

## THE IMPACT OF DIGITAL TRANSFORMATION ON SUSTAINABLE TOURISM MARKETING WITH A FOCUS ON AI BIG DATA AND CONSUMER BEHAVIOUR

Leyla HAJIYEVA <sup>1\*</sup>, Hijran MURADOVA <sup>2</sup>, Elnur ALIYEV <sup>1</sup>

<sup>1</sup> Azerbaijan State University of Economics, Department of Applied Economics, Baku, Azerbaijan; lhajiyeva788@gmail.com (L.H.); aliyev\_elnur43@hotmail.com (E.A.)

<sup>2</sup> Azerbaijan State University of Economics, Department of Business and Logistics, Baku, Azerbaijan; h.muradova@outlook.com (H.M.)

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**Abstract:** The purpose of this study is to explore ways of enhancing the effectiveness of sustainable tourism marketing in Azerbaijan through the use of digital technologies, particularly artificial intelligence tools and big data. The research methodology involves secondary data analysis, content analysis, a survey of 300 tourism and marketing professionals, comparative analysis, and a SWOT analysis. These methods allow for the assessment of how effectively digital technologies are being applied in the marketing of sustainable tourism in Azerbaijan. The findings demonstrate that 62% of respondents from the tourism industry and 65% of sustainable tourism marketing specialists use digital platforms to plan trips at least several times a week. The most widely used digital tools in both groups are online agencies (such as Booking.com and Expedia), with 91 representatives from the tourism sector and 87 marketing professionals reporting their use. Over 60% of all respondent's express trust in AI-based recommendations, indicating a high level of digital integration in tourism-related decision-making. A majority of participants, 71% in tourism and 81% in marketing, consider sustainable tourism to be important or very important for the development of the industry. Furthermore, 68% of the overall sample stated that digital platforms significantly or partially altered their travel planning habits, while 62% were willing to pay more for environmentally responsible services. The practical value of this study lies in its potential use by tourism marketing professionals, public sector representatives, and digital platform developers in creating effective strategies for promoting sustainable tourism through artificial intelligence and big data technologies.

**Keywords:** promotion strategies, innovative tools, market trends, professional networks, intelligent systems

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### INTRODUCTION

Several researchers actively examined the gradual impact of digital transformation on the tourism industry, highlighting how it has opened new avenues for sustainable development, service personalisation, and a deeper understanding of consumer behaviour. In the study by Amirov et al. (2023), the overall influence of information technologies on the development of the tourism sector was explored. The researchers argued that IT solutions contributed to enhanced service quality, improved logistics, and more effective customer communication. They also emphasised that digital tools supported greater transparency, accessibility, and integration of tourism services, which remain essential conditions for the advancement of sustainable tourism. The study conducted by Bešić et al. (2024) investigated the role of digital technologies, staff expertise, and sustainability principles in strengthening the competitiveness of personalised tourism products. The authors demonstrated that digital transformation increased the appeal of such offerings, particularly when combined with environmentally responsible practices and a high level of professional competence. Bilalov (2024) focused on evaluating the effectiveness of digital marketing campaigns in the context of tourism promotion in Azerbaijan. The study showed that big data analytics, referring to large volumes of diverse data generated at high speed and requiring advanced methods of processing and analysis, enabled more accurate audience targeting, optimised advertising costs, and improved engagement with potential tourists via social media and online platforms.

The studies reviewed provide valuable insights into the role of digital transformation in tourism. Purhani et al. (2025) focus on the challenges and development priorities of digital marketing in mountain tourism, highlighting the necessity of adapting to technological advancements while preserving cultural and environmental integrity. Satiti & Udin (2025) conduct a bibliometric analysis to assess the impact of digital transformation on tourism development, revealing trends in digital technologies that drive industry growth and consumer engagement. Thiruthanigesan et al. (2025) explore the transformative impact of artificial intelligence (AI) tools in tourism, emphasizing AI's potential to enhance customer experience and operational efficiency. Veseli et al. (2025) examine the influence of digital marketing on promoting

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\* Corresponding author

sustainable tourism, concluding that digital tools are essential for both marketing effectiveness and the promotion of eco-friendly tourism practices. These studies collectively underscore the significance of digital innovation in shaping the future of tourism, with a particular focus on sustainability and technological integration.

Chorna et al. (2024) investigated how digitalisation influenced the transformation of business models among tourism enterprises, enhancing their operational efficiency and competitiveness at national and international levels. The study placed particular emphasis on the economic impact of digital innovation, including its contribution to Gross Domestic Product (GDP) growth, the creation of new employment opportunities, and the development of related industries. The study conducted by Cioppi et al. (2023) provided a systematic and thematic review of academic literature on digital transformation in marketing. The findings indicated that digital transformation reshaped companies' marketing strategies, improved client engagement, and influenced business adaptation within the digital economy.

Despite the considerable contributions of the aforementioned researchers in exploring digital transformation in tourism, their work largely centred on general technological approaches, without examining the specific mechanisms through which digital tools influence the environmental, social, and economic dimensions of sustainable tourism marketing. Studies provide important information about the impact of digital transformation on tourism, but they have several limitations. In particular, they focus mainly on theoretical approaches and do not take sufficient account of empirical data, which limits their practical applicability. Many of them rely on existing literature, which may lead to new trends or regional differences being overlooked. In addition, some studies do not fully analyze the challenges associated with technology adoption, such as data privacy issues or unequal access to the latest technologies in different countries. Some studies do not take into account important aspects such as technical barriers or financial difficulties that limit small businesses' access to new technologies. There are also shortcomings in the analysis of the long-term effects of the introduction of digital tools on tourist behavior, particularly with regard to sustainable tourism.

This highlights the need for further research that takes into account the real conditions and rapidly changing nature of digital technologies in different regions. The purpose of the article is to analyze the main trends in the digital transformation of the tourism industry and develop a strategy for the effective application of innovative technologies in promoting sustainable tourism. The objectives are to examine the use of digital platforms for travel planning and the promotion of tourism services among industry professionals and sustainable tourism marketing experts, as well as to identify strategic areas for enhancing the effectiveness of sustainable tourism marketing through digital technologies.

## MATERIALS AND METHODS

The study involves an analysis of secondary data obtained from open sources. These include official reports by international organisations, such as the United Nations World Tourism Organization (UNWTO) (2025) and the Organisation for Economic Co-operation and Development (OECD) (2023). Additionally, market research on the UAE sustainable tourism market, projected to exceed US\$ 164.62 million by 2033 (2022), was utilised. The OECD's report on tourism trends and policies further contributed valuable data to the analysis (UNWTO: Rethink and transform, 2022). Particular attention is given to materials from the Organisation for Economic Co-operation and Development (2022), the Ministry of Digital Development and Transport of the Republic of Azerbaijan (2025), and publications by the World Economic Forum (2022).

Relevant academic literature was drawn from leading journals including the Journal of Sustainable Tourism, Tourism Management, and Current Issues in Tourism. Selection of journal publications was based on criteria of scholarly relevance, high impact factor, and recognition within the academic tourism community. Figure 1 outlines the key steps in the research methodology, illustrating the process from data collection to qualitative and quantitative analysis.

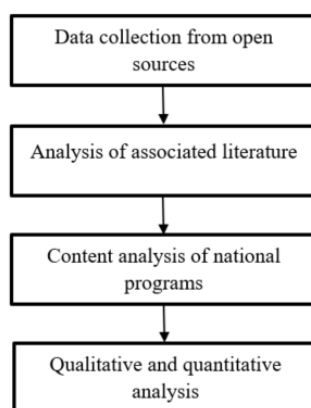


Figure 1. Methodology flowchart (Source: Compiled by the authors)

Information published by the State Tourism Agency of the Republic of Azerbaijan (2025) and data from official digital platforms such as Azerbaijan.travel and Visit Azerbaijan were actively utilised. Particular focus was placed on the analysis of national programmes such as “Digital Azerbaijan” and the “Sustainable and smart tourism strategy until 2023-2026” (Organisation for Economic Co-operation, 2022; State Tourism Agency of, 2023; Innovation and Digital Development..., 2025). These programmes outline the integration of AI, big data, and smart analytics into the tourism sector. Content analysis identified a range of practices implemented in Azerbaijan, including the development of intelligent tourist

recommendation systems, the use of digital platforms for personalised promotion of tourist routes, and the application of analytical dashboards to monitor tourist flows. The content analysis was conducted manually using MAXQDA software, which supported efficient data categorisation and visualisation. The unit of analysis consisted of specific text fragments from academic publications that described digital solutions relevant to sustainable tourism marketing. Four main coding categories were established: personalisation of the tourist experience, application of artificial intelligence, digital client engagement, and promotion of environmental responsibility through digital tools. The analysis identified twelve key practices, including the implementation of AI-powered mobile applications for route recommendations (e.g., Visit Azerbaijan AI Guide), integration of interactive maps for sustainable routes, use of big data for forecasting tourist flows, deployment of augmented reality/virtual reality (AR/VR) for environmental education, and social media campaigns promoting environmentally conscious behaviour. Case studies concerning the use of big data within the Azerbaijan.travel platform received particular attention. These were selected based on their level of innovation, implementation scale, and alignment with sustainable tourism principles. The analysis included indicators such as the degree of personalisation in tourist offerings, effectiveness of user engagement, frequency of data updates, and the impact on promoting environmentally responsible travel routes. The content of these practices enabled an assessment of how specific digital solutions contribute to the effectiveness of marketing strategies within Azerbaijan's tourism sector.

The study was conducted between January and October 2024, a period that coincided with the launch of the updated digital tourism development strategy of Azerbaijan, the intensification of national sustainable tourism campaigns, and the expansion of features on the Azerbaijan.travel platform. This timing ensured both the relevance and representativeness of the collected data. A mixed-method approach was employed for data collection, combining qualitative and quantitative techniques. The empirical foundation of the study consisted of surveys conducted among representatives of the tourism industry (150 participants) and professionals specialising in sustainable tourism marketing (150 participants). In total, 300 respondents from various regions of Azerbaijan participated in the study. Respondents ranged in age from 21 to 55 years and were actively engaged in the tourism sector or in sustainable tourism marketing. All participants had a minimum of one year's professional experience and utilised digital tools in their work. Inclusion criteria for the sample required professional engagement in the tourism or marketing sectors, experience with digital platforms for travel planning or tourism promotion, and a basic understanding of sustainable tourism. The sampling strategy was non-random and purposive. Sampling was conducted through the online distribution of questionnaires via professional networks, social media (LinkedIn, Facebook groups for tour operators), industry associations, and sustainable tourism forums. Respondents were selected from across the country to ensure geographic diversity and to reflect a wide range of perspectives and practices. The questionnaire included closed and semi-open questions addressing the use of digital platforms for travel planning, trust in AI-generated recommendations, perceptions of sustainable tourism, and the influence of digital technologies on consumer behaviour (Table 1).

Table 1. Survey of tourism industry representatives and sustainable tourism marketing specialists (Source: compiled by the authors)

No.	Question	Answers
1.	How often do you use digital platforms when planning your travels?	- Daily; Several times a week; Several times a month; Rarely; Never;
2.	Which digital tools do you use most frequently when planning your travels?	- Online travel agencies (e.g., Booking.com, Expedia); Transport services (e.g., Uber, Lyft, Google Maps); Official websites of tourism companies; Social media platforms (e.g., Instagram, Facebook); Other (please specify)
3.	How much do you trust AI-based recommendations when selecting travel destinations?	- Fully trust; Mostly trust; Neutral; Distrust; Do not trust at all
4.	How important do you consider sustainable tourism for the future development of the tourism industry?	- Very important; Important; Not particularly important; Not important
5.	Have digital platforms changed your travel habits?	- Yes, substantially; Yes, but only slightly; No, not at all;
6.	Are you willing to pay more for services that promote sustainable tourism (e.g., eco-friendly hotels, low-emission transport)?	- Yes, willing to pay more; Possibly, depending on the conditions; No, not willing to pay more; Not sure
7.	How would you rate the current level of development of digital platforms supporting sustainable tourism?	- Highly developed; Developed, but with room for improvement; Moderately developed; Poorly developed; Not developed at all
8.	How important is ecological awareness when choosing travel destinations?	- Very important; Moderately important; Slightly important; Not important
9.	Do you use digital tools to assess the environmental sustainability of tourism services (e.g., eco-certifications, online reviews)?	- Always; Occasionally; Rarely; Never
10.	Do you believe that the development of artificial intelligence will influence the future of sustainable tourism?	- Yes, positively; Yes, negatively; Neither positively nor negatively; Not sure
11.	How would you assess the role of digital platforms in the development of sustainable tourism in Azerbaijan?	
12.	In your opinion, which factors have the greatest influence on tourists' decisions to choose sustainable services?	

Open-ended responses were analysed using content analysis. The research adhered to the ethical guidelines set out in the American Sociological Association (American Sociological Association, 2023). Validity and reliability were ensured through a preliminary pilot test involving a small group of respondents (n=20), and internal consistency was assessed using

Cronbach's alpha ( $\alpha=0.82$ ). The sample's representativeness was supported by the purposive inclusion of participants from different regions of Azerbaijan, with consideration given to professional background, sectoral involvement, and age group.

Comparative analysis and Strengths, Weaknesses, Opportunities, Threats (SWOT) analysis methods were also employed. The comparative analysis enabled an evaluation of the effectiveness of conventional versus digital marketing within the context of sustainable tourism. The SWOT analysis supported the assessment of the strengths and weaknesses associated with the application of AI and big data in specific sustainable tourism marketing practices. These methods facilitated the development of a comprehensive understanding of the current challenges and opportunities presented by digital transformation in the sustainable tourism sector. The comparative analysis was conducted using criteria such as audience reach, communication costs, speed of feedback, degree of personalisation, and effectiveness in influencing environmentally responsible consumer behaviour. The SWOT analysis was conducted in collaboration with a team of experts in sustainable tourism marketing. Findings were independently reviewed by two external specialists.

The study also examined behavioural shifts in consumer conduct prompted by the digitalisation of tourism services. The use of big data proved instrumental in enhancing the understanding of client needs within sustainable tourism. The study integrated approaches from marketing, information technology, and sociology for the collection and analysis of consumer behaviour data. Behavioural changes were analysed through big data indicators such as website traffic, engagement with mobile applications, and social media interactions. This approach allowed for the identification of correlations between environmental awareness and the selection of tourism services. Strategic areas for improving the effectiveness of sustainable tourism marketing through digital technologies were subsequently identified.

## RESULTS

### 1. Analysis of practices and cases of implementing innovative technologies in the marketing strategies of tourism companies

Reports from the United Nations World Tourism Organization (2025) provide up-to-date statistical data on global tourism development, including trends in digitalisation within the field of sustainable tourism (UAE sustainable tourism, 2023; UNWTO: Rethink and transform, 2022). The 2021-2023 UNWTO reports highlighted examples of digital technology integration into sustainability strategies in countries such as Spain, Singapore, and the United Arab Emirates. These served as reference points for assessing similar initiatives in Azerbaijan. Reports from the Organisation for Economic Co-operation and Development (2025) proved valuable due to their emphasis on the analysis of digital innovations, including artificial intelligence, data analytics, and smart platforms. The report *Tourism Trends and Policies 2022* introduced a typology of countries based on the extent of digital integration within the tourism sector. This enabled a comparison between the programmes of Azerbaijan, such as "Digital Azerbaijan," and those of OECD member states (Ministry of Digital Development, 2025). The report included the example of Denmark, which successfully applied AI to monitor tourist flows. Similar developments were observed in the case studies examined through the Azerbaijan.travel platform.

Materials from the World Economic Forum (WEF) contributed to the research by outlining strategic approaches to countries' digital competitiveness. The *Travel & Tourism Development Index 2021* classified Azerbaijan among countries actively advancing digital tourism services (Uppink, 2022). This confirms the importance of state-led initiatives in the digital transformation of the tourism sector. Academic publications such as the *Journal of Sustainable Tourism, Tourism Management, and Current Issues in Tourism*, referenced in the list of sources, provided the theoretical and methodological foundation for the study. The *Journal of Sustainable Tourism* explored "smart tourism" and environmental balance, whereas *Tourism Management* focused on practical aspects of marketing strategy formation using big data. *Current Issues in Tourism* examined behavioural changes in tourists resulting from digital interventions, which informed the analysis of corresponding behaviours in Azerbaijan. Based on the results of the content analysis, the Azerbaijan travel platform was found to have actively employed big data-driven analytical tools to systematise information on user behaviour. These data allowed identifying tourist preferences in terms of destination selection, travel frequency, demand seasonality, and the popularity of specific tourist attractions (Hajiyeva & Teymurova, 2019; Myskiv & Nycz-Wojtan, 2022). For instance, analytics conducted via the platform in 2023 indicated that 42% of users were interested in ecotourism routes, while 31% favoured cultural and historical locations.

A further 18% selected gastronomic tours, whereas only 9% expressed interest in entertainment tourism. These figures were used in the development of international marketing campaigns, particularly within programmes promoting the tourism potential of Azerbaijan in European and Asian markets. Digital transformation practices in tourism marketing in Azerbaijan included the use of smart analytics for real-time monitoring of tourist flows.

The country's Ministry of Digital Development generated tourist load maps for specific regions using a digital analytics system. In 2023, these maps demonstrated the highest tourist density in Baku (45% of total visits), followed by Qabala (21%) and Sheki (14%). This information enabled prompt responses to infrastructure-related challenges and supported the adaptation of tourist service logistics. Azerbaijan.travel reported that more than 65% of users in 2023 utilised the personalised route function, based on previous search queries and geolocation activity.

The study also identified key challenges in implementing digital technologies within sustainable tourism marketing in Azerbaijan. Among the main barriers were a low level of digital literacy among small tourism business operators (noted in 38% of the analysed reports), limited funding for IT infrastructure in regional areas (29%), and a shortage of specialists in data analysis and AI solution development (24%). The findings highlighted the strategic commitment of Azerbaijan to strengthening the role of digital technologies in tourism development, contributing to the establishment of a more adaptive, flexible, and sustainable approach to managing the tourism sector.

## 2. Analysis of the use of digital platforms for travel planning and promotion of travel services

The study examined the responses of participants, specifically representatives of the tourism industry and specialists in sustainable tourism marketing, concerning the use of digital platforms and their attitudes towards sustainable development principles in tourism. The survey included questions aimed at identifying patterns in digital behaviour, levels of trust in artificial intelligence (AI)-based technologies, respondents' environmental motivations, and their willingness to support sustainable tourism both financially and practically (Table 2).

Table 2. Survey result of the study participants (Source: compiled by the authors)

Question	Response options	Number of representatives	
		Tourism industry	Sustainable tourism marketing
How often do you use digital platforms to plan your travels?	- Daily	42	51
	- Several times a week	58	47
	- Several times a month	33	29
	- Rarely	12	20
	- Never	5	3
Which digital tools do you most frequently use for travel planning?	- Online agencies (Booking.com, Expedia)	91	87
	- Transport services (e.g., Uber, Lyft, Google Maps)	62	66
	- Official websites of tourism companies	55	73
	- Social media platforms (e.g., Instagram, Facebook)	48	61
	- Other	14	19
How much do you trust AI-based recommendations for choosing travel destinations?	- Fully trust	26	34
	- Mostly trust	61	59
	- Neutral	42	41
	- Distrust	15	13
	- Do not trust at all	6	3
How important do you consider sustainable tourism for the future development of the tourism industry?	- Very important	77	92
	- Important	49	41
	- Not particularly important	18	12
	- Not important	6	5
Do you feel that the use of digital platforms has changed your travel habits?	- Yes, substantially	61	73
	- Yes, but only slightly	67	58
	- No, not at all	22	19
Are you willing to pay more for services offering sustainable tourism?	- Yes, willing to pay more	39	47
	- Possibly, depending on the conditions	73	71
	- No, not willing to pay more	24	18
	- Not sure	14	14
What is your assessment of the development level of digital platforms supporting sustainable tourism?	- Highly developed	18	24
	- Developed, but with room for improvement	66	72
	- Moderately developed	42	36
	- Poorly developed	21	16
	- Not developed at all	3	2
How important is ecological awareness to you when choosing travel destinations?	- Very important	64	82
	- Moderately important	52	46
	- Slightly important	23	17
	- Not important	11	5
Do you use digital tools to assess the environmental sustainability of tourism services?	- Always	21	33
	- Occasionally	58	63
	- Rarely	41	39
	- Never	30	15
Do you believe that AI development will affect the future of sustainable tourism?	- Yes, positively	88	104
	- Yes, negatively	12	8
	- Neither positively nor negatively	34	28
	- Not sure	16	10

The analysis of the data indicates a high level of digital engagement among representatives of the tourism industry and professionals in sustainable tourism marketing. A substantial proportion of respondents in both groups, over 60%, regularly use digital platforms for travel planning, either daily or several times a week. This suggests that digital technologies became an integral part of professional activity and personal habits, regardless of the respondents' area of expertise. Among the tools used for planning travel, online agencies such as Booking.com and Expedia are the most frequently utilised, serving as primary sources of information for more than half of the participants. Transport services and official websites of tourism companies also remain important. Marketing professionals demonstrate slightly higher levels of activity in using social media, likely reflecting their professional focus on digital communication. With regard to trust in recommendations generated by artificial intelligence, the majority of respondents (around 60% in each group) express a moderate to high level of confidence, indicating a gradual acceptance of AI as a reliable tool in travel planning. However, a degree of scepticism remains, as around 10% of those surveyed report distrust or complete distrust of such systems. It should be noted that the survey was conducted exclusively among professionals; consumers were not included in the sample.

There is a strong awareness of the importance of sustainable tourism across both groups, particularly among marketing professionals, over 60% of whom consider it “very important” for the future of the industry. This reflects a deeper understanding of the strategic value of environmental responsibility in the promotion of tourism products. This is further supported by the willingness of a notable share of respondents (over 25%) to pay more for environmentally responsible services, though most participants express conditional readiness depending on specific circumstances.

More than 85% of respondents in each group agree that digital platforms altered their travel habits to some extent, illustrating a transformation in behavioural patterns under the influence of digital technologies. Only a small minority (fewer than 15%) report no such impact. The current level of development of digital platforms that support sustainable tourism is considered “developed but with room for improvement” by nearly half of the participants, signalling both recognition of progress and the expectation of continued advancement. Environmental awareness appears to be highly integrated into travel decision-making processes, with nearly 80% of marketing professionals and 75% of tourism industry representatives considering this factor important or very important.

However, only one-third of respondents consistently use digital tools to assess the environmental sustainability of services, indicating scope for improving digital ecological awareness. Most respondents across both groups expect artificial intelligence to have a positive impact on the future of sustainable tourism, suggesting a gradual development of trust in emerging technologies within the context of environmentally focused tourism development.

The analysis of responses to open-ended questions provided deeper insight into participants’ views on the impact of digital technologies on the advancement of sustainable practices within the tourism sector in Azerbaijan. It also helped to identify key factors that, in their opinion, influence tourist behaviour when selecting environmentally responsible services. In response to the question “How do you assess the role of digital platforms in the development of sustainable tourism in Azerbaijan?”, the majority of respondents expressed the belief that digital platforms play an increasingly significant role in shaping tourist preferences and promoting sustainable tourism. Respondents emphasised that these platforms function not only as channels of communication between service providers and consumers but also enhance transparency regarding the environmental characteristics of offered products and services. Through digital tools such as ratings, reviews, and the integration of eco-certifications, respondents are empowered to make informed choices in favour of sustainable alternatives.

Several professionals highlighted the need for the development of national or regional digital platforms that incorporate environmental criteria and support the growth of domestic tourism through engagement with local initiatives. Particular attention was drawn to the issue of trust in digital data. Some participants noted that the absence of verified sources or official regulation within the digital space reduces the effectiveness of such platforms in promoting genuinely sustainable practices. In response to the question “Which factors, in your view, most influence tourists’ choices of sustainable services?”, participants from both target groups demonstrated a comprehensive understanding of consumer motivations. The most frequently cited factors included the balance between price and quality, tourists’ awareness of sustainable tourism, the availability of reliable information, the presence of visual and digital markers of sustainability (certificates, eco-labels, sustainability indicators), and the convenience and comfort of alternative options. A number of respondents noted that environmental awareness among the population in Azerbaijan remains at a formative stage. Consequently, information campaigns in the digital sphere should focus not only on promoting sustainable tourism but also on educating prospective tourists. Socio-psychological factors were also mentioned, including the influence of friends, opinion leaders, and the behaviour of other tourists on social media, which can act as triggers for individuals to reconsider their choices in favour of sustainable practices.

Open responses indicate that digital technologies in the context of sustainable tourism are viewed not merely as tools for promotion or booking, but as potentially powerful instruments for shaping environmentally conscious consumption habits. Therewith, respondents identified several challenges, such as distrust of online information, uneven development of digital infrastructure, and limited levels of digital and environmental literacy among broad segments of consumers. These issues highlight the need for targeted cross-sectoral efforts to overcome existing barriers.

### **3. Key advantages, challenges, and opportunities for sustainable tourism in the context of digital transformation**

The comparative analysis conducted within the study offered deeper insight into the distinctions between conventional approaches to promoting tourism services and the growing integration of modern digital technologies into the marketing strategies of sustainable tourism. Conventional marketing, which includes printed materials (brochures, magazines, travel guides), television and radio advertising, and participation in industry exhibitions and forums, retains several strengths. These include the ability to foster emotional trust through direct interaction, build a stable brand, and reach target audiences in regions with low levels of digital infrastructure (Kupi, 2025). While still relevant in the context of offline engagement, this approach faces limitations in terms of rapid market responsiveness, personalised communication, and real-time performance analysis. In contrast, digital marketing, encompassing the use of social media, AI-based digital platforms, mobile applications, automated chatbots, and big data algorithms, offers a high degree of flexibility and adaptability (Lazaj et al., 2024).

These tools enable tourism companies to craft tailored messages that address the specific needs of target segments, conduct in-depth analysis of consumer behaviour, and provide recommendations aligned with environmental responsibility.

A particularly important role in the promotion of sustainable tourism is played by the capacity of digital marketing to ensure transparency (Babayeva et al., 2024; Ihnatenko et al., 2020). By displaying sustainability certifications, publishing reviews, and disseminating educational content on ecological initiatives, digital channels contribute to raising awareness among tourists and encouraging more responsible choices (Gulaliyev et al., 2021; Karyy et al., 2025). The results of the SWOT analysis contributed to the development of a comprehensive understanding of how digital tools

may enhance marketing strategies focused on sustainable tourism, alongside the challenges likely to arise during their integration. Table 3 presents a summary of the SWOT analysis, reflecting the strengths, weaknesses, opportunities, and threats associated with the application of AI and big data in the promotion of sustainable tourism. The findings from the SWOT analysis indicate that the strengths highlight the considerable potential of digital tools in improving communication with target audiences. Personalised marketing messages generated through the analysis of large data sets enable a deeper understanding of tourists' interests, needs, and behavioural patterns (Waliszewski et al., 2025).

This fosters more effective targeting of environmentally responsible services, increases customer loyalty, and strengthens the market position of sustainable tourism. Nevertheless, several limitations hinder the full-scale implementation of digital solutions, particularly among small and medium-sized enterprises. Key weaknesses include the high cost of adopting AI and big data technologies, a lack of qualified personnel, technical integration difficulties, and the possible erosion of emotional connection with clients. These are compounded by risks related to data protection, which have become increasingly relevant in the context of emerging regulatory standards. External opportunities point to a growing societal demand for sustainable, individualised, and digitally supported tourism.

However, the threats identified in the analysis point to the need for a cautious approach to technological transformation. In particular, the rapid obsolescence of digital solutions, consumer distrust towards algorithmic systems, risks associated with excessive dependence on major technology platforms, and the complexity of complying with regulatory requirements require ongoing monitoring and adaptation. A digital approach is not without its challenges.

Among the most noteworthy are the need to uphold ethical standards regarding the processing and storage of personal data, increased demands for digital literacy among staff, and a continuous need for technical updates and the alignment of marketing strategies with changes in platform algorithms and the dynamics of the digital environment.

Table 3. SWOT analysis of AI and big data use in tourism marketing (Source: compiled by the authors)

<b>Strengths</b>	<b>Weaknesses</b>
<ul style="list-style-type: none"> <li>- Personalisation of marketing messages based on big data analytics               <ul style="list-style-type: none"> <li>- Real-time consumer behaviour prediction</li> </ul> </li> <li>- Resource optimisation and reduced promotion costs               <ul style="list-style-type: none"> <li>- Improved targeting</li> </ul> </li> <li>- Support for environmental responsibility (e.g., recommendations for eco-friendly routes)</li> </ul>	<ul style="list-style-type: none"> <li>- High financial costs of technology implementation</li> <li>- Integration challenges in small and medium-sized enterprises               <ul style="list-style-type: none"> <li>- Shortage of qualified specialists</li> </ul> </li> <li>- Risk of losing emotional connection with the client               <ul style="list-style-type: none"> <li>- Cybersecurity and data privacy threats</li> </ul> </li> </ul>
<b>Opportunities</b>	<b>Threats</b>
<ul style="list-style-type: none"> <li>- Rising demand for sustainable and personalised tourism               <ul style="list-style-type: none"> <li>- Use of open data in tourism</li> </ul> </li> <li>- Development of partnerships with the IT sector</li> <li>- Growing interest in transparency, ethics, and sustainability</li> <li>- Rapid market responsiveness through behavioural analytics</li> </ul>	<ul style="list-style-type: none"> <li>- Regulatory restrictions on personal data processing</li> <li>- Technological dependence on major IT platforms               <ul style="list-style-type: none"> <li>- Fast obsolescence of software</li> </ul> </li> <li>- User distrust in algorithm-based recommendations</li> <li>- Lack of transparency in the operation of digital systems</li> </ul>

#### 4. Strategic areas for enhancing the effectiveness of sustainable tourism marketing through digital technologies

The findings made it possible to identify strategic areas for improving the effectiveness of sustainable tourism marketing through the implementation of digital technologies, particularly in countries undergoing active transformation of their tourism sectors in response to global digitalisation challenges. One such example is Azerbaijan, where recent years have seen an intensification of state policy in the fields of sustainable tourism and digital development.

The use of digital tools, including big data, consumer behaviour analytics, and elements of AI, has the potential to significantly improve communication between tourism service providers and consumers, in addition to enabling the personalisation of the tourist experience (Hasanova & Najafova, 2025; But et al., 2023). In Azerbaijan, a key strategic focus is placed on integrating digital platforms into tourism infrastructure. This includes mobile applications for travel planning, intelligent recommendation systems, the use of cloud services, and digital mapping. An important factor is the development of analytical systems that allow tracking the dynamics of tourist flows, tourist preferences, seasonality of demand, and the influence of external factors on tourist activity. Research results indicate that national tourism operators and state bodies responsible for tourism promotion in Azerbaijan began actively utilising big data tools to forecast tourism trends, optimise marketing campaigns, and enhance the quality-of-service provision.

The development of systems for monitoring tourist feedback through digital channels enables not only prompt responses to comments but also the formation of a comprehensive strategy for improving tourism products with a focus on sustainability and responsible consumption. Artificial intelligence allows automating the analysis of large-scale data, identifying behavioural patterns among tourists, and adapting marketing messages to individual user needs (Kubiczek et al., 2025; Costantino et al., 2021). These approaches considerably enhanced the promotion of Azerbaijan's national tourism brand, particularly within the context of digital transformation (Garajamirli, 2025). The use of social media as a strategic communication channel allows the state tourism agency to disseminate information about tourism products, events, and the country's cultural heritage to a broad international audience in a timely manner.

The Visit Azerbaijan platform emerged as a key digital tool, combining personalised recommendations, interactive maps, and interest-based segmentation, significantly improving potential tourists' user experience. Support from technologies such as big data and analytical dashboards enables the monitoring of visitor behaviour on the website, analysis of campaign effectiveness, and real-time adjustments to marketing strategies. International partnership projects, especially those undertaken in cooperation with the UNWTO and the European Union, facilitated the integration of

Azerbaijan into global tourism initiatives and contributed to the formation of a positive image of the country as a sustainable and innovative tourism destination. As a result, digital approaches support not only the growth of tourism demand but also the enhancement of the international recognition of Azerbaijan as a competitive actor in the sustainable tourism market. The findings also emphasise the importance of inter-agency cooperation in the digital transformation of tourism, particularly between the Ministry of Culture and Tourism of Azerbaijan, IT companies, educational institutions, and local communities. Such collaboration fosters the creation of innovative models for managing the tourism sector, directed towards achieving sustainable development and strengthening the country's competitiveness in the international tourism market. The study, therefore, affirms that digital technologies, including AI and big data, are driving the transformation of sustainable tourism marketing by increasing communication effectiveness and shaping a new paradigm of interaction between the tourism sector and consumers within the digital economy.

## DISCUSSION

The findings of the study fully correspond to the research objectives, having identified key digital tools that enhance the effectiveness of sustainable tourism marketing and assessed the extent of their implementation among tourism business representatives. The purpose of the study was achieved through the synthesis of empirical data and the formulation of practical recommendations. Digital transformation altered approaches to marketing in the field of sustainable tourism, particularly through the integration of artificial intelligence and the analysis of big data. The results demonstrate that the use of AI and big data contributes to a deeper understanding of consumer behaviour and improves the effectiveness of marketing strategies.

This aligns with the conclusions of Siddik et al. (2025), who highlighted AI as a critical driver of efficiency and intelligent capabilities in tourism, significantly advancing its sustainability. The adoption of financial technologies, specifically FinTech, also plays an important role in the digital transformation of tourism. The study discovered that the integration of FinTech solutions such as blockchain and mobile payments enhances transactional efficiency and supports sustainable tourism development. These findings are consistent with the work of Abedalrhman (2024), who emphasised the potential of FinTech to revolutionise the tourism industry by boosting economic outcomes and promoting resilience. Digital marketing remains a key instrument in the promotion of sustainable tourism, particularly in mountainous regions.

Cuomo et al. (2021) illustrated how large-scale social data could be integrated into the co-design of tourism experiences. The authors argued that such data analytics provided insights into tourist expectations and preferences, allowing for the adaptation of cultural products to specific audiences and the development of more attractive routes aligned with sustainable development principles. El Archi et al. (2023) conducted a review of digital technology implementation in sustainable tourist destinations. Their analysis highlighted the need for a clearly defined research agenda concerning the digital transformation of tourism. Particular emphasis was placed on the integration of digital solutions into strategic planning processes, notably in relation to environmental impact monitoring and the management of tourist flows. In the paper by Al Fararni et al. (2021), a conceptual model of a hybrid recommender system for the tourism industry was presented. The model was based on a combination of artificial intelligence (AI) and big data, employing behavioural, contextual, and demographic data to generate personalised recommendations and improve the effectiveness of marketing strategies. The digital transformation within the tourism industry of Vietnam, with particular emphasis on the importance of big data, was examined by Ha & Huan (2023). Their study demonstrated that large-scale data played a substantial role in identifying shifts in consumer preferences, analysing market trends, and supporting strategic decision-making through predictive analytics. The study by Madanchian (2024) also attracted attention, offering valuable insights into the effective use of Artificial Intelligence for analysing customer behaviour.

The author highlighted the potential for applying similar approaches within the tourism sector, where AI could be utilised to predict consumer behaviour, automate customer service, and improve levels of client satisfaction. The study by Tadi et al. (2024) further highlighted the role of combining AI and big data in advancing responsible tourism through enhanced visitor flow forecasting and resource optimisation.

The current study corroborates these findings, showing that such technologies support the minimisation of environmental impact and improve the management of tourism destinations.

Digital marketing has a positive influence on the promotion and development of sustainable tourism (Hrinchenko et al., 2023; Shahini & Shahini, 2025). This aligns with the findings of Veseli et al. (2025). The results of the study indicate that the use of digital platforms contributes to raising awareness of environmentally friendly tourism products and attracting a greater number of environmentally conscious travellers. Zeqiri et al. (2020), Pohuda (2023), noted that the digitalisation of the tourism industry considerably affects the structure and dynamics of the market. The findings demonstrate that the introduction of advanced technologies is reshaping the ways in which service providers and consumers interact, fostering greater transparency and improving access to information, which is consistent with the conclusions of these authors. The study also highlights the potential of artificial intelligence to efficiently process and analyse feedback, offering valuable insights for service enhancement. This corresponds with the findings of Zhang et al. (2025), who compared the effectiveness of hotel review management using generative AI versus human resources. Zhang & Chen (2024) demonstrated that the integration of digital technologies into human resource processes enhances organisational efficiency and adaptability. This is reflected in the present study, which identifies the digital transformation of human resource management in the digital age. The study confirms that the strategic adoption of digital technologies can be essential for ensuring the sustainability and competitiveness of tourism enterprises in a rapidly evolving digital environment. This supports the conclusions of Zhang (2023), who emphasised the importance of developing and implementing digital strategies to foster the tourism sector's growth and its adaptation to current

demands. Digital platforms incorporating AI and big data emerge as critical tools for improving competitiveness, enhancing customer engagement, and driving innovation in tourism services (Sevastyanov & Donchenko, 2023).

Focusing on the impact of digital transformation on sustainable tourism marketing, with particular attention to AI and big data, the study highlights the opportunities these technologies offer for analysing consumer preferences. This is supported by Mich (2022), who explored the main aspects of using AI and big data in tourism. It was established that artificial intelligence and data analytics enable tour operators to develop more personalised offerings tailored to the individual interests and requirements of travellers, thereby improving the overall customer experience.

These approaches also increase the efficiency of marketing campaigns by reducing advertising and targeting costs, aligning with the findings of Abid et al. (2025), who noted that AI and big data enhance the understanding of consumer behaviour, leading to more optimised marketing strategies within the tourism sector. The study by Han & Guo (2025) also demonstrated that the integration of big data and artificial intelligence within recommendation systems enables tourism companies to provide more accurate and timely advice to their clients. The current study highlights that the use of such systems increases the precision of personalised recommendations, significantly enhancing consumer experience and satisfaction in the tourism sector. The influence of AI and big data on shaping consumer behaviour is further supported by the findings of Pagala et al. (2024), who examined how data-driven personalised marketing can strongly impact customer decision-making processes. The study conducted by S.

Blanco-Moreno et al. (2023) emphasised that the integration of digital technologies into tourism marketing creates new opportunities for collecting and analysing large volumes of data. This observation corresponds with the present study. The importance of continuous data monitoring in the effective implementation of sustainable development strategies in tourism was noted. Bulchand-Gidumal et al. (2024) stated that the use of AI in marketing strategies enables tourism companies not only to promote services more efficiently but also to ensure business resilience amid rapid market changes. The findings of this study showed a high level of trust among respondents regarding the use of digital technologies, particularly artificial intelligence and big data, in the marketing of sustainable tourism.

This trend reflects broader international developments, as highlighted in reports by the United Nations World Tourism Organization (2025) and the Organisation for Economic Co-operation and Development (2025).

These reports emphasised the role of digitalisation in enhancing customer orientation and operational efficiency within tourism services. Additional insights from the UAE sustainable tourism market report, which is expected to exceed US\$ 164.62 million by 2033 (2023), further underscore this trend. Moreover, the UNWTO's 2022 report stressed the importance of supporting talent and SMEs (2022) in tourism transformation. Certain regional differences were identified in the context of Azerbaijan, as noted in the OECD's tourism trends and policies report (Organisation for Economic Co-operation, 2022). Respondents from Baku exhibited higher awareness and trust in digital tools compared to those from smaller regions, indicating an uneven level of digital literacy across the country.

The survey results clearly reflect trends that align with the findings of the SWOT analysis, particularly the high level of trust in digital tools for travel planning and the substantial demand for sustainable tourism. These outcomes underscore the importance of employing AI and big data to personalise offers. For instance, 91% of respondents from the tourism sector frequently use online agencies, reinforcing the conclusion that digital platforms hold substantial potential for marketing sustainable tourism. Moreover, a considerable proportion of respondents (66%) reported that while digital platforms are being developed, they still require improvement. This aligns with the weaknesses identified in the SWOT analysis, such as limitations in the adoption of advanced technologies due to high costs and technical difficulties. One of the primary advantages of using AI and big data lies in their capacity to develop innovative marketing strategies that directly respond to consumer needs and market trends.

These technologies have been shown to enhance the effectiveness of marketing strategies while also enriching the tourist experience by making it more personalised, relevant, and meaningful. Digital transformation has thus become a crucial component of sustainable tourism, integrating environmental, economic, and social dimensions of development. This observation corresponds with the study by Noorizadeh et al. (2021), which focused on the use of data to optimise business processes. The authors emphasised that digital tools can reduce resource management costs and contribute to sustainable development through process optimisation in tourism. Despite these benefits, ethical concerns and data privacy issues must be addressed when applying AI and big data in tourism marketing. According to Hamamah et al. (2024), the successful implementation of these technologies requires a clear policy on data protection and the safeguarding of consumers' personal information. The use of big data in managing tourist flows also enables companies to anticipate trends and optimise service delivery. This is supported by Agrawal et al. (2022), who noted that the analysis of large datasets facilitates more accurate infrastructure and resource planning in the tourism sector.

Based on the findings, it is advisable for tourism businesses to invest in mobile applications with AI-powered recommendations for personalised travel planning and to implement digital literacy programmes for staff to ensure the effective use of innovative tools. From a policy perspective, the development of strategies to support the digitalisation of small and medium-sized tourism enterprises is recommended, including grant schemes, tax incentives, and educational initiatives aimed at building competencies in sustainable tourism and digital technologies.

Digital transformation emerges as a powerful driver of change in sustainable tourism, particularly through the adoption of AI and big data technologies. These innovations enhance consumer engagement, enabling tourism enterprises to deliver personalised offers and reduce resource management costs. The findings on AI and big data applications in sustainable tourism marketing confirm the immense potential of these technologies to transform the tourism industry.

## CONCLUSIONS

In analysing the digitalisation of tourism in Azerbaijan, the study demonstrated a gradual yet purposeful implementation of innovative approaches within the sphere of sustainable tourism. According to reports by the World Tourism Organization, Azerbaijan was actively developing a national tourism strategy centred on digital transformation. This included increased investment in digital infrastructure and the creation of platforms to promote the national tourism brand. Analytical materials from the OECD confirmed the substantial role of digital tools in collecting statistics and analysing tourist behaviour, alongside the development of personalised travel itineraries. The reports also emphasised the importance of initiatives such as “Digital Azerbaijan” and the “Sustainable and Smart Tourism Strategy 2030”, which prioritised the integration of artificial intelligence and big data into the tourism sector. As part of the study, a survey was conducted involving 300 respondents, comprising representatives of the tourism industry and specialists in sustainable tourism marketing. The survey demonstrated that 63% of participants used digital platforms for travel planning several times a week or on a daily basis. Approximately 80% expressed trust in AI-based recommendations, and over 70% recognised the importance of environmental awareness when choosing travel destinations.

These findings indicated a growing ecological consciousness among the population and an openness to digital innovations. The analysis of the survey results showed that digital technologies altered consumer behaviour patterns. A total of 45% of respondents reported that digital services considerably influenced their travel habits. A trend emerged towards the use of AI recommendations in route selection, alongside increased interest in sustainable initiatives, particularly through engagement with relevant certifications and online reviews. The SWOT analysis enabled the identification of key opportunities for integrating AI and big data into marketing practices. Specifically, the findings highlighted that the use of big data allows personalising communication with tourists, adapting marketing strategies to market fluctuations, and enhancing corporate environmental responsibility. These opportunities, in turn, could contribute to strengthening the competitiveness of Azerbaijan within the global tourism market.

The study outlined strategic areas for enhancing the effectiveness of sustainable tourism marketing through digital technologies. Key areas included the personalisation of the tourist experience based on big data, the development of interactive platforms for promoting environmentally responsible travel routes, the application of artificial intelligence for forecasting tourist flows, and the active engagement of social media to raise awareness of sustainable tourism principles. The practical value of the study lies in its potential application by tourism companies and governing bodies for the implementation of effective digital strategies in the promotion of sustainable tourism. The study faced several limitations, including a relatively small sample consisting solely of experts from Azerbaijan, the absence of data from tourist consumers, restricted access to closed statistical datasets of digital platforms, time constraints on data collection, and a lack of access to internal analytics of tourism platforms. Future research should address these limitations by expanding the sample size, incorporating international comparisons, and exploring long-term behavioural changes among consumers.

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