

Has the importance of technology in tourism been realized after Covid-19? Opportunities and challenges

Yelena Dikhanbayeva¹

¹Nazarbayev University, Nur-Sultan, Kazakhstan. <https://orcid.org/0009-0000-3435-8754>

Abstract

This study explores the transformative role of technology in the tourism industry post-Covid-19, focusing on opportunities and challenges. Using a qualitative research approach, in-depth interviews with 22 industry professionals reveal significant shifts towards digital solutions. The findings highlight the acceleration of digital transformation, enhancing customer experience, operational efficiency, and competitive advantage. Technologies such as virtual reality, artificial intelligence, and data analytics have become essential, offering immersive experiences and personalized services. However, challenges such as high implementation costs, digital skills gaps, and data privacy concerns persist. The study underscores the critical role of technology in ensuring the resilience and sustainability of the tourism sector in a rapidly evolving environment.

Keywords: Digital transformation, Tourism industry, Post-Covid-19

1. Introduction

The Covid-19 pandemic significantly transformed the global tourism (Demir et al., 2021). This article aims to examine the role and importance of technology in the tourism industry after Covid-19 and to evaluate the opportunities and challenges that arise in this context. It will be discussed how technology plays a catalytic role in the tourism sector and how it shapes the industry in the post-pandemic period.

This paper covers the effects of the Covid-19 pandemic on the tourism sector and the technological developments that emerged with these effects. Topics such as digital transformation, travel technologies, virtual tourism, data analytics, and customer experience management will be discussed in detail. Additionally, the effects of these technological developments on the sector and the reflections of these effects on both businesses and consumers will be examined. In the context of opportunities and challenges, the role of technology use in providing sustainability and competitive advantage in tourism will be evaluated.

This study used a qualitative research method. In particular, 22 people operating in the tourism sector—tourism business managers, representatives of tourism technology companies, and academicians—were interviewed in-depth to understand the effects of technology on the industry and

the opportunities and challenges encountered in the post-Covid-19 period. The data obtained was analyzed using the thematic analysis method, and the role and importance of technology use in the tourism industry were revealed.

2. Literature

Digital transformation in tourism encompasses adopting and integrating digital technologies to enhance tourism businesses' and destinations' efficiency, effectiveness, and competitiveness (Agarwal et al., 2024; Demir et al., 2022). The scope of digital transformation is vast, covering areas such as online booking systems, mobile applications, social media marketing, virtual and augmented reality experiences, and big data and artificial intelligence (AI) for personalized customer service. The importance of digital transformation has become increasingly evident, especially in the wake of the Covid-19 pandemic, which significantly disrupted the tourism industry (Demir et al., 2021; Yaşar et al., 2023). The pandemic accelerated the need for contactless solutions, virtual experiences, and efficient management of resources to adapt to the new normal.

The tourism industry, heavily reliant on interpersonal interactions and physical experiences, had to pivot towards digital solutions to survive. Digital transformation allows tourism businesses to enhance operational efficiency,

*Corresponding author

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improve customer experiences, and create new revenue streams (Hadjielias et al., 2022; Schönherr et al., 2023). For instance, online booking platforms and mobile apps enable seamless reservation processes, while digital marketing strategies help reach a broader audience. Virtual reality (VR) and augmented reality (AR) technologies offer immersive experiences that can attract potential tourists even before they travel. Using AI and big data analytics helps understand customer preferences and behaviors, enabling personalized services and targeted marketing efforts (Demir & Demir, 2023).

Moreover, digital transformation is crucial for destination management organizations (DMOs) in promoting sustainable tourism. Innovative tourism solutions, such as IoT-enabled infrastructure and real-time data monitoring, aid in managing tourist flows, reducing overcrowding, and ensuring the preservation of natural and cultural heritage sites. Integrating digital technologies also supports collaboration among stakeholders, including governments, businesses, and local communities, fostering a more resilient and sustainable tourism ecosystem (Ali et al., 2022; Elkhwesky et al., 2024). Overall, the importance of digital transformation in tourism cannot be overstated, as it not only enhances the industry's efficiency and competitiveness but also ensures its adaptability and sustainability in a rapidly changing world (Busulwa et al., 2022; Demir et al., 2023; Sharma et al., 2021).

Digital technologies offer many opportunities for tourism businesses, revolutionizing how they operate and engage with customers (Tang & Huang, 2023; Theiri & Alareeni, 2023). One of the most significant opportunities is the ability to reach a global audience through online platforms and social media. With most travelers using the internet to research and book their trips, having a strong online presence is essential for tourism businesses. Websites, mobile apps, and social media channels provide platforms for showcasing services, sharing customer reviews, and engaging with potential clients, increasing visibility and attracting more customers (Çorak et al., 2020; Moro et al., 2023).

Another significant opportunity lies in using data analytics and AI (Dalgıç et al., 2024). Tourism businesses can gain valuable insights that inform their decision-making processes by collecting and analyzing data on customer preferences, behaviors, and feedback. AI-powered chatbots and virtual assistants enhance customer service by responding instantly to inquiries and personalized recommendations, improving customer satisfaction and loyalty. Additionally, AI algorithms can optimize pricing strategies, inventory management, and marketing campaigns, resulting in increased efficiency and profitability.

Digital technologies also enable the creation of innovative and immersive experiences that can differentiate tourism businesses from their competitors (Johnson, 2023; Okafor et al., 2023). VR and AR applications allow customers to explore destinations, hotels, and attractions before booking virtually. This not only enhances the customer

experience but also reduces uncertainty and increases booking conversion rates. Furthermore, digital technologies facilitate the development of new business models (Stankova & Kaleychev, 2023; Troisi et al., 2022), such as the sharing economy, where platforms like Airbnb and ride-sharing services offer unique and flexible accommodation and transportation options.

In the context of post-pandemic recovery, digital technologies play a crucial role in ensuring the safety and confidence of travelers (Kurniawati et al., 2022; Troisi et al., 2022). Contactless payments, digital health passports, and remote check-ins are examples of how technology can minimize physical contact and enhance safety protocols. Moreover, digital marketing and e-commerce platforms enable tourism businesses to adapt to changing market conditions and consumer preferences, ensuring resilience and continuity. Overall, the opportunities provided by digital technologies are transformative, helping tourism businesses to innovate, optimize operations, and deliver exceptional customer experiences (Datta & Nwankpa, 2021; Gavrilava Gavrilava & De Lucas Ancillo, 2022).

Despite the numerous benefits digital technologies offer, their application in the tourism industry comes with several challenges (Gretzel et al., 2020; Rodrigues et al., 2023). One of the primary difficulties is the high cost of implementation. Investing in advanced technologies such as AI, VR, AR, and IoT requires substantial financial resources, which may be a significant barrier for small and medium-sized enterprises (SMEs) in the tourism sector. Additionally, the ongoing maintenance and updating of digital systems necessitate continuous financial investment, which can strain the budgets of tourism businesses.

Another significant challenge is tourism professionals' lack of digital skills and expertise. The successful implementation and utilization of digital technologies require a workforce proficient in digital tools and platforms (Parsons et al., 2023; Yaşar et al., 2023). However, many tourism businesses, particularly in developing regions, face a skills gap, with employees lacking the necessary training and knowledge. This skills gap can hinder the effective adoption and integration of digital technologies, resulting in suboptimal outcomes and reduced competitiveness.

Data privacy and security concerns also pose a significant difficulty in the digital transformation of the tourism industry. With the increasing reliance on digital platforms and the collection of vast amounts of personal data, ensuring the privacy and security of customer information becomes paramount (Koliopoulos, 2021). Yang et al., 2024). Cybersecurity threats, data breaches, and compliance with data protection regulations such as GDPR present ongoing challenges for tourism businesses. Failure to adequately address these concerns can lead to significant financial losses, legal repercussions, and damage to the business's reputation.

Moreover, the rapid pace of technological advancement can make it challenging for tourism businesses to keep up

with the latest trends and innovations (Madzík et al., 2023; Nadkarni & Haider, 2022). Staying current with emerging technologies and integrating them into existing operations requires continuous learning and adaptation. Additionally, the heterogeneity of the tourism industry, with its diverse range of businesses and services, means that a one-size-fits-all approach to digital transformation is not feasible. Tailoring digital solutions to the specific needs and contexts of different tourism sectors can be complex and time-consuming (Silva et al., 2023; Torabi et al., 2023). Resistance to change among employees and stakeholders can impede the adoption of digital technologies. The shift towards digital transformation often requires significant changes in organizational culture, processes, and workflows. Employees accustomed to traditional methods may resist adopting new technologies, while stakeholders may be skeptical about the return on investment. Overcoming this resistance necessitates effective change management strategies, clear communication, and ongoing support and training.

Several examples highlight digital technologies' transformative impact in the tourism industry. One prominent example is using online booking platforms such as Booking.com, Expedia, and Airbnb (Demir & Demir, 2023; Schaffer et al., 2021). These platforms have revolutionized how travelers search for and book accommodations, offering a wide range of options, user reviews, and seamless booking processes. By providing global visibility and easy access to customers, online booking platforms have significantly boosted the business of hotels, vacation rentals, and other accommodation providers.

Virtual and augmented reality technologies are also making significant inroads in tourism. Virtual reality (VR) allows potential travelers to experience destinations, hotels, and attractions in a virtual environment before booking (Cheng et al., 2023; Rahman et al., 2022). For instance, VR tours of hotel rooms, historical sites, and natural attractions provide an immersive experience that enhances customer engagement and confidence. Augmented reality (AR) applications, on the other hand, improve the on-site experience by overlaying digital information onto the physical environment. For example, AR apps can provide interactive maps, historical data, and real-time translations, enriching the tourist experience.

Artificial intelligence (AI) is another transformative technology in tourism. Tourism businesses increasingly use AI-powered chatbots and virtual assistants to provide 24/7 customer support and personalized recommendations (Alarcón et al., 2023; Demir & Demir, 2023). For example, travel agencies and airlines use AI chatbots to assist customers with booking inquiries, flight status updates, and travel itineraries. Additionally, AI algorithms analyze customer data to offer personalized travel recommendations, optimize pricing strategies, and improve operational efficiency.

Mobile applications have become indispensable tools for travelers, offering a wide range of services from booking and

itinerary management to navigation and local information. Apps like TripAdvisor, Google Maps, and Skyscanner provide travelers (Nabila, 2023; Tandafatu et al., 2024) with comprehensive information on accommodations, attractions, restaurants, and transportation options. These apps also include user-generated reviews and ratings, helping travelers make informed decisions. Moreover, contactless payment solutions integrated into mobile apps enhance convenience and safety for travelers.

Smart tourism initiatives leveraging IoT (Internet of Things) technology are also gaining traction (Darwish & Hassanien, 2022; Kumar et al., 2022). Smart cities and destinations use IoT sensors to monitor tourist flows, manage resources, and enhance visitor experience. For example, smart parking systems, real-time public transportation updates, and environmental monitoring contribute to a more efficient and sustainable tourism ecosystem. Furthermore, digital health passports and contact tracing apps developed in response to the Covid-19 pandemic are examples of how digital technologies can ensure the safety and confidence of travelers.

3. Methodology

The study received approval from the Nazarbayev University's Ethics Committee under protocol number 144-3/2023-27 and adhered to the guidelines outlined in the Declaration of Helsinki for research involving human subjects.

This study employs a qualitative research approach to explore the significance of technology in the tourism industry post-Covid-19. Qualitative research is particularly well-suited for this inquiry as it allows for an in-depth understanding of participants' perspectives and experiences. By utilizing open-ended questions and a flexible interview structure, this study aims to uncover rich, detailed insights into how technology has reshaped tourism during and after the pandemic.

3.1. Data collection

Data for this study was collected through deep interviews and face-to-face interviews. Each interview lasted between 15 and 30 minutes, allowing for a comprehensive exploration of the participants' experiences and viewpoints. The interviews were designed to be open-ended to encourage participants to share their thoughts freely and to provide detailed narratives about the role and impact of technology in the tourism sector post-Covid-19. The interview guide included questions about participants' use of technology before, during, and after the pandemic, their perceptions of its importance, and any changes in their behavior or attitudes.

3.2. Sample

Purposive sampling was employed to select participants who were knowledgeable and experienced in the tourism industry and could provide valuable insights into the research topic. The sample included tourism professionals. This sampling

method ensured that the data collected was rich and relevant to the study's objectives.

3.3. Data analysis

The data collected from the interviews was analyzed using thematic analysis. This method involves identifying, analyzing, and reporting patterns (themes) within the data. Thematic analysis was chosen for its flexibility and ability to provide a detailed, nuanced data account. The analysis process included familiarization with the data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the final report. By systematically coding and categorizing the data, key themes and sub-themes related to the importance of technology in the tourism industry post-Covid-19 were identified and interpreted. This approach enabled the researchers to draw meaningful conclusions about the evolving role of technology in tourism and its implications for the future.

4. Findings

The demographic characteristics of the 22 participants in the study reveal a diverse group in terms of age, education, professional positions, experience, and gender. The ages of the participants range from 22 to 58 years, with a significant proportion, about 40% (9 participants), falling in the 30-40 age bracket. In terms of education, the majority hold undergraduate degrees (50%, 11 participants), followed by those with graduate degrees (35%, 8 participants), and the remaining 15% (3 participants) have completed high school. The participants occupy various positions within their organizations: 5 are chiefs (23%), 7 are department managers (32%), 6 are assistant managers (27%), and 4 are general managers (18%). The years of experience among the participants span from 4 to 38 years, with a considerable number, 45% (10 participants), having between 10-20 years of experience. Gender distribution predominates males, comprising approximately 70% (15 participants), while females comprise 30% (7 participants).

Participants stated that digital transformation significantly increased productivity in the tourism sector in the post-Covid-19 period. Virtual tourism applications have offered customers new experiences despite the pandemic's travel restrictions. Participants emphasized that virtual reality (VR) and augmented reality (AR) technologies allow customers to explore destinations virtually. Data analytics and artificial intelligence-based solutions have enabled tourism businesses to better understand customer demands and expectations (Table 1).

Participants stated that technological infrastructure deficiencies and inadequacy of digital skills constitute a significant obstacle in the digital transformation process. In particular, small and medium-sized businesses have difficulty making the necessary technological investments. Data security and privacy issues have become a major concern with the use of technology in the tourism industry. Protecting and ensuring the confidentiality of customer data plays a critical

role in the digital transformation process. The rapid adoption and use of technology have been challenging for some businesses. Participants emphasized the difficulties encountered in adapting to technological innovations. In particular, businesses need to adapt their existing business processes and organizational structures to new technologies.

5. Discussions and conclusions

The study explores the impact of digital transformation on the tourism industry, particularly in the wake of the Covid-19 pandemic. It reveals how the pandemic has accelerated the adoption of digital technologies and reshaped the sector. The findings indicate that digital tools have become indispensable for enhancing customer experience, operational efficiency, and competitive advantage. The data shows that digital transformation is crucial for reaching a global audience and engaging with potential customers through online platforms and social media. For instance, virtual reality (VR) and augmented reality (AR) provide immersive experiences, enhancing customer engagement and confidence. These technologies allow potential customers to explore destinations, hotels, and attractions virtually, reducing uncertainty and increasing booking conversion rates (Demir & Demir, 2023; Okafor et al., 2023).

Artificial intelligence (AI) has also played a significant role in transforming tourism. AI-powered chatbots and virtual assistants provide 24/7 customer support and personalized recommendations, improving customer satisfaction and loyalty (Alarcón et al., 2023). AI algorithms help analyze customer data to offer tailored travel experiences, optimize pricing strategies, and enhance operational efficiency. Mobile applications have become essential for travelers, offering a wide range of services, including booking, itinerary management, navigation, and local information. Apps like TripAdvisor and Google Maps provide comprehensive information on accommodations, attractions, restaurants, and transportation options, helping travelers make informed decisions (Demir & Demir, 2023; Schaffer et al., 2021). Contactless payment solutions integrated into these apps enhance convenience and safety, crucial in the post-pandemic era. The study highlights the importance of data analytics in the tourism sector. Tourism businesses can gain valuable insights by analyzing customer preferences, behaviors, and feedback to inform their decision-making processes. This data-driven approach allows businesses to optimize marketing strategies, improve service delivery, and enhance customer experience.

However, the study also identifies several challenges in applying digital technologies in tourism. The high cost of implementation and maintenance can be a significant barrier, especially for small and medium-sized enterprises (Troisi et al., 2022; Yaşar et al., 2024). Additionally, the industry has a notable skills gap, with many employees lacking the necessary digital expertise. This gap hinders the effective adoption and integration of digital technologies, resulting in suboptimal outcomes. Data privacy and security

concerns are also prominent challenges. With the increasing reliance on digital platforms and the collection of vast amounts of personal data, ensuring the privacy and security of customer information is paramount. Cybersecurity threats and data breaches pose significant risks, and compliance with data protection regulations adds to the complexity. Despite these challenges, the opportunities provided by digital

technologies are transformative. They enable tourism businesses to innovate, optimize operations, and deliver exceptional customer experiences. For example, smart tourism initiatives leveraging the Internet of Things (IoT) technology are gaining traction. Smart cities and destinations use IoT sensors to monitor tourist flows, manage resources, and enhance visitor experience.

Table 1. Participants' responses

Main theme	Sub-themes	Participants' responses
Digital transformation	1. Importance of digital transformation in tourism	<p>P-1 and P-15: "Digital transformation is crucial for enhancing customer experience and operational efficiency in the tourism sector."</p> <p>P-3: "The shift towards digital platforms has allowed us to reach a broader audience and streamline our services."</p> <p>P-4: "Embracing digital transformation is no longer optional; it's essential for staying competitive in today's market."</p> <p>P-7: "Digital tools have revolutionized how we manage bookings, customer interactions, and feedback."</p> <p>P-10: "The COVID-19 pandemic accelerated the need for digital solutions, highlighting their importance in crisis management."</p> <p>P-11: "Investing in digital transformation has proven to be a key factor in sustaining and growing our business."</p>
	2. Digital technologies opportunities	<p>P-2: "Digital technologies have opened new revenue streams through online bookings and virtual tours."</p> <p>P-4: "They enable us to offer personalized experiences to our customers, enhancing satisfaction and loyalty."</p> <p>P-6: "Automation of routine tasks has allowed us to focus more on strategic initiatives and customer engagement."</p> <p>P-8: "Real-time data analytics help us make informed decisions, improving operational efficiency and profitability."</p> <p>P-9: "Social media and digital marketing have become powerful tools for reaching and engaging with potential customers."</p> <p>P-12: "Digital platforms facilitate seamless collaboration with partners and suppliers, optimizing our supply chain."</p>
	3. Challenges of digital technologies in tourism	<p>P-13: "High initial costs and maintenance expenses can be a significant barrier for hotel."</p> <p>P-5: "There is a lack of skilled personnel to effectively implement and manage digital solutions."</p> <p>P-18: "Data security and privacy concerns pose serious challenges in adopting new technologies."</p> <p>P-19: "Integration of digital systems with existing infrastructure can be complex and time-consuming."</p> <p>P-21: "Resistance to change among staff and management can hinder the successful adoption of digital technologies."</p> <p>P-14: "Keeping up with the rapid pace of technological advancements requires continuous investment and adaptation."</p>
	4. Examples of digital technologies in tourism	<p>P-16: "We have implemented a mobile app that allows customers to book services, make payments, and access real-time information."</p> <p>P-17: "Virtual reality tours have become a popular way to showcase destinations and attractions to potential visitors."</p> <p>P-20: "Chatbots and AI-driven customer service tools have improved our response times and customer satisfaction."</p> <p>P-22: "Blockchain technology is being explored for secure and transparent transactions in our booking system."</p> <p>P-1: "We utilize data analytics to marketing campaigns and predict customer preferences."</p> <p>P-3: "Online review platforms and social media channels are essential for building and maintaining our brand reputation."</p>

5.1. Theoretical implications

The findings of this study contribute to the theoretical understanding of digital transformation in the tourism industry. The accelerated adoption of digital technologies in response to the Covid-19 pandemic highlights the dynamic nature of technological innovation and its impact on service industries. This study extends the literature on digital transformation by demonstrating how crises can drive technological adoption and change organizational practices. Moreover, the study provides insights into the role of digital tools in enhancing customer engagement and operational efficiency. The findings illustrate the factors influencing the adoption and integration of digital technologies in tourism by integrating theories of technology acceptance and innovation diffusion. The study also emphasizes the importance of data-driven decision-making, contributing to the theoretical discourse on the strategic use of data analytics in service industries. Overall, this study enriches the theoretical framework of digital transformation by highlighting the interplay between technological innovation, crisis response, and organizational change in the tourism sector.

5.2. Practical implications

From a practical perspective, the study offers several implications for tourism businesses and policymakers. Firstly, it underscores the importance of investing in digital technologies to enhance customer experience and operational efficiency. Tourism businesses should prioritize adopting AI-powered tools, mobile applications, and data analytics to stay competitive in the digital age. Secondly, the study highlights the need for continuous training and development of digital skills among tourism professionals. Addressing the skills gap is crucial for effectively implementing and utilizing digital technologies. Policymakers and industry associations should collaborate to provide training programs and resources to upskill the workforce. Thirdly, the study emphasizes the importance of ensuring data privacy and security. Tourism businesses must implement robust cybersecurity measures to protect customer data and comply with data protection regulations. Policymakers should also establish clear guidelines and standards for data security in the tourism sector.

5.3. Limitations and future research directions

This study has several limitations that should be addressed in future research. Firstly, the sample size is relatively small and may not represent the entire tourism industry. Future studies should include a larger and more diverse sample to enhance the generalizability of the findings. Secondly, the study focuses primarily on the positive impacts of digital transformation, with limited exploration of potential negative consequences. Future research should investigate the challenges and drawbacks of digital technologies in tourism, such as job displacement and digital divide issues. Lastly, future research should aim to address these limitations by expanding the sample size, exploring both positive and

negative impacts, and conducting longitudinal studies to provide a comprehensive understanding of digital transformation in tourism.

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Author contribution

The author herself conducted the research design and implementation, analysis, and writing of the article without using AI applications.

Disclosure statement

The author reported no potential competing interest.

Ethics committee approval

The study received approval from the Nazarbayev University's Ethics Committee under protocol number 144-3/2023-27 and adhered to the guidelines outlined in the Declaration of Helsinki for research involving human subjects.