

## ARTIFICIAL INTELLIGENCE IN SMART TOURISM: AN EMPIRICAL FRAMEWORK

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### Abstract

Smart tourism is heavily dependent on the ability to not only gather vast amounts of data, but also to effectively store, process, merge, analyze, and utilize big data to drive business innovation, operations, and services through the use of artificial intelligence and big data techniques. Smart tourism is the dynamic integration of human experiences with intelligent technologies. It is closely associated with the advancement of Smart Cities and is closely aligned with advancements in technologies such as Artificial Intelligence, IoT, Big Data, and 5G. The core principles of smart tourism revolve around enhancing tourism experiences, optimizing resource management efficiency, and maximizing destination competitiveness with a strong focus on sustainability. Smart tourism offers advantages such as upgraded tourism experiences, easy access to information about local attractions, and enhanced transportation networks. It also boosts the performance and competitiveness of tourism-related businesses. By utilizing AI-driven recommendation systems, travelers can receive personalized suggestions for attractions, dining options, and activities that cater to their preferences, with these recommendations continuously evolving to provide more precise and relevant tips as time passes. This study involved a questionnaire survey of 320 participants, utilizing stratified random sampling. The tourism sector is gaining prominence as a field of study focusing on these topics recently.

Key Words: Artificial intelligence, Technology, Smart tourism

### Introduction

Smart tourism refers to travel experiences that are enhanced by technology, allowing travellers to easily navigate unfamiliar cities, book activities online, and use their mobile devices to manage their entire trip. Artificial intelligence is continuously advancing and proving to be a reliable and appealing solution for businesses. The travel and tourism industry, in particular, is embracing AI to streamline various processes, from travel planning to assisting customers during their trips. Proficient at creating detailed itineraries, while chatbots are handling an increasing number of customer service requests. Smart tourism, a result of modern technology, has a significant impact on all sectors of the tourism industry. It provides tourists with new information services, destination details, consultations, and the ability to book travel products from the comfort of their homes, greatly enhancing the level of service in the tourism industry. For tourism destinations and operators, smart tourism enables online marketing of their products, attracting tourists, and implementing intelligent management of tourism destinations (Otowicz, 2022).

The main focus is artificial intelligence and intelligent automation within the tourism sector. Evaluating, conceptualizing, planning, and implementing AI solutions for the travel industry requires a thorough analysis that cannot be achieved solely through intelligent automation. According to Zhao et al (2011), AI can determine the most reliable systems for the tourism field and how they can be developed to cater to future travelers. Zhang et al (2022) first introduced the idea of "smart tourism" back in 2008, and since then, technologies like Internet applications, the Internet of Things, cloud computing, and AI.

Tourism, as an emerging sector, is experiencing rapid growth in contemporary society. The advent of smart tourism has shown consistent progress, playing a crucial role for local tourism operators and management departments. Nevertheless, certain tourism businesses have failed to grasp the significance of this trend and have not allocated sufficient attention to it. Tourism enterprises must adapt to the changing landscape and seize the appropriate opportunities for transformation. By leveraging smart tourism, enterprises can analyze the preferences and requirements of tourists using relevant data. This enables them to identify target customer segments, offer personalized services tailored to the needs of tourists, enhance service efficiency, lower marketing expenses, and make informed decisions based on data-driven insights. Tourism management departments can benefit from the real-time data from smart tourism terminals to take quick actions and address tourist complaints promptly. This helps in making informed decisions and providing better services. Leung (2022) Social media platforms also enable tourists to share their travel experiences instantly and give feedback on various review sites.

### **Background of the Study**

Passiante Del Vecchio (2017) it is essential to adopt methodological approaches for the preliminary analysis of the various nations to determine the similarities, differences, and peculiarities of each region; to cross-correlate these factors in tourist-integrated paths, and to encourage the development of ICT infrastructures and knowledge-intensive services.

To help smart tourism stakeholders leverage artificial intelligence to integrate cross-departmental business and streamline key performance metrics to build a business-level IT plan, Tsaih (2018) conceptual framework integrates three key components: (1) artificial intelligence / machine learning, (2) institution/organizational, and (3) business processes. Artificial intelligence is only useful if it can perform the following three tasks: (1) cognitive engagement (speech or pattern recognition), (2) cognitive process automation (robotic process automation), and (3) cognitive insight (prediction, advice).

Nguyen (2019) the majority of application-level users are tourists who utilize ultra-portable Internet terminals (such as tablets and smart phones) or other Internet-connected travel equipment. Databases, fundamental software, and hardware are all part of the infrastructure. Based on this hardware, a data center with a variety of travel-related details and a unique organization in charge of maintaining and updating data.

Popesku (2019) intelligent systems and tourism in ideal, given how complicated the decision-making process is when it comes to travel. Robots, artificial intelligence, and service automation have opened up a world of new possibilities for travel agencies been implemented to some degree in the tourism sector, there is still a dearth of scientific research on the topic. This research aims to provide a much-needed scientific perspective on the topic by continuing the recently begun conversation on artificial intelligence applications in tourism.

Caballero Sánchez (2019) the methods discussed in this article can be categorized as advancements that are expanding and use ICT to enhance several facets of the travel and tourism sector. The study's results are outstanding, and given the variety of scenarios it addresses, it's safe to say that artificial intelligence-based methods will be widely used in the travel and tourism sector in the future.

Gajdošík&Marciš (2019) the idea of "smart tourism" arose in response to these developments, offering real-time solutions, sophisticated analytics, and improving visitor experience. By examining the spatial and temporal distribution characteristics of tourist flow in scenic locations, Li Daming (2020) developed a BD platform based on information about tourist flow. To forecast visitor flow in the space-time distribution dimension, he suggested DM technology based on the hybrid kernel relevance vector machine algorithm and the dragonfly algorithm.

In this conceptual study by Kiliçhan & Yilmaz (2020), robotic technologies and artificial intelligence applications were first assessed, and the advancement of these technologies was disclosed. In light of this, it can be said that the study which discloses the existing state of affairs and draws conclusions for the future from writers with industry experience is significant and will benefit both the literature and practitioners in the field.

Tussyadiah in 2020 this study contributes to theory and practice by laying out the need to create an automated future of tourism as a social phenomenon and an economic activity. Designing useful AI, promoting adoption, evaluating the effects of intelligent automation, and leveraging AI to build a sustainable future. Undertakings in these domains will facilitate an organized generation of knowledge, reflecting a collaborative endeavour

among scientists to guarantee the advantageous implementations of intelligent automation in the tourism industry. The Curated Collection on Artificial Intelligence and Robotics for the Annals of Tourism Research is also launched with this paper.

The first bibliometric on AI in the tourist sector was done by Kirtil & Aşkun (2021); it shows research trends and popular articles and offers a basic overview of AI, making it helpful for academics and tourism experts.

Filieri et al (2021) Artificial intelligence (AI) has the potential to drastically change the travel and tourism (TTI) sector investigate the features of AI start-ups in the tourist industry, the AI technology areas funded by venture capitalists (VCs), and the stages of the supply chain where VC-financed AI areas are in high demand. VCs showed a great interest in AI solutions that enable marketing automation, segmentation, and personalization by supporting the AI technological domains of learning, communication, and services (i.e., big data, machine learning, and natural language processing). Moreover, pre-and post-trip considerations are the focus of VC-backed AI solutions.

Particular integration between tourism and big data analysis methodology applied by Pei & Zhang (2021). The analytical model may strongly recommend tourist-favourite picturesque sites, according to the results. Consequently, it can serve as a model for integrating artificial intelligence with tourism as well as a real-world illustration for such integration in the future.

Jie Li (2021) the purpose of this essay is to investigate how artificial intelligence is being used in smart tourism. Gain a deeper understanding of the present state of artificial intelligence product application in smart tourism by analyzing its flaws, those of the traditional tourism system, and how it applies to smart tourism. The survey's findings indicate that the popular and well-developed artificial intelligence tour guide products currently in use in picturesque locations are more well-liked by the general audience. The app's AI tour guide features are currently under development and need refinement.

Jabeen et al (2022) the goal of this study is to create a framework for identifying and ranking the critical elements in the application of automation and artificial intelligence (AI) in the travel and hospitality sector. A framework that recognizes and may assist in resolving some of the obstacles to automation and artificial intelligence implementation in the global hotel and tourism industry is provided to policymakers. The findings offer a roadmap for further study in this field.

Jamaluddin & Rahmat (2022) through novel, engaging, and visually appealing ways of communicating and interacting with clients, artificial intelligence (AI) technology has the potential to improve the perceived quality of services. This article also highlights prospective applications of AI in the tourist sector, including self-driving cars, AI in pest control, monitoring crops and forests, decision support systems, forest preservation, virtual reality, and AI-enhanced travel.

Koseoglu, Saydam, and Arici (2022) in response to the growing interest in service robotics and artificial intelligence (AI) in the travel and hospitality industries. To identify the key topics, bibliometrics (citation and co-citation) and content analysis were used to extract and examine several journal papers on artificial intelligence.

The goal of Stroumpoulis et al. (2022) is also to investigate the conditions in which the use of these technologies and applications could provide travel agencies with a competitive edge. As a result, this study outlines the strategic importance of AI and BDA in ST, offers recommendations for their use, and lays the groundwork for further study.

Solaklis et al (2022) important customer-based elements and technology influencing VCC in the tourist industry using a theory-based general literature review approach. The authors develop a theoretical framework that hypothesizes the factors influencing VCC in the AI-driven tourism sector after analyzing the pertinent literature. Artificial intelligence identifies customer-based elements of VCC, including anthropomorphism, trust, hedonic motivations, perceptions, attitudes, and past experiences. Technologies that affect VCC include chat bots, AI-enabled self-service kiosks, machine learning (ML), natural language processing (NLP), meta verse tourism, and new reality.

Samala et al (2022) the main objective of this article is to highlight robotics and artificial intelligence (AI) in the travel and tourism sector. The implementation of AI and robotics is anticipated to bring about positive and enhanced changes in tourism marketing, ultimately enhancing the overall visitor experience. Emerging technologies like chat bots, virtual reality, language interpreters, etc., can be effectively utilized in the travel, tourism, and hospitality industries.

Milton (2023) Operational efficiency, as demonstrated by technologies like chatbots and predictive analytics, becomes a key differentiator. Drones and virtual reality are emphasized as game-changing technologies that give travelers new perspectives on their travel destinations. Artificial intelligence can completely transform travel experiences, as demonstrated by innovations like sentiment analysis powered by AI, real-time translation,

and augmented reality tours. Concurrently, there is a growing focus on using AI to promote ethical and sustainable travel.

Ndou et al (2023) are studying something cool! They are looking at tourism and how it connects to culture and nature. They want to use a special strategy that involves working together, sharing knowledge marketing, and managing things across different countries. It's all about finding new opportunities and understanding how this method can make a big impact.

This research paper by Ruoran (2023), utilizes tourism data from 2010 to 2021 to create a regression model and an exponential curve model for predicting passenger traffic. Additionally, we construct a tourism spatial dimension model to establish a tourism data table. The data is pre-processed, and a data mining (DM) model is built using a SQL Server model. The experimental phase of the study focuses on cities that have implemented smart tourism DM technology.

Mengdan (2023) the advancement of artificial intelligence and the customization of tourism demands are driving the integration of artificial intelligence into the tourism sector. Various policies in China have been introduced to support the development of smart tourism, with artificial intelligence playing as a technical backbone. The findings indicate that AI has the potential to enhance the quality of tourism services, streamline management processes, and enhance targeted marketing efforts. However, challenges such as inadequate planning and incomplete functionalities have been identified during the implementation phase. To address these issues, a smart tourism framework on artificial intelligence has been proposed in this paper, consisting of four subsystems catering to tourists, businesses, government entities, and residents, respectively, to enhance the capabilities of the current system.

### **Methodology**

The technique of information gathering is applied in this field of strategies and information. The information is gathered using a quantitative approach. The address for this article's overview will be printed and given to the study participant in person. Usually, there are two ways to get information: one is through subjective methods, and the other is through quantitative approaches. The data classified as secondary were previously gathered from websites. Secondary data serves as the foundation for the theoretical frame's data. These secondary data came from books, journals, other expedition reports, and internet resources. In January 2024, a quantitative check was suggested. In any paper, data collecting can be a very important and significant component. The selection of an information collection framework is

also extremely important and plays a crucial role in presenting the correct information.

### Analysis and Interpretation of Data

**Table 1: Percentage Analysis**

Category	Classification	Frequency	Percentage
Gender	Male	190	59.4
	Female	130	40.6
Age	19-29 Years	84	26.3
	30-39 Years	74	23.1
	40-49 Years	79	24.7
	50-60 Years	22	6.9
	Above 60 Years	61	19.1
Occupation	Industrialist	13	4.1
	Doctors / Engineers / Lawyers	21	6.6
	Government Service	36	32.5
	Private Service	46	14.4
	Agriculture	104	11.3
	Student	24	7.5
	Retired / Unemployed	76	23.8
Education qualification	School education	61	19.1
	Diploma	74	23.1
	Under Graduate	155	48.4
	Post Graduate	30	9.4
Members of the family	1-3	121	37.8
	4-6	176	55.0
	Above 7	23	7.2
Monthly salary	Less than 10 K	26	8.1
	10K - 25 K	58	18.1
	25K - 50K	100	31.3
	50K – 1L	38	11.9
	More than 1,00,000	98	30.6
Area of residency	Rural	183	57.2
	Urban	137	42.8
Travel mode	Independent	110	34.4
	Package Tour	81	25.3
	Family members and friends	129	40.3
Marital Status	Single	227	70.9
	Married	93	29.1
Frequency of Travel per year	1-2	66	20.6
	3-4	76	23.8
	5-7	55	17.2
	Above 7	123	38.4
Accommodation	Non-star Hotel	130	40.6
	Cottages	109	34.1
	Guesthouse	36	11.3
	Rooms / Lodges	45	14.1
Month of visit	January – June	187	58.4
	July – December	133	41.6

It is evident that among the gender of the respondents, 59.4 percent have male respondents, followed by female respondents at 40.6 percent. Among the age of the respondents, 26.3 percent of the respondents were 19-29 Years old, followed by 30-39 Years of respondents 23.1 percent, trailed by 40-49 Years respondents have 24.7% and the

remaining age group people have youngsters 6.9% and Above 60 years age people have 19.1%. Regarding designation of the employees, 4.1 percent of the respondents were Industrialists, followed by Doctors / Engineers / Lawyers respondent 6.6 percent, tailed by Government Service of the respondents have 32.5%, and the highest respondents of Agriculture 11.2% and Retired / Unemployed respondents the study only 23.2%. Education Qualification of the respondents is the number of respondents who have a school education with 19.1 percent, Diploma with 23.1 percent, trailed by Graduate respondents with 48.4 percent highly qualified in the sector. Postgraduate respondents are 9.4%. 1-3 family members are 37.8%, 4-6 family members have 55%, and Above 7 family members groups in 7.1%. Highlights the respondents' marital status, the number of respondents who have 70.9% are Single, followed by married respondents at 29.1 percent. The month of the visit of the respondents is January – June 58.4%, and July – December 41.6%.

**Table 2: Benefits of AI In St and The Month of Visit In The Respondents**

ANOVA						
		Sum of Squares	DF	Mean Square	F	Sig.
Personalization	Between Groups	.300	1	.300	.328	.567
	Within Groups	291.122	318	.915		
	Total	291.422	319			
Dynamic pricing	Between Groups	5.268	1	5.268	4.564	<b>.033</b>
	Within Groups	367.029	318	1.154		
	Total	372.297	319			
Hospitality	Between Groups	5.526	1	5.526	4.138	<b>.043</b>
	Within Groups	424.674	318	1.335		
	Total	430.200	319			
Customer support	Between Groups	.234	1	.234	.440	.507
	Within Groups	169.063	318	.532		
	Total	169.297	319			
Automated process	Between Groups	3.454	1	3.454	4.744	<b>.030</b>
	Within Groups	231.543	318	.728		
	Total	234.997	319			
Improved Security	Between Groups	9.973	1	9.973	7.635	<b>.006</b>
	Within Groups	415.374	318	1.306		
	Total	425.347	319			
Increase efficiency	Between Groups	17.042	1	17.042	21.638	<b>.000</b>
	Within Groups	250.446	318	.788		
	Total	267.488	319			
Better Marketing Strategies	Between Groups	3.169	1	3.169	2.647	.105
	Within Groups	380.719	318	1.197		
	Total	383.888	319			



According to the above table, there is a significant difference between the respondents' month of visit and the benefits of artificial intelligence in smart tourism for eight factors: dynamic pricing, hospitality, customer support, automated process, improved security, and increased efficiency. This difference is observed when the significant value is less than the "P" value (0.05%). The null hypothesis is thus disproved. The advantages of artificial intelligence in smart tourism do not much differ from those of personalization, customer assistance, and better marketing strategies. As a result, the null hypothesis is accepted, indicating that, on average, visitor opinion regarding the benefits of artificial intelligence in smart tourism is not as strong as it is during the month of the visit.

**Table 3: Challenges of Artificial Intelligence in Smart Tourism**

**One-Sample Statistics**

	Mean	Std. Deviation	Std. Error Mean	t	Sig. (2-tailed)
Data Privacy and security	3.80	1.165	.065	58.332	.000
Ethical use of AI	3.59	1.281	.072	50.094	.000
Accessibility and inclusivity	3.81	1.180	.066	57.714	.000
Job Displacement	3.45	1.281	.072	48.190	.000
Adaptation and Training	4.04	1.158	.065	62.386	.000
Trust and Acceptance	4.09	1.035	.058	70.664	.000

Data security and privacy (T value = 58.332; Mean = 3.80; SD = 1.165; Standard Error M = 0.065; sig value = 0.000). AI used ethically (mean = 3.59, standard deviation = 1.281, error margin M = 0.072, T value = 50.094, significance value = 0.000), Inclusivity and accessibility (T value = 57.714; Mean = 3.81; SD = 1.180; Std. Error M = 0.066; sig value = 0.000), Adaptation and Training for Job Displacement (Mean = 4.04, SD = 1.158, St. Error M = 0.065, T value = 62.386, and the sig value) (Mean = 4.09, SD = 1.035, St. Error M = 0.058, T value = 70.664, and the sig value 0.000) Trust and Acceptance.

**Table 4: Trends of Artificial Intelligence In Smart Tourism**

		Correlations					
		TA1	TA2	TA3	TA4	TA5	TA6
TA1	Pearson Correlation	1					
	Sig. (2-tailed)						
TA2	Pearson Correlation	.225**	1				
	Sig. (2-tailed)	.000					
TA3	Pearson Correlation	-.215**	-.286**	1			
	Sig. (2-tailed)	.000	.000				
TA4	Pearson Correlation	.275**	.376**	-.101	1		
	Sig. (2-tailed)	.000	.000	.072			

TA5	Pearson Correlation	-.058	.089	.131*	.079	1	
	Sig. (2-tailed)	.299	.112	<b>.019</b>	.158		
TA6	Pearson Correlation	-.036	-.199**	.106	-.069	-.118*	1
	Sig. (2-tailed)	.524	<b>.000</b>	.058	.219	<b>.035</b>	
**. Correlation is significant at the 0.01 level (2-tailed).							
*. Correlation is significant at the 0.05 level (2-tailed).							

Trends of Artificial Intelligence, Variables related to IoT, AI Voice Search Optimization, VR and AR, Block chain, Trip Planning, and Translation Services. Preference for AI trends that, at the 1% significance level, show a positive link with other factors. With a Pearson value of 0.225\*\*, -0.215\*\*, 0.275\*\*, 0-.058, and -0.036, there is a moderately high positive connection among the variables between AI Voice Search Optimization, VR and AR, Block chain, Trip Planning, and Translation Services at a 1% level of significance. Based on N = 320 respondents, the 2-tailed significance,  $p = 0.000$ , shows the strongest correlation

### Recommendations and Conclusion

Nearly every stage of the traveler's journey has been automated and transformed thanks to improvements brought about by the recent development and application of information technology in the industry. By using AI in travel, consumers can improve in-transit experiences, expedite the hotel booking process, and customize trip planning. Furthermore, AI is essential to the security of air travel. Artificial intelligence is revolutionizing the travel and tourism sector in several ways, including improving the booking and planning process, generating personalized recommendations, and offering 24/7 customer support through chat bots. AI has several advantages for the tourist sector, including better marketing tactics, more individualized travel experiences, enhanced efficiency, and better customer service.

The tourism sector, which is India's largest service sector, can boost the nation's economic expansion. The development of the tourism infrastructure and upkeep of tourist attractions, including hotels, rest stops, airports, and train stations, becomes crucial for all inhabitants. As artificial intelligence becomes more and more integrated into corporate operations, there will be a greater need for people with expertise in this area. In conclusion, firms looking to stay ahead of the curve and improve overall performance must fully utilize AI.

### Future of Artificial Intelligence in the Travel Industry

AI has transformed the travel and tourism industry by streamlining processes and revolutionizing the consumer experience. Artificial intelligence and machine learning in the tourism and travel sector as companies look to increase efficiency and offer better services to

clients. AI and ML technologies provide a plethora of options for travel and tourism businesses to enhance customer experiences and boost productivity. AI and ML have the potential to expedite the booking process. For instance, chat bots can be created to assist customers and address their inquiries. Moreover, AI can analyze customer data to create personalized experiences based on their preferences and interests. Additionally, AI can be utilized by travel and tourism businesses to automatically track and monitor customer service complaints, thereby enhancing customer satisfaction. AI and machine learning are also employed to enhance search engine optimization for travel and tourism companies. By utilizing AI-driven SEO technologies, it is now easier to target potential customers by customizing online content to their preferences. Forecasting is another valuable application of AI and ML in the travel and tourism industry. Airlines, airports, and hotel chains utilize AI-powered forecasting systems to predict customer demand and effectively manage it. AI models can also be utilized to forecast aircraft delays and suggest alternative routes, reducing customer delays.

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