International Journal for Research in Tourism and Hospitality
Published by: **Green Publication Services**
Volume 01 Issue 01 March 2026

DIGITAL TECHNOLOGIES IN TOURISM AND HOSPITALITY: EMERGING TRENDS AND INDUSTRY APPLICATIONS

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ABSTRACT

This article reviews the role of digital technologies in transforming tourism and hospitality, with particular attention to emerging technological trends, major industry applications, strategic benefits, and critical challenges. It seeks to provide an integrated understanding of how digital transformation is reshaping service systems, organisational practices, and destination management in the sector. The article adopts a review-based approach to synthesise key academic discussions on digital transformation in tourism and hospitality. The analysis is organised around conceptual foundations, emerging digital technologies, operational applications, strategic benefits, critical concerns, and future research directions. The review shows that technologies such as artificial intelligence, big data analytics, the Internet of Things, robotics, automation, virtual and augmented reality, blockchain, and smart platforms are increasingly embedded across tourism and hospitality operations. These technologies improve service quality, personalisation, convenience, operational efficiency, competitiveness, resilience, and sustainability. At the same time, digital transformation raises important concerns related to privacy, cybersecurity, data governance, ethics, workforce disruption, capability gaps, and implementation complexity. The findings suggest that digital transformation should be understood as a multidimensional and ecosystem-level process rather than a simple matter of technology adoption. The article contributes by offering an integrated review of digital transformation in tourism and hospitality, linking technologies, applications, opportunities, and risks within a single conceptual discussion. It also highlights future research directions for understanding the long-term implications of increasingly intelligent and interconnected tourism systems.

Article History:

Article Type: **Review**

Received Date: **10/12/2025**
Revised Date: **06/01/2026**
Accepted Date: **15/02/2026**
Published Date: **29/03/2026**

Keywords: digital transformation; tourism and hospitality; smart tourism; emerging technologies

1. Introduction

Digital technologies have emerged as the core in the revolution of tourism and hospitality and have transformed the way organisations work, compete, and generate value. In recent decades, the industry has shifted from early adoption of information and communication technologies to highly connected, data-driven, and platform-based service landscapes. This has essentially changed the pattern of tourism markets, their behaviour, and the strategic focus of the hospitality and tourism companies. Previous research on eTourism had already determined that information technology was already so much integrated in tourism management that it influenced distribution, marketing, communication and service delivery (Buhalis & Law, 2008). Subsequent evaluations confirmed that this technological trend had become even more acute with internet-based platforms, mobile applications, and digital intermediaries acquiring even greater importance in the production and consumption processes of tourism (Navío-Marco et al., 2018).

The modern era of change is more extensive and more impactful than the previous waves of digitalisation. Digital transformation does not always imply the emergence of new channels or means, but a change in the way tourism and hospitality ecosystems work. It entails incorporating digital technologies into organisational strategy, its operational systems, customer interfaces, and interorganizational relations. In this case, tourism and hospitality are experiencing a digital revolution that is characterised by automation, connectivity, intelligence, and personalisation of services in a fashion never seen before (Pencarelli, 2020). The transformation is not exclusive to a certain segment of the industry. It spans across airlines, hotels, restaurants, travel agencies, destinations, attractions, and platform-based service providers, where digital capability is a main factor in competitiveness and adaptation.

This shift has been hurried by the growing importance of smart, immersive and platform technologies. The applications of artificial intelligence, big data analytics, smart systems, robotics, and digital platforms are changing the manner in which businesses interact with their customers as well as how they conduct their internal business operations. Meanwhile, the design of tourism experience and service is changing as a result of immersive technologies and interoperable digital infrastructures. The concept of smart hospitality in the hospitality industry is a shift towards ecosystems where interconnectivity and interoperability enable services, devices, and actors to operate more closely with each other (Buhalis & Leung, 2018). These tendencies indicate that digital transformation of tourism and hospitality is no longer an isolated instance of technological

use, but the introduction of smart systems that can influence every stage of the travel and service experience.

This change has been attracting more academic interest, too. The research on the new technologies in the tourism industry has become increasingly faster-growing and conceptually diversified, abandoning the disciplinary silos of research in favour of more complex and integrative conceptions of technological change (Sigala, 2018). Additional literature has strived to make the very concept of the digital transformation a distinct field of study of hospitality and tourism research, emphasising the fact that it is not only needed to understand the particular technologies but the entire shift of the organisation and the sector that they produce (Cheng et al., 2023). This trend aligns with the rest of the management and information systems literature, where digital transformation is viewed as a multi-dimensional process, which includes strategic renewal, changes in value creation, and new business organisation (Verhoef et al., 2021; Vial, 2021).

The transforming logic of competition is highly intertwined with the digital transformation at the strategic level. In an effort to maintain pace with technological investments to innovation, customer interaction, and long-term positioning of digitally mediated markets, digital business strategy has gained prominence as businesses endeavour to keep abreast with these new trends (Bharadwaj et al., 2013). The strategic implications of digital transformation in the sphere of tourism and hospitality, in which the interaction with the customer, the speed of the service, personalisation, and coordination are the most essential ones, are particularly acute. Organisations should not just implement new technologies, but must also create consistent transformation plans which cover infrastructure, culture, capabilities and redesigning services. This is what makes digital transformation not only a tech issue, but a managerial issue as well, because the organisations have to formulate effective strategies in terms of the ways in which digital transformation can be integrated into the overall business goals (Hess et al., 2016).

Although the amount of research available in this field has been increasing, the literature is still disjointed. Certain of the studies are specific to specific technologies, such as artificial intelligence, big data, or social media, and others are specific to particular functions of operations, such as marketing, service delivery, or customer experience. Although useful, these contributions tend to be partial only in showing the general change that is occurring within the systems of tourism and hospitality. It still needs a more in-depth and critical synthesis that will help close the gap between the new technologies and applications, strategic advantages, and threats. Such a review is needed especially because the digitisation process does not necessarily proceed in a homogenous and

problem-free fashion. It brings about new possibilities of performance, innovation, and value creation, but there are governance, ethics, labour, and technological dependence issues.

It is on this backdrop that the present paper reviews the new digital technologies that are shaping the tourism and hospitality industry and looks at the important applications of these technologies in the industry, their strategic importance and the major challenges. The article is informed by the opinion that digital transformation is viewed as a system process, and it not only impacts firms, but destinations, service ecosystems and the overall stakeholder networks. It makes its contribution by integrating fragmented bodies of literature into an integrated conversation about the ways in which digital technologies are changing the nature of tourism and hospitality conceptually, operationally and strategically. By doing so, the tensions and the direction of the research are also established by the review in a way that defines an increasingly intelligent, connected and data-saturated discipline.

2. Conceptual Foundations of Digital Transformation

Digital transformation in tourism and hospitality is more than the use of isolated technological tools. It refers to a wider reorganisation of how organisations in the tourism and hospitality industry generate value, design services, engage with stakeholders, and compete in more interconnected environments. Digital transformation in this sector is directly connected with the incorporation of digital infrastructures, smart systems, and networked platforms into service processes and customer journeys. The idea has been developed in parallel with the advent of smart tourism, which views tourism systems as digitally capable, data-intensive, and highly interactive ecosystems and not as linear service chains (Gretzel, Sigala, et al., 2015; Gretzel, Werthner, et al., 2015).

In the tourism and hospitality sector, this change is particularly pronounced since the industry is experience-based, information-heavy and relies on real-time collaboration between various actors. Before, during, and after travel, travellers now communicate with destinations, intermediaries, accommodation providers, and mobility services via connected digital interfaces. Consequently, the digital transformation is no longer about the optimisation of back-end, but also about the transformation of experience production, personalisation, and co-creation. The concept of smart tourism destinations exemplifies this change by integrating physical infrastructure with digital technology to increase service integration, destination competitiveness, and visitor connections (Boes et al., 2016; Gretzel, Sigala, et al., 2015). Digital transformation in tourism and hospitality

can then be perceived in this light as the shift in the provision of traditional service to digitally mediated, ecosystem-based value creation.

One of the key aspects of this change is the connection between technology, service innovation and value creation. Digital technologies are helping firms and destinations to go beyond the standardised nature of products to dynamic, personalised, and context-aware services. Intelligent systems, applications, sensors, and analytics enable tourism operators to react to customer demands immediately and customise services throughout the travelling experience. This aids service innovation not only in enhancing the responsiveness of operations but also in increasing the experiential opportunities that tourists have. Recommendations that are personal, connectivity, and adaptive service environments represent the way in which technological capabilities may be integrated within the co-creation of value (Buhalis & Amaranggana, 2015; Neuhofer et al., 2015).

The service-dominant view of tourism also enhances the relationship between technology and value creation. Instead of defining value as a product created by firms and provided to inert consumers, this approach perceives value as co-created through the interactions between firms, customers, technologies, and more general institutional contexts. Digital platforms and smart infrastructures contribute to this co-creation in tourism and hospitality by permitting participation, feedback, customisation, and collaborative experience constructions. The concept of smart destinations fits this reasoning especially well since it is based on the idea of integrated service systems, where various stakeholders are involved in the process of creating shared value (Vargo & Lusch, 2008; Wang et al., 2013).

There are a number of conceptual approaches that are particularly handy in the study of sectoral change in this region. The smart tourism ecosystem perspective is one such lens since it considers destinations and hospitality systems as assemblies of interdependent technologies, organisations, institutions and users. This method emphasises that digital transformation is not just an organisational phenomenon but an ecosystem-scale transformation in terms of interoperability, data exchange, and coordinated service innovation (Boes et al., 2016; Gretzel, Werthner, et al., 2015). It also details the reasons why digital maturity in tourism is not just about firm-level adoption but also the wider destination environment.

The second significant view is digital innovation logic. Digital innovation is not like traditional innovation since digital technologies can be reprogrammed, generative, and recombined across contexts easily. This implies that tourism and hospitality innovation is becoming more continuous,

dispersed and platform-based, as opposed to episodic and firm-based. Digital innovation organising logic contributes to understanding how tourism services change due to constant recombination of information, tools, and interfaces, whereas digital innovation management provides a more comprehensive approach to the concept of how organisations can adjust to such dynamic circumstances (Nambisan et al., 2017; Yoo et al., 2010).

The third point of view is the experiential and constructivist view of smart tourism. Not only are the experiences of tourism technologically enriched, but also the social and cognitive construction of meaning-making and interpretation occur through interaction. The given perspective is helpful since it makes digital transformation not limited to technical realisation. It highlights the perception, interpretation, and interaction of digitally mediated environments by tourists, and the influence of these interpretations on the success or failure of technological change within the industry (Hunter et al., 2015; Neuhofer et al., 2015). The overall interconnection of technologies, applications, outcomes, and risks is generalised in Figure 1.

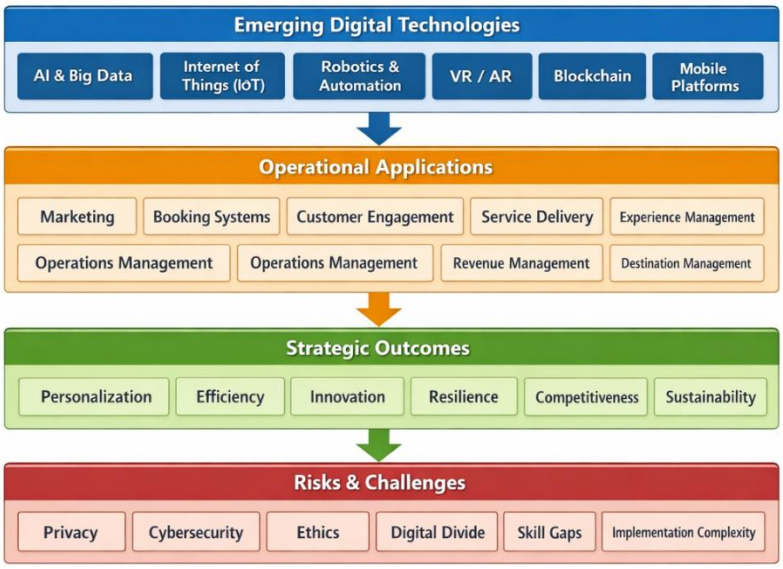

Figure 1. Conceptual framework of digital transformation in tourism and hospitality

Collectively, these theoretical underpinnings indicate that digital transformation in tourism and hospitality can be interpreted as a multidimensional process, which connects technological integration, service innovation, and value creation to the ecosystem level. It should be conceptualised then not as explicit technical change, but as the architecture of a structural change in the functioning, competition and experience provisioning of tourism and hospitality systems in an increasingly smart and connected world. The main ideas of the digital transformation in the tourism and hospitality industry are summarised in Table 1.

Table 1. Key Concepts Underpinning Digital Transformation in Tourism and Hospitality

Concept	Brief meaning in tourism and hospitality	Relevance to the review
Digital transformation	Integration of digital technologies into business models, service processes, and stakeholder interactions	Provides the overarching lens of the article
Smart tourism	Technology-enabled tourism systems are built on connectivity, data, and real-time interaction	Explains destination-level digital evolution
Smart hospitality	Interoperable service ecosystem linking guests, staff, devices, and platforms	Extends digital transformation to hospitality operations
Service innovation	Redesign of services through digital tools, automation, and personalisation	Connects technology with new value propositions
Value co-creation	Joint creation of value through interactions among firms, tourists, and digital systems	Explains how experiences are produced in digital environments
Digital innovation	Continuous recombination of digital resources for new services and processes	Helps explain dynamic sectoral change
Smart tourism ecosystem	Network of actors, technologies, institutions, and data flows in destinations	Supports ecosystem-level understanding of transformation

3. Emerging Digital Technologies in Tourism and Hospitality

A combination of technologies is transforming the way information is created, processed and converted into services and experiences, thus defining the digital transformation of tourism and hospitality. Some of the most powerful ones include artificial intelligence, big data, analytics, the Internet of Things, robotics, automation, immersive technologies, blockchain, and mobile platforms. Collectively, these technologies are growing the sector's personalisation capabilities, operational efficiency, predictive decision-making and coordination of services in real time.

Digital transformation in tourism and hospitality has made artificial intelligence, big data, and analytics a central point since they empower companies and destinations to derive practical insights out of extensive and varied flows of data. Tourism is a highly data-heavy industry, and the presence of digital remnants is created when making bookings, reviews, mobility, transactions, and online interactions. The increased academic interest in big data shows its strategic value in the study of tourist behaviour, predicting demand, enhancing the work of segmentation, and aiding managerial decision-making throughout the industry (Li et al., 2018; Mariani et al., 2018). Recent reviews also indicate that the application of analytics has gone beyond the descriptive capabilities to predictive and prescriptive capabilities, making the use of data in intelligence one of the central elements of competitive tourism and hospitality systems (Lyu et al., 2022; Mariani & Baggio,

2022). Artificial intelligence reinforces this trend through facilitating learning, recognising patterns and responding intelligently that can be utilised in customer service, pricing, recommending and optimising experiences.

The Internet of Things, robotics, and automation are a second key stream of technology. These technologies are becoming more integrated into service worlds where objects, digital systems and processes of operation are linked. The Internet of Things enhances intelligent hospitality and tourism environments by means of sensor-based surveillance, connected gadgets, and real-time information exchanges, which enable companies to manage resources and service experiences in a more effective way. This change is expanded by robotics and automation that handle customer-facing and back-end services, such as reception services, deliveries, cleaning, and information services. It is implied in the literature that robotics in hospitality and tourism has evolved into a more serious field of service innovation, reorganisation of labour, and design of the interface with customers (Ivanov et al., 2019; Tussyadiah, 2020). Simultaneously, service robot growth has spawned an increasing body of research on employee attitudes, since the adoption of technologies impacts job design and role expectations, as well as service work social relations (Xu et al., 2023).

Another significant area of emerging digital technologies is virtual reality and augmented reality, which are especially applicable in experience-based industries like tourism and hospitality. The technologies are applied to inspire pre-travel, destination marketing, interpretation and on-site: they are used to create immersive, or enriched environments. The body of information on virtual and augmented reality has, over time, shifted the discussion of novelty to a narrower scope of experience enhancement, emotional involvement and decision support in the context of tourism (Loureiro et al., 2020). The more recent synthesis suggests that immersive technologies are becoming more applicable to areas of promotion, as well as service design, education, accessibility, and hybrid versions of tourism consumption, which combine physical and digital touch (Calisto & Sarkar, 2024).

The mobile platforms and blockchain provide an additional layer of digital transformation by enhancing connectivity, transparency, and efficiency in transactions. The concept of blockchain has been mentioned as a technology that has the potential to transform the way business is conducted by providing a secure, decentralised, and traceable system, which can be applied to payments, managing identities, loyalty programs, and establishing trust during the exchanges in tourism and hospitality (Kizildag et al., 2019). Although now a highly normalised aspect of tourism practice, mobile platforms are the core of the digital ecosystem since they serve as the interface

connecting with several other technologies, coordinating, and experiencing them. Table 2 shows the major emerging digital technologies and the way they are predominantly used in tourism and hospitality.

Table 2. Emerging Digital Technologies and Their Main Tourism and Hospitality Uses

Technology	Core function	Major tourism and hospitality uses
Artificial intelligence	Learning, prediction, and intelligent response	Chatbots, recommendation systems, pricing, service automation
Big data and analytics	Extraction of insights from large datasets	Demand forecasting, customer profiling, sentiment analysis
Internet of Things	Real-time connectivity among devices and systems	Smart rooms, tracking, energy management, service monitoring
Robotics	Automated execution of physical or interactive tasks	Reception, delivery, cleaning, and information assistance
Automation	Reduction of manual intervention in routine processes	Check-in/check-out, booking workflows, back-office processing
Virtual reality	Immersive digital simulation	Virtual destination previews, experience marketing, training
Augmented reality	Overlay of digital content onto physical settings	Guided interpretation, attraction enhancement, visitor engagement
Blockchain	Secure, decentralised transaction and record systems	Payments, identity management, loyalty systems
Mobile platforms	Portable interface for access and interaction	Booking, navigation, communication, and real-time service access

Taken together, these technologies indicate that the sector is moving toward increasingly intelligent, connected, automated, and immersive service systems. A broader frontier is now emerging in which these technologies are not simply adopted individually but combined into integrated digital environments. This convergence is shaping future tourism and hospitality services around real-time responsiveness, seamless interaction, and more adaptive forms of value creation.

4. Applications Across Tourism and Hospitality Operations

The operational use of digital transformation in tourism and hospitality is most emphasised in its practical implementation in the customer journey and the larger system of service. Emerging digital technologies are no longer restricted to support functions; they are defining how companies

appeal to customers, handle reservations, provide customised experiences, and organise destination-level services. These applications disclose that technology is not only infused in the communication and transactions but also in the design of value-generating interactions in tourism and hospitality operations.

Marketing, booking and customer engagement are one of the most significant areas of application. Travellers are changing the way they search, compare, and make decisions with respect to travel through digital platforms. The use of social media, online travel agents, and review sites has become part of the travel planning process as it affects the visibility, credibility, and decision-making. User-generated content, peer reviews, and digital interactions are increasingly becoming the mediators of travel information search and influence consumer perceptions prior to purchase (Xiang & Gretzel, 2010). This process has also been enhanced by online review websites, which create high quantities of assessive information that companies can utilise to track customer perception, performance benchmarking, and optimise marketing efforts (Xiang et al., 2017). Most recent studies indicate that online review research has emerged as a significant branch of the hospitality and tourism literature, due to its strategic importance in consumer voice and engagement tendencies and platform-mediated reputation-building (Zheng et al., 2023). Simultaneously, the review divergence by the type of platforms and time implies that the process of digital interaction is not homogeneous, and platform-specific interpretation becomes more significant to managerial practice (Kirilenko et al., 2024).

The second significant area of implementation is related to personalisation, service delivery, and experience management. Digital technologies allow firms and destinations to provide services in a more precise way based on the needs, preferences and situational context of the customers. The use of real-time data and connected interfaces will help tourism and hospitality providers to design more responsive and personal interactions. This can especially be seen through the emergence of smart tourism apps and recommendation systems, which operate on data management and smart filtering to pair users with the right products, destinations, and experiences (Hamid et al., 2021). What has also been termed real-time co-creation, these technologies enable dynamic adjustment of service experiences where firms and consumers continually interact through real-time interaction (Buhalis & Sinarta, 2019). The implementation of smart systems in destinations has also revealed that technology can shape the perceptions of destinations and behavioural intentions among tourists, particularly when digital resources enhance access to information and enhance experiences (Tavitiyaman et al., 2021). On a larger scale, the findings of smart destination studies

indicate that tourism experiences can be reinforced through technology-enhanced environments that enhance the sense of convenience, engagement, and interpretive richness (Sustacha et al., 2023).

Digital applications also play a crucial role in operations, revenue management, and smart destination systems. The growing access to digital traces and customer-generated information has enhanced the capability of organisations to track service performance and make decisions. Online review mining facilitated by big data and machine learning can be applied to the online hospitality industry to detect patterns of service quality, weaknesses in operations, and priorities of customers to guide more effective managerial responses (Le et al., 2025). Analytical applications can be used to augment operational intelligence using scattered digital feedback to create structured decision support. At the destination level, the smart systems are used in their integration where they combine data, connectivity and service coordination to enhance the management of flows, information delivery and destination competitiveness. These systems contribute to a transformation of the disjointed service delivery to the more coordinated, data-based tourism operations. Table 3 demonstrates the application of digital technologies in key areas of operation within tourism and hospitality.

Table 3. Applications of Digital Technologies Across Tourism and Hospitality Operations

Operational domain	**Typical digital applications**	**Expected outcomes**
Marketing and promotion	Social media analytics, digital advertising, influencer engagement	Greater visibility, stronger engagement, targeted communication
Booking and distribution	Online booking engines, dynamic packaging, and mobile reservation systems	Convenience, faster transactions, broader market reach
Customer engagement	Review platforms, chatbots, and personalised messaging	Higher interaction, better relationship management
Service delivery	Smart rooms, digital concierge services, contactless interfaces	Seamless service, convenience, and service consistency
Experience management	Recommendation systems, real-time updates, smart destination apps	Personalisation, satisfaction, richer experiences
Operations management	Automation tools, monitoring systems, data dashboards	Efficiency, cost control, faster response
Revenue management	Predictive analytics, demand forecasting, and dynamic pricing	Improved pricing decisions and revenue optimisation

Destination management	Smart mobility, visitor flow systems, integrated platforms	Better coordination, sustainability, and improved destination governance

Overall, digital applications across tourism and hospitality operations demonstrate that technology has become inseparable from contemporary service design and management. Its role extends from customer acquisition and booking to personalised engagement, operational optimisation, and destination-level coordination. The sector is therefore moving toward a model in which digital capabilities are embedded across interconnected operational domains rather than confined to isolated functional activities.

5. Strategic Benefits and Transformational Potential

The strategic importance of digital technologies in tourism and hospitality is not only in their practical value but also in their ability to transform the value of services, the performance of organisations, and the long-term evolutionary path of the industry. With increased integration of digital tools in the tourism systems, they add value beyond enhancing customer experiences in the short term to enhancing innovation, resilience, and sustainability at both firm and destination levels.

The impact on the quality of services, convenience, and customer satisfaction is one of the most evident advantages of digital transformation. Digital technologies complement the tourism experience by making it more seamless, interactive and personalised throughout the travel journey. The enhanced tourism experiences offered by technologies are no longer restricted to the access to information or convenience in transactions, but more often feature greater sensual, emotional and participatory aspects that enhance perceived value. This change shows the increased incorporation of digital interfaces in core service experiences, where companies and destinations can develop more responsive and engaging customer experiences (Neuhofer et al., 2014). Recent synthesis also points to the idea that smart tourist technologies have a positive effect on the satisfaction of tourists, as they make tourism more efficient, reduce uncertainty, and facilitate more individualised and context-sensitive experiences (Yap et al., 2025). In that sense, digital transformation enhances the customer value beyond the convenience to the extent of being more relevant and enriching the experience.

Efficiency, competitiveness, and innovation are other strategic benefits that are brought about by digital transformation. Smart technologies, data-based systems, and smart platforms enable organisations to simplify decision-making, respond more quickly to dynamic situations on

demand, and orchestrate the service resources more efficiently. The competencies enhance the operational agility and competitiveness within a more dynamic environment. Besides the efficiency gains, digital transformation brings about innovation since it enables organisations to test new service models, business processes and value propositions. It is especially significant regarding tourism, as the innovation is bound to be present where technology meets experience design and ecosystem collaborators. Empirical signs that digital transformation is a business model innovator are present, especially where organisational processes that facilitate experimentation and learning, such as innovation laboratories and collaborative development spaces, exist (Santarsiero et al., 2024). This shows that digitalisation is not just a modernisation process; it is a strategic pathway in which tourism and hospitality organisations are able to renew their potential and rebrand themselves within competitive markets.

The long-term aspect of resilience, sustainability and sector change is the other component of transformational potential. Digital technologies would enable the organisation to be more resilient by enhancing the flexibility of its organisation, responsiveness to information, and recovery ability in the event of a disruption. Digital transformation, in terms of hospitality, has been associated with an increased organisational resilience, and in particular, where digital leadership, positive organisational culture, and proactive organisational behaviour are used to support the integration of new technologies and adapting practices (Ullah et al., 2025). The same tendencies may be followed in the restaurant setting, where the digital transformation can contribute to resilience in a range of ways, including flexibility, the continuity of providing services, and improved responsiveness to environmental shocks (Lee et al., 2026). These results indicate that digitalisation is part of resilience, not just as a technical tool but also as an organisational capacity that is part of culture, leadership, and strategic orientation.

Sustainability and destination-level development are also becoming more and more linked with the transformational potential of digital technologies. By enhancing resource coordination, visitor flow management, and evidence-based decision-making, smart tourism systems can aid in making the destination management of such destinations more sustainable. The evidence of systematic reviews shows that smart tourism destinations can be considered sustainable based on the compatibility of technological infrastructure and governance, integration of stakeholders, and long-term planning (Shafiee et al., 2019). This process can be strengthened by big data analytics that would aid in making more informed sustainability strategies and assist destinations and firms to learn more about environmental and behavioural trends in sustainable tourism development

(Agrawal et al., 2022). Even more recent literature is indicating the intersection of smart technologies and artificial intelligence in the development of integrated smart destination ecosystems, with long-term sectoral change being based on ecosystem-level intelligence, but not on isolated digital adoption (Bingöl & Yang, 2025). The digital applications in tourism and hospitality operate as a feedback mechanism, as depicted in Figure 2, whereby customer interaction produces data, which is used to update the adaptation of the services and subsequent interaction.

Figure 2. Feedback-loop model of digital applications in tourism and hospitality

Overall, the strategic benefits of digital transformation extend well beyond incremental technological improvement. They reflect a broader transition toward more intelligent, adaptive, innovative, and sustainable tourism and hospitality systems, with implications for customer experience, organisational competitiveness, and the future evolution of the sector.

6. Challenges, Risks, and Critical Concerns

Although digital transformation in tourism and hospitality has a strategic potential, its proliferation comes with a series of major challenges, risks, and critical issues. These issues transcend technical adoption and include privacy issues, governance, ethics, capability and organisational readiness development. As the digital systems are further integrated in the work of the tourism and hospitality industries, the industry will need to confront the contradictions between efficiency,

personalisation, and automation in demand and trust, inclusion and humanistic values of service provision.

One of the critical problems that should be mentioned is related to privacy, cybersecurity and data governance. The modern tourism and hospitality setting is based on the unceasing gathering, archiving, and examining of customer and operational data. This brings significant opportunities for personalisation and choice, but leaves the individual vulnerable to privacy invasion, data abuse, surveillance and cybersecurity threats. The increased sophistication of smart tourism infrastructures has propelled data protection and digital security to become the core topics in scholarly and management discourses (Gong & Schroeder, 2022). The digital traveller within the tourism and hospitality settings is a recent trend in which the collection of data by the platform, mobile applications, connected devices, and location systems is rapidly increasing. This increases the issues of consent, transparency, ownership, and responsible use of personal information, making effective data governance a strategic requirement as opposed to a regulatory afterthought (Yallop et al., 2021). Governance is a particularly pertinent issue in smart destinations because multiple stakeholders interact through the shared digital platform, and the need to apply principles that can be utilised to create accountability, coordination, and responsible innovation (Gretzel & Jamal, 2020).

A second group of challenges relates to ethical challenges, the digital divide, and the dangers of being too reliant on technology. The growth of intelligent systems and AI-based services has the potential to generate unequal access to destinations, companies, and groups of users, particularly where infrastructure, digital literacy, or investment capacity is skewed. This creates the likelihood of digital transformation exacerbating instead of alleviating inequalities in the sector. Critical discussions of the subject of innovation in smart destinations have revealed that the implementation of digital solutions cannot be perceived as necessarily progressive, as it can also enact exclusion, power centralisation, and other types of technological dependence that are not adequately questioned (Williams et al., 2020). The excessive use of data-based and automated systems can also make organisations less adaptable in case the human judgment and relational service opportunities are underestimated, as well as contextual understanding. Ethical issues also arise when technology influences the decision-making process in a manner that is opaque, biased, or challenging to users and employees.

The third key area is organisational barriers, skills shortages, and the complexity of implementation. Digital transformation in tourism and hospitality is not an easy process of

installing technology. It involves diffusion, assimilation and integration within organisational structures, service processes and stakeholder relationships. The shift between adoption and meaningful smartness in hospitality relies on facilitating conditions that facilitate organisational learning, alignment, and absorptive capacity instead of owning digital tools in hospitality settings (Stylos et al., 2021). Digital transformation can have ambivalent impacts at the employee level. Although it has the potential to open doors to empowerment and innovation, it can cause more alienation, doubt, and role disruption unless implementation is facilitated by motivation, communication, and participation (Ye & Chen, 2024). The current research on the application of artificial intelligence also indicates that the transformation of the workforce is a significant managerial issue, particularly in situations where the workforce has to adjust to the new human-machine relations, changed work scopes, and altered expectations of the services (Kumawat et al., 2025; Shin et al., 2025).

The lack of competency gaps exacerbates these challenges. Digital transformation demands managers and employees to acquire new technical, analytical and strategic skills, but the industry has a history of not matching workforce development and educational preparation to new digital demands. Digital literacy, systems thinking, and change-oriented capabilities are becoming increasingly important skills in hospitality management (Busulwa et al., 2022). Simultaneously, the digital transformation of hospitality and tourism curricula is not evenly distributed, indicating that educational institutions might not be ready to prepare graduates for the realities of an industry that is digitally transforming (Busulwa et al., 2024).

On the whole, the issues related to the digital transformation show that the technological change in tourism and hospitality is a governance, organisational, and human concern, as much as a technical one. The success of digital transformation in the long run will thus be determined by the ability of the sector to mitigate such risks without compromising on trust, inclusiveness, and quality of services.

7. Future Research Directions

Future studies of digital transformation in the tourism and hospitality industry must shift beyond descriptions of technology adoption to more theoretical, methodological, and ecosystem-level research. One significant missing point in the current literature is that most studies are technology-centric and application-oriented, but pay minimal consideration to the overarching theoretical discussions regarding how digital transformation alters value creation, service relationships,

organisational capabilities and destination governance. There should be further development of concepts that will help to explain not only the adoption of technologies but also their transformation in terms of competitive interactions, stakeholder relationships, and long-term sectoral structures. This requires more intense involvement of service ecosystem theory, socio-technical approaches, systems thinking of innovation, and critical approaches to governance.

Methodologically, more comparative, longitudinal and interdisciplinary research designs would be beneficial to the field. A large part of the existing evidence is founded on cross-sectional research, limited-country settings, and short-term evaluations of user perceptions or adoption intention. Future research ought to consider the dynamic nature of the digital transformation over time, the disparities in the effects of digital transformation on the various destinations and market segments and how various organisations respond at varying levels of technological maturity. It would be particularly useful to conduct comparative studies between developed and emerging tourism economies, urban and rural destinations and large, small and medium enterprises (SME). Longitudinal studies might help to answer whether the positive aspects of digital transformation are long-lasting or if new risks and inequalities emerge. The interdisciplinary collaboration is also crucial since digital tourism is a complex phenomenon that needs information systems, management, marketing, data science, urban studies, and ethics knowledge.

Another valuable agenda of future scholarship is offered by the emerging technologies. Generative AI will revolutionise customer communication, content creation, recommendation systems and operational decision support, but little has been said about how it will affect authenticity, trust, labour, and governance. Another potential frontier that promises to be useful to destination planning, simulation, crowd management, and sustainability monitoring is digital twins. In a broader view, future research on how smart ecosystems can progress should consider the use of AI, real-time data infrastructures, platform interconnectivity, and human-centred design. In this respect, the further evolution of the research should be less preoccupied with the technologies that cannot be linked with one another and more with the change of the tourism and hospitality system as a whole in the more intelligent and networked spaces.

8. Conclusion

The digital transformation has emerged as one of the major contributors to tourism and hospitality and has revolutionised the way services are being designed, offered and consumed across the industry. This review has shown that the advent of artificial intelligence, big data, analytics,

robotics, immersive technologies, blockchain and intelligent platforms is not only a new set of tools but that it is fundamentally altering the structural logic of tourism and hospitality systems. The technologies are being combined more in terms of marketing, booking, personalisation, operations and destination management as the centrality of digital capability in firm performance and destination competitiveness. The review further asserts that the importance of digital transformation is in its two-fold nature. On the one hand, it possesses a high degree of strategic advantages in the form of quality of the provided services, convenience, customer satisfaction, efficiency, innovation, resilience and sustainability. On the other hand, it brings serious concerns regarding privacy, cybersecurity, ethics, governance, disruption and complexity of implementation of the workforce. This paradox means that the digital transformation should not be viewed as a fundamentally positive or linear process, but a multi-dimensional one and this multi-dimensional change should be evaluated and controlled critically. Theoretically, the article highlights the importance of considering a digital transformation through the prism of ecosystem, service, and innovation, instead of a technological adoption problem. Practically, it means that successful change is anchored on more than just investment in technology. It involves organisational preparedness, leadership encouragement, digital abilities, and governance frameworks, tallying innovation with trust and inclusiveness. In sum, technology will shape the future of tourism and hospitality in a way that it will not be, in the way digital technologies will be intelligently, ethically and strategically utilised in the service systems of the tourist destination, in the organisation's activity, and in the development of the destination itself.

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