digitalization improves service quality, reduced human interaction may weaken customer relationships. Overall, the study supports the human-centered transformation principles of Industry 5.0 and provides practical recommendations to help hotels achieve competitive advantage.

KEYWORDS

Industry 5.0, Hotel Businesses, Smart Hotel Applications, Edremit Gulf.

ARTICLE HISTORY

Received 12 September 2025 Accepted 12 May 2026

1. Introduction

The relationship between humans and their environment should be viewed as that influences and shapes each other. Every action a person takes, whether small or large, can cause significant changes throughout the world. For example, discoveries such as fire, the wheel, and the telephone have changed human life and made it more comfortable from the moment they appeared. These inventions have formed important turning points in world history and have aimed to improve life (Ozden, 2022). Throughout different stages of human history, social structures have undergone major transformations. Each new phase has reshaped humanity's relationship with its environment and guided the development of society. Every invention developed by humans has the potential to influence not only its own era but all human history. Looking at the developmental timeline of human history, we see the emergence of the hunter-gatherer society (Society 1.0), the emergence of the agricultural society (Society 2.0), the industrial society following the industrial revolution (Society 3.0), the knowledge-based society (Society 4.0), and today's smart society or super-smart society (Society 5.0), which goes beyond the information society (Fukuyama, 2018). In other words, while mechanical production methods powered by steam and water were developed during the first industrial revolution, electricity came to the fore during the second industrial revolution, and mass production began on the production line. With the third industrial revolution, information technologies became an indispensable part of daily life. The Fourth Industrial Revolution has been shaped by advanced technologies such as the Internet of Things (IoT), big data, artificial intelligence (AI), and robotics (Dulgaroglu, 2021; Iyigunor, 2022). One of the main examples of these advanced technologies finding application in the tourism sector is automation systems. Automation systems are among the most prominent technological advances today. The acceleration of mechanization in the hotel sector and the continuous increase in innovations related to these systems have made the value of automation even more apparent. Observations show that many tasks in hotel management can be performed more efficiently and easily thanks to automation technologies. In particular, the secure digital recording of guest information and the execution of accommodation processes through these systems greatly facilitate management activities (Dulgaroglu, 2024a). Such digital solutions require not only businesses but also societies to integrate with technology. In this context, approaches that go beyond automation are becoming increasingly important. The Society 5.0 concept is a highly innovative concept for countries and communities striving to adapt in the era emerging after the fourth industrial revolution (Demirci Celep, 2020). These developments pave the way for accelerated digital transformation in the tourism sector, the automation of service processes, and the widespread adoption of data-driven management practices. Within the scope of the Society 5.0 vision, artificial intelligence, robotic systems, and big data technologies offer innovative solutions that both personalize the customer experience and increase business efficiency in tourism (Iyigunor, 2022; Dulgaroglu, 2024b). This situation contributes to tourism evolving beyond being merely an economic activity into a strategic sector integrated with smart society goals.

With the Industry 5.0 revolution and the increasing presence of smart applications in our lives, workers are expected to experience less fatigue. Smart systems are expected to be more deeply integrated into production and supply chains. This can lead to increased productivity and operational performance in production. In addition, smart solutions and environmentally friendly applications are expected to come to the fore, reducing workplace accidents and production times (Nahavandi, 2019). Industry 5.0 technologies can facilitate innovation and adaptation to environmental conditions for businesses in rapidly changing markets. In this context, artificial intelligence, the Internet of Things, and cyber-physical systems can increase business efficiency. This enables them to balance supply and demand more effectively. These technologies help companies optimize their operations more flexibly and quickly, enabling them to rapidly adapt to changes in the market (Kumar et al., 2023). Hotel managers, while technologies reduce time and labor costs in business processes (Buhalis & Law, 2008), also aims to improve service quality (Tuominen & Ascensão, 2016).

This study examines the transition process from Industry 4.0 to Industry 5.0 and the effects of smart technologies on 4- and 5-star hotels in the Edremit Gulf of Balıkesir Province, a region of significant tourism importance located in Türkiye's Western Marmara region. The region has distinct characteristics in terms of both natural resources and infrastructure capabilities and faces certain challenges in terms of

tourism management compared to other tourism regions in the Mediterranean. The study aims to analyze management experiences related to smart applications through interviews with hotel managers. This process highlights the importance of the human factor in implementing and developing technological evolution, creating impacts on employment and competency requirements in hotel businesses. The study identifies the effects of digitalization, which is intensifying across all sectors with Industry 5.0, on the performance of tourism businesses and develops recommendations for the evaluation of smart applications in the tourism sector.

2. Literature Review

2.1 Industry 4.0 and the Distinctive Features of Industry 4.0

Industry 4.0 is an innovation process that aims to create smart and autonomous production structures by bringing together companies' communication networks, digital technologies, and cyber-physical systems. This transformation enables companies to increase their technological capacity, respond more quickly to customer needs, and enhance their competitive strength (Yalçiner, 2020). New hardware aims to be low-cost, more efficient, smaller in size, and highly reliable, unlike traditional hardware. In addition, the operating systems and software that will run this hardware are also expected to be more efficient in terms of resources and memory. The Industry 4.0 process can take place in three stages. The first stage begins with the Internet of Things (IoT), where machines communicate wirelessly with each other. The second stage is based on the Internet of Services (IoS), which refers to new digitalized service areas. The third and final stage is cyber-physical systems; these are self-managing and self-operating systems that act as copies of virtual environments through sensors (Marangoz et al., 2022). Thanks to its broad scope, Industry 4.0 can eliminate deficiencies in industry by enabling the convergence of physical and digital systems. The transition to a technology-based production process and the promotion of more efficient use of resources are expected to increase the competitiveness of businesses. Therefore, Industry 4.0 is of critical importance for all countries and societies (Wang et al., 2016; Imamoglu et al., 2021).

The rapid spread and development of Industry 4.0 applications, the use of smart systems in manufacturing and industrial fields is expected to expand. Acatech's Industry 4.0 forum final report lists the significant innovations offered by this era as follows (Acatech, 2013):

- The global interaction of storage systems and machines,
- The development of smart products equipped with location information, the emergence of products that are each unique and can determine their own location,
- The establishment of smart factories that can adapt to product characteristics and enable more efficient use of resources,
- The emergence of new business models using Big Data, particularly the development of new services,
- A new social infrastructure in the workplace for employees and a work structure that takes individual differences into account,
- Better work-life balance,
- The ability to respond quickly to individual consumer demands,
- Increased capacity for engineering and instant problem solving through the development of smart software.
- These innovations demonstrate that the digital transformation brought about by Industry 4.0 will have a significant impact on the business world and social life.

2.2 Industry 5.0 and Enabling New Technologies

While Industry 4.0 was still gaining traction, Japanese Prime Minister Shinzo Abe introduced the concept of Society 5.0 at the CEBIT IT Fair held in Hannover, Germany, in 2017. Society 5.0 is also referred to as Industry 5.0. The fundamental philosophy behind this concept is based on the idea that technology should be accepted not as a threat to society, but rather as a supportive tool (Develi, 2017). The foundation of So-

ciety 5.0 is the collection of data from the real world, the processing of this data using computers, and the application of the results back into the real world (Alkaya, 2022). The main goal of Society 5.0 is to ensure that technological advances are integrated in a way that is compatible with society (Okan Gökten, 2018). The Industry 5.0 model aims to create a new industrial revolution that uses Industry 4.0 technologies to achieve social goals such as sustainability. This model is shaped not only by technological developments but also by a transformation that will provide social benefits (Sadic, 2021). European Commission (2020), has defined six enabling technologies for Industry 5.0. These are;

- Personalized human-machine interaction technologies that connect and combine the strengths of humans and machines,
- Smart materials and technologies supported by embedded sensors that enable materials inspired by biology and with recyclable properties to be equipped with advanced features,
- Technologies that enable holistic modeling of systems such as digital twins and simulations,
- Data transmission, storage, and analysis technologies that can manage data and system interoperability,
- Artificial intelligence technologies,
- Energy efficiency, renewable energy, and storage technologies.

Industry 5.0 aims to bring about a more sustainable, flexible, and human-centered transformation in production processes by combining these technologies. Advances in artificial intelligence technologies, one element of this transformation, are creating significant advantages in many areas, including the tourism sector (Xu et al., 2021). These innovative systems are among the technological tools increasingly adopted by the tourism industry. Artificial intelligence solutions play a critical role in solving problems encountered in service delivery and management processes. Thanks to these developing technologies, work processes for both managers and employees in tourism sub-sectors such as accommodation, transportation, aviation, and museums are becoming more efficient (Dulgaroglu, 2024b).

2.3 The Transformation of Hotel Operations with Smart Applications

Hotel businesses are economic entities that prepare, produce, and ultimately provide added value by offering tourist products and services based on economic principles to meet tourists' accommodation, food, and beverage needs, as well as certain levels of entertainment and other social requirements (Sener, 1997). These businesses organize their services to meet the needs of visitors and generate economic value (Oztekin & Ilhan, 1994). Hotel businesses, one of the types of businesses in the tourism sector, are also notable as a labor-intensive field. In this sector, the human-centered nature of the service highlights that the attitudes of employees are an important factor that directly affects the quality of the goods and services offered. Employee behavior plays a decisive role in the production and delivery of the service and is one of the factors that most influences the final quality (Kantarci, 1997).

Industry 5.0 technologies can facilitate innovation and rapid integration for businesses in rapidly changing markets. In this context, productive artificial intelligence, the Internet of Things, and cyber-physical systems aim to maximize production efficiency by increasing the balance between supply and demand for companies. These technologies improve overall output performance by providing businesses with greater flexibility and responsiveness (Kumar et al., 2023). The concept of a smart hotel can be defined as accommodation businesses where operational activities are carried out in harmony with technology through the integration of smart applications into hotel management processes (Ercan, 2019). Smart hotels provide competitive advantage by creating an innovative business model in the accommodation sector. These hotels automate their services using data-driven systems, advanced technologies, and solutions that require no human intervention (e.g., artificial intelligence (AI) and the Internet of Things (IoT)). This technological infrastructure is one of the fundamental characteristics of smart hotels and enables their differentiation within the sector (Kim et al., 2020).

2.4 Related Studies

Research conducted in the hospitality industry after 2011 has examined the impact of digital technologies on the sector in a multidimensional manner. Iranmanesh and colleagues (2022) reviewed 79 articles to assess the contributions of digital tools such as artificial intelligence, mobile applications, virtual reality (VR), and social media to hotel performance. The study noted that these technologies have positive effects, particularly on financial efficiency, service quality, and competitiveness, but that there are significant gaps in the literature regarding employee perspectives, innovation, and cybersecurity. Similarly, Dang and Nguyen (2023) analyzed value creation processes with customers in the digital age and revealed that artificial intelligence and Metaverse applications make the customer experience in tourism more interactive and personalized. These studies show that digitalization brings not only operational but also experiential transformation.

Post-COVID-19 studies have focused on the implementation processes of digital transformation. García-López, Galindo-Pérez-de-Azpíllaga and Foronda-Robles (2025) examined the levels of digitalization in hotels in the Andalusia region and identified economic constraints, integration problems, and lack of staff training as the main obstacles. Wynn and Lam (2023), based on interviews with information technology managers in the hospitality sector, emphasized that digitalization should be approached not only through technical infrastructure investments but also through factors such as strategic orientation, employee compliance, and system integration. Zeqiri (2024) also noted that digital platforms have transformed traditional hotel management practices in marketing and reservation processes, creating more flexible and technology-focused business models.

Recent studies have shown that digitalization has gained a human-centered dimension with the Industry 5.0 approach. Gangwar and Reddy (2023) emphasized that advanced technologies increase satisfaction by personalizing the guest experience, but that the human factor remains important. Ghazy and Fedorova (2022) examined hotel employees' attitudes toward collaboration with robots, noting that while employees view technology positively in terms of efficiency, they express concerns about job security and lack of interaction. Gajić and colleagues (2024) demonstrated that the integration of artificial intelligence and the Internet of Things (IoT) make significant contributions to operational efficiency and environmental sustainability. Finally, Colak (2024) emphasized that globally scaled unmanned smart hotels reduce costs through artificial intelligence and automation, but the lack of human contact remains a limiting factor in the user experience. These findings indicate that the hospitality industry's digital transformation process requires a balanced approach to technological innovation and the human element.

Previous studies have examined the impact of digital technologies on the hospitality industry, but they have mostly focused on general-level applications and performance outcomes, providing limited information on local-scale studies and human-centered assessments based on hotel managers' experiences (Iranmanesh et al., 2022; Dang & Nguyen, 2023; García-López et al., 2025). The significance of this study lies in filling this gap in the literature by directly revealing managers' experiences in the transition to Industry 5.0 and the managerial and operational impacts of smart applications through interviews conducted at 4- and 5-star hotels in the Edremit Gulf, thereby guiding the future.

3. Methodology

This study aims to examine the transition process from Industry 4.0 to Industry 5.0 in 4- and 5-star hotels in the Edremit Gulf and the effects of smart applications. The research was conducted using a qualitative research model. Qualitative research is an observation and commentary-focused approach that aims to develop an in-depth understanding of the subject matter. This method allows the researcher to examine and understand the problem in its natural environment under real conditions and is generally geared towards the detailed exploration of phenomena (Guba & Lincoln, 1994; Klenke, 2016). Data was collected using interview techniques. Semi-structured interview forms were used in interviews with hotel managers in the Edremit Gulf. Interviews with hotel managers were conducted using an interview form consisting of five research questions. The interview form was prepared using tourism literature related to smart applications. In addition, the opinions of twenty experts in the field of tourism were consulted.

Five are Associate Professor Doctors and five are Professor Doctors who teach in the field of tourism of the 20 individuals consulted for expert opinions. The other 10 individuals were selected to provide expert opinions and included three General Managers, three Front Office Department Managers, two Food & Beverage Department Managers, and two Executive Chefs who already use smart applications. Thus, both academic and tourism professionals' opinions were sought when formulating the research questions. The research questions prepared by drawing on the relevant literature and expert opinions are as follows (Karakus, 2020; Çolak & Karakan, 2021; Baykal & Yazıcı Ayyıldız, 2022; Durmaz, 2023):

- What are your hotel's initiatives regarding smart applications in the context of digital transformation?
- What advantages could your business gain from implementing smart applications?
- What are the disadvantages of smart applications for hotel managers?
- How do smart applications affect the competitive environment for hotel businesses?
- What are your suggestions for the widespread adoption and development of smart hotel applications in Türkiye?

The study was conducted using a case study design, and managers' experiences were examined in depth. Data collected through interview forms were analyzed and evaluated using content analysis techniques. Although content analysis is a technique that can be used in both qualitative and quantitative research, it is generally used to examine content in mass media (Sallan Gül & Kahya Nizam, 2021). This method aims to identify, classify, and interpret the fundamental elements of a text or discourse. Content analysis is conducted objectively by adopting a systematic and methodological approach (Robert & Bouilaget, 1997). The population of the study consists of individuals working in managerial positions at accommodation establishments in Türkiye, while the sample consists of hotel managers in the Edremit Gulf.

Purposive sampling was used to collect data in this study. Purposive sampling method has actually developed as part of the qualitative research process. This method allows for the examination of situations with in-depth knowledge on a specific topic, thereby offering the researcher the opportunity to obtain richer and more meaningful data (Yildirim & Simsek, 2000). Accordingly, the sample was determined from among 4- and 5-star hotel businesses affiliated with the Ministry of Culture and Tourism and located in the Edremit Gulf region, which use smart applications and have experienced the digital transformation process actively. It has been determined that only ten hotels use smart applications among the 4- and 5-star hotels in the region. Therefore, the purposive sampling method was employed in this study. Hotels that using smart applications of six are 5-star hotels and four are 4-star hotels, all of which are included in the scope of the study. Serving in managerial positions, being directly involved in the digitalization process at the decision-making and implementation levels and having at least three years of managerial experience were considered the main selection criteria for participants. These criteria aimed to reach participants with the knowledge and experience necessary to directly respond to the research questions. In addition, face-to-face interviews were conducted with the participants selected through purposive sampling between 20.05.2025 and 20.08.2025. The interview technique is referred to as an interview in some sources. According to this definition, an interview is a conversation between two or more people conducted for a specific purpose and within a specific framework (Coskun et al., 2017). Each interview lasted an average of 45 minutes, and all interviews were audio recorded to collect data. This method provides in-depth information on the impact of smart applications on hotel businesses.

Relevant literature and previous studies were utilized while preparing the interview form. The research questions were determined based on a literature review on digital transformation and smart hotel applications. The research questions were developed in line with the findings and recommendations of Karakus (2020), Çolak and Karakan (2021), Baykal and Yazıcı Ayyıldız (2022) and Durmaz (2023). The study includes the responses and evaluations provided by 20 participants consisting of four General Managers, four Front Office Managers, four Food & Beverage Managers, four Executive Chefs, two Assistant Front Office Managers and two Assistant Food & Beverage Managers working in hotel businesses to the research questions. As selection criteria, it was considered that participants were directly involved in the decision-making and implementation stages of their businesses' digitalization process and had at least three years of managerial experience. These criteria ensure that participants possess the knowledge and experience relevant to the research questions. The participants' identities were kept confidential and each

participant was assigned a code. A total of 20 participants were interviewed and each participant was numbered from P1 to P20 in a manner known only to the researcher.

4. Results

The findings section of the study presents data collected through interviews. This data was transferred to a digital format, resulting in 37 pages of raw data. The raw data collected was examined using content analysis and placed within a conceptual framework. Various codes have been developed in line with these concepts, and these codes have been classified according to their similarities and differences. The first research question is directed at participants' work on smart applications in their hotels in terms of digital transformation. The findings regarding the answers to the first research question asked to participants, "What are your hotel's efforts regarding smart applications in terms of digital transformation?", are presented in Table 1. The themes that emerged in the participants' views on what your hotel's smart application efforts are in terms of digital transformation, the categories of the emerging themes, and code examples are presented in Table 1. According to Table 1, the theme that stood out most in participants' views on what your hotel's smart applications are doing in terms of digital transformation was "Digital Infrastructure and Integration Systems" (N=84). The theme "Digital Infrastructure and Integration Systems" was most reflected in the categories "PMS (Property Management System)" and "Internet of Things" (f=20; f=20). The categories "Channel Manager," "CRM," and "Cloud Computing" followed the "PMS (Property Management System)" and "Internet of Things" categories in terms of value (f=16; f=9; f=19).

Table 1. Participants' opinions on the efforts in their hotels regarding smart applications within the scope of digital transformation

Themes	Categories	Code Examples	Frequency (f)	Frequency (N)
Smart Technologies and Automation	Artificial intelligence	In the digital transformation process, our hotel aims to increase operational efficiency with advanced technologies such as Artificial Intelligence and the Internet of Things (P1-P2-P3-P4-P5-P7-P8-P9-P10-P11-P12-P13-P14-P15-P17-P18-P19-P20).	18	
	Automation	Our hotel, which designs the guest experience according to the requirements of the age, features applications such as Automation systems (P3-P5-P10-P11-P12-P15-P17-P19).	8	36
	Personalized service	Personalized services are offered to guests (P8-P9-P13-P16).	4	
	Data analytics	Guest preferences are analyzed through data analytics and CRM applications to provide personalized services. (P1-P5-P15-P17-P19-P20).	6	
Digital Infrastructure and Integration Systems	PMS (Property Management System)	Thanks to software such as PMS, guest relations are managed more effectively (P1-P2-P3-P4-P5-P6-P7-P8-P9-P10-P11-P12-P13-P14-P15-P16-P17-P18-P19-P20).	20	
	Channel manager	Multichannel reservations are easily managed through systems such as channel managers (P1-P2-P3-P4-P6-P7-P8-P9-P10-P11-P12-P13-P14-P16-P18-P20).	16	
	CRM	An intelligent and integrated system has been established by using CRM solutions together (P1-P3-P5-P7-P14-P15-P16-P17-P19).	9	84
	Cloud computing	All these systems operate in the cloud environment and on a secure infrastructure (P1-P2-P3-P4-P5-P6-P7-P8-P9-P10-P11-P12-P13-P14-P15-P17-P18-P19).	19	
	Internet of Things	In our hotel, we implement digital transformation applications such as the Internet of Things (IoT) (P1-P2-P3-P4-P5-P6-P7-P8-P9-P10-P11-P12-P13-P14-P15-P16-P17-P18-P19-P20).	20	

Security and Reliability	Cybersecurity	Data is protected with cybersecurity measures (P2-P3-P4-P5-P6-P7-P8-P9-P10-P11-P12-P13-P14-P15-P16-P17-P18-P19).	18	23
	Cyber-physical systems	We secure this digital structure with cyber-physical security systems (P6-P20).	2	
	NFC	We provide fast and contactless guest check-in with NFC solutions (P3-P16-P20).	3	
Digitalization Processes	Digital check-in/check-out	Digital check-in/check-out and other technologies are increasing guest satisfaction (P1-P2-P4-P6-P7-P8-P9-P10-P11-P12-P13-P14-P16-P18-P20).	15	18
	Digital transformation	Our hotel utilizes applications such as Artificial Intelligence as part of its digital transformation (P2-P4-P18).	3	

Source: Our Elaboration

The theme that stood out most in participants' views on their work with smart applications in their hotels regarding digital transformation was "Digital Infrastructure and Integration Systems," followed by the theme "Smart Technologies and Automation" (N=36). This theme was most reflected in the "Artificial Intelligence" category (f=18). The "Artificial Intelligence" category was followed by the "Automation," "Personalized Service," and "Data Analytics" categories (f=8; f=4; f=6). The theme "Security and Reliability" followed the theme "Smart Technologies and Automation" (N=23). This theme is most reflected in the "Cybersecurity" category (f=18). The 'Cybersecurity' category is followed by the "Cyber-Physical Systems" and "NFC" categories (f=2; f=3). The theme "Security and Reliability" was followed by the theme "Digitalization Processes" (N=18). This theme is most reflected in the "Digital check-in/check-out" category (f=15). The "Digital transformation" categories followed the "Digital check-in/check-out" category in terms of value (f=3).

The findings in Table 1 indicate that hotel businesses focus on digital infrastructure and integration systems during the digital transformation process primarily. In particular, the use of systems such as PMS (Property Management System), the Internet of Things (IoT) and cloud computing has been observed to be prominent. Similarly, Anwar et al. (2024) found in their study that the integration of digital technologies and cloud-based PMS accelerates operational processes in hotels, enhances the quality of services provided to customers and provides a competitive advantage in the industry. Therefore, it can be said that the finding presented in Table 1 is also supported by the literature.

The second question of the research concerns the advantages that hotel managers can obtain through the implementation of smart applications in their businesses: "What advantages could you gain from implementing smart applications in your business?" The prominent themes in participants' opinions regarding the advantages of implementing smart applications in their businesses, along with the categories of emerging themes and sample codes, are presented in Table 2. According to Table 2, the theme that stood out the most in participants' opinions regarding the advantages of implementing smart applications in their businesses was "Efficiency and Business Processes" (N=23). The "Efficiency and Business Processes" theme was most strongly reflected in the "Efficiency" category (f=19). The "Efficiency" category was followed by the values of "Reduced Workload" and "Ease of Workload" categories (f=2; f=2).

Table 2. Participants' opinions on the advantages that can be gained from implementing smart applications in their businesses

Themes	Categories	Code Examples	Frequency (f)	Frequency (N)
Smart Applications and Digitalization	Smart Applications	Smart applications both accelerate and simplify tasks (P1-P2).	2	7
	Automation	Automation capabilities also enhance our performance (P2-P7).	2	
	Data Analysis	Data analysis capabilities also improve our performance (P2-P5).	2	
	Communication Alignment	Communication between departments is also more effective (P8).	1	
Speed and Time Management	Speed	Operations are becoming faster (P1-P2-P4-P14-P15).	5	18
	Time Savings and Gains	It saves time (P3-P6-P7-P8-P9-P10-P11-P12-P13-P16).	10	
	Organization	Work proceeds in a more organized manner (P2-P9-P10).	3	
Efficiency and Business Processes	Efficiency	Efficiency is increasing (P1-P2-P3-P4-P6-P7-P8-P9-P10-P11-P12-P13-P14-P15-P16-P17-P18-P19-P20).	19	23
	Reduced Workload	It reduces employees' workload and facilitates daily tasks (P5-P20).	2	
	Ease of Workload	The operational load is reduced, which also improves service quality and overall efficiency (P16-P20).	2	
Cost and Savings	Cost Reduction	It reduces costs (P1-P2-P3-P7-P8-P9-P11-P12-P14-P15-P16-P17-P20).	13	22
	Reduction in Personnel Costs	Costs are decreasing, and waste is being reduced (P7-P8-P9-P12-P13-P15-P18-P19).	8	
	Prevention of Waste	It reduces costs, prevents waste, and lowers the error rate (P20).	1	
Guest Satisfaction and Experience	Guest Satisfaction	It increases guest satisfaction (P1-P2-P3-P4-P7-P9-P10-P11-P13-P18).	10	14
	Ease of Guest Access	Services are delivered more quickly and accurately, which enhances quality (P5-P19).	2	
	Satisfaction and Loyalty	It increases both satisfaction and loyalty (P5).	1	
	Service Accessibility	Services are delivered more quickly and accurately, which improves quality (P19).	1	
Staff and Human Resources	Reduction in Required Staff	Reducing costs (P7-P8-P9-P12-P13-P15-P18-P19).	8	8
Service Quality and Competitiveness	Competitive Advantage	It allows us to respond more quickly to guests' expectations (P5-P14).	2	16
	Improvement in Service Quality	It directly reflects on both service quality and guest satisfaction (P1-P3-P4-P7-P8-P9-P10-P11-P12-P13-P14-P15-P16-P20).	14	

Source: Our Elaboration

In participants' opinions regarding the advantages that can be gained from implementing smart applications in their businesses, the most prominent theme, "Efficiency and Business Processes," was followed by the "Cost and Savings" theme (N=22). This theme was most strongly reflected in the "Cost Reduction" category (f=13). The "Cost Reduction" category was followed by the "Reduction in Personnel Costs" and "Prevention of Waste" categories (f=8; f=1). The "Cost and Savings" theme was followed by the "Speed and Time Management" theme (N=18), which was most strongly reflected in the "Time Savings and Gains" category (f=10). The "Time Savings and Gains" category was followed by the "Speed" and "Organization" categories (f=5; f=3). The "Speed and Time Management" theme was followed by the "Service Quality and Competitiveness" theme (N=16), which was most strongly reflected in the "Improvement in Service Quality" category (f=14). The "Improvement in Service Quality" category was followed by the "Competitive

Advantage" category (f=2). The "Service Quality and Competitiveness" theme was followed by the "Guest Satisfaction and Experience" theme (N=14), which was most strongly reflected in the "Guest Satisfaction" category (f=10). The "Guest Satisfaction" category was followed by the "Ease of Guest Access," "Satisfaction and Loyalty," and "Service Accessibility" categories (f=2; f=1; f=1). The "Guest Satisfaction and Experience" theme was followed by the "Staff and Human Resources" theme (N=8), which was most strongly reflected in the "Reduction in Required Staff" category (f=8). The "Staff and Human Resources" theme was followed by the "Smart Applications and Digitalization" theme (N=7), which was most strongly reflected in the "Smart Applications," "Automation," and "Data Analysis" categories (f=2; f=2; f=2). The "Smart Applications," "Automation," and "Data Analysis" categories were followed by the "Communication Alignment" category (f=1).

The findings in Table 2 show that smart applications are most commonly associated with the theme of "Efficiency and Business Processes" in businesses with advantages such as "Efficiency," "Reduced Workload" and "Ease of Workload" standing out. According to a study conducted by Zaharia (2025), the implementation of digital services and digital systems in hotels increases process automation, enhances operational efficiency and enables employees to perform their tasks more effectively. Therefore, it can be said that the finding presented in Table 2 is also supported by the literature.

The third research question of the study was designed to gather hotel managers' opinions on the disadvantages that may arise from smart applications: "What are the disadvantages of smart applications for hotel managers?" The prominent themes in participants' opinions regarding the disadvantages of smart applications for hotel managers, along with the categories of emerging themes and sample codes, are presented in Table 3. According to Table 3, the theme that stood out the most in participants' opinions regarding the disadvantages of smart applications for hotel managers was "Technological Problems and Systems" (N=28). The "Technological Problems and Systems" theme was most strongly reflected in the "Technical Issues" category (f=10). The "Technical Issues" category was followed by the "System Failure," "System Malfunctions," "Error Risk," "Risk of Incorrect Information," and "Integration Difficulty" categories (f=8; f=1; f=5; f=2; f=2).

Table 3. Participants' opinions on the disadvantages of smart applications for hotel managers

Themes	Categories	Code Examples	Frequency (f)	Frequency (N)
Performance and Operations	Departmental Differences	It has many disadvantages in departments other than the front office department (P1).	1	4
	Performance Pressure on Employees	It may create performance pressure (P1-P6).	2	
	Continuous Supervision	It may create constant oversight and performance pressure on managers (P6).	1	
Cost and Financial Challenges	High Cost	High initial costs may make it difficult to invest in smart technologies. Additionally, maintenance costs and technical issues of robotic systems and other automation tools can also pose an extra burden for businesses (P2-P3-P7-P9-P11-P12-P13-P14-P15-P18-P19-P20).	12	16
	Time and Financial Disadvantage	In the short term, it creates an additional burden in terms of both time and cost (P16-P19).	2	
	Personnel Employment Cost	Additional training is required for the staff; this also creates an extra burden in terms of both time and cost in the short term (P18).	1	
	Technical Maintenance Requirement	The necessity of employing personnel from different fields with technical knowledge for the regular maintenance and updates of smart systems also translates into a continuous cost element for the business (P18).	1	

Technological Problems and Systems	Technical Problems	Potential technical issues (P2-P3-P4-P10-P11-P15-P16-P17-P18-P20).	10	28
	System Failure	System malfunctions or security vulnerabilities can lead to both operational disruptions and breaches of data security (P3-P8-P10-P11-P15-P16-P17-P20).	8	
	System Malfunctions	Systemic disruptions can lead to both operational interruptions and data security breaches (P18).	1	
	Risk of Error	The inability to immediately correct errors that may occur in applications poses a significant problem (P2-P4-P7-P12-P13).	5	
	Risk of Incorrect Information Circulation	The risk of conveying incorrect information to guests can negatively affect customer satisfaction (P18-P20).	2	
	Integration Difficulty	Disruptions and issues that arise when smart applications are not properly integrated (P2-P16).	2	
Training and Human Factor	Need for Training	Providing training to employees is mandatory (P2-P3-P7-P9-P12-P13-P18-P19).	8	10
	Communication Problems	Communication and coordination between departments will not be effective (P9-P17).	2	
Security and Data Protection	Security Risk	Security risks pose challenges (P3-P7-P14-P15-P16-P17).	6	12
	Cybersecurity Risk	Cybersecurity vulnerability (P7-P14-P15).	3	
	Security Vulnerabilities and Weaknesses	System-related malfunctions or security vulnerabilities can lead to both operational disruptions and breaches of data security (P18-P20).	2	
	Data Privacy Concern	The visibility of big data in hotel reviews to everyone can be perceived as image damage for managers (P6).	1	
Customer Experience and Image	Guest Dissatisfaction	Guests' expectations regarding the hotel may not be met; this can lead to dissatisfaction (P8-P16-P18-P20).	4	7
	Lack of Emotional Contact	Environments lacking emotional contact (P8).	1	
	Cultural Incompatibility	Cultural mismatches and differences in expectations due to not targeting the right guest portfolio (P16).	1	
	Damage to Image	Issues and disruptions that arise when smart applications are not properly integrated (P16).	1	
Positive Opinions	No Disadvantages	Smart applications have no disadvantages for hotel managers (P5).	1	2
	Provides Benefits	Smart applications provide benefits for hotel managers (P5).	1	

Source: Our Elaboration

Among participants' opinions on the disadvantages of smart applications for hotel managers, the most prominent theme was "Technological Problems and Systems", followed by the "Cost and Financial Challenges" theme (N=16). This theme was most reflected in the "High Cost" category (f=12). The "High Cost" category was followed by "Time and Financial Disadvantages", "Personnel Employment Cost", and "Technical Maintenance Requirement" categories (f=2; f=1; f=1). The "Cost and Financial Challenges" theme was followed by the "Security and Data Protection" theme (N=12), which was most reflected in the "Security Risk" category (f=6). The "Security Risk" category was followed by "Cybersecurity Risk", "Security Vulnerabilities", and "Data Privacy Concerns" categories (f=3; f=2; f=1). The "Security and Data Protection" theme was followed by the "Training and Human Factor" theme (N=10), which was most reflected in the "Training Requirement" category (f=8). The "Training Requirement" category was followed by the "Communication Issues" category (f=2). The "Training and Human Factor" theme was followed by the "Customer Experience and Image" theme (N=7), which was most reflected in the "Guest Dissatisfaction" category (f=4). The

"Guest Dissatisfaction" category was followed by "Lack of Emotional Contact", "Cultural Mismatch", and "Image Damage" categories ($f=1$; $f=1$; $f=1$). The "Customer Experience and Image" theme was followed by the "Performance and Operation" theme ($N=4$), which was reflected in the "Departmental Differences", "Performance Pressure on Employees", and "Continuous Oversight" categories ($f=1$; $f=2$; $f=1$). Finally, the "Performance and Operation" theme was followed by the "Positive Opinions" theme ($N=2$), reflected in the "No Disadvantages" and "Provides Benefits" categories ($f=1$; $f=1$).

The findings in Table 3 indicate that, from the perspective of hotel managers, smart applications are most associated with the theme of "Technological Problems and Systems," with technical issues, system failures, malfunctions and integration difficulties being particularly prominent. This suggests that technological barriers are perceived as a significant disadvantage from a management perspective during the digital transformation process. Similarly, García López et al. (2025) found in their study that technical problems such as system integration, application compatibility and deficiencies in technological infrastructure affect the effectiveness of digital transformation in hotel businesses negatively. Therefore, it can be said that the finding presented in Table 3 is also supported by the literature.

The fourth question asked to hotel managers is a research question regarding the impact of smart applications on the current competitive environment: "What effects do smart applications have on the competitive environment for hotel businesses?" The prominent themes, categories, and code examples related to participants' opinions on the effects of smart applications on the competitive environment for hotel businesses are presented in Table 4. According to Table 4, the most prominent theme in participants' opinions on the effects of smart applications on the competitive environment for hotel businesses was "Competition and Market Position" ($N=34$). This theme was most reflected in the "Competitive Strength" category ($f=15$). The "Competitive Strength" category was followed by "Competitive Advantage", "Increase in Competition", "Dependence on Competitive Conditions", "No Contribution to Competition", "Market Position", and "Price Competition" categories ($f=3$; $f=1$; $f=1$; $f=1$; $f=12$; $f=1$).

Table 4. Participants' opinions on the effects of smart applications on the competitive environment for hotel businesses

Themes	Categories	Code Examples	Frequency (f)	Frequency (N)
Service Quality and Guest Experience	Service Quality	The improvement of service quality through applications directly increases the hotel's competitive strength (P1-P2-P3-P4-P5-P6-P7-P10-P11-P13-P14-P15-P16-P17-P18).	15	33
	Service Speed and Efficiency	Fast and efficient service is provided (P6-P17-P20).	3	
	Customer Loyalty	Through technologies, guests receive faster, more efficient, and personalized service, which increases customer loyalty. (P2-P5-P14).	3	
	Guest Satisfaction	Guests' greater utilization of services increases their satisfaction (P1- P2-P3-P5- P6-P10-P13-P14-P19).	9	
	Brand Value and Image	The brand image improves, reflecting positively on the brand value (P5-P6).	2	
	Digital Reputation	The hotel's digital reputation is also strengthened (P11).	1	
Competition and Market Position	Competitive Strength	Competitive strength increases (P1-P2- P3-P4-P5-P6- P7- P9-P10-P11-P12- P13- P14- P16- P18).	15	34
	Competitive Advantage	If different applications are used under different conditions, an advantage can be gained by staying ahead of competitors (P9- P19- P20).	3	
	Increase in Competition	It creates intense competition (P17).	1	
	Dependence on Competitive Conditions	If competing hotels use the same applications under the same conditions, equality is maintained (P8-P9).	2	
	Market Position	Its position in the market is strengthened (P1-P2-P7- P10-P12- P14- P15- P16-P17- P18- P19-P20).	12	
	Price Competition	It can create competition in pricing (P15).	1	

Technology and Digitalization	Technology Usage	Hotels that use technology effectively gain a more advantageous position compared to their competitors (P1-P2- P4- P5- P8- P14- P18- P19- P20).	9	
	Differentiation Through Technology	If different applications are used under different conditions, an advantage can be gained by staying ahead of competitors (P9).	1	
	Critical Perspective on Technology	Smart applications provide no benefits to hotel businesses in terms of the competitive environment (P8).	1	15
	Digital Marketing	Advertisements in the digital environment (P7).	1	
	Sales and Marketing	Positive results are also achieved in terms of sales and marketing activities (P20- P14- P5).	3	
Operational Efficiency and Cost	Operational Efficiency	Increase in the hotel's operational efficiency (P13).	1	
	Cost Reduction	By increasing the hotel's operational efficiency, it reduces costs (P13).	1	2
Overall Impact and Outcomes	Positive Impact	It has a positive impact (P2- P18).	2	2

Source: Our Elaboration

Among participants' opinions on the effects of smart applications on the competitive environment for hotel businesses, the most prominent theme was "Competition and Market Position", followed by the "Service Quality and Guest Experience" theme (N=33). This theme was most reflected in the "Service Quality" category (f=15). The "Service Quality" category was followed by "Service Speed and Efficiency", "Customer Loyalty", "Guest Satisfaction", "Brand Value and Image", and "Digital Reputation" categories (f=3; f=3; f=9; f=2; f=1). The "Service Quality and Guest Experience" theme was followed by the "Technology and Digitalization" theme (N=15), which was most reflected in the "Technology Usage" category (f=9). The "Technology Usage" category was followed by "Differentiation Through Technology", "Critical Perspective on Technology", "Digital Marketing", and "Sales and Marketing" categories (f=1; f=1; f=1; f=3). The "Technology and Digitalization" theme was followed by the "Operational Efficiency and Cost" and "Overall Impact and Outcomes" themes (N=2; N=2). These themes were reflected in the "Operational Efficiency", "Cost Reduction", and "Positive Impact" categories (f=1; f=1; f=2).

The findings in Table 4 indicate that smart applications have significant effects on the competitive environment for hotel businesses, particularly under the theme of "Competition and Market Position," with "Competitive Strength" standing out. This result aligns with previous academic studies showing that digital transformation strengthens competitive advantage and market position. For example, in their study, Demir & Şen Demir (2025) found that technology investments and innovative strategies significantly enhance competitive performance in hotel businesses and that the adoption of digital technologies supports competitive strength. Therefore, it can be said that the finding presented in Table 4 is also supported by the literature.

The final research question asked to hotel managers concerns recommendations for the dissemination and development of smart hotel applications in Türkiye: "What are your recommendations for the dissemination and development of smart hotel applications in Türkiye?" The prominent themes, categories, and code examples regarding participants' opinions on the dissemination and development of smart hotel applications in Türkiye are presented in Table 5. According to Table 5, the most prominent theme in participants' opinions on recommendations for the dissemination and development of smart hotel applications in Türkiye was "Digitalization and Technological Transformation in Hotels" (N=17). This theme was most reflected in the "Digital Infrastructure" category (f=7). The "Digital Infrastructure" category was followed by "Technology Dissemination", "Digital Investment", "Technology Adequacy", "Technological Equipment", "Digital Transformation", and "Digital Applications" categories (f=3; f=2; f=2; f=1; f=1; f=1).

Table 5. Participants' opinions on recommendations for the dissemination and development of smart hotel applications in Türkiye

Themes	Categories	Code Examples	Frequency (f)	Frequency (N)
Support and Collaboration	Government Support	Government incentives and support, tax incentives and R&D support, training programs supported by the government, government-backed digital investments, training-focused government assistance, and government support for infrastructure (P1-P5-P6-P7-P10-P11-P14-P16-P17).	9	15
	Public-Private Partnership	Public-private partnerships, training-focused public-private collaborations, training and employment cooperation, free and widespread training initiatives through collaboration, and pre-season training partnerships (P3-P12-P14-P18-P19).	5	
	University Collaboration	Collaboration with universities (P4).	1	
Training within the Scope of Smart Applications	Training	Staff training, government-supported training, high school and university education, training and human resources, government support, and joint government and private sector training (P1-P4-P6-P9-P10-P14-P15-P16-P18-P19-P20).	11	14
	Training Curriculum	A practical training curriculum and a tourism-focused education model can enhance skills and industry readiness (P2-P12).	2	
	Practical Training	Practical internship training (P2).	1	
Incentives, Taxes, and Regulations	Incentives	Government incentives, tax reduction incentives, and widespread incentive programs (P1-P2-P20).	3	9
	R&D Incentives	R&D incentives (P5).	1	
	Tax Reduction	Government tax reductions and tax relief regulations (P1-P8).	2	
	Tax Regulations	Tax regulations (P5).	1	
	Grant	Widespread grant programs (P20).	1	
	Regulatory Measures	Infrastructure regulations (P8).	1	
Seasonality in Hotels	Seasonal Staff	Seasonal employee balance (P3).	1	4
	Staff Integration	Staff integration (P3).	1	
	Staff Adaptation	Staff adaptation, staff digital adaptation (P6-P7).	2	
Digitalization and Technological Transformation in Hotels	Technology Dissemination	Technology dissemination, technology development, government-supported training (P4-P15-P18).	3	17
	Digital Investment	Digital investment training, the expansion of digital investment (P6-P7).	2	
	Technology Adequacy	Technology adequacy, technology training model (P9-P12).	2	
	Technological Equipment	Strong infrastructure equipment (P11).	1	
	Digital Transformation	Widespread digital transformation (P14).	1	
	Digital Applications	Digital applications (P16).	1	
	Digital Infrastructure	Incentives for digital infrastructure, infrastructure development, strong digital infrastructure, government-supported infrastructure, infrastructure and training support, infrastructure development and training (P5-P8-P11-P17-P18-P19-P20).	7	

Safety and Emergency Preparedness in Hotels	Security Systems	Digital security solutions (P1).	1	2
	Emergency Management	Security integration (P13).	1	
High Cost	High Cost	Chain hotel leadership (P15).	1	1

Source: Our Elaboration

The theme that stood out the most in participants' opinions regarding suggestions for the dissemination and development of smart hotel applications in Türkiye was "Digitalization and Technological Transformation in Hotels," followed by the "Support and Collaboration" theme (N=15). This theme was mostly reflected in the "Government Support" category (f=9). The "Government Support" category was followed by the "Public-Private Partnership" and "University Collaboration" categories (f=5; f=1). The "Support and Collaboration" theme was followed by the "Education" theme (N=14), which was mostly reflected in the "Education" category (f=11). This category was further divided into "Education Curriculum" and "Practical Training" categories (f=2; f=1). The "Education" theme was followed by the "Incentives, Taxes, and Regulations" theme (N=9), which was mostly reflected in the "Incentives" category (f=3). This category included "R&D Incentives," "Tax Reduction," "Tax Regulations," "Grants," and "Regulatory Measures" categories (f=1; f=2; f=1; f=1; f=1). The "Incentives, Taxes, and Regulations" theme was followed by the "Seasonal Staff in Hotels" theme (N=4), mostly reflected in the "Staff Adaptation" category (f=2). This category included "Seasonal Staff" and "Staff Integration" (f=1; f=1). The "Seasonal Staff in Hotels" theme was followed by the "Safety and Emergency Preparedness in Hotels" theme (N=2), reflected in the "Security Systems" and "Emergency Management" categories (f=1; f=1). Finally, the "Safety and Emergency Preparedness in Hotels" theme was followed by the "High Cost" theme (N=1), reflected in the "High Cost" category (f=1).

The findings in Table 5 show that, the theme of "Digitalization and Technological Transformation in Hotels" stands out with elements such as digital infrastructure, technology dissemination, digital investment, and technological equipment being highlighted among the participants' recommendations regarding the promotion and development of smart hotel applications in Türkiye. This result is consistent with previous academic studies emphasizing that investments in digital infrastructure hold strategic importance in the tourism and hospitality sector. For example, a study by Nikopoulou, Kourouthanassis, Chasapi, Pateli, & Mylonas (2023) found that, in the adoption of digital technologies by hospitality businesses, the adequacy of technological infrastructure, the availability of financial resources, and environmental regulations are significant determinants. This underscores the need for investments in digital infrastructure and technological transformation strategies. Therefore, it can be said that the findings in Table 5 are also supported by the literature.

Research shows that digital transformation in hotel operations increases operational efficiency, particularly through digital infrastructure and system integration. For example, technologies such as hotel management systems, the Internet of Things and artificial intelligence have the potential to improve service quality and process efficiency (Jabbar et al., 2024; Anwar et al., 2024). In addition, the contributions of smart applications to business processes show that digital transformation could play an important role in reducing the workload in hotels and improving service standards (Anwar et al., 2024). On the other hand, challenges such as system integration and employee training in the adoption of digital technologies are highlighted in the literature frequently (Anwar et al., 2024). Furthermore, the literature suggests that digital transformation applications have strategic value in terms of providing a competitive advantage, meeting customer expectations and improving hotel performance (Citak et al., 2025).

Hotel managers in the Edremit Gulf evaluated digitalization positively in terms of customer satisfaction, operational efficiency, and competitive advantage, supporting the findings of Iranmanesh et al. (2022), which indicate that digital technologies contribute to both the financial and service quality dimensions of hotel performance. Furthermore, views on the potential of smart applications to personalize services and transform guest experiences align with Dang and Nguyen (2023)'s emphasis on co-creating value with customers in the digital era. As noted by Wynn and Lam (2023), digitalization is not merely a technical process but also a management approach requiring a strong IT (information technology) strategy and employee alignment; this corresponds with the study's finding that managers emphasized differences in education

and adaptation. Similarly, Zeqiri (2024)'s observation that digital platforms transform business models aligns with the intensive use of online reservation systems and digital marketing channels by hotels in the region. Gangwar and Reddy (2023)'s emphasis on the human-centered technological transformation vision of Industry 5.0 is supported by this study, which shows managers' tendencies to integrate technology with the human factor. On the other hand, as seen in Ghazy and Fedorova (2022)'s findings on human-robot collaboration, employees approach digitalization with both opportunities and concerns, a pattern also observed in this research. Finally, the studies by Gajić et al. (2024) and Colak (2024) on sustainability and unmanned hotel applications support this research's combined focus on digitalization's contribution to operational efficiency and managerial sensitivity toward maintaining human interaction.

A review of the literature reveals that findings from the Edremit Gulf case study demonstrate that hotels' use of digital infrastructure and smart applications increases operational efficiency, improves business processes and provides a competitive advantage. These results, in line with general trends in the literature, show that digital transformation is not merely a technological innovation; it must also be approached as a human-centered, strategic and sustainable process in line with research objectives (Jabbar et al., 2024; Anwar et al., 2024; Citak et al., 2025).

5. Conclusion

Today, hotel businesses in the Edremit Gulf of Balıkesir Province are experiencing the digital evolution process at varying levels. While some hotels actively use mobile applications, digital room control systems, and online reservation infrastructures to enhance the guest experience, others continue to provide services through traditional methods. Especially in the post-pandemic period, rising digital expectations have guided hotel managers and directors toward technology investments. However, during the integration of digital applications, infrastructure deficiencies, staff adaptation issues, and cost concerns have emerged as the main challenges. This situation indicates that the digitalization process in the region is not progressing homogeneously. However, the positive effects of smart applications, particularly in improving customer experience, accelerating operational processes, and increasing brand visibility, encourage hotel managers and directors to take a more willing and supportive approach to this transformation. Hotel businesses in the Edremit Gulf show differences in the digitalization process when compared to other tourist regions in the Mediterranean. Lack of technical infrastructure in the region, employee integration issues, and cost concerns stand out as more significant challenges compared to hotels in other regions. However, positive outcomes such as increased customer satisfaction, improved operational efficiency and enhanced brand visibility demonstrate that hotels in the region have high potential for digital transformation. As a result, hotel businesses in the Edremit Gulf still demonstrate a structure open to development in the transition to digitalization and Industry 5.0, yet they hold the potential to contribute to the digital future of regional tourism with the right strategy and investments.

This study examines the impact of digital applications (mobile applications, digital room control systems, online reservation infrastructures, and smart hotel software), referred to as "smart applications" in the title, on management processes in hotel businesses operating in the Edremit Gulf. This study has been done through content analysis based on interviews with managers and directors of these businesses. The findings show that smart applications affect the decision-making, planning, implementation and performance evaluation stages of management processes. Digitalization processes accelerate, reduce operation errors and increase efficiency in terms of operational management. Online reservation systems and digital platforms strengthen brand awareness and provide a competitive advantage in terms of marketing and competition management. Smart technologies enhance customer experience and service quality within the scope of customer relationship management. It has been determined that hotel managers with high digital skills approached the process in a more planned and conscious manner, while employees with low digital skills struggled with the adaptation process in terms of human resources and strategic management. However, infrastructure deficiencies, cost factors and the digital skill level of employees are key factors determining the effectiveness of digital transformation in hotels. As a result, digital (smart) applications are emerging in hotel businesses not only as a technological innovation but also as a comprehensive management tool that transforms operational, strategic and human resources

processes. The success of digital transformation is not solely dependent on technological equipment, but is also directly related to employees' digital skills, adaptability and the training they receive. This situation further highlights the importance of human resources planning and employment strategies in hotel businesses. Particularly the need for digitally skilled personnel, the necessity of retraining existing employees and rising training costs are emerging as significant employment-related challenges for hotel businesses during the digital transformation process. The analysis of these data revealed that while participants exhibited varying levels of knowledge regarding digital transformation, they shared a common view that digitalization makes processes in hotel businesses more efficient and enhances customer satisfaction. In particular, managers and directors who received training on smart hotel software approached the process more consciously and willingly, whereas participants without any training experienced difficulties in adaptation. This finding indicates that digital evolution is not only a technological process but also a human resource-oriented one.

In their systematic review, Iranmanesh et al. (2022) emphasized the contribution of digital technologies to performance improvement in the hotel industry, particularly highlighting service quality, efficiency, and competitive advantage. Similarly, this study revealed a shared view that digitalization facilitates management processes and enhances customer satisfaction. Dang and Nguyen (2023) noted that innovative applications such as artificial intelligence and the metaverse transform value co-creation processes with customers; likewise, this research observed that smart applications make services more personalized. As in García-López et al. (2025), who drew attention to the challenges encountered in post-COVID-19 digital transformation, integration, cost, and staff training issues were frequently mentioned in this study. Wynn and Lam (2023) argued that digitalization is not merely a technical process but should be addressed alongside strategic orientation and employee alignment, a perspective supported by the findings of this research. Zeqiri (2024) highlighted the transformation of business models through digital platforms, and in this study, the effects of digitalization were observed in marketing, reservations, and customer relations. Consistent with Gangwar and Reddy (2023) regarding Industry 5.0, efforts to integrate technology with a human-centered approach were evident in hotels in the Edremit Gulf. Similarly, Ghazy and Fedorova's (2022) findings on human-robot collaboration reflect managers' approaches that carry both opportunities and concerns. Studies by Gajić et al. (2024) and Colak (2024) focus on sustainability and unmanned hotel models, while this research contributes locally to the literature by addressing both the contribution of digitalization to operational efficiency and expectations regarding human interaction.

Based on the findings, it is recommended that hotel businesses increase investments in robust digital infrastructure to promote digital transformation and the widespread adoption of smart applications. Additionally, enhancing employees' digital skills and implementing continuous training programs are crucial for human-robot collaboration and the integration of technology into operational processes. Assigning expert teams and optimizing system integration to minimize technological issues will support the effective use of smart applications. In this way, hotel businesses can strengthen their competitive advantage while increasing guest satisfaction and achieving sustainable growth.

The following recommendations can be proposed for the effective implementation of digital transformation processes in hotel businesses within the scope of Industry 5.0 and smart applications:

- Increase digital infrastructure investments: Ensure the up-to-date and efficient use of integration systems such as Property Management Systems (PMS), the Internet of Things (IoT), and cloud computing in hotels.
- Support human-robot collaboration: Strengthen employees' digital skills and provide training in robotics and AI to enhance the contribution of technology to operational efficiency and service quality.
- Prevent technical issues: Establish robust technical support and regular maintenance processes to address system failures, integration challenges, and error risks.
- Balance technology and human-centered personalization: Preserve the importance of human touch and creative tasks alongside technological solutions to enhance guest satisfaction.
- Promote sustainability and green energy usage: Encourage the adoption of renewable energy sources for energy efficiency and cost management.

- Develop strategies to increase competitive advantage: Leverage digitalization to achieve a competitive edge and implement innovative practices to strengthen market positioning.
- Collaborate with digital content creators and local stakeholders: Highlight cultural and environmental values through professional and original content in destination promotions.
- Expand smart applications that enhance guest experience: Support department-level digital solutions to accelerate business processes and improve service quality.
- Continuous development of employees' digital competencies: Regular training to update hotel staff's digital skills ensures effective and seamless use of technology, enhancing human-robot collaboration.
- Digitalization of guest feedback systems: Implement real-time guest feedback mechanisms integrated with smart applications to continuously monitor and improve service quality.
- Strengthening cybersecurity and data protection policies: As digitalization increases, safeguarding customer and business data becomes critical; hotels should develop comprehensive cybersecurity measures and data privacy policies.
- Establish multichannel communication and service models: Provide seamless, multichannel communication with guests via digital platforms, social media, and mobile apps to enhance satisfaction and loyalty.
- Deploy smart systems in energy and waste management: Use sensors and automation systems to optimize energy consumption and waste management in line with sustainability goals.

If these recommendations are implemented, the technological transformation process within the scope of smart applications in hotel businesses can result in sustainable success in terms of both efficiency and guest satisfaction.

REFERENCES

- Alkaya, A. (2022). Toplum 5.0 bağlamında dijital dönüşüm ve pazarlamadaki yansımaları. In *Endüstri 4.0'dan Toplum 5.0'a: Yeni üretim tarzının gelişimi ve yansımaları* (ss. 123–140). Gazi Kitabevi.
- Anwar, F. A., Deliana, D., & Suyamto. (2024). Digital transformation in the hospitality industry: improving efficiency and guest experience. *International Journal of Management Science and Information Technology*, 4(2), 428–437. <https://doi.org/10.35870/ijmsit.v4i2.3201>
- Baykal, M., & Yazıcı Ayyıldız, A. (2022). Otel yöneticileri ve misafirleri perspektifinden dijitalleşme. *GSI Journals Serie A: Advancements in Tourism, Recreation and Sports Sciences (ATRSS)*, 5(2), 307–324.
- Buhalis, D., & Law, R. (2008). Progress in information technology and tourism management: 20 years on and 10 years after the internet—The state of eTourism research. *Tourism Management*, 29(4), 609–623.
- Citak, M. E., Hatun, H. İ., Ecevit, A., & Körpe, B. (2025). Otel endüstrisinde dijital dönüşüm: Konuk deneyimini iyileştiren teknolojik çözümler. *Selçuk Turizm ve Bilişim Araştırmaları Dergisi*, 8, 26–33. <https://doi.org/10.71276/stbad.1772965>
- Coskun, R., Altunışık, R., & Yildirim, E. (2007). *Sosyal bilimlerde araştırma yöntemleri: SPSS uygulamalı*. Sakarya Yayıncılık.
- Colak, E. (2024). Unmanned smart hotel: Applications and examples. *Worldwide Hospitality and Tourism Themes*, 16(5), 611–626. <https://doi.org/10.1108/WHATT-06-2024-0137>
- Colak, O., & Karakan, H. İ. (2021). Akıllı otel uygulamaları ve bu uygulamalar hakkında yönetici görüşleri: Gaziantep ili örneği. *Pamukkale Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, 42, 168–184. <https://doi.org/10.30794/pausbed.744680>
- Dang, T. D., & Nguyen, M. T. (2023). Systematic review and research agenda for the tourism and hospitality sector: Co-creation of customer value in the digital age. *Future Business Journal*, 9, Article 94. <https://doi.org/10.1186/s43093-023-00274-5>
- Demir, M., & Şen Demir, Ş. (2025). The relationship between technology investments, innovation strategies, and competitive performance in the hospitality industry: A mixed methods approach. *International Journal of Hospitality Management*, 128, Article 104151. <https://doi.org/10.1016/j.ijhm.2025.104151>
- Demirci Celep, N. (2020). *Toplum 5.0: İnsan merkezli toplum*. Türk Eğitim Derneği.
- Develi, H. (2017, Kasım 2). Endüstri 4.0'dan Toplum 5.0'a. *Dünya Gazetesi*. <https://www.dunya.com/kose-yazisi/endustri-40dan-toplum-50a/389146>
- Durmaz, M. Ş. (2023). *Yeşil anahtar ödüllü otellerde dijital dönüşüm uygulamaları: İzmir ve Ankara örnekleri* (Yüksek lisans tezi). Selçuk Üniversitesi, Sosyal Bilimler Enstitüsü, Konya.
- Dulgaroglu, O. (2021). Digitalization in tourism: Smart tourism applications, digital tourism and tourism 4.0. *Journal of Tourism and Management*, 2, 1–15.

- Dulgaroglu, O. (2024a). Otel işletmelerinde kullanılan ön büro otomasyon sistemlerine yönelik teknoloji temelli bir bakış. *Journal of Travel and Tourism Research*, 25(25), 94–111.
- Dulgaroglu, O. (2024b). Turizmde yapay zekâ teknolojileri ve robotlaşma. *Uluslararası Turizm, Ekonomi ve İşletme Bilimleri Dergisi*, 8(2), 82–95.
- Ercan, F. (2019). Smart tourism technologies: Applications in hotel business. In V. Krystev, R. Efe, & E. Atasoy (Eds.), *Theory and Practice in Social Sciences* (pp. 528–546). St. Kliment Ohridski University Press.
- European Commission. (2020). *Enabling technologies for Industry 5.0: Results of a workshop with Europe's technology leaders*. Directorate General for Research and Innovation.
- Fukuyama, M. (2018). *Society 5.0: Aiming for a new human-centered society*. https://www.jef.or.jp/journal/pdf/220th_Special_Article_02.pdf
- Gajić, T., Petrović, M. D., Milanović Pešić, A., Conić, M., & Gligorijević, N. (2024). Innovative approaches in hotel management: Integrating artificial intelligence (AI) and the internet of things (IoT) to enhance operational efficiency and sustainability. *Sustainability*, 16(17), Article 7279. <https://doi.org/10.3390/su16177279>
- Gangwar, V. P., & Reddy, D. (2023). Hospitality industry 5.0: Emerging trends in guest perception and experiences. In V. P. Gangwar (Ed.), *Opportunities and Challenges of Business 5.0 in Emerging Markets* (Chapter 10). IGI Global. <https://doi.org/10.4018/978-1-6684-6403-8.ch010>
- García-López, A. M., Galindo-Pérez-de-Azpillaga, L., & Foronda-Robles, C. (2025). The flow of digital transition: The challenges of technological solutions for hotels. *Social Indicators Research*. <https://doi.org/10.1007/s11205-024-03487-5>
- Ghazy, K., & Fedorova, A. E. (2022). Hotel employees' attitude and acceptance toward human-robot co-working based on the Industry 5.0 concept. *Changing Societies & Personalities*, 6(4), 906–926. <https://doi.org/10.15826/csp.2022.6.4.210>
- Guba, E. G., & Lincoln, Y. S. (1994). Competing paradigms in qualitative research. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of Qualitative Research* (Vol. 2, pp. 163–194). Sage.
- Iranmanesh, M., Ghobakhloo, M., Nilashi, M., Tseng, M.-L., Yadegaridehkordi, E., & Leung, N. (2022, October). Applications of disruptive digital technologies in hotel industry: A systematic review. *Computers and Industrial Engineering*, 173, Article 108690. <https://doi.org/10.1016/j.cie.2022.108690>
- Imamoglu, S. Z., Erat, S., & Yörük, E. G. (2021). Endüstri 4.0 ve Toplum 5.0'a geçiş sürecinde sosyal inovasyonun rolü. In O. Yılmaz, H. Simsek, S. Sağtaş, & M. Aslan (Eds.), *Değişimden dönüşüme: Sosyal bilimlerde yeni normlar* (ss. 17–32). Gazi Kitabevi.
- Iyigunçor, T. (2022). Ekonomik ve toplumsal dijitalleşme: Endüstri 4.0'dan Toplum 5.0'a. *Uluslararası Sosyal Medya ve İletişim Araştırmaları Dergisi*, 4(1), 47–59.
- Jabbar, U. A., Prabowo, B. A., Hanafi, R. A., & Info, A. (2024). Digital transformation in hotel management: optimizing guest experience in the industry 4.0 Era. In *Proceeding of The International Global Tourism Science and Vocational Education*.
- Kantarci, K. (1997). *Otel işletmelerinde iş tatmininin ölçülmesi ve işgören performansına etkileri* (Yayımlanmamış doktora tezi). Dokuz Eylül Üniversitesi, Sosyal Bilimler Enstitüsü, İzmir.
- Karakus, F. (2020). *Endüstri 4.0 sürecinde lojistiğin yemek ve içecek endüstrisine etkisi* (Yüksek lisans tezi). Balıkesir Üniversitesi, Sosyal Bilimler Enstitüsü, Balıkesir.
- Kim, J. J., Lee, M. J., & Han, H. (2020). Smart hotels and sustainable consumer behavior: Testing the effect of perceived performance, attitude, and technology readiness on word-of-mouth. *International Journal of Environmental Research and Public Health*, 17(2), 1–19. <https://doi.org/10.3390/ijerph17020436>
- Klenke, K. (2016). *Qualitative research in the study of leadership* (2nd ed.). Emerald Group Publishing.
- Kumar, U., Kaswan, M. S., Kumar, R., Chaudhary, R., Garza-Reyes, J. A., Rath, R., & Joshi, R. (2023). A systematic review of Industry 5.0 from main aspects to the execution status. *The TQM Journal*. <https://doi.org/10.1108/TQM-06-2023-0183>
- Marangoz, M., Kara, E., Yılmaz, H., & Demirdağ, F. (2022). Sanayinin dönüşümü ve evreleri. In M. Marangoz & H. H. Özkoç (Eds.), *Endüstri 4.0 ve işletme yönetimi* (ss. 3–28). Beta Yayıncılık.
- Nahavandi, S. (2019). Industry 5.0—A human-centric solution. *Sustainability*, 11(16), Article 4371. <https://doi.org/10.3390/su11164371>
- Nikopoulou, M., Kourouthanassis, P., Chasapi, G., Pateli, A., & Mylonas, N. (2023). Determinants of digital transformation in the hospitality industry: technological, organizational, and environmental drivers. *Sustainability*, 15(3), Article 2736. <https://doi.org/10.3390/su15032736>
- Okan Gökten, P. (2018). Karanlıkta üretim: Yeni çağda maliyetin kapsamı. *Muhasebe Bilim Dünyası Dergisi*, 20(4), 880–897. <https://doi.org/10.31460/mbdd.460897>
- Ozden, A. T. (2022). 1.0'dan 5.0'a dünya: Web, pazarlama, endüstri ve toplum. *Journal of Business in the Digital Age*, 5(1), 29–44.
- Oztekin, H., & İlhan, İ. (1994). Konaklama endüstrisi ve konaklama işletmelerinin sınıflandırılması. *Anatolia: Turizm Araştırmaları Dergisi*, 5(2), 12–15.
- Robert, A. D., & Boullaguet, A. (1997). *Analyse de contenu*. Presses Universitaires de France (P.U.F.).

- Sadic, Ş. (2021). Endüstri 5.0 ve sürdürülebilirlik. In G. İ. Sönmeztürk Bolatan (Ed.), *Endüstri 5.0: Dijital toplum* (ss. 1–25). Ekin Yayınevi.
- Sallan Gül, S., & Kahya Nizam, Ö. (2021). Sosyal bilimlerde içerik ve söylem analizi. *Pamukkale Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, 42(Özel sayı 1), Ö181–Ö198.
- Sener, B. (1997). *Modern otel işletmelerinde yönetim ve organizasyon* (2. Baskı). Gazi Kitabevi.
- Tuominen, P., & Ascenção, M. (2016). The hotel of tomorrow: A service design approach. *Journal of Vacation Marketing*, 22(3), 279–292. <https://doi.org/10.1177/1356766715608780>
- Yalçiner, A. Y., & Caylak, İ. (2020). Türkiye’de dijital dönüşüme başlangıç için AHP ve TOPSIS yöntemleri ile sektörel sıralama. *Afyon Kocatepe Üniversitesi Fen ve Mühendislik Bilimleri Dergisi (APJES)*, 8(2), 258–265. <https://doi.org/10.21541/apjes.526700>
- Yildirim, A., & Simsek, H. (2000). *Sosyal bilimlerde nitel araştırma yöntemleri* (2. baskı). Seçkin Yayıncılık.
- Zaharia, R.-M. (2025). The digital transformation of hotel services: employees’ perceptions on the reconfiguration of operational. In *Annals of Dunarea de Jos University of Galati. Economics and Applied Informatics*, 3, 179–184. <https://doi.org/10.35219/eai15840409563>
- Zeqiri, A. (2024). From traditional to digital: The evolution of business models in hospitality through platforms. *Platforms*, 2(4), 221–233. <https://doi.org/10.3390/platforms2040015>
- Wang, S., Wan, J., Li, D., & Zhang, C. (2016). Implementing smart factory of Industrie 4.0: An outlook. *International Journal of Distributed Sensor Networks*, 12(1), 1–10. <https://doi.org/10.1155/2016/3159805>
- Wynn, M. G., & Lam, C. (2023). Digitalisation and IT strategy in the hospitality industry. *Systems*, 11(10), Article 501. <https://doi.org/10.3390/systems11100501>

ORCID

Oguzhan Dulgaroglu  <https://orcid.org/0000-0002-1992-0531>

Seznur Avan  <https://orcid.org/0009-0004-8393-5174>

Notes on contributors

Oguzhan Dulgaroglu is an Associated Professor Doctor at the Balıkesir University, Burhaniye Faculty of Applied Sciences. Oguzhan Dulgaroglu completed his undergraduate education in Tourism Management at Akdeniz University. He received his master’s degree in Tourism Management from the Institute of Social Sciences at Canakkale Onsekiz Mart University. He received his PhD in Tourism Management from the Institute of Social Sciences at Balıkesir University. Dulgaroglu has been an Associate Professor in Tourism as of September 7, 2023. He served as Vice Dean at the Burhaniye Faculty of Applied Sciences at Balıkesir University between April 19, 2023, and June 1, 2024. Dulgaroglu has published over 60 academic studies in national and international journals and bookstores.

Seznur Avan is a Master’s Degree Student at Balıkesir University Social Sciences Institute. Seznur Avan completed her undergraduate studies in Tourism and Hotel Management at Balıkesir University’s Burhaniye Faculty of Applied Sciences. She is pursuing her master’s degree in Accommodation Management at Balıkesir University’s Institute of Social Sciences. Her research interests include Tourism and Accommodation Management. Avan has published an academic study in a national journal.