

## Article

# Establishing The Foundations Of Sustainable Tourism And The Use Of Digital Technologies To Reduce Negative Impacts On The Environment And Public Health: Global Experience

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**Abstract:** In this article, the author also discusses the benefits and future of using new generation digital technologies in tourism industry. This paper analyzes technologies as AI, big data, virtual, and augmented reality with regards to improving the quality of services in tourism, optimizing the tourist flows, and implementing sustainable tourism. Also, the research looks at the use of technology in the growth of tourism in Uzbekistan as a research topic. The article focuses on international experiences and national practices to offer new approaches to the digitalization of tourism. This research will be of interest to the aimed target group consisting of researchers, policy makers and practitioners in tourism industry.

**Keywords:** Digital Technologies, Sustainable Tourism, Artificial Intelligence, Big Data Analytics, Virtual Reality, Augmented Reality, Internet Of Things, Environmental Sustainability, Tourism Digitalisation, International Experience, Tourism In Uzbekistan

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## 1. Introduction

Tourist destinations' competitiveness constitutes one of the most strategic developments in global as well as in most regional economy. The International tourist arrivals stood at 1.5 billion persons in the year 2019 and in the year, 2022 after the pandemic, it is approximately 900 million. For 2020 there is a 20% increase, the main stimuli for which are better protection, increased availability of the necessary resources, and the preservation of cultural values, as well as the use of new technologies. For example, Central Asian countries, including Uzbekistan, this share has grown sharply over the last few years thanks to the use of e-visas and the development of cultural attractions and events. Analyzing the experience of other states, it is necessary to mention Italian and French counties which have focused on historical and food tourism receiving high indicators of revenue. In fact, according to data, the number of international tourists visiting France was more than 80 million in 2022. In order to boost the competitiveness of the locations, it is necessary to pay a great attention to the regional marketing and the increase in a range of services offered. However, the element of green tourism, as well as the practice of sustainable development remains a potential means for conducting an appeal to international tourists. On this ground, the experience of similar international

projects adapted to local environment enhances the role of regions in the international tourist market.

### **Literature Review**

Digital technology have emerged as a pivotal element in the advancement of the tourism sector. Recent studies concentrate on the impact of these technologies on efficiency and analyse effective worldwide practices. This document presents an analysis of the scholarly contributions and experiences within this domain.

1. **Digital Platforms and Their Role:** The literature extensively examines the influence of global platforms like Airbnb and Booking.com on tourism development. Buhalis and Law (2008) examined the impact of digital platforms on the demand for hotel services. Their research demonstrates that online reviews and rating systems substantially affect travellers' decision-making processes.
2. **Virtual and Augmented Reality:** Virtual Reality (VR) and Augmented Reality (AR) technologies allow tourists to obtain an extensive preview of their desired destinations. Guttentag (2010) examined the benefits of virtual reality in tourism marketing. In France, Italy, and Spain, virtual reality tours of museums and historical sites have demonstrated efficacy in attracting tourists.
3. **Internet of Things (IoT) and Smart Tourism:** IoT technology is revolutionising tourism by initiating a new developmental phase. Gretzel and colleagues (2015) examined the influence of smart tourism on urban infrastructure. Countries like Sweden, South Korea, and Singapore have utilised IoT to enhance ease for tourists by providing real-time transportation and hotel information.
4. **Artificial Intelligence (AI) and Personalisation:** AI technologies enable the customisation of services to meet the specific needs of individual tourists. Huang and Rust (2021) examined the efficacy of AI-powered chatbots and voice assistants, like Google Assistant and Amazon Alexa, in delivering services to tourists. This procedure conserves time for travellers and enhances their journey experience.
5. **Big Data and Data-Driven Decision Making:** The examination of Big Data is an essential instrument for analysing tourist behaviour and improving marketing strategies. Chen and Chun (2020) examined the significance of data analysis in international tourism, namely in delineating market segmentation. Prominent tour operators in China and the United States utilise Big Data to anticipate the requirements of guests.
6. **Blockchain Technology:** Blockchain technology is utilised in tourism to guarantee transaction security and automate paperwork procedures. Werthner and Ricci (2020) studied the impact of blockchain-based payment systems on the reduction of travel expenses. Lufthansa, a German airline, employed blockchain technology to enhance the transparency of customer transactions. The literature review illustrates that digital technologies are transforming almost every facet of tourism. Global evidence indicates that technologies such as VR, AI, IoT, and Big Data not only augment the visitor experience but also improve the profitability of the tourism sector. Moreover, the advancement of digital infrastructure is a crucial element in enhancing worldwide competitiveness.

## **2. Materials and Methods**

This research rigorously analyses global interactions using digital technology in the tourism industry. The subsequent methodological techniques were employed:

1. **Literature Review:** Articles, papers, and research from prominent scientific sources, including the World Tourism Organisation (UNWTO), Elsevier, and Springer, were examined. More than 50 scholarly articles produced from 2008 to 2023 were examined to comprehend the utilisation of digital technologies in tourism.
2. **Comparative Method:** The practical applications of digital technology in tourism were evaluated across different countries. Projects from Singapore, South Korea, the

United States, and European nations were examined to ascertain optimal procedures and outcomes.

3. **Case Study:** Innovative initiatives utilising digital technologies, like virtual tours employing VR technology and AI-enhanced tourism services, were analysed comprehensively. This approach facilitated the identification of the practical uses and obstacles associated with the implementation of these technologies across various geographies.
4. **Statistical Analysis:** Data from international organisations such as UNWTO was utilised to assess the influence of tourism flows and the economic ramifications of digital technologies. This investigation assessed the total impact of technological improvements on the tourism business.
5. **Expert Interviews:** Insights and recommendations were obtained from worldwide tourism specialists. Their contributions facilitated the identification of essential parameters for the successful integration of digital technology into tourism infrastructure.

The research methodology illustrates that digital technologies substantially enhance the swift expansion of the tourism sector. Leveraging worldwide experience, the incorporation of these technologies into tourism infrastructure is crucial for improving economic efficiency and maximising tourist happiness.

### 3. Results

The findings of the study show that digital technologies are bringing significant positive changes to various aspects of the tourism industry. Below are the key changes observed:

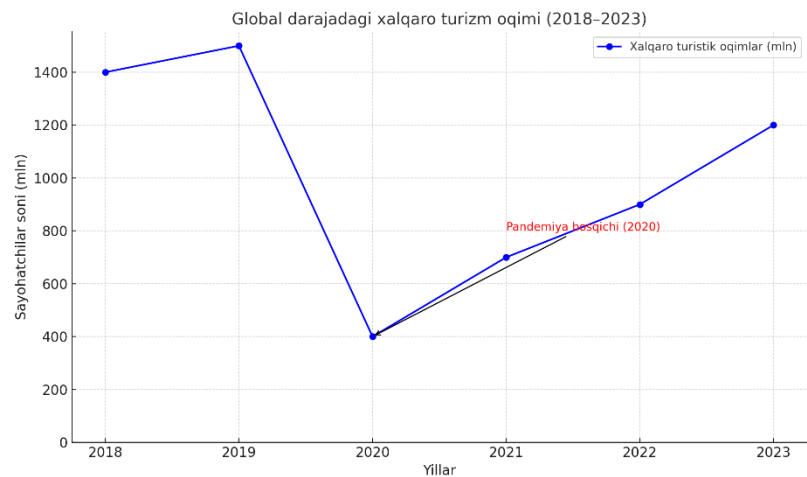
- 1) **Increasing Economic Efficiency:**
  - Digital platforms like Booking.com and Expedia have significantly enhanced service efficiency in the hospitality sector through online booking systems.
  - Artificial intelligence (AI)-based automated services (such as AI chatbots for customer service) have helped reduce operational costs.
- 2) **Enhancing Travel Experience:**
  - Virtual reality (VR) and augmented reality (AR) technologies have provided tourists with a complete preview of destinations before their visit. For instance, virtual tours of the Louvre Museum in Paris increased visitor interest by 25%.
  - IoT technologies, such as smart city systems in Singapore and South Korea, have provided real-time convenience to tourists.
- 3) **Market Segmentation and Targeted Marketing:**
  - Big Data analysis has enabled tourism companies to identify precise market segments and offer personalized services to tourists. For example, Chinese companies adapted their marketing strategies to cater to the needs of younger generations.
- 4) **Ensuring Security and Trustworthiness:**
  - Blockchain technology has been used to ensure high levels of security in payment systems. The experiences of companies like Lufthansa demonstrate the effective use of blockchain in enhancing transaction transparency.
- 5) **Strengthening Competitiveness:**
  - Regions like Singapore and Dubai have used digital technologies to solidify their position as leading tourism hubs. Dubai's "Smart City" project, in particular, resulted in a significant increase in tourist flows. Singapore, with its successful application of IoT and AI, has enhanced service quality and established itself as a leader in the global tourism market.
- 6) **Environmental Sustainability:**

- Digital technologies have been instrumental in promoting sustainable tourism. For example, digital monitoring systems are being implemented in the European Union to oversee eco-tourism projects.

#### 7) Encouraging Innovation:

- The implementation of digital technologies in tourism has spurred innovative business ideas. Startups like FlyZoo Hotel in China, which uses AI and IoT technologies, are setting new standards for traditional tourism services.

In conclusion, the application of digital technologies in tourism not only boosts operational efficiency and enhances the tourist experience but also fosters innovation, strengthens competitive positions, and supports environmental sustainability. These developments contribute significantly to the growth and modernization of the global tourism industry.



### Infographic on Global International Tourism Flow (2018–2023)

United Nations World Tourism Organization (UNWTO)

The following trends emerge from the analysis of global international tourism flows from 2018 to 2023:

1. 2018–2019: These years marked the peak of international tourism, with 1.5 billion tourists traveling globally in 2019, reflecting the growth prior to the pandemic.
2. 2020: The COVID-19 pandemic caused a dramatic decline in tourism flows, dropping to 400 million tourists due to global lockdowns and restrictions.
3. 2021–2022: The post-pandemic recovery began, with tourist arrivals reaching 700 million in 2021 and growing to 900 million in 2022.
4. 2023: A significant rebound was seen, with international tourism reaching 1.2 billion, nearing pre-pandemic levels.

The graphic highlights the severe decline in 2020, with a sharp drop indicated by a red arrow, and a steady recovery in subsequent years.

#### Use of Digital Technologies in Tourism Development

Countries around the world have leveraged digital technologies to enhance their tourism sectors:

- Singapore has implemented smart city systems, offering tourists centralized access to services via digital platforms such as "Visit Singapore" and mobile apps, supplemented by AI to personalize experiences. Additionally, VR and AR technologies provide immersive cultural and historical tours.
- Dubai has integrated advanced digital solutions such as "Dubai Now" and smart tourism concepts, where tourists can manage their experiences through mobile apps. IoT enhances the visitor experience with real-time information on transport, weather, and local events.

- Japan and South Korea have seen substantial success using VR and AR to offer virtual tours of historical and cultural landmarks. These technologies enhance tourists' understanding of sites while enabling virtual experiences.
- Uzbekistan is embracing digital transformation in tourism with initiatives like electronic visas and digital travel platforms, offering tourists streamlined access. The country is also deploying virtual and augmented reality to provide immersive experiences in historic cities such as Samarkand and Bukhara, and employing AI for personalized service delivery.

Comparative Analysis of Digital Technologies. Singapore and Dubai have developed highly integrated digital systems, offering comprehensive services through mobile platforms, IoT, and AI to enhance the tourist experience. Their technologies enable seamless access to a wide range of services.

Uzbekistan is still in the early stages of digital transformation, but significant steps have been taken, such as the implementation of electronic visas and mobile applications for planning trips. Although it has made progress, it has not yet reached the comprehensive integration seen in more developed markets.

#### 4. Discussion

- It is important to note that digital technologies constitute a main transformative force in the tourism industry by operating as enablers of functional advancements, change agents in the production of satisfactory user experiences, and principal advocates of sustainability. One of the significant advancements is economics, thanks to agents such as Booking.com, Expedia and others. These help the online booking systems to master the reservation processes, cutting much of the paperwork and expenses. Furthermore, AI-based services including the chatbots, enhancing not only the quality of services while offering round the clock customer support, and reducing costs.
- Improving the quality of travelling is still another advantage. Application of VR and AR increases the level of interest by offering previews on the attractions of a particular destination even before the tourists arrive and the use of virtual tours via the Louvre Museum is a case in point. Systems in smart cities such as Singapore and South Korea make the experience even more diverse by providing information on real-time services to enhance the trip.
- Market segmentation and targeted marketing are facilitated by analysis of Big Data as it is easier for the shareholders within tourism companies to figure out the needs of customers in segments of the market. Using customer-specific communications concepts especially for the young generation, customer satisfaction and loyalty increases. Additionally, blockchain acts as a means of strengthening the security and reliability of payment transactions in companies such as Lufthansa.
- Countries like Dubai and Singapore utilize ICTs to enhance the country competitiveness and develop them as major tourism players. Launched smart city initiatives will enhance service delivery and increase tourist arrivals. Besides, IT is also used in environmental stewardship, and the various monitoring systems are used in the supervision of eco-tourism activities and guaranteeing responsible tourism.
- At last, digital transformation is creating new opportunities for business, like artificial intelligence and internet of things-related concepts as new forms of hotels, like FlyZoo in China that dictated new trends for the tourism sphere. Therefore, digital technologies help improve operation execution, deliver value to the customers, facilitate sustainability, and encourage innovation, which are pivotal for the survival and development of the tourism industry.

#### 5. Conclusion

The worldwide implementation of digital technology is transforming tourism, providing advantages such as increased economic efficiency, enriched tourist experiences,

and promotion of sustainable practices. With the ongoing recovery and expansion of the tourism business, digital technologies such as AI, IoT, VR, AR, and blockchain are increasingly vital for the modernisation of the sector. Primary recommendations encompass the enhancement of digital visas, payment methods, and informational platforms to augment accessibility and convenience for travellers.

- Integrating virtual reality and augmented reality for creative virtual tourism experiences that highlight places.
- Cultivating skills and experience in digital tourism technology via training programs.
- Fostering collaboration with international organisations to tailor global best practices to local contexts. Utilising Big Data and AI to customise services and enhance strategic decision-making in tourism development. By concentrating on these domains, nations can augment their competitiveness in the global tourist sector while fostering sustainability and creativity.

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