Artificial Intelligence Adoption in Tourism

Key Considerations for Sector Stakeholders

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ISBN, printed version: 978-92-844-2605-8
ISBN, electronic version: 978-92-844-2606-5
DOI: 10.18111/9789284426065

Published by the World Tourism Organization, Madrid, Spain, and Saxion University of Applied Sciences, Enschede, Netherlands.
First published: 2025

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Affiliate Members and Public-Private Collaboration Department
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Authoring organization:
Saxion University of Applied Sciences

UN Tourism editorial team:
Department of Innovation, Education and Investments
Department of Market Intelligence, Policies and Competitiveness
Department of Ethics, Culture and Social Responsibility
Publications Section

Layout: Impacto Creativo de Comunicación, Spain

Recommended citation:
World Tourism Organization and Saxion University of Applied Sciences (2025), *Artificial Intelligence Adoption in Tourism – Key Considerations for Sector Stakeholders*, UN Tourism, Madrid,
DOI: https://doi.org/10.18111/9789284426065.

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Acknowledgements

The World Tourism Organization (UN Tourism) would like to sincerely thank its Affiliate Member Saxion University of Applied Sciences for its efforts and dedication to carry out this first UN Tourism publication addressing artificial intelligence (AI).

Saxion University of Applied Sciences has emerged as a key collaborator for UN Tourism and the broader tourism industry. Its approach to applied knowledge makes it an ideal partner for developing solutions and strategies that are crucial to staying ahead of emerging trends and new technologies in tourism, particularly in the case of AI.

Artificial Intelligence Adoption in Tourism – Key Considerations for Sector Stakeholders is also the result of a collaboration with a wide range of UN Tourism Affiliate Members who have contributed through practical case studies demonstrating how they are utilizing AI to advance their businesses, enhance visitor experiences and complement the travel journey across various stages – from planning and booking to on-site engagement and post-travel reviews.

Collaborating Affiliate Members were:

- Booking.com
- Colliers MENA
- Expedia Group
- General Directorate of Tourism and Hospitality of Madrid Region
- Grupo Piñero
- JTB Corp.
- Madrid Destino (Madrid Tourism City Council)
- Meliá Hotels International
- NEOM
- Tripadvisor
- Vienna Tourist Board
- Visit Benidorm

This publication was prepared by an experienced team of researchers from Saxion University of Applied Sciences and counted with the guidance from UN Tourism through the Affiliate Members and Public-Private Collaboration Department, and the Innovation, Education and Investments Department. Valuable contributions were made by the UN Tourism Departments of Market Intelligence, Policies and Competitiveness Department; and Ethics, Culture and Social Responsibility.

Foreword

Zurab Pololikashvili
Secretary-General,
World Tourism Organization (UN Tourism)

Artificial intelligence (AI) has the potential to revolutionize global tourism, unlocking new opportunities to enhance resilience, create jobs and drive sustainable development – all while supporting our overarching commitment to people, planet, and prosperity. At UN Tourism, we believe AI can be a powerful tool to transform how we experience, manage and grow the tourism sector. Our focus is on ensuring that AI is implemented in ways that are inclusive, transparent and aligned with our shared goals for a more equitable world.

By integrating AI responsibly, we empower our member states to innovate while addressing global challenges, fostering economic resilience and advancing sustainability. AI has the potential not only to drive growth and efficiency but also to safeguard human dignity and inclusivity, ensuring that all nations and communities can benefit from its advancements.

The present publication on *Artificial Intelligence Adoption in Tourism* underscores our commitment to leading such transformation responsibly. Through continued collaboration with stakeholders across industries and borders, we ensure that AI serves as a force for positive change, helping bridge divides and contributing to a more connected and inclusive global tourism ecosystem.

This publication is made possible through the collaboration of UN Tourism Affiliate Members; and the Saxion University of Applied Sciences has played a leading role in applying academic knowledge to real-world challenges, reflected throughout the report. This practical approach has been complemented by other Affiliate Members, whose shared knowledge and practical examples of AI in tourism give a solid perspective on how this technology can improve customer service, increase efficiency and support sustainable practices, offering perspectives from different parts of the sector.

Public-private collaboration, as exemplified by our Affiliate Members, is crucial for tourism to stay ahead of technological advancements. To this end, UN Tourism trusts its Affiliate Members to continuously assess future technological trends and ensure that the tourism sector remains both resilient and forward-looking.

Foreword

Irene Rispens
Dean Hospitality Business School,
Saxion University of Applied Sciences

The rise of artificial intelligence (AI) brings huge challenges in business, government and education, needing us to rethink our approach entirely. AI is changing society in profound ways, so we must look beyond old ideas to find new solutions.

To tackle these challenges, we need three key traits: the ability to think flexibly and see problems from different angles; the willingness to collaborate across various fields; and the courage to take on the ethical responsibilities of new technology. This shift in thinking is crucial as AI advances rapidly.

Through the harmonious integration of theoretical insight and practical application, this publication demonstrates the power of multidisciplinary collaboration. Experts in technology, social sciences, business and ethics have joined efforts to create a robust framework to address the challenges and opportunities the tourism sector is facing.

The thorough analysis and real-world solutions in this document show that we can adapt to this AI-driven change – and even shape it for the better.

As we face this pivotal moment, this paper may serve as guide and source of hope, lighting our way toward a future where AI benefits everyone.

At Saxion University of Applied Sciences, we pride ourselves on translating technological advancements like AI into real-world applications that benefit society. The contributors to this publication have done an exceptional job, making it a perfect illustration of our mission, and I am immensely proud of their work. The pleasant and fruitful collaboration between Saxion and UN Tourism highlights our joint commitment to harnessing technology for the greater good. We are thankful to many other UN Tourism Affiliate Members for sharing their practical experiences with us, which have greatly enriched this paper. It is my sincere pleasure to present this collective effort, confident that it will pave the way for a brighter, more innovative future for the tourism sector and society as a whole.

Executive summary

In an era of rapid technological advancement, artificial intelligence (AI) has emerged as a revolutionary force, reshaping industries and redefining human interactions with technology. The tourism sector, known for its dynamic nature and customer-centric focus, stands at the forefront of this AI-driven transformation. From personalized travel recommendations to automated hotel services, AI is not just enhancing operational efficiency but fundamentally altering the way travellers experience their journeys.

This report delves into the multifaceted impact of AI on the tourism sector and, in particular, the hospitality industry. It aims to provide stakeholders – including industry leaders, policymakers, technologists and academics – with a thorough understanding of the current landscape, future possibilities and critical considerations surrounding AI adoption in this sector.

Subsequently, it provides key considerations at a general scale and recommendations for specific stakeholders in the tourism supply chain.

Given the current – and potential wide-range – possibilities of AI, and the multi-stakeholder nature of the tourism sector itself, it is important that the implementation of AI in this sector follows a collaborative and inclusive approach. To this end, the publication includes a set of case studies provided by UN Tourism Affiliate Members that reflect diverse applications of AI in tourism, showcasing how various stakeholders can benefit from and adopt AI-driven innovations.

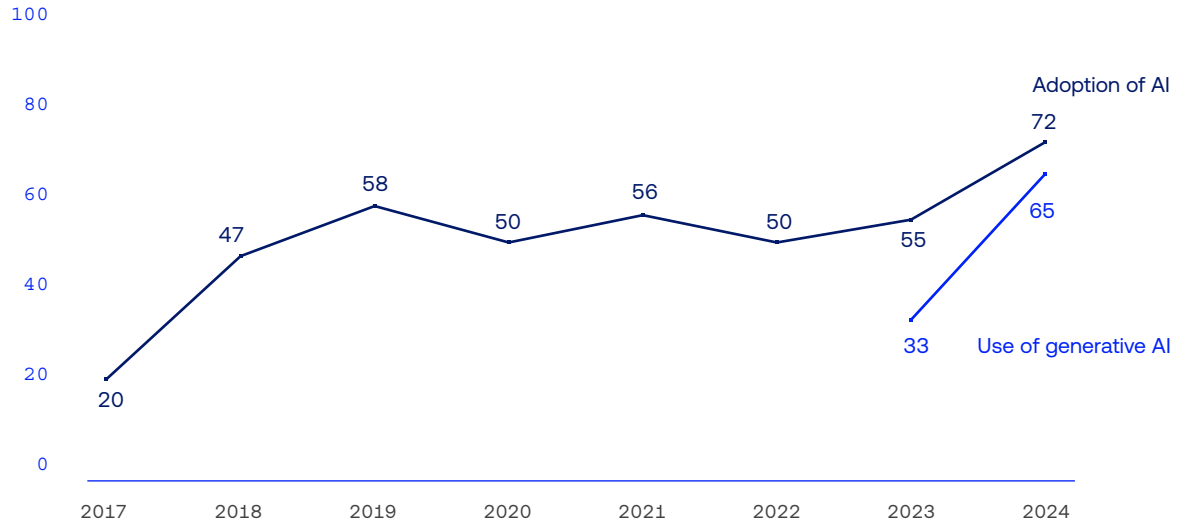
Concept of mobile electronic services for digital solutions. AI-generated image. © Rainer Hendla | Dreamstime.com

Introduction

The dawn of the 21st century has ushered in an age of unprecedented technological innovation, with artificial intelligence (AI) at its forefront. This transformative technology, once confined to the realms of science fiction, has now permeated virtually every aspect of our lives. The tourism sector thrives on human interaction and personalized experiences, and, as such, is undergoing a paradigm shift as it embraces the potential of AI.

From the moment travellers begin to plan their journey to the time they return home with memories, AI is playing an increasingly pivotal role – intelligent chatbots assist in trip planning, machine learning algorithms personalize hotel recommendations and predictive analytics optimize pricing strategies. The integration of AI in this industry has not only streamlined operations and enhanced decision-making processes, but has also redefined the concept of customer service in the digital age.

Figure I.1: **Organizations that have adopted artificial intelligence (AI) in at least one (1) business function (% of respondents)**



Note: In 2017, the definition for *AI adoption* was using AI in a core part of the organization's business or at scale. In 2018 and 2019, the definition was embedding at least 1 AI capability in business processes or products. Since 2020, the definition has been that the organization has adopted AI in at least 1 function.

Source: McKinsey Global Survey on AI, 1,363 participants at all levels of the organization, 22 February – 5 March 2024. Results can be consulted in: McKinsey & Company (2024), *The state of AI in early 2024: Gen AI adoption spikes and starts to generate value,* May 2024, McKinsey & Company, www.mckinsey.com. Copyright (c) 2024, All rights reserved. Reprinted by permission.

The implementation of AI technologies has been rapidly accelerating in recent years. This is illustrated by the implementation rate of ChatGPT, which was the fastest growing application ever to hit 100 million users.[1] While precise implementation rates can of course vary depending on the specific sector and type of AI application, estimates suggest that a significant portion of large enterprises are adopting or experimenting with AI in some form (see figure I.1).

As with any transformative technology, the adoption of AI in tourism brings with it a complex array of opportunities and challenges. While it promises increased efficiency, personalization and novel experiences, it also raises important questions about data privacy, job displacement, misinformation and the preservation of the human touch in an industry built on hospitality.

Research objectives

This publication aims to provide a comprehensive exploration of AI in the tourism sector, addressing three primary research questions:

1. Current landscape: What is the current use and perception of AI in tourism and hospitality?

   Answering this question will offer an in-depth analysis of existing AI applications in the industry, from customer-facing technologies to back-end operational systems. It will also examine how different stakeholders – including businesses, employees, and travellers – perceive and interact with these AI solutions.

2. Opportunities and challenges: Which opportunities and challenges should be considered when applying AI?

   This question will be approached from multiple perspectives:

   - **Ethics:** Addressing concerns about privacy, data security, trustworthiness of information and the potential for bias in AI systems.
   - **Democratization:** Examining how AI can make travel more accessible and inclusive, while also considering the risk of creating new forms of digital divide.
   - **Strategic implementation:** Taking these opportunities and challenges into account, how can AI be applied in tourism?

     Addressing this question will provide actionable insights and strategies for the effective and responsible implementation of AI in the industry. It will consider various scales of operation, from small local businesses to multinational corporations and diverse subsectors within tourism. Moreover, it will address how frameworks or models that have been successfully implemented in other industries could be adapted for tourism.
   - **Business:** Exploring how AI can drive revenue growth, operational efficiency and competitive advantage.
   - **Legal:** Investigating the regulatory landscape surrounding AI use in tourism, including issues of liability and compliance.

1 Duarte, F. (2024), 'ChatGPT users', Exploding Topics, available at: https://explodingtopics.com/blog/chatgpt-users [20-11-2024].

01. The AI revolution: concept and current state

Abstract: This chapter provides an overview of artificial intelligence (AI) as a field defined by the simulation of human-like intelligence. AI, established in 1956, has undergone cycles of growth and setbacks but has seen tremendous progress in recent years, largely due to advancements in machine learning, big data and computational power. The technology has revolutionized multiple industries, from healthcare to finance, showcasing its versatility in enhancing operational efficiency and personalization. However, the widespread adoption of AI also presents significant economic and social challenges, including potential job displacement, ethical concerns about privacy, and the need for responsible, transparent AI practices. The chapter emphasizes the need for regulatory frameworks that can keep pace with rapid technological developments, especially given international variations in data protection laws like GDPR and CCPA. Global cooperation, as urged by bodies like the UN, is essential to develop AI governance frameworks that benefit all. The chapter also explores emerging research areas such as artificial general intelligence (AGI), quantum computing, and AI-human collaboration.

Key words: artificial intelligence (AI) | machine learning | deep learning | natural language processing (NLP) | data privacy | artificial general intelligence (AGI) | quantum computing

Smart city and Internet of things. © Busakorn Pongparnit | Dreamstime.com

For the purpose of this report, *Artificial intelligence* (AI) refers to the simulation of human intelligence processes by machines, particularly computer systems. These processes include learning, reasoning, problem-solving, perception and language understanding.[2] As AI continues to evolve and impact various aspects of society, decision-makers in government and business can be expected to understand its current state, potential and challenges.

Definition and historical reference

The field of AI was formally established in 1956 at the Dartmouth Conference, where the term *artificial intelligence* was coined.[3] Since then, AI has experienced several cycles of enthusiasm and disappointment, often referred to as *AI winters*.[4] However, the last decade has seen unprecedented progress in AI capabilities, largely due to advancements in machine learning, particularly deep learning, and the availability of big data and powerful computing resources.[5]

Rapid progress and technological advancements

Recent years have witnessed remarkable advancements in AI technologies. In natural language processing (NLP), models like GPT-3 have demonstrated human-like text generation capabilities.[6] Computer vision has achieved superhuman performance in tasks such as image classification.[7] Generative AI models like DALL-E have shown the ability to create original images from text descriptions.[8]

These advancements have been driven by improvements in deep learning architectures, increased computational power and the availability of large datasets. The transformative potential of these technologies across various sectors is significant and continues to grow.

AI adoption has accelerated across numerous industries. In healthcare, AI is being used for early disease detection, drug discovery and personalized medicine.[9] The financial sector leverages AI for fraud detection, risk assessment and algorithmic trading.[10] Manufacturing benefits from AI-powered predictive maintenance and quality control.[11]

2 Russell, S. and Norvig, P. (2021), *Artificial intelligence: A modern approach,* 4th edition, Pearson, Hoboken, available at: https://dl.ebooksworld.ir/books/Artificial.Intelligence.A.Modern.Approach.4th.Edition.Peter.Norvig.%20Stuart.Russell.Pearson.9780134610993.EBooksWorld.ir.pdf or aima.cs.berkeley.edu [30-10-2024].

3 McCarthy, J. et al. (2006), 'A proposal for the Dartmouth summer research project on artificial intelligence, August 31, 1955', *AI Magazine,* 27(4), p. 12, DOI: https://doi.org/10.1609/aimag.v27i4.1904.

4 Hendler, J. (2008), 'Avoiding another AI winter', *IEEE Intelligent Systems,* 23(2), March–April 2008, pp. 2–4, DOI: 10.1109/MIS.2008.20.

5 LeCun, Y.; Bengio, Y. and Hinton, G. (2015), 'Deep learning', *Nature,* 521, pp. 436–444, DOI: https://doi.org/10.1038/nature14539.

6 Brown, T.B. et al. (2020), 'Language Models are Few-shot Learners', *arXiv,* DOI: https://doi.org/10.48550/arXiv.2005.14165.

7 He, K.; Zhang, X.; Ren, S. and Sun, J. (2015), 'Delving Deep into Rectifiers: Surpassing Human-Level Performance on ImageNet Classification', *2015 IEEE International Conference on Computer Vision (ICCV),* Santiago, Chile, 2015, pp. 1026–1034, DOI: 10.1109/ICCV.2015.123.

8 Ramesh, A. et al. (2021), 'Zero-Shot Text-to-Image Generation', *arXiv,* DOI: https://doi.org/10.48550/arXiv.2102.12092.

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10 Buchanan, B.G. (2019), *Artificial intelligence in finance,* Zenodo, Geneva, DOI: 10.5281/zenodo.2612536.

11 Lee, J. et al. (2018), 'Industrial Artificial Intelligence for industry 4.0-based manufacturing systems', *Manufacturing Letters,* 18, pp. 20–23, DOI: https://doi.org/10.1016/j.mfglet.2018.09.002.

Economic impact and labour market disruption

Various reports project that AI will contribute significantly to the global economy, with estimates ranging between USD 15.7 trillion and USD 19.9 trillion by 2030.[12] However, this growth is not without challenges. The World Economic Forum (WEF) predicts that by 2025, 85 million jobs may be displaced by a shift in the division of labour between humans and machines, while 97 million new roles may emerge.[13]

This potential for job displacement (especially jobs that can be automated with AI, like many front desk services) and job creation necessitates a proactive approach to workforce development. Governments and businesses need to focus on reskilling and upskilling programmes to prepare workers for the AI-driven economy.[14]

Current limitations and challenges

Despite impressive capabilities, current AI systems have significant limitations. Most AI today is narrow or weak AI, designed to perform specific tasks within defined parameters. These systems lack true understanding or general intelligence comparable to human cognition.[15]

AI systems often struggle with tasks requiring common sense reasoning, adaptability to new situations and understanding context beyond their training data. The black box nature of some complex AI models, particularly deep learning systems, poses challenges for interpretability and accountability.[16]

Ethical concerns and responsible AI development

As AI becomes more pervasive, ethical considerations have come to the forefront. Key concerns include:

- Bias and fairness: AI systems can perpetuate or amplify existing societal biases present in their training data.[17]
- Privacy: The data-hungry nature of AI raises concerns about data collection and usage practices.[18]
- Transparency and accountability: The complexity of AI systems often makes it difficult to explain their decision-making processes.[19]
- Autonomy and human oversight: Determining the appropriate level of human oversight in autonomous systems is crucial.[20]

Addressing these ethical concerns requires a multidisciplinary approach, involving technologists, ethicists, policymakers and affected communities.[21]

12 PwC (2017), *Sizing the prize: What's the real value of AI for your business and how can you capitalise?,* PwC, available at: https://www.pwc.com/gx/en/issues/analytics/assets/pwc-ai-analysis-sizing-the-prize-report.pdf [30-10-2024].

Fioretti, L. et al (2023), *The Global Impact of Artificial Intelligence on the Economy and Jobs,* IDC, Needham, available at: https://www.idc.com/getdoc.jsp?containerId=US51057924 [04-11-2024].

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19 Doshi-Velez, F. and Kim, B. (2017), *Towards a Rigorous Science of Interpretable Machine Learning,* arXiv, DOI: https://doi.org/10.48550/arXiv.1702.08608.

20 Amodei, D. et al. (2016), *Concrete Problems in AI Safety,* arXiv, DOI: https://doi.org/10.48550/arXiv.1606.06565.

21 Floridi, L. et al. (2018), 'AI4People – An Ethical Framework for a Good AI Society: Opportunities, Risks, Principles, and Recommendations', *Minds & Machines,* 28, pp. 689–707, DOI: https://doi.org/10.1007/s11023-018-9482-5.

Data dependence and quality

The performance of AI systems is heavily dependent on the quality and quantity of data used for training. This reliance on data presents both opportunities and challenges. While the increasing digitization of information provides vast amounts of data for AI training, ensuring the quality, relevance and representativeness of this data is crucial.[22]

Data privacy regulations like the General Data Protection Regulation (GDPR) in Europe or the California Consumer Privacy Act (CCPA) in the United States of America have implications for data collection and usage practices, potentially affecting AI development and deployment.[23]

Regulatory landscape and policy challenges

The rapid advancement of AI has outpaced the development of regulatory frameworks. Policymakers face the challenge of fostering innovation while mitigating risks and protecting public interests. Key areas requiring regulatory attention include AI safety standards, accountability mechanisms, data protection and ethical guidelines.[24]

International cooperation is crucial in developing coherent AI governance frameworks. Initiatives like the OECD AI Principles aim to promote AI that is innovative and trustworthy and that respects human rights and democratic values.[25]

In the tourism sector, differing international data protection regulations pose significant challenges for companies operating across borders. Regulations such as the General Data Protection Regulation (GDPR) in Europe or the California Consumer Privacy Act (CCPA) in the United States of America, have created a complex landscape for global hotel chains and online travel agencies that collect vast amounts of personal data. These companies must navigate varying requirements for data collection, storage, processing and user consent across different jurisdictions. Ensuring compliance with these diverse regulations while maintaining seamless operations and personalized services is a major challenge for the tourism industry in the age of AI.[26]

The United Nations has also recognized the need for global cooperation in AI governance. A recent report emphasizes the importance of developing international frameworks to ensure AI benefits humanity as a whole, highlighting the need for inclusive dialogue and collective action to address the challenges posed by AI technologies.[27]

International competition and strategic importance

AI has become a matter of national strategic importance, with countries vying for technological leadership. China, the United States of America and the European Union have all developed (national) AI strategies, investing heavily in research, development and talent acquisition.[28]

This race for AI supremacy has implications for economic growth, national security, and geopolitical influence. The concentration of AI capabilities raises concerns about potential technological divides between nations.[29]

22 Stoica, I. et al. (2017), 'A Berkeley view of Systems Challenges for AI', *arXiv,* DOI: https://doi.org/10.48550/arXiv.1712.05855.

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25 *Organisation for Economic Co-operation and Development (2019), Recommendation of the Council on Artificial Intelligence,* OECD Legal Instruments, OECD, Paris, available at: https://legalinstruments.oecd.org/en/instruments/oecd-legal-0449 [30-10-2024].

26 Bulchand-Gidumal, J. et al. (2024), 'Artificial intelligence's impact on hospitality and tourism marketing: exploring key themes and addressing challenges', *Current Issues in Tourism,* 27(14), pp. 2345–2362. DOI: https://doi.org/10.1080/13683500.2023.2229480.

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28 Castro, D.; McLaughlin, M. and Chivot, E. (2019), *Who is winning the AI race: China, the EU or the United States?,* Center for Data Innovation, available at: https://datainnovation.org [30-10-2024].

29 Lee, K.F. (2018), *AI Superpowers – China, Silicon Valley, and the New World Order,* Harper Business, New York.

Snapshot: Vienna Tourist Board – famous Vienna painters

Vienna Tourist Board rolled out a campaign featuring AI-generated works of famous painters found in Vienna – like the world's largest collection of works by Klimt, Schiele and Bruegel – replacing their iconic figures with cats. These AI artworks were juxtaposed with the originals and showcased on billboards in print and online adverts in major cities in the United States of America. The AI tools used included Midjourney for creating the basic artwork, Dall-E 2 for extending the images, and Topaz Gigapixel for scaling up for large displays like Times Square billboards.

In short videos historian Markus Hübl explains AI, Viennese art, and their intersection in UnArtificial Art. The Vienna Tourist Board wants travellers of all generations to understand and appreciate the cultural significance of its many museums.

This new campaign echoes its 2018 #ToArtItsFreedom about censorship, and its 2021 campaign that exposed works of arts on a new Only Fans account, which shows how Vienna is in touch with its past and in line with its future.

Note: Please consult the detailed case study on page 86.

Future potential and emerging research areas

Ongoing research promises even more transformative capabilities in the future. Areas of particular interest include:

- Artificial general intelligence (AGI): The development of AI systems with human-like general intelligence remains a long-term goal.[30]
- Quantum computing: The intersection of quantum computing and AI could potentially lead to exponential increases in processing power.[31]
- Neuromorphic computing: AI systems inspired by the structure and function of the human brain could lead to more efficient and adaptable AI.[32]
- AI-Human collaboration: Developing AI systems that augment human capabilities rather than replace them is an area of growing focus.[33]

Conclusion

The current state of AI is characterized by rapid technological progress, widespread adoption and transformative potential across various sectors of society and the economy. However, this progress is accompanied by significant challenges, including ethical concerns, regulatory gaps and potential disruptions to labour markets.

As decision-makers in governments and businesses, it is crucial to approach AI with a balanced perspective, recognizing both its immense potential and the need for responsible development and deployment. This requires staying informed about technological advancements, fostering interdisciplinary collaboration and developing adaptive policies that promote innovation while safeguarding public interests.

The decisions made today regarding AI will shape its trajectory and impact for years to come. By understanding the current state of AI and actively engaging with its development, we can work towards harnessing this powerful technology for the benefit of society while mitigating potential risks and challenges.

30 Goertzel, B. and Pennachin, C. (eds., 2007), *Artificial General Intelligence,* Springer, Berlin/Heidelberg, DOI: https://doi.org/10.1007/978-3-540-68677-4.

31 Biamonte, J.; Wittek, P.; Pancotti, N. et al. (2017), 'Quantum machine learning', *Nature,* 549, pp. 195–202, DOI: https://doi.org/10.1038/nature23474.

32 Schuman, C.D. et al. (2017), 'A Survey of Neuromorphic Computing and Neural Networks in Hardware', *arXiv,* DOI: https://doi.org/10.48550/arXiv.1705.06963.

33 Daugherty, P. R. and Wilson, H. J. (2018), *Human + Machine: Reimagining Work in the Age of AI,* Harvard Business Review Press, Boston.

02.
AI in tourism: a further exploration of applications and impact

Abstract: This chapter addresses the transformative role of artificial intelligence (AI) within the tourism sector. AI applications, such as personalized tourist recommendations, chatbots and voice-activated services, enhance customer service by analysing data to tailor experiences. Operational efficiency also benefits from AI, where tools like predictive analytics and dynamic pricing maximize occupancy and manage inventory. Advanced technologies, including facial recognition, augmented reality (AR) and real-time translation, further elevate customer experiences by improving convenience, safety and engagement. However, in order to move forward, the sector must address challenges such as data privacy, maintaining human connection and ensuring inclusivity, while responsibly leveraging AI's potential to provide memorable and efficient travel experiences.

Key words: personalized tourist recommendations | chatbots | voice-activated services | dynamic pricing | predictive analytics | facial recognition | augmented reality (AR)

Robotic assistant with artificial intelligence programme. © Ekkasit919 | Dreamstime.com

2.1 Applications

The tourism sector is experiencing a technological revolution driven by artificial intelligence (AI). This chapter examines the multifaceted impact of AI on the industry, focussing on current applications and their effects – the field has evolved from simple expert systems to sophisticated machine learning algorithms and AI-powered devices that are reshaping every aspect of the travel experience.[34]

Customer service and personalization

- Personalized recommendations: AI algorithms analyse vast amounts of data, including user preferences, past behaviours and trends, to provide personalized recommendations for destinations, accommodations, activities and attractions. This enhances the user experience and increases customer satisfaction.[35]

- Chatbots and virtual assistants: AI-powered chatbots and virtual assistants offer instant responses to customer inquiries, assist with bookings and provide support throughout the travel journey. They operate 24/7, improving customer service and reducing operational costs for travel companies.[36]

- Voice-activated services: Hotels are increasingly implementing voice-activated AI devices, such as Amazon Alexa, to provide guests with a hands-free way to control room features, request services or obtain information.

34 Kong, H. et al. (2023), '30 years of artificial intelligence (AI) research relating to the hospitality and tourism industry', *International Journal of Contemporary Hospitality Management*, 35(6), pp. 2157–2177, DOI: https://doi.org/10.1108/IJCHM-03-2022-0354.

35 Citak, J. et al. (2021), 'A note on the applications of artificial intelligence in the hospitality industry: preliminary results of a survey', *Procedia Computer Science*, 192, pp. 4552–4559. DOI: https://doi.org/10.1016/j.procs.2021.09.233.

36 Jiwnani, L. (2024). "AI's transformative role in the hospitality industry." Published on 13 February 2024, *Deloitte*, available at: https://www.deloitte.com/es/es.html [31-10-2024].

Operational efficiency

- Revenue management: AI is used for dynamic pricing and revenue management. Machine learning algorithms analyse historical data, current market trends and competitor pricing to optimize pricing strategies in real-time. This ensures maximum occupancy and revenue.

- Inventory management: AI helps in predicting demand and managing inventory efficiently. For example, AI tools can forecast the demand for hotel rooms or rental cars, allowing companies to adjust their inventory and pricing accordingly.[37]

- Dynamic pricing: AI enables dynamic pricing models that adjust prices in real-time based on demand, seasonality and other factors. This helps businesses optimize revenue and occupancy rates while offering competitive prices to travellers.[38] It is important to recognize that this approach may raise ethical concerns regarding price transparency. While dynamic pricing models are effective in maximizing revenue, they can also be perceived negatively by customers, who might feel they are being charged unfairly.

- Predictive analytics: AI algorithms analyse historical data to predict future travel trends, demand patterns and customer behaviours. This enables businesses to make informed decisions regarding inventory management, marketing strategies, and resource allocation.[39]

Snapshot: NEOM and Arena – Building cognitive empathy

NEOM and Arena have developed an AI-based personal concierge, the Arena's OneBrain system, which has been integrated into the Visit NEOM App and the Booking and Distribution System.

OneBrain consists of two core technologies: the Large Human Behaviour Model (LXM) and the Real-time Adaptation Engine. The LXM analyses human behaviour using data from thousands of products and millions of consumers and travellers. The Real-time Adaptation Engine refines the LXM in real time, selecting the best decisions for specific contexts. It continuously acquires new information and adjusts to changes and new traveller preferences as they arise.

Arena has installed, configured and integrated various components of the platform within NEOM systems, such as data, bookings, distribution and the application. Additionally, the company has ingested corpora of human expertise in the form of unstructured oral and verbal data and connected to real-time user experiences. This was achieved in just cero days, demonstrating the first proof-of-intelligence for this novel user experience in the VisitNEOM App.

Note: Please consult the detailed case study on page 81.

37 Samala, N. et al. (2020), 'Impact of AI and robotics in the tourism sector: a critical insight', *Journal of tourism futures,* 8(1), pp. 73–87, DOI: https://doi.org/10.1108/JTF-07-2019-0065.

38 Citak, J. et al. (2021), 'A note on the applications of artificial intelligence in the hospitality industry: preliminary results of a survey', *Procedia Computer Science,* 192, pp. 4552–4559. DOI: https://doi.org/10.1016/j.procs.2021.09.233.

39 Jiwnani, L. (2024). "AI's transformative role in the hospitality industry." Published on 13 February 2024, *Deloitte,* available at: https://www.deloitte.com/es/es.html [31-10-2024].

Enhancing customer experience

- Augmented reality (AR) and navigation: Companies like Airbnb Experiences and various tour operators leverage AR technology combined with AI to offer immersive and interactive tour experiences. By overlaying digital information onto physical locations, AR tour guides enhance storytelling and provide engaging educational content for tourists.[40]

- Translation services: AI-powered language translation services enable tourists to communicate effectively in foreign languages. These services leverage advanced machine learning algorithms to translate text, speech and images in real-time, facilitating seamless communication in multilingual environments.

- Enhanced safety and security: AI-powered solutions, such as facial recognition and biometric authentication, enhance safety and security measures at airports, hotels, and tourist attractions. These technologies streamline security procedures, mitigate risks and improve the overall travel experience.[41]

Smart translation in a restaurant.
© Tetiana Kalian | Dreamstime.com

40 Ivanov, S. and Webster, C. (2019), 'Perceived Appropriateness and Intention to Use Service Robots in Tourism', in: Pesonen, J. and Neidhardt, J. (eds.), *Information and Communication Technologies in Tourism 2019*, Springer, Cham, pp. 237–248, DOI: 10.1007/978-3-030-05940-8_19.

41 Citak, J. et al. (2021), 'A note on the applications of artificial intelligence in the hospitality industry: preliminary results of a survey', *Procedia Computer Science,* 192, pp. 4552–4559. DOI: https://doi.org/10.1016/j.procs.2021.09.233.

2.2 Impact

The impact of AI on travel planning is well illustrated by a recent YouGov survey conducted among travellers from the United Kingdom and the United States of America. The report reveals that:[42]

- 42% of travellers have either already incorporated AI into their travel plans or expressed curiosity about trying it. An additional 16% show interest despite not having used AI yet. However, 28% of travellers prefer to stick with traditional trip planning methods, avoiding AI altogether;
- When it comes to specific AI tools used in travel planning, language translation assistance tops the list (25% of the British and 31% of the American citizens). This is followed closely by personalized recommendations (14% of the British and 22% of the American citizens) and AI-powered reviews and ratings systems (14% of the British and 23% the American citizens);
- Customized itineraries that cater to unique travel styles and interests are sought after by a similar proportion of travellers in both markets (12% of Brits and 18% of Americans); and
- A significant portion of travellers also shows interest in real-time assistance and chatbot services (11% of the British and 19% of the American citizens).

These survey results highlight the growing acceptance and integration of AI in travel planning, particularly among travellers from the United Kingdom and the United States of America. While a substantial portion of travellers remain hesitant, the majority are either already using AI tools or show interest in doing so. Language assistance, personalized recommendations and customized itineraries emerge as the most popular AI applications in travel.

This trend suggests that the travel industry is likely to see continued innovation and adoption of AI technologies to enhance the planning experience and cater to evolving traveller preferences. However, the industry must also address the concerns of those who prefer traditional methods to ensure inclusive services for all travellers.[43]

42 Fernandes, J. (2024), 'Understanding travel in the era of AI,' *YouGov Reports*, available at: https://business.yougov.com/content/49456-understanding-travel-in-the-era-of-ai [31-10-2024].

43 Tussyadiah, I. and Miller, G. (2019), 'Perceived Impacts of Artificial Intelligence and Responses to Positive Behaviour Change Intervention', in: Pesonen, J. and Neidhardt, J. (eds.), *Information and Communication Technologies in Tourism 2019,* Springer, Cham, DOI: https://doi.org/10.1007/978-3-030-05940-8_28.

Snapshot: Expedia Group's Romie

The Espedia Group recently introduced Romie, a travel planning assistant "fuelled by the power of AI". The alpha version of the Romie experience is currently available on EG Labs™, a hub for experimental products. It aims to provide travellers with a AI-powered travel buddy able to support with planning, shopping, booking and even help when something unexpectedly changes during a trip. The assistant serves as the travel agent, concierge and personal assistant, all in one. Like the ideal travel companion, Romie gets progressively intelligent – learning who the travellers are, remembering what type of trips the traveller likes.

Note: Please consult the detailed case study on page 67.

Conclusion

The integration of AI in the tourism sector is transforming the industry, offering unprecedented opportunities for personalization, efficiency and innovation. From customer service to operational management and safety measures, AI is revolutionizing how travel businesses operate and how travellers experience their journeys.

As AI continues to evolve, it promises to create more immersive, sustainable and user-centric travel experiences. However, the industry must navigate challenges such as data privacy concerns, the need for human touch in hospitality and ensuring accessibility for all travellers, regardless of their technological preferences.

The future of AI in tourism will likely be characterized by more sophisticated, integrated and intelligent systems that seamlessly blend the physical and digital aspects of travel. By embracing these technologies responsibly and thoughtfully, the tourism industry can harness the power of AI to create more memorable, efficient and sustainable travel experiences for all.

Person in airport ready to travel, checking her smart watch. © Jose Manuel Gonzalez | Dreamstime.com

03. Towards guiding principles for AI adoption in tourism

Abstract: This chapter presents relevant points for responsible AI implementation in tourism, examining AI's potential alongside its ethical, democratic and technological challenges. It explores the benefits of AI applications, such as personalized recommendations and operational efficiency, while addressing key ethical concerns around privacy, fairness, transparency and human oversight. The chapter outlines a structured approach to ethical AI, including stakeholder identification, impact assessment and continuous monitoring. It also emphasizes the need for inclusive AI practices that respect democratic principles and safeguard data sovereignty.

Key words: smart tourism destinations (STDs) | human oversight | data protection authorities (DPAs) | traditionally marginalized groups | digital sovereignty | smart hospitality

Tourist experiencing virtual reality. © Chih Yuan Wu | Dreamstime.com

3.1 Ethical AI in tourism: enhancing experiences while safeguarding values

This chapter aims to provide a comprehensive framework for responsible artificial intelligence (AI) implementation in tourism by presenting a balanced view of AI's potential and pitfalls from six different perspectives.

As artificial intelligence (AI) becomes more advanced and integrated into the tourism sector, it offers both potential benefits and risks. AI applications like chatbots, recommendation engines and predictive analytics can enhance customer service, personalization, and operational efficiency for tourism businesses. However, the rapid adoption of AI also raises important ethical considerations around privacy, bias and misinformation, transparency and accountability, and how these relate to the experienced quality of output (a major challenge to customer satisfaction and effective use and validity of content). Developing and adhering to ethical AI guidelines is crucial for promoting trust and responsible innovation in tourism.[44]

The importance of respecting, protecting, and promoting human rights and fundamental freedoms throughout the AI system life cycle is emphasized by the UNESCO *Recommendation on the Ethics of Artificial Intelligence.*[45] This is particularly relevant in the tourism sector, where AI systems interact directly with diverse groups of people from various cultural backgrounds.

A framework for responsible AI implementation

Before delving into specific ethical considerations, it is helpful to sketch a framework for ethically responsible AI implementation.

Ethics applied to technology is about the values (or ends) of innovation, but also about the effects of technical means and how these inflict with values. *Questioning means & ends* (following the two basic questions and four subquestions of the ethical readiness check is therefore a comprehensive way to get to a perspective of ethics in technology:[46]

1. Does the means serve a good cause?
   - What is the purpose of the innovation?
   - Is it a good cause, or is the purpose questionable or controversial?
   - Is the purpose clear, or are there conflicting values?
   - Are there hidden motives?

2. Is it a good means for the purpose?
   - Does the means work for the purpose?
   - Is this the best alternative?
   - Is the means susceptible to abuse or improper use?
   - What (un)intended (side)effects can occur?

44 European Commission (2019), *Ethics Guidelines for Trustworthy AI,* High-Level Expert Group on Artificial Intelligence, European Commission, Brussels, available at: https://ec.europa.eu/digital-single-market/en/news/ethics-guidelines-trustworthy-ai [31-10-2024].

45 United Nations Educational, Scientific and Cultural Organization (2022), *Recommendation on the Ethics of Artificial Intelligence,* UNESCO, Paris, available at: https://www.unesco.org/en [31-10-2024].

46 Dorrestijn, S. (n.d.), 'Use the tool – Ethical Readiness Check', *Product Impact Tool,* available at: https://productimpacttool.org/en/portal-english/ [31-10-2024].

Four themes that come to the fore from an ethics of perspective will be discussed in this section:

1. Privacy and data rights;
2. Fairness and non-discrimination;
3. Transparency and explainability; and
4. Human oversight and control.

A framework should further provide a structured approach to assessing and addressing ethical concerns in AI development and deployment.[47] The framework encourages tourism businesses to:

- Identify stakeholders and their interests;
- Map potential impacts and risks;
- Assess value alignment;
- Develop mitigation strategies; and
- Establish ongoing monitoring and adjustment processes.

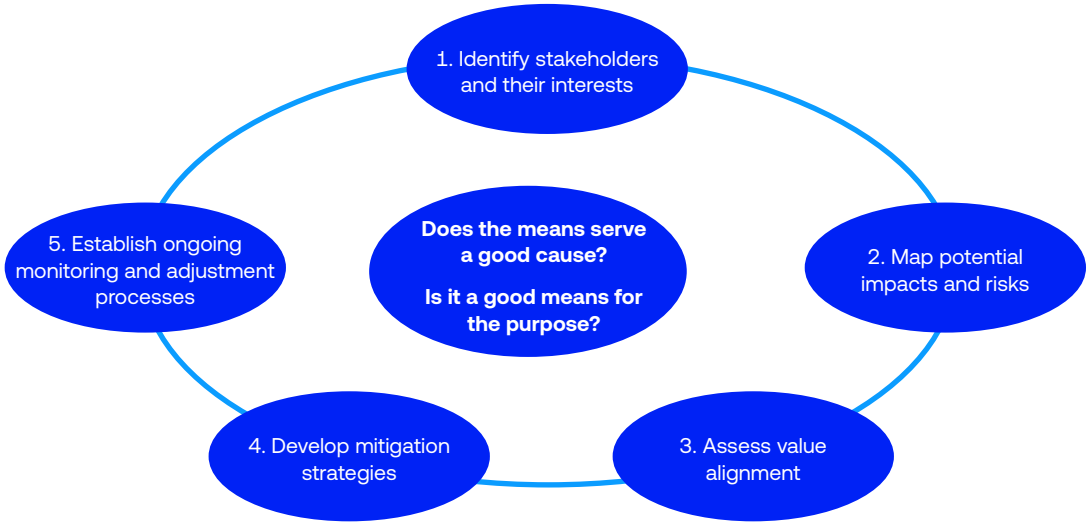
By incorporating these steps into AI development and implementation, tourism businesses can proactively address ethical challenges and ensure their AI solutions are aligned with societal values and stakeholder expectations.

3.1.1 Privacy and data rights

One of the core ethical challenges with AI in tourism relates to data privacy. Travel companies collect and process large amounts of personal data, including travel histories, preferences and financial information among others. AI systems then analyse this data to generate insights and personalized services. While this can improve the customer experience, it also creates privacy risks if data is mishandled or exploited without consent.

Ethical AI guidelines should mandate robust data governance and security controls, and give customers clear notice and choices over how their data is collected and used. There must be appropriate safeguards to prevent unauthorized access and strict limitations on secondary uses of data beyond the original purpose. Customers should be able to easily access, correct, delete or download their data as desired.

Figure 3.1: **Virtuous circle for the implmenetation of artificial intelligence (AI) solutions in tourism**



Sources: based on Dorrestijn, S. (n.d.), 'Use the tool – Ethical Readiness Check', *Product Impact Tool*, available at: https://productimpacttool.org/en/portal-english/ [31-10-2024] and Ivanov, S. H., & Umbrello, S. (2021). "The ethics of artificial intelligence and robotisation in tourism and hospitality – a conceptual framework and research agenda." *Journal of Smart Tourism*, 1(4), pp. 9–18. DOI: https://doi.org/10.52255/smarttourism.2021.1.4.3.

47 Bhandari, U. (2024), 'Roles of AI in Digital Transformation of Tourism Business,' *Master's Thesis*, available at: https://www.theseus.fi/bitstream/handle/10024/818152/Bhandari_Ujjwal.pdf [31-10-2024].

Applying the ethical readiness check, tourism businesses should:

- Identify stakeholders: travellers, employees, partners and regulatory bodies;
- Map impacts: Potential data breaches, unauthorized data sharing, or invasive profiling;
- Assess value alignment: ensure data practices align with privacy rights and regulations;
- Develop mitigation: implement strong data protection measures and transparent policies; and
- Monitor and adjust: regularly audit data practices and update protections as needed.

A crucial role in overseeing the responsible development and deployment of AI systems is played by the data protection authorities (DPAs). They ensure compliance with data protection regulations, provide guidance on best practices, and investigate potential violations.

The European Data Protection Supervisor (EDPS) has issued orientations for EU institutions using generative AI, emphasizing the need for risk assessments, transparency and accountability. DPAs are instrumental in safeguarding individuals' rights in the face of AI advancements, particularly concerning data minimization, purpose limitation and the right to explanation of automated decision-making.

3.1.2 Fairness and non-discrimination

AI models can inadvertently encode and perpetuate harmful human biases related to characteristics like race, gender, age or disabilities. In tourism, this could manifest as discriminatory pricing, services or recommendations. For example, an AI pricing algorithm could charge certain demographics higher rates without justification. Recommendation engines for attractions or activities may exhibit cultural biases.

To prevent discriminatory outcomes, ethical AI guidelines should require rigorous testing for bias during the full AI lifecycle from data collection to model outputs. Where bias is detected, it must be mitigated. So, continuous monitoring is needed. AI systems should be designed from the ground up with fairness in mind as a core principle. Furthermore, it is important that a diversity of perspectives are directly involved with the development of AI as an additional safeguard against discrimination and bias.

In the context of the ethical readiness check:

- Identify stakeholders: diverse traveller groups and marginalized communities;
- Map impacts: potential discrimination in pricing, recommendations or service quality;
- Assess value alignment: ensure AI outcomes align with principles of equality and inclusion;
- Develop mitigation: implement bias detection and correction mechanisms; and
- Monitor and adjust: continuously test for fairness and refine algorithms as needed.

3.1.3 Transparency and explainability

There is often a 'black box' problem with AI, where the decision-making processes and criteria are opaque, too complex to interpret or where dicision-makers do not have the necessary knowledge or understanding to evaluate the proposed technology. This lack of transparency can undermine trust and accountability. In tourism applications like AI chatbots or recommendation engines, it should be clear to users that they are interacting with an AI, not a human. The reasoning behind the AI's outputs like pricing or personalized suggestions should also be explainable.

Ethical AI guidelines can mandate transparency requirements such as clear AI disclosures and opt-in consent, human-understandable explanations for AI decisions that impact users, and documentation on the data sources, algorithms and development processes. User interfaces should provide straightforward ways for people to request explanations or report potential issues.

Applying the ethical readiness check:

- Identify stakeholders: travellers, customer service representatives, regulators;
- Map impacts: potential confusion, mistrust or regulatory non-compliance;
- Assess value alignment: ensure transparency aligns with consumer rights and expectations;
- Develop mitigation: create clear AI disclosures and explainable AI features; and
- Monitor and adjust: gather user feedback on transparency and improve as needed.

3.1.4 Human oversight and control

While AI can enhance tourism services in many ways, it is important that there is appropriate human oversight, control and the ability to override AI systems when needed. Ethical guidelines should specify responsibilities and processes for monitoring AI performance, investigating errors or failures and enforcing corrective actions. There should be human decision-makers accountable for AI-driven outcomes, particularly in higher-risk or impactful scenarios.

Additionally, ethical AI guidelines can promote human-centred design principles that keep users in control. This means enabling intuitive ways for people to modify AI preferences, set constraints or opt-out of personalized services altogether. Human oversight and controllability measures engender trust and protect against negative impacts from loss of agency or automation bias.

In the ethical readiness check framework:

- Identify stakeholders: employees, managers, travellers;
- Map impacts: potential errors, loss of human judgment or over-reliance on AI;
- Assess value alignment: ensure AI complements rather than replaces human expertise;
- Develop mitigation: implement human oversight processes and user control features; and
- Monitor and adjust: regularly assess the balance between AI and human involvement.

Example for the application of ethical AI princiles – AI chatbot for hotel bookings

To illustrate ethical AI principles in practice, consider an AI chatbot used by a major hotel chain for reservation assistance. This virtual agent can answer questions, recommend properties and packages, process bookings and facilitate changes or cancellations via a conversational interface across devices.

Applying ethical guidelines and the ethical readiness check, the development and deployment of the chatbot should include:

Stakeholder identification:

- Travellers of diverse backgrounds;
- Hotel staff and management;
- Booking partners and third-party vendors;
- Data protection authorities; and
- Programmes and AI service vendors.

Impact mapping:

- Privacy risks from data collection and processing;
- Potential bias in recommendations or pricing;
- User confusion or frustration with AI interactions; and
- Displacement of human customer service roles.

Value alignment assessment:

- Ensure the chatbot aligns with company values of hospitality and customer service;
- Verify compliance with data protection regulations and industry standards; and
- Assess alignment with societal expectations for AI transparency and fairness.

Mitigation strategies:

- Implement clear AI disclosure and opt-in consent processes;
- Develop explainable AI features for recommendations and pricing;
- Create robust data protection measures and user privacy controls; and
- Establish human oversight and intervention protocols.

Monitoring and adjustment:

- Continuously monitor chatbot performance and user satisfaction;
- Regularly audit for bias and privacy compliance;
- Gather feedback from both users and hotel staff; and
- Iterate on the AI model and user interface based on insights gained.

By proactively addressing ethical AI risks through this comprehensive approach, the hotel chain demonstrates accountability, builds public trust, and promotes responsible innovation that creates value while respecting customer rights and societal values.

3.1.5 A need for ethical AI leadership in tourism

With artificial intelligence (AI) rapidly permeating the tourism industry, now is the time to establish ethical guidelines and governance practices. Upholding core principles like privacy, fairness, transparency and human-centricity will be essential for realizing AI's benefits while mitigating risks and protecting the interests of both businesses and consumers.[48]

The ethical readiness check provides a valuable framework for tourism businesses to systematically address ethical considerations throughout the AI lifecycle. By identifying stakeholders, mapping impacts, assessing value alignment, developing mitigation strategies and establishing ongoing monitoring processes, companies can ensure their AI initiatives are not only innovative but also responsible and trustworthy.[49]

Ethical AI is a collaborative endeavour, and tourism stakeholders should engage in cross-industry cooperation, consult interdisciplinary expertise and seek customer feedback to further evolve best practices as this technology frontier advances. By taking a proactive and comprehensive approach to ethical AI, the tourism industry can position itself as a leader in responsible innovation, enhancing experiences while safeguarding the values that are fundamental to sustainable and inclusive travel.[50]

The earlier mentioned UNESCO *Recommendation on the Ethics of Artificial Intelligence*[51] aligns with this approach, calling for multi-stakeholder, multidisciplinary and pluralistic dialogue about the ethical issues relating to AI systems, emphasizing the importance of international cooperation in addressing the challenges and opportunities presented by AI technologies.

Furthermore, it stresses the need for ongoing monitoring and evaluation of AI policies and practices. It suggests that relevant stakeholders should develop appropriate tools and indicators for assessing the effectiveness and efficiency of AI ethics policies against agreed standards, priorities and targets.

By aligning with these global ethical standards and implementing robust governance frameworks, the tourism industry can ensure that the use of AI technologies not only enhances operational efficiency and customer experiences but also contributes to the broader goals of sustainable development and cultural preservation.

Digital Fingerprint. AI-generated image. © Wiskareunan Chi | Dreamstime.com

48 Dorrestijn, S. (n.d.), 'Use the tool – Ethical Readiness Check', *Product Impact Tool,* available at: https://productimpacttool.org/en/portal-english/ [31-10-2024].

49 Tussyadiah, I. (2020), 'A review of research into automation in tourism: Launching the Annals of Tourism Research Curated Trail on Artificial Intelligence and Robotics in Tourism', *Annals of Tourism Research,* 81, March 2020, DOI: https://doi.org/10.1016/j.annals.2020.102883.

50 Ivanov, S. H., & Umbrello, S. (2021). "The ethics of artificial intelligence and robotisation in tourism and hospitality – a conceptual framework and research agenda." *Journal of Smart Tourism,* 1(4), pp. 9–18. DOI: https://doi.org/10.52255/smarttourism.2021.1.4.3.

51 United Nations Educational, Scientific and Cultural Organization (2022), *Recommendation on the Ethics of Artificial Intelligence,* UNESCO, Paris, available at: https://www.unesco.org/en [31-10-2024].

3.2 Democracy and democratic principles in relation to AI in tourism

When we explore AI in tourism and its linkage to democracy and democratic principles, we automatically enter the field of technological (possible), legal (admissible) and ethical (desirable) challenges on the use of AI in tourism. This often implies assessing its safeguarding of values such as equality, transparency, honesty, integrity and sustainability. Integrating democratic principles into AI and tourism involves ensuring that the development and deployment of AI technologies in the tourism sector respect human rights and rule of law.[52]

A fundamental question as such is – whether we take the time to fully assess the question, together with all relevant stakeholders – if AI is the desirable solution in the tourism industry. If the answer to the question is *yes*, it is important to make a distinction between the exploration phase and the implementation phase. Too often companies already start implementing AI tools while they are inadvertently still in the exploration phase.

The next sections will describe the following four democratic principles which help exploring the desirability of AI in tourism:

1. Level playing field;
2. AI and traditionally marginalized groups;
3. AI and universal accessibility; and
4. Digital sovereignty.

3.2.1 Level playing field

A *level playing field* refers to a situation in which all participants in tourism (companies, multinationals, SMEs, customers, civil society organizations and other direct and indirect stakeholders) have equal opportunities, conditions and advantages in interest representation in decision-making. Key aspects include:

- Participation/stakeholder engagement: involve various stakeholders, including tourists, local communities and industry players in the development and implementation of AI in tourism;
- Feedback mechanisms: provide channels for tourists and other stakeholders to give feedback on AI systems and their impact, and ensure this feedback is used to improve these systems; and
- Fair competition: use AI to create fairer opportunities for local businesses and communities in tourist destinations, ensuring that benefits are distributed more evenly.

This way all stakeholders can participate fully and fairly, benefiting from and contributing to tourism in an equitable manner. Creating and maintaining a level playing field often requires active intervention, such as policy changes, regulation enforcement and continuous monitoring to prevent the emergence of new inequalities.

52 Huizinga, J. (1950), *Homo Ludens – a study of the play element in culture*, translation from the original version in Dutch from 1938, The Beacon Press, Boston.

Jungherr, A. (2023), 'Artificial Intelligence and Democracy: A Conceptual Framework', *Social Media + Society*, 9(3), DOI: https://doi.org/10.1177/20563051231186353.

Snapshot: Meliá Hotels International – tailoring experiences to each hotel customer

Meliá Hotels International is implementing a real-time hotel recommendation system to offer tailored suggestions for each customer based on their preferences. This includes the use of first-party cookies to personalize the website experience, adjusting certain components to align with individual user preferences.

Additionally, personalization extends to the contact centre, where customers are directed to the most suitable group of agents for their specific needs. Upselling offers at hotels are also being personalized to enhance the relevance and appeal of the promotions presented.

An AI-driven Q&A system is in development to assist clients in obtaining information about hotels. This system pulls data from Magnolia CMS to simplify the search and retrieval of relevant hotel features for both customers and employees. Currently, the system is being tested within the Social Care, Contact Center and Gex service teams, and its effectiveness is being evaluated to identify further use cases.

Note: Please consult the detailed case study on page 79.

3.2.2 AI and traditionally marginalized groups

One of the cornerstones of democracy is respecting the rights of all population groups as equal citizens and stakeholders in any process affecting their lives. In the context of AI and tourism, this principle can be applied as follows:

- Inclusiveness: a system can ensure that tourism services provide inclusive experiences by considering the needs of all population groups, including people with disabilities, specific access requirements and seniors;
- Cultural sensitivity: AI systems should be designed to respect and accommodate various cultural realities and languages, promoting a richer, more inclusive and engaging travel experience, benefiting visitors and host communities alike;
- Local communities: ensure that local cultures and communities, particularly indigenous peoples, directly benefit from or can limit tourism so they are not being overshadowed or exploited by dominant market forces or imposed development models, in opposition with their collective aspirations;
- Cultural identity: AI can help in creating cultural experiences that are respectful of and beneficial to local communities, whose rights, especially those related to intellectual property, have been particularly violated in the past.[53] However, any use of AI implicating indigenous communities, needs to be preceded by an explicit Free, Prior, and Informed Consent (FPIC);[54] and
- Data governance: as an emerging technology, AI can perpetuate exacerbate existing disparities, implying that "Indigenous data – whether stories, instruments, values, or customs – must guide and serve as the foundation for 21st century data governance and AI

53 González Zepeda, L. E. and Martínez Pinto, C. E. (2023), *Inteligencia artificial centrada en los pueblos indígenas: perspectivas desde América Latina y el Caribe*, UNESCO, Paris and Montevideo, available at: https://unesdoc.unesco.org/ark:/48223/pf0000387814 [31-10-2024].

54 United Nations (2007), 'United Nations Declaration on the Rights of Indigenous Peoples', UN DESA, New York, available at: https://social.desa.un.org/issues/indigenous-peoples/united-nations-declaration-on-the-rights-of-indigenous-peoples [19-11-2024].

development to promote equity and advance justice for Indigenous Peoples", through tourism.[55]

In conclusion, when properly planned and managed, AI has the potential to empower local communities by supporting sustainable tourism practices that equitably distribute economic benefits.

3.2.3 AI and universal accessibility

The rapid spread of new AI technologies has brought additional opportunities for inclusion but also accessibility barriers. Biased data used to train algorithms often do not take into account end-users with disabilities. There are different ways in which generative AI-associated systems may pose risks for individuals with disabilities. In particular, language-based systems may add a negative connotation to disability-related keywords and phrases or provide wrong outcomes due to a public data set containing statistical distortions or wrong entries.[56] Some of the specific opportunities identified by ONCE Foundation to address AI-related challenges, include:

1. Integrating AI technologies to break down accessibility barriers in daily lives, and also tourism, including image and video recognition, as well as the processing of text, audio and natural language features; and

2. Using AI technologies to guide people and assist them with outdoor and indoor mobility.[57]

AI in the context of cultural tourism, as well as nature-based attractions can bring benefits, especially in the interpretation and communication sphere, by creating solutions for visitors and locals with specific access requirements.[58] UN Tourism calls for creating alternative approaches with the help of digital interpretation, virtual and augmented reality or AI in case barriers cannot be removed.[59]

3.2.4 Digital sovereignty

Digital sovereignty is the assertion of control over a nation's digital infrastructure, data and technology resources, ensuring autonomy, security and regulatory independence in the digital realm while upholding democratic principles of transparency, accountability and citizen participation in decision-making processes related to digital governance.[60] Key aspects in relation to AI and tourism include:

- Data ownership: Ensuring data ownership for potential travellers means that any scraping of their personal information from travel websites is strictly regulated. This ensures that the collected data remains within the country's control, preventing unauthorized foreign access and ensuring compliance with local privacy laws to protect travellers' personal information.

- Big tech dependency: Big tech dependency in tourism AI can limit local innovation and control. Reliance on global tech giants for AI solutions may lead to data sovereignty issues, economic leakage and reduced competitive edge for local businesses.

55 Tapu, I.F. and Fa'agau, T.K. (2022), 'A New Age Indigenous Instrument: Artificial Intelligence & Its Potential for (De)colonialized Data', *Harvard Civil Rights – Civil Liberties Law Review,* 57(2), Fall 2022, pp. 715–757, available at: https://journals.law.harvard.edu/crcl/vol-57-no-2-fall-2022/ [20-11-2024].

56 Welker, Y. (2023), 'Generative AI holds potential for helping people with disabilities – but it need policy to shape it', article part of the AI Governance Summit, published on 3 November 2024, WEF, Geneva, available at: https://www.weforum.org/events/ai-governance-summit-2023/ [31-10-2024].

57 ONCE Foundation (2024), 'Mobility and accessibility solutions using AI technologies', available at: https://www.ifema.es/en/global-mobility-call/press-releases/fundacion-once-presents-mobility-and-accessibility-solutions [31-10-2024].

58 Pasikowska-Schnass, M. and Lim, Y.-S. (2023), *Artificial intelligence in the context of cultural heritage and museums – Complex challenges and new opportunities*, Briefing, PE 747.120 – May 2023, European Parliament, EU, available at: https://www.europarl.europa.eu/RegData/etudes/BRIE/2023/747120/EPRS_BRI(2023)747120_EN.pdf [31-10-2024].

59 World Tourism Organization, Una Norma Española, and Fundación ONCE (2023), *How to apply ISO Standard 21902: Accessible Tourism for All – Recommendations for key players in the cultural tourism ecosystem*, UN Tourism, Madrid, available at: https://www.unwto.org/accessibility [20-11-2024].

60 Kreps, S. and Kriner, D. (2023), *How AI Threatens Democracy, Journal of Democracy,* 34(4), October 2023, pp. 122–131, Project MUSE, DOI: https://dx.doi.org/10.1353/jod.2023.a907693.

Encouraging homegrown tech development can mitigate these risks and enhance national digital autonomy.[61]

- Marketing manipulation: AI-driven marketing manipulation in tourism can shape and control travellers' choices by leveraging personalized data to overly influence decisions, often prioritizing profit over authentic experiences. This can undermine trust, exploit consumer behaviour and disadvantage smaller local businesses unable to compete with aggressive tactics of larger corporations.

Digital sovereignty in AI in tourism implies asserting data ownership to mitigate big tech dependency. This empowers destinations to control their narrative, reducing susceptibility to external marketing manipulation by managing data locally, fostering stakeholders' autonomy and ensuring that tourism benefits align with local values and priorities.

Person in wheelchair experiencing virtual reality in an art gallery. © Anna Tolipova | Dreamstime.com| Dreamstime.com

61 Schaake, M. (2024), *The Tech Coup – How to Save Democracy from Silicon Valley,* Princeton University Press, Princeton.

3.3
A technological perspective

The tourism industry is undergoing a transformative shift due to the integration of artificial intelligence (AI), which is enhancing both operational efficiency and customer experiences. This section examines the technological impact of AI on tourism, focussing on the underlying technologies, their current applications and future technological trends. The field has evolved from simple expert systems to sophisticated machine learning algorithms and AI-powered devices that are reshaping every aspect of the travel experience.[62]

Futuristic uban transport. AI-generated image.
© © Jane Rubtsova | Dreamstime.com

Snapshot: Booking.com – fairness in machine learning

The Booking.com machine learning team focussed on algorithmic transparency and fairness and looked for space where bias might be present. This led them to discovering several countries were outliers on credit card chargeback fraud, some with majority false positive rates. False positives are a bad customer experience, and can cause loss of a customer, but chargeback fraud can also be devastating for small and medium-sized businesses. Therefore, false negatives need to be minimized. A balance between the two objectives must be found.

An experiment to include a bias correction measure in the machine learning algorithm was added to the base fraud detection model, which already produced very good results detecting fraud. By increasing the fairness quotient, Booking.com was able to reduce the number of false positives interrupting the booking of accommodation.

Note: Please consult the detailed case study on page 63.

62 Kong, H. et al. (2023), '30 years of artificial intelligence (AI) research relating to the hospitality and tourism industry', *International Journal of Contemporary Hospitality Management*, 35(6), pp. 2157–2177, DOI: https://doi.org/10.1108/IJCHM-03-2022-0354.

Main technologies

1. Machine learning and deep learning

Machine learning, particularly deep learning, forms the backbone of many AI applications in tourism. These technologies enable systems to learn from vast amounts of data and improve their performance over time without explicit programming.[63] Applications include:

- Personalized recommendations: Deep learning models analyse user preferences, historical behaviour and current trends to provide tailored travel suggestions.[64]
- Demand forecasting: Machine learning algorithms predict travel patterns and optimize pricing strategies.[65]
- Image recognition: Deep learning models can analyse and categorize travel images, enabling visual search capabilities and enhancing content management for tourism websites and applications.[66]

2. Natural language processing (NLP)

NLP enables machines to understand, interpret and generate human language, facilitating more natural interactions between AI systems and users. Examples of NLP-related applications include:

- Chatbots and virtual assistants: NLP powers AI-driven customer service tools, enabling them to understand and respond to customer queries in multiple languages.[67]
- Sentiment analysis: NLP techniques analyse customer reviews and social media posts to gauge public opinion and identify trends.[68]
- Multilingual support: Advanced NLP models enable real-time translation services, breaking down language barriers for international travellers.[69]

3. Computer vision

Computer vision technology allows AI systems to interpret and analyse visual information from the world. Applications in tourism include:

- Facial recognition: Enhances security measures and streamlines check-in processes at hotels and airports.[70]
- Augmented reality (AR): Combines computer vision with AR to provide interactive and immersive tourist experiences.[71]

63 Kong, H. et al. (2023), '30 years of artificial intelligence (AI) research relating to the hospitality and tourism industry', *International Journal of Contemporary Hospitality Management*, 35(6), pp. 2157–2177, DOI: https://doi.org/10.1108/IJCHM-03-2022-0354.

64 Cotter, K. et al. (2024), 'Technology is a wish your heart makes: How Disney harnesses practical magic discourse to legitimize MyMagic+,' *New Media & Society*. DOI: https://doi.org/10.1177/14614448241230923.

65 Aluri, A.; Price, B.S. and McIntyre, N.H. (2019), 'Using machine learning to cocreate value through dynamic customer engagement in a brand loyalty program', *Journal of Hospitality & Tourism Research*, 43(1), pp. 78–100, DOI: https://doi.org/10.1177/1096348017753521.

66 García-Madurga, M.Á. and Grilló-Méndez, A.J. (2023), '*Artificial Intelligence in the tourism industry: An overview of reviews*', Administrative Sciences, 13(8), 172., DOI: https://doi.org/10.3390/admsci13080172.

67 Ukpabi, D. C.; Aslam, B. and Karjaluoto, H. (2019), 'Chatbot Adoption in Tourism Services: A Conceptual Exploration', in: Ivanov, S. and Webster, C. (eds.), *Robots, Artificial Intelligence, and Service Automation in Travel, Tourism and Hospitality*, Emerald Publishing Limited, pp. 105-121, Emerald Publishing Limited, Leeds, DOI: DOI:10.1108/978-1-78756-687-320191006.

68 Gretzel, U. (2019), 'The role of social media in creating and addressing overtourism', in: Dodds, R. and Butler, R. (eds.), *Overtourism: Issues, realities and solutions*, De Gruyter Oldenbourg, pp. 62–75, DOI: https://doi.org/10.1515/9783110607369-005.

69 Dwivedi, Y.K. et al. (2024), 'Leveraging ChatGPT and other generative artificial intelligence (AI)-based applications in the hospitality and tourism industry: practices, challenges and research agenda', *International Journal of Contemporary Hospitality Management*, 36(1), pp. 1–12, DOI: https://doi.org/10.1108/IJCHM-05-2023-0686.

70 Buhalis, D. and Leung, R. (2018), '*Smart hospitality – Interconnectivity and interoperability towards an ecosystem*', *International Journal of Hospitality Management*, 71, pp. 41–50, DOI: https://doi.org/10.1016/j.ijhm.2017.11.011.

71 García-Madurga, M.Á. and Grilló-Méndez, A.J. (2023), '*Artificial Intelligence in the tourism industry: An overview of reviews*', Administrative Sciences, 13(8), 172., DOI: https://doi.org/10.3390/admsci13080172.

- Visual search: Enables travellers to search for destinations, accommodations or attractions by uploading images, enhancing the trip planning process.[72]

4. Internet of things (IoT)

IoT involves connecting various devices and sensors to the Internet, allowing for data collection and automated interactions. Applications include:

- Smart hotels: IoT devices control room temperatures, lighting and other amenities based on guest preferences.[73]
- Real-time monitoring: IoT sensors collect data on tourist flows, helping manage crowds and tourism carrying capacity. [74]
- Baggage tracking: IoT-enabled luggage tags can provide real-time information about the location of baggage, reducing the stress of lost luggage for travellers.[75]

5. Generative AI

Recent advancements in generative AI, such as large language models like Chat GPT, are opening new possibilities in the tourism sector:

- Content creation: Generative AI can produce personalized travel itineraries, marketing copy and even assist in menu creation for restaurants.[76]
- Virtual travel experiences: AI-generated content could provide immersive virtual tours and experiences.[77]
- Personalized storytelling: Generative AI can create customized travel stories or guides based on a traveller's interests and past experiences, enhancing engagement and inspiration.[78]

6. Edge AI

Edge AI involves deploying AI algorithms on local devices rather than in the cloud, enabling faster processing and improved privacy. Potential applications include:

- Real-time translation devices: Edge AI could power more efficient and private language translation tools for travellers, operating without the need for constant Internet connectivity.
- Smart cameras: AI-powered cameras could provide real-time information about attractions and crowd levels without sending data to the cloud, enhancing privacy and reducing data transmission costs.
- Autonomous tour guides: Edge AI could enable more sophisticated and responsive robot tour guides, capable of interacting with visitors and providing information in real time.[79]

72 Huang, A. et al. (2022), 'When artificial intelligence meets the hospitality and tourism industry: an assessment framework to inform theory and management', *Journal of Hospitality and Tourism Insights,* 5(5), pp. 1080–1100, DOI: 10.1108/JHTI-01-2021-0021.

73 Buhalis, D. and Leung, R. (2018), '*Smart hospitality – Interconnectivity and interoperability towards an ecosystem', International Journal of Hospitality Management,* 71, pp. 41–50, DOI: https://doi.org/10.1016/j.ijhm.2017.11.011.

74 Gretzel, U.; Fuchs, M.; Baggio, R. et al. (2020), *e-Tourism beyond COVID-19: A call for transformative research,* Information Technology & Tourism, 22, pp. 187–203, DOI: https://doi.org/10.1007/s40558-020-00181-3.

75 Kong, H. et al. (2023), '30 years of artificial intelligence (AI) research relating to the hospitality and tourism industry', *International Journal of Contemporary Hospitality Management,* 35(6), pp. 2157–2177, DOI: https://doi.org/10.1108/IJCHM-03-2022-0354.

76 Dwivedi, Y.K. et al. (2024), 'Leveraging ChatGPT and other generative artificial intelligence (AI)-based applications in the hospitality and tourism industry: practices, challenges and research agenda', *International Journal of Contemporary Hospitality Management,* 36(1), pp. 1–12, DOI: https://doi.org/10.1108/IJCHM-05-2023-0686.

77 Huang, A. et al. (2022), 'When artificial intelligence meets the hospitality and tourism industry: an assessment framework to inform theory and management', *Journal of Hospitality and Tourism Insights,* 5(5), pp. 1080–1100, DOI: 10.1108/JHTI-01-2021-0021.

78 García-Madurga, M.Á. and Grilló-Méndez, A.J. (2023), *'Artificial Intelligence in the tourism industry: An overview of reviews',* Administrative Sciences, 13(8), 172., DOI: https://doi.org/10.3390/admsci13080172.

79 Ivanov, S. and Webster, C. (2019), 'Perceived Appropriateness and Intention to Use Service Robots in Tourism', in: Pesonen, J. and Neidhardt, J. (eds.), *Information and Communication Technologies in Tourism 2019,* Springer, Cham, pp. 237–248, DOI: 10.1007/978-3-030-05940-8_19.

Technological challenges and considerations

The application of AI in the tourism sector also brings challenges that should be taken into consideration:

- **Data management and integration:** The effectiveness of AI in tourism relies heavily on the ability to collect, process and integrate large volumes of data from various sources. This presents challenges in data standardization, quality control and integration of legacy systems.[80]

- **Privacy and security:** As AI systems in tourism handle sensitive personal data, robust encryption methods and secure data handling practices are crucial. Implementing privacy-preserving AI techniques, such as federated learning, could help address these concerns.[81]

- **Scalability and performance:** As the volume of data and the complexity of AI models increase, ensuring system scalability and maintaining real-time performance become significant challenges. Cloud computing and distributed AI architectures are being explored as potential solutions.[82]

- **Interoperability:** With various AI systems and technologies being deployed across the tourism ecosystem, ensuring interoperability between these systems is crucial for seamless user experiences and efficient operations.[83]

- **Environmental impact:** AI systems, particularly cloud computing and data centres, have high energy costs, and data centres can have a significant impact on the environment.[84]

Space tourism. AI-generated image. © Volodymyr Semeniuk | Dreamstime.com

80 Li, J. et al. (2018), 'Big data in tourism research: A literature review', *Tourism Management*, 68, pp. 301–323, DOI: https://doi.org/10.1016/j.tourman.2018.03.009.

81 Stankov, U. and Gretzel, U. (2020), 'Tourism 4.0 technologies and tourist experiences: a human-centered design perspective', *Information Technology & Tourism*, 22, pp. 477–488, DOI: DOI:10.1007/s40558-020-00186-y.

82 Huang, A. et al. (2022), 'When artificial intelligence meets the hospitality and tourism industry: an assessment framework to inform theory and management', *Journal of Hospitality and Tourism Insights*, 5(5), pp. 1080–1100, DOI: 10.1108/JHTI-01-2021-0021.

83 Buhalis, D. and Leung, R. (2018), '*Smart hospitality – Interconnectivity and interoperability towards an ecosystem*', *International Journal of Hospitality Management*, 71, pp. 41–50, DOI: https://doi.org/10.1016/j.ijhm.2017.11.011.

84 Katal, A.; Dahiya, S. and Choudhury, T. (2023), *Energy efficiency in cloud computing data centers: a survey on software technologies*, Cluster Computing, 26, pp. 1845–1875, DOI: https://doi.org/10.1007/s10586-022-03713-0.

Future technological trends in AI

Developments that are expected to have a crucial impact on the application of AI:

- **Explainable AI (XAI):** As AI systems become more complex, there is a growing need for transparency in how these systems make decisions. XAI techniques aim to make AI algorithms more interpretable and trustworthy.[85]

- **Quantum computing in AI:** Although still in its early stages, quantum computing has the potential to dramatically enhance the capabilities of AI systems, particularly in complex optimization problems relevant to tourism, such as route planning and resource allocation.[86]

- **AI-powered predictive maintenance:** Advanced AI algorithms could predict maintenance needs for tourism infrastructure and transportation systems, improving safety and efficiency.[87]

- **Blockchain and AI integration:** The integration of blockchain technology with AI could enhance data security, enable more transparent transactions and create new possibilities for decentralized tourism services.[88]

- **Emotion AI:** Emerging emotion AI technologies aim to recognize, interpret and respond to human emotions. In tourism, this could lead to more empathetic AI

Intelligent suitcase on a cobblestone street in a city. AI-generated image. © Serghei Starus | Dreamstime.com

85 Tussyadiah, I. and Miller, G. (2019), 'Perceived Impacts of Artificial Intelligence and Responses to Positive Behaviour Change Intervention', in: Pesonen, J. and Neidhardt, J. (eds.), *Information and Communication Technologies in Tourism 2019,* Springer, Cham, DOI: https://doi.org/10.1007/978-3-030-05940-8_28.

86 Kong, H. et al. (2023), '30 years of artificial intelligence (AI) research relating to the hospitality and tourism industry', *International Journal of Contemporary Hospitality Management,* 35(6), pp. 2157–2177, DOI: https://doi.org/10.1108/IJCHM-03-2022-0354.

87 García-Madurga, M.Á. and Grilló-Méndez, A.J. (2023), *'Artificial Intelligence in the tourism industry: An overview of reviews',* Administrative Sciences, 13(8), 172, DOI: https://doi.org/10.3390/admsci13080172.

88 Gretzel, U.; Fuchs, M.; Baggio, R. et al. (2020), *e-Tourism beyond COVID-19: A call for transformative research,* Information Technology & Tourism, 22, pp. 187–203, DOI: https://doi.org/10.1007/s40558-020-00181-3.

89 Tussyadiah, I. (2020), 'A review of research into automation in tourism: Launching the Annals of Tourism Research Curated Trail on Artificial Intelligence and Robotics in Tourism', *Annals of Tourism Research,* 81, March 2020, DOI: https://doi.org/10.1016/j.annals.2020.102883.

3.4 Smart hospitality: AI and the tourism experience

In today's rapidly evolving tourism industry, the adoption of advanced technology is essential for improving visitor experiences and efficiently sharing information. Over the past two decades, the tourism industry has undergone a profound transformation driven by information and communication technologies that have disrupted structures, processes and practices.[90] One of the most transformative technological innovations in this field is artificial intelligence. Due to the COVID-19 pandemic, the tourism industry has suffered a setback, making it necessary to rethink the industry to promote a post-pandemic restart in which AI technologies could be the engine for a new renaissance of the whole sector.[91]

These developments of AI have created the current expansion and enhancement of the industry:[92]

- New search engines and web data mining;
- New tools to enhance the tourist's experience, such as augmented reality and virtual reality devices;
- New tools for processing ever-larger amounts of data, such as machine learning, deep learning, and neural networks, enabling increasingly accurate estimates and forecasts in real-time; and
- New robotics to interact with customers and to perform routine tasks.

With the ability to process vast amounts of data, analyse patterns and provide intelligent insights,[93] AI tools have emerged as a game-changer in the domain of tourism information services.

Based on needed AI-assisted functions, four major types of intelligence were developed in AI:[94]

1. Mechanical intelligence: learn or adapt at the minimum;
2. Analytical intelligence: learn and adapt systematically based on data;
3. Intuitive intelligence: learn and adapt intuitively based on understanding; and
4. Empathetic intelligence: learn empathetically based on experience.

90 Gretzel, U. et al. (2015), 'Smart tourism: foundations and developments', *Electronic Markets*, 25(3), pp. 179–188, DOI: 10.1007/s12525-015-0196-8.

Sigala, M. (2018), 'New technologies in tourism: From multi-disciplinary to anti-disciplinary advances and trajectories', *Tourism Management Perspectives*, 25, pp. 151–155, DOI: https://doi.org/10.1016/j.tmp.2017.12.003.

91 Hall, C.; Scott, D. and Gössling, S. (2020), 'Pandemics, transformations and tourism: be careful what you wish for', *Tourism Geographies*, 22(3), pp. 577–598, DOI: https://doi.org/10.1080/14616688.2020.1759131.

92 Furman, J. and Seamans, R. (2019), 'AI and the Economy', *Innovation Policy and the Economy*, 19(1), pp. 161–191, DOI: https://doi.org/10.1086/699936.

93 Alyasiri, O.M.; Akhtom, D. and Ali, A.H. (2023), 'Exploring GPT-4's Characteristics Through the 5Vs of Big Data: A Brief Perspective', *Babylonian Journal of Artificial Intelligence*, vol. 2023, pp. 5–9, DOI: https://doi.org/10.58496/BJAI/2023/002.

Alyasiri, O.M.; Akhtom, D. and Alrasheedy, M.N. (2023), 'An Overview of GPT-4's Characteristics through the Lens of 10V's of Big Data', *2023 3rd International Conference on Intelligent Cybernetics Technology & Applications (ICICyTA), Denpasar, Bali, Indonesia, 2023*, pp. 201–206, DOI: 10.1109/ICICyTA60173.2023.10429032.

94 Huang, M.H. and Rust, R.T. (2018), 'Artificial intelligence in service', *Journal of Service Research*, 21(2), pp. 155–172, DOI: https://doi.org/10.1177/1094670517752459.

Self-learning and connectivity are two dominant features of AI.[95] Algorithm-based machine learning, deep learning (artificial neural networks) and automated machine learning are approaches to enable self-learning in AI. The Internet of things (IoT), which refers to the connection and data exchange among humans, machines and objects, enables connectivity in AI-facilitated devices and platforms.[96]

Snapshot: The Smat Guidance AI chatbot in Jeddah

A Smart Guidance chatbot to be used in Jeddah, Saudi Arabia, utilizes advanced technologies, including natural language processing (NLP) and machine learning. NLP allows the chatbot to engage in natural, intuitive conversations, understanding and responding to user inquiries in a human-like manner. Meanwhile, machine learning enables the chatbot to continuously enhance its performance by learning from each interaction, thereby offering increasingly accurate and relevant responses over time.

This chatbot provides real-time recommendations for attractions, hotels, activities and travel plans – all customized according to individual user preferences and historical data. It serves as a centralized information source, reducing the need for tourists to visit multiple websites or applications. Additionally, its interactive design makes the process of obtaining information and planning activities more engaging and enjoyable for users.

Note: Please consult the detailed case study on page 65.

3.4.1 AI integration in smart tourism destinations

The integration of AI offers unprecedented opportunities to revolutionize various aspects of tourism, from personalized recommendations to real-time data collection. smart tourism destinations (STDs) have emerged as an increasingly important concept in the tourism industry, enhancing the visitor experience and improving destination management. An essential aspect of this concept is utilizing advanced technologies to provide an enhanced experience for tourists and improve operational efficiency.[97]

SEGITTUR *(Sociedad Estatal para la Gestión de la Innovación y las Tecnologías Turísticas),* the Spanish state company for the management of innovation and tourism technologies, has defined a framework for STDs. According to SEGITTUR, there are five main pillars or dimensions of STDs:

1. **Innovation:** This pillar focusses on incorporating new technologies and processes to improve the tourist experience and destination management. It includes aspects like digital transformation, the use of emerging technologies and fostering a culture of innovation within the tourism sector.

2. **Technology:** This dimension emphasizes the use of cutting-edge technological solutions to enhance tourism services and infrastructure. It includes elements such as IoT (Internet of things), big data analytics, artificial intelligence, mobile applications and smart city technologies.

3. **Sustainability:** This pillar addresses the environmental, economic and sociocultural aspects of tourism development. It aims to ensure that

95 Huang, M.H. and Rust, R.T. (2018), 'Artificial intelligence in service', *Journal of Service Research,* 21(2), pp. 155–172, DOI: https://doi.org/10.1177/1094670517752459.

96 Huang, M.H. and Rust, R.T. (2021), 'Engaged to a robot? The role of AI in service', *Journal of Service Research,* 24(1), pp. 30–41., https://doi.org/10.1177/1094670520902266.

97 SEGITTUR and Alzua-Sorzabal, A. (2024), 'Methodological Framework of the Spanish Smart Tourism Destinations Model', in: Andrades, L.; Romero-Dexeus, C., and Martínez-Marín, E. (eds.), *The Spanish Model for Smart Tourism Destination Management. Tourism, Hospitality & Event Management,* Springer, Cham, pp. 37–86, DOI: https://doi.org/10.1007/978-3-031-60709-7_3.

Lukita, C. et al. (2023), 'Examining the Impact of Artificial Intelligence and Internet of Things on Smart Tourism Destinations: A Comprehensive Study', *Aptisi Transactions on Technopreneurship (ATT),* 5(2sp), pp. 135–145, DOI: https://doi.org/10.34306/att.v5i2sp.332.

tourism growth is balanced with the preservation of natural resources, local culture and community well-being.

4. **Accessibility:** This dimension focusses on making the destination inclusive and accessible to all visitors, regardless of their physical abilities or age. It includes both physical accessibility of infrastructure and digital accessibility of information and services.

5. **Governance:** This pillar relates to the management and decision-making processes in the destination. It emphasizes transparency, stakeholder participation, public-private-community collaboration and data-driven decision making.

These five pillars work together to create a holistic approach to developing and managing STDs. They aim to improve the overall quality of the tourism experience while ensuring the long-term sustainability and competitiveness of the destination.

STDs make use of existing technologies to actively gather and analyse data to better understand visitors' needs, requests and behaviours and then deliver better services and experiences that are timelier and context-aware. Moreover, data can be used for destination planning and management. By providing open access to data for tourism businesses and travellers, as well as other stakeholders outside the sector (e.g., mobility) through a single platform, the creation of STDs improve the travel and tourism sector.[98]

In recent years, the convergence of artificial intelligence (AI) has played a crucial role in transforming STDs into smart and interactive destinations. By harnessing the capabilities of AI technologies like machine learning, natural language processing and computer vision, STDs can create personalized and immersive experiences for visitors while optimizing operational efficiency and revolutionizing destination management.

The power of AI lies in its ability to collect, analyse and interpret massive volumes of data, empowering STDs to extract valuable insights into visitor preferences, behaviours and emerging trends. The potential of these technologies to deliver accurate and trustworthy data enables customized services, contributing to visitor satisfaction and enhancing their overall experience.[99]

Enhancing the tourism experience and increasing resource management effectiveness to increase destination competitiveness and tourist satisfaction are the key goals of smart tourism destinations, in addition to guaranteeing the optimalization of planning, management and sustainability over a long period of time.[100]

The integration of AI in smart hospitality and tourism experiences represents a significant leap forward in the sector. By leveraging AI's capabilities to process vast amounts of data, provide personalized experiences and optimize operations, the tourism sector can offer more engaging, efficient and sustainable services. Beyond enhancing services, AI also holds great potential in shaping tourism destination policy and management, enabling smarter decision-making and strategic planning. As AI continues to evolve, it will play an increasingly central role in creating smarter destinations that adapt not only to the changing needs and preferences of travellers but also to the dynamic requirements of destination management and policy frameworks.

98 Jovicic, D. Z. (2017), 'From the traditional understanding of tourism destination to the smart tourism destination', *Current Issues in Tourism,* 22 (3), pp. 276–282, DOI. https://doi.org/10.1080/13683500.2017.1313203.

99 Mishra, S. and Tyagi, A.K. (2022), 'The Role of Machine Learning Techniques in Internet of Things-Based Cloud Applications', in: Pal, S.; De, D., and Buyya, R. (eds), *Artificial Intelligence-based Internet of Things Systems. Internet of Things.* Springer, Cham, DOI: https://doi.org/10.1007/978-3-030-87059-1_4.

100 Buonincontri, P. and Micera, R. (2016), 'The experience co-creation in smart tourism destinations: a multiple case analysis of European destinations', *Information: Technology & Tourism,* 16, pp. 285–315, DOI: https://doi.org/10.1007/s40558-016-0060-5.

3.5 AI in theme parks or similar attractions: predictive maintenance and beyond for enhanced operational efficiency and visitor satisfaction

The integration of artificial intelligence (AI) in the tourism sector serves as a significant catalyst for innovation and efficiency.[101] However, achieving a critical balance between AI implementation and the perceived human touch by customers remains essential for maintaining customer satisfaction. As AI technology evolves and increasingly incorporates elements of human interaction, determining the exact balance between automation and personal engagement becomes more complex.[102]

This section uses the case of AI-driven predictive maintenance to illustrate how AI can enhance operational efficiency, reduce costs and improve visitor satisfaction.

Snapshot: Osaka Convention and Tourism Bureau – A generative multilingual chatbot

The Osaka Convention and Tourism Bureau (OCTB) replaced its existing AI chatbot on Osaka's official tourist information website with a generative AI chatbot capable of handling more than 20 languages – the first of its kind in Japan – enhancing multilingual acceptance capabilities for the rapidly growing number of foreign visitors to Japan.

In preparation for the Expo 2025 in Osaka, Kansai, the OCTB will use this type of generative AI chatbots to improve the convenience of multilingual inquiries at tourist information centres and call centres, and to save labour in the management of tourist information, thereby improving hospitality for and satisfaction of foreign visitors coming to Osaka.

Note: Please consult the detailed case study on page 74.

101 Samala, N. et al. (2020), 'Impact of AI and robotics in the tourism sector: a critical insight', *Journal of tourism futures,* 8(1), pp. 73–87, DOI: https://doi.org/10.1108/JTF-07-2019-0065.

102 Saini, A. and Bhalla, R. (2022), '*Artificial intelligence and automation: transforming the hospitality industry or threat to human touch*', *Handbook of Research on Innovative Management Using AI in Industry 5.0*, IGI Global, pp. 88–97, DOI: 10.4018/978-1-7998-8497-2.ch006.

3.5.1 Enhancing operational efficiency

Traditional maintenance methods in theme parks rely on reactive measures, addressing issues as they occur. In contrast, predictive maintenance leverages real-time data analytics to anticipate and prevent problems. This shift from reactive to proactive maintenance helps continue the seamless operation of rides, attractions and equipment, ensuring minimal disruptions for visitors.

This is illustrated by the MagicBand system as used by Disney Parks, which exemplifies how AI can enhance operational efficiency. The MagicBand is a wearable Radio-frequency identification-enabled wristband that allows guests to access various services, such as park entry, FastPass reservations and cashless payments. It also collects data on visitor movements and preferences to enhance personalized experiences and support park operations.[103]

3.5.2 Cost reduction

The implementation of AI-driven predictive maintenance can lead to significant cost savings by predicting and preventing failures in equipment and systems. This approach helps avoiding high costs associated with emergency repairs and unplanned downtime. Additionally, it allows for maintenance to be scheduled during less busy times, optimizing resource allocation and reducing labour costs.

3.5.3 Improving visitor satisfaction

Visitor satisfaction is key to the tourism industry, and AI-driven predictive maintenance can play a crucial role in ensuring a positive visitor experience. Well-maintained and consistently operational attractions contribute to a seamless and enjoyable visit. By minimizing ride downtimes and ensuring the safety and reliability of attractions, high levels of visitor satisfaction can be maintained.

Disney's MagicBand demonstrates this crucial role in both predictive maintenance and enhancing the visitor experience by collecting and analysing data on visitor preferences and behaviours. AI systems can recommend personalized experiences, such as ride suggestions or dining options, which enhance the overall visitor experience and make each visit unique and memorable.[104]

103 Atwood, C. (2023), *Really Magic Bands?: Disney's MagicBand Wearables and Theme Park Place-making*, Master's Thesis, The Ohio State University, available at: http://rave.ohiolink.edu/etdc/view?acc_num=osu1681821550319279 [31-10-2024].

Luechtefeld, L. E. (2021), *The Expanding Role of Analytics in Operations*, Honors Thesis, University of Dayton, available at: https://ecommons.udayton.edu [31-10-2024].

104 Lee, S. (2021), 'Transforming the theme park customer experience: Focusing on Disney's MyMagic+', *International Theme & Amusement Park Journal*, 2(1), available at: https://seoul.edu/?page_id=6631 [31-10-2024].

Podeschi, R. (2023), 'Chapter 4: IOT in Tourism', in: Alka Maurya, J.; Munoz, M.; Gaur, L. and Singh, G. (eds.), *Disruptive Technologies in International Business: Challenges and Opportunities for Emerging Markets*, De Gruyter, Berlin/Boston, pp. 29–36, DOI: https://doi.org/10.1515/9783110734133-004.

3.6 Legal aspects

The implementation of artificial intelligence in the current era presents a challenging legal equation: on one hand, there is exponential growth in its development and application; on the other, legislators at international, regional and national levels struggle to create a body of legislation that anticipates potential interferences with its application. This challenge strains policies and legislative systems worldwide, which are facing this innovation with sociological and technological enthusiasm, albeit with logical reservations unparalleled to date.

From conceptual and legal implementation perspectives, AI offers both risks and opportunities in the tourism sector, based on an extensive interpretation of consumer and user rights as subjects of protection. The imperative need to ensure transparency, data privacy, intellectual property rights and the guarantee of equality and non-discrimination, among others, leads to approach this reality from the perspective of universal human rights, as enshrined in the United Nations Declaration of Human Rights from 1948.

Likewise, the geopolitical characteristics that shape the world require a clear differentiation in the efforts of various regions and countries to elaborate a legal framework for AI application in tourism. Except for specific regulations, the lack of international conventions on AI that would allow for a supranational approach to the sector presents a risk: the difficulty of dealing with individual legislation worldwide and the challenge of harmonizing it with each country's national law.

3.6.1 The implementation of AI regulation: non-binding and binding

International non-binding legal approaches

One of the fundamental challenges in approaching the implementation of AI regulations in tourism is the lack of binding legal instruments. Although there are specific regulations at the supranational level on certain aspects of AI (e.g., in the European Union), or laws and strategic approaches to the subject (in Canada, China, Japan, the Republic of Korea or the United States of America, among others),[105] there is a significant gap in drafting supranational laws and regulations at a global level that establish binding limits of application. The development of instruments that safeguard against non-compliance, that impose corresponding sanctions and that could potentially result in an unnatural cessation of technological innovation is a complex undertaking that requires considerable goodwill from all parties involved.

The non-binding nature of regulations concerning the use of new technologies and AI offers challenges and difficulties, but also opportunities. The *Global Code of Ethics for Tourism* (GCET) is an illustrative example. Although it predates the use of AI in the sector, the GCET already addressed the use of new technologies in its article 5.3, underlining that "the introduction of new technologies should be aimed at improving the quality of services provided and the conditions of the populations concerned". Article 8.3, on the Freedom of Movement of Tourists, also stresses the need to keep tourism professionals updated and foster knowledge, "particularly in the field of foreign languages and new technologies".[106]

105 LegalNodes (2024), 'Global AI Regulations Tracker,' available at: https://legalnodes.com/article/global-ai-regulations-tracker [31-10-2024].

106 World Tourism Organization (1999), *Global Code of Ethics for Tourism (GCET)*, UN Tourism, Madrid, available at: https://www.unwto.org/global-code-of-ethics-for-tourism [04-11-2024].

Another clear example, which reinforces the risk of a lack of binding normative texts on tourism and AI, is the Organisation for Economic Co-operation and Development (OECD) guidelines on AI. Although the OECD Principles on AI do not refer specifically to tourism, it is possible to infer the central aspects that should govern the use of AI. The text states that "AI actors should respect the rule of law, human rights, and democratic values, throughout the AI system lifecycle. These include freedom, dignity and autonomy, privacy and data protection, non-discrimination and equality, diversity, fairness, social justice, and internationally recognized labour rights."[107] These aspects are expressly based on the United Nations Declaration of Human Rights (1948) and, as such, should be of mandatory compliance.

The aforementioned approaches, both as articulations and recommendations, are paramount for understanding and subsequent legal implementation of AI use in the tourism sector. However, as mentioned, they are not binding in character and therefore move away from the peremptory need for a binding, restrictive and guarantor approach to AI use in the sector.

Although this obstacle is part of the concerning legal reality, we cannot ignore the importance of declarations from major supranational actors as ethical guarantors and beacons of this new horizon.

Supranational law: the case of the European Union and its binding nature

The European legislative framework allows for an understanding of the importance and scope of supranational laws which – in the form of directives (that require harmonization with the national laws of the member states) or regulations (directly applicable and immediately incorporated into the national body of law) – become part of the intricate legislative framework of EU member states. In both cases, European legislation is understood to be binding, that is, of mandatory compliance.

Apart from this general scope of understanding, the European Union has taken initiatives of a normative nature in its own role as legislator at the supranational level. In July 2024, the EU Artificial Intelligence Act was published, coming into force in August 2024. As mentioned in its preamble, its fundamental objective is: "to improve the functioning of the internal market by laying down a uniform legal framework in particular for the development, the placing on the market, the putting into service and the use of artificial intelligence systems (AI systems) in the Union, in accordance with Union values, to promote the uptake of human-centric and trustworthy artificial intelligence (AI) while ensuring a high level of protection of health, safety, fundamental rights as enshrined in the Charter of Fundamental Rights of the European Union [...], including democracy, the rule of law and environmental protection, to protect against the harmful effects of AI systems in the Union, and to support innovation."[108]

Generally speaking, this act is based on the idea of developing products and services in such a way that their implementation offers opportunities and limits where needed. Ultimately, the spirit of the act is based on strengthening human rights and protecting the principles of privacy, non-discriminatory treatment, and transparency. Based on these, the act offers a first supranational approach that will be implemented in the regulations of the member states.

The act constructs a lexical field of necessary application. Again, although it does not deal exclusively with or specifically mention the tourism sector, it does specify areas of action that fall within the sector. Thus, the Act establishes as a first line of action a clear recognition of those instruments resulting from the AI that pose an objective risk to the fundamental rights of citizens, namely:[109]

107 Organisation for Economic Co-operation and Development (n.d.), 'AI principles', OECD, Paris, available at: https://www.oecd.org [04-11-2024].

108 EUR-Lex (2024), 'EU Artificial Intelligence Act', European Union, ELI: http://data.europa.eu/eli/reg/2024/1689/oj.

109 EUR-Lex (2024), 'EU Artificial Intelligence Act', European Union, ELI: http://data.europa.eu/eli/reg/2024/1689/oj.

- **Prohibited AI systems against human rights:** which concretely or subliminally lead to behavioural manipulation, use social characteristics to classify individuals or misuse a subject's vulnerabilities against the law. In this case, clients could be confronted with facial recognition in hotels, which may violate their rights;

- **High-risk AI systems:** used as safety components that are not covered by EU laws, requiring third-party conformity assessments, for example, profiling systems that process personal data are always considered high-risk. In the case of the tourism sector, AI systems that automate personalized recommendations for customers by profiling their preferences, behaviours and location data; and

- **General purpose AI (GPAI):** refers to AI models that display significant generality capable to competently perform a wide range of distinct tasks regardless of the way the model is placed on the market and that can be integrated into a variety of downstream systems or applications. This does not cover AI models that are used before their release on the market for research, development and prototyping activities (EU AI-Act overview, 2024). Within the sector, AI platforms that handle large datasets, such as customers' booking preferences, trends in the customer behaviour or reviews, could be integrated in this group.

It should be stressed that, although the EU Artificial Intelligence Act is not the first supranational standard (such as the already mentioned OECD Principles on AI from 2019, or the UNESCO recommendations on the ethics of AI from 2021), it is the first of its binding nature at European level, pioneering at the supranational level and spearheading legislation to come.

Snapshot: Madrid – Enhancing tourist experience and destination quality

The General Directorate of Tourism and Hospitality of Madrid Region developed and implemented a platform for travel agents that uses advanced communication optimization techniques to enhance client interactions, thereby improving the travel experience in the Region of Madrid across the entire customer journey. Implemented AI-driven applications include:

- Optimization of telephone messages: Enhanced customer service by optimizing telephone communications using AI, providing clearer and more efficient messaging;

- Creation of itineraries and planning: Leveraged AI to design customized itineraries and travel plans based on individual preferences and data analysis;

- Text correction and elaboration: Used AI for proofreading, editing and creating engaging written content for marketing and informational purposes;

- Editing and image creation tools: Implemented AI-driven tools for editing and creating images, enhancing visual appeal in promotional materials;

- Artificial audio, music and video creation: Integrated AI to produce synthetic audio, music and video content for immersive marketing campaigns; and

- Specialized training: More than 300 travel agents were provided with training in the use of the platform and in the most advanced AI tools in digital marketing, essential for the correct use of the platform.

Note: Please consult the detailed case study on page 69.

The EU General Data Protection Regulation (GDPR), adopted in 2016 and enforced starting in 2018, serves as a cornerstone for data protection and privacy in the European Union. It is particularly relevant in the context of AI due to the extensive and sensitive use of data by AI systems. The GDPR emphasizes transparency, requiring organizations to clearly communicate how data is collected, processed and used. It enforces accountability, mandating that those who handle data adhere to strict regulations, and it underscores respect for individual data rights, such as the right to access, rectify and erase personal data. Given the potential opacity of AI systems, GDPR provides a necessary legal framework to ensure ethical and lawful AI implementation across the European Union.[110]

In the context of tourism, as in any other field where data is used, express consent in the collection and processing of private data must be a *conditio sine qua non.* Transparent and truthful information, as well as the responsibility of those involved in this process, must be a cornerstone. The rights of consumers for confidentiallity, as outlined in the *International Code for the Protection of Tourists*,[111] also highlight the importance of protecting travellers' personal data and, therefore, should be extended to the application of AI in tourism. The Code includes recommendations arising from the need to protect consumers from the problems encountered during the COVID-19 pandemic. Although of proven use, its legal nature is also not binding, stressing once again the challenge of its effective application in the industry.

Thus, a further problem emerges: the coexistence of mandatory rules of a more general scope and those relating to tourism from a more specific point of view and without the status of mandatory rules. In this regard, it is important to emphasize the obligatory nature of the rules related to AI, especially the punitive elements of financial nature that could apply in case of non-compliance, which help to monitor and control the primarily private activity in this sector.

Regional and national regulations regarding the use of AI

Although more regional in nature, various countries have opted to legislate in response to the challenges and opportunities presented by AI. Australia, Canada, China, India, Japan, the Republic of Korea, Singapore and the United States of America have adopted guidelines and directives that address ethical issues in the development and application of AI. It is relevant to highlight the capacity of various governments to establish guidelines and recommendations that serve as guides and deterrents. Additionally, the efforts made in matter of a concrete legal approach underline the vast road that lies ahead for legislators.

The catalytic and monitoring role of public institutions: the scope of regional and local regulations

In view of the application of supranational norms, such as those of the European Union, as well as recommendations on the use of AI in the framework of tourism, it is necessary to underpin the essential role of public institutions.

It is relevant to mention that specific legislation regarding the use of AI in tourism is still developing, as are the legal aspects regarding AI in general. Thus, for the time being, it should be discussed that public institutions have a clear role in the regulation concerning the protection of consumer rights, privacy and fairness. In that sense, national public institutions should monitor compliance and act punitively in cases of contravention.

110 European Union (2016), *General Data Protection Regulation (GDPR)*, Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data. Official Journal of the European Union, L119, pp. 1–88, available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32016R0679 [31-10-2024].

111 World Tourism Organization (2022), *International Code for the Protection of Tourists*, UN Tourism, Madrid, DOI: https://doi.org/10.18111/9789284423361.

3.6.2 Artificial intelligence, workers' rights and labour law: cost and opportunity

One of the most worrying issues in the application of AI systems is the possible threat to workers' rights, as well as the potential loss of jobs through automation. The International Labor Organization (ILO) itself points out the urgent need to create mitigating elements to alleviate the possible effects of AI on job automation, especially in clerical work, where human touch is present but not strictly necessary for effectiveness.[112] In this sense, the tourism sector is particularly sensitive to the disappearance or reduction of their need for workers, especially in jobs that can be performed by chatbots or service robots (as is increasingly the case in the hospitality sector). Against this background, ILO underlines the importance of observers and partners to avoid negative effects (collective redundancies in the industry and the role of trade unions in this discussion as guarantors of workers' rights).

Furthermore, AI systems in the tourism sector may create a scenario for inequality by automating certain jobs that are, in practice, heavily feminized and racialized, risking a reversal of the progress in women's access to the labour force in recent decades.[113]

However, it is also necessary to point out the importance that AI systems can have on training and specialization in the sector. In this sense, public institutions can and should support courses that implement the knowledge and specialization of workers in the insertion of AI systems in their own work environment. The training provided by public bodies guarantees controls on the respect of the law in force and the limits indicated therein. In this way, the public institutions with decision-making power in the sector must warrant that the information is truthful, the instruments used are adequate and do not contravene the European AI Act (if applicable). Their role in vigilance must guarantee the correct application of the standards beyond the understanding of its articles.

Another clearly positive aspect of the application of AI in the sector's labour field is the possibility it offers to harmonize schedules and promote equal business opportunities between large tourism companies and SMEs. For example, the use of AI for programming virtual assistants to send automatic and personalized updates on travel itineraries to customers in another time zone prevents small companies from working overtime at the expense of their personal lives; or, on the contrary, from eliminating this possibility in their dealings with customers, as they are unable to compete with large companies that can offer this service.

3.6.3 Navigating AI regulation in tourism

The profoundly innovative nature and exponentially growing use of AI in the tourism sector leads to to necessary reflections and legal challenges to be considered before and while implementing AI in the tourism sector:

- Consider positive exemples of implementation of AI in the sector, especially those promoted and monitored by public institutions.
- Establish public bodies to control the development and implementation of AI tools applicable to the tourism sector; public institutions must function as guarantors and safeguards of citizens' most fundamental human rights.
- Seek a supranational, ethical and legal commitment on AI in the sector that seeks effective legal cooperation by tourism stakeholders.
- Approach legal regulation of AI implementation from the universal principles set out in the Universal Declaration of Human Rights from 1948.

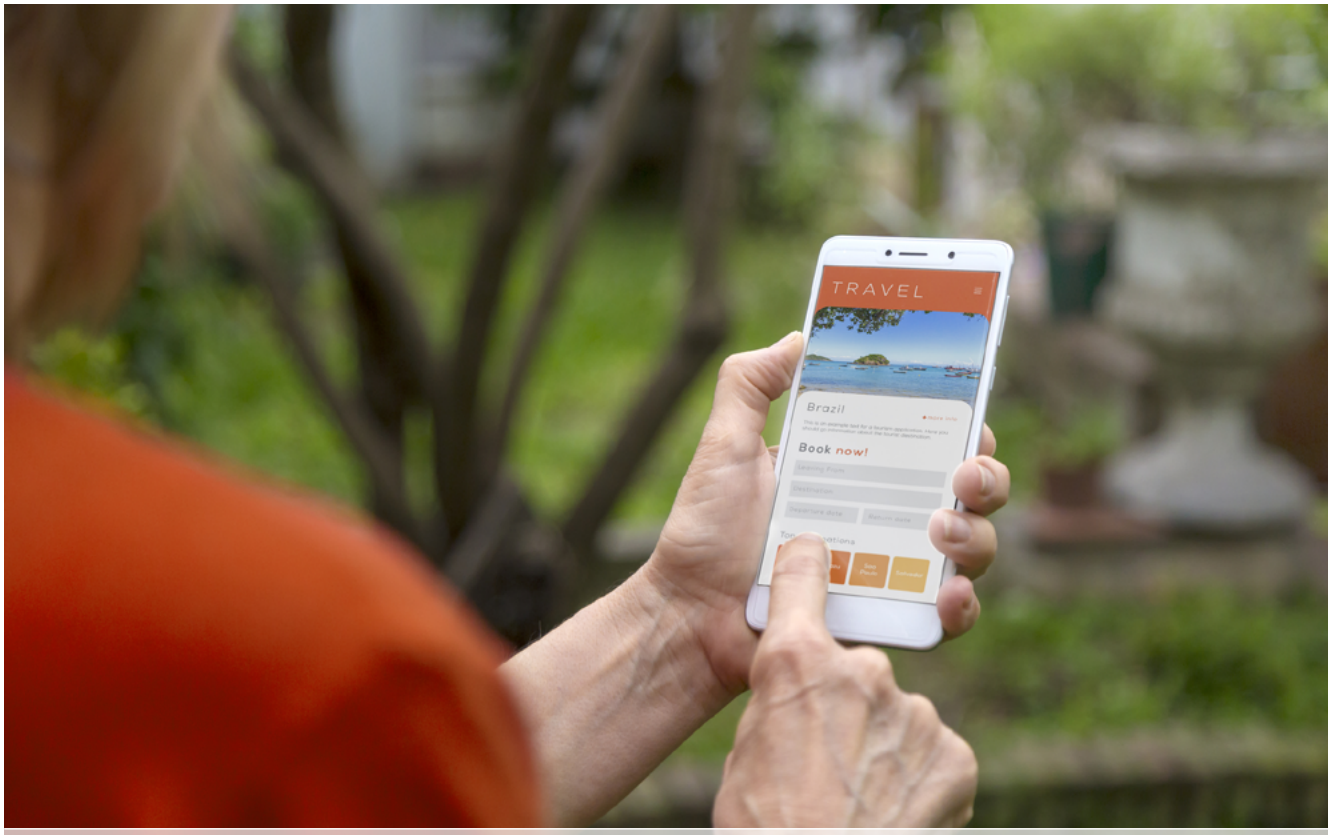
112 Gmyrek, P.; Berg, J. and Bescond, D. (2023), *Generative AI and jobs: A global analysis of potential effects on job quantity and quality,* ILO Working paper 96, ILO, Geneva, available at: https://www.ilo.org/publications [04-11-2024].

113 Madgavkar, A. et al. (2019), *The future of women at work: Transitions in the age of automation,* McKinsey Global Institute, Brussels, available at: https://www.mckinsey.com [04-11-2024].

- Consider the importance of incorporating a lexical field of international application for a uniform understanding of the AI field and the challenge this implies, given the rapid development of the responsible technologies. The definitions, essential for understanding a global phenomenon on a worldwide scale, also serve to concretize the scope of the topic for those subjects connected to the tourism sector.

- Create monitoring bodies at national and subnational levels to monitor compliance with implemented standards.

- Consider the possibilities of reconciling work and, therefore, the effectiveness of the work that can be carried out with the help of AI, as a way to implement quality of services required in the tourism sector and to respect consumers' rights.



Traveller using a booking application on smart phone. © Alejandro27 | Dreamstime.com

04.
Final insights

Abstract: This chapter outlines essential considerations for AI adoption in tourism, focussing on ethical, technological and business impacts. It emphasizes the need for ethical AI guidelines addressing privacy, transparency and fairness, alongside the importance of digital sovereignty and equitable AI access for all stakeholders. Technological advancements like chatbots, virtual assistants and predictive maintenance enhance personalization and operational efficiency. Business-specific recommendations are included for sector stakeholders, from national tourism administrations (NTAs) to accommodation and transport providers.

Key words: national tourism administrations (NTAs) | destination management organizations (DMOs) | data privacy | predictive maintenance | personalized guest experiences | chatbot | virtual assistants

Electronic tunnel. © Oleksii Tkach | Dreamstime.com

4.1 Key considerations

The following are key considerations for implementing AI in tourism, ensuring its transformative potential is harnessed responsibly while addressing ethical, legal and technological challenges.

Ethical considerations

- Development of ethical AI guidelines in tourism to address privacy, bias, transparency and accountability concerns.
- Balance between AI implementation and maintaining authentic human interactions in hospitality.
- Validation of information provided by AI tools.

Democratization of AI in tourism

- Assurance of a level playing field for all stakeholders in the tourism industry when implementing AI.
- Protection of minority rights and cultural sensitivity in AI-driven tourism experiences.
- Concept of digital sovereignty concerning data ownership and control in tourism AI applications.

Technological advancements

- Role of AI in personalized travel planning, chatbots, virtual assistants and operational efficiency.
- Use of AI technologies to enhance guest experiences, improve operations and support tourism planning and management by public administrations at local and national levels.

Smart hospitality

- Emergence of smart tourism destinations (STDs) utilizing AI and other advanced technologies.
- Importance of data collection and analysis in creating personalized and immersive visitor experiences.

AI-driven predictive maintenance

- Enhancement of operational efficiency, cost reduction and visitor satisfaction through AI-driven predictive maintenance.
- Challenges faced by smaller operators in implementing AI-driven systems and potential solutions.

Business and legal perspectives

- Balance AI implementation with the perceived human touch in customer service.
- Consideration of cost reduction and improvements in visitor satisfaction through AI technologies.

Future implications

- Potential for AI to revolutionize various aspects of the tourism sector, from personalized recommendations to streamlined operations.
- Importance of addressing challenges such as data privacy and the potential loss of human interaction in hospitality services.

4.2 Takeaways for tourism stakeholders

By embracing these principles, the tourism industry can harness the full potential of AI while addressing ethical concerns and maintaining the essential human elements of hospitality and travel experiences.

National tourism administrations (NTAs) and destination management organizations (DMOs)

- Focus on developing ethical AI guidelines addressing privacy, bias, transparency and accountability concerns in tourism. It is essential that tourism is included in the national and transnational discussion on this.
- Explore how AI can enhance smart tourism destinations (STDs) to enhance visitor experiences and improve operational efficiency.
- Ensure a level playing field for all stakeholders and protect minority rights and cultural sensitivity.
- Address digital sovereignty concerns related to data ownership and control in tourism AI applications.

Accommodation providers

- Implement AI-powered chatbots and virtual assistants to handle customer inquiries and improve response times.
- Consider AI-driven predictive maintenance systems to reduce costs and minimize disruptions.
- Explore AI for personalized guest experiences and recommendations.
- Balance AI automation with maintaining the human touch in hospitality services.

Transportation sector

- Use AI to optimize pricing strategies and resource allocation.
- Implement predictive maintenance for vehicles and infrastructure.
- Enhance security measures through facial recognition and anomaly detection.

Travel agencies and tour operators

- Explore AI for personalized travel planning and recommendations.
- Consider AI-powered chatbots for customer service.
- Use AI to analyse customer data and predict travel trends.

Food and beverage businesses

- Leverage AI for inventory management and demand forecasting.
- Implement personalized menu recommendations that prioritize local culinary aspects.
- Optimize pricing strategies using AI.

Leisure and cultural attractions

- Use AI for crowd management and optimizing visitor flows.
- Create virtual or augmented reality experiences enhanced by AI.
- Provide personalized recommendations and tour guidance using AI.

Conference and exhibition organizers

- Explore AI for matchmaking between attendees and exhibitors.
- Implement AI-powered virtual assistants for event information and navigation.
- Analyse attendee data to improve future events.

Cross-sector recommendations for stakeholders

- Prioritize data privacy, consent and security in AI systems.
- Maintain a balance between AI automation and human interaction.
- Continuously update AI algorithms to reflect changing trends and preferences.
- Ensure transparency in AI-driven decision-making processes.
- Invest in staff training to work effectively alongside AI technologies.

Artificial intelligence control panel. © Vyychan | Dreamstime.com

05. UN Tourism's AI-driven initiatives – Experiences from the UN Tourism Online Academy and the UN Tourism Innovation Network

Innovation in in learning. © Phuttaphat Tipsana | Dreamstime.com

5.1 The UN Tourism Online Academy

Innovation is a driving force behind the transformation of numerous sectors, reshaping industries and redefining how they operate. Across fields like healthcare, finance and manufacturing, innovative technologies and approaches are enhancing efficiency, fostering creativity and opening new opportunities. The tourism sector is no exception; it has seen a profound shift, with digitalization and technological advancements paving the way for improved customer experiences, sustainable practices and new business models.

In tourism education, innovation in learning platforms is vital for preparing students to thrive in an evolving landscape. By harnessing advanced technologies, educational institutions are equipping future professionals with the skills to navigate and adapt to the sector's dynamic challenges. Increasingly, institutions are integrating digital learning platforms, artificial intelligence and virtual reality to create immersive and personalized learning experiences. These innovations enhance student engagement and understanding, empowering learners to develop practical skills and insights that are essential for success in the tourism sector.

The UN Tourism Online Academy stands as a leading example of how innovation is being applied in tourism education. By offering digital courses and incorporating AI tools, it aims to make quality education accessible globally, fostering a deeper understanding of sustainable tourism practices and preparing a new generation of professionals for a rapidly changing sector.

AI tools were introduced to enhance the usability and performance of the UN Tourism Online Academy. This initiative was made possible with the support of the Kingdom of Saudi Arabia (KSA) as part of a wider KSA e-Learning project, and was implemented in partnership with IE University in collaboration with UN Tourism. The primary goals are to provide practical, real-time support for participants, enabling a personalized learning experience through assignment feedback and the assistance of an AI tutor. IE University supplies the technology, while UN Tourism and its academic partners, who developed the MOOCs in collaboration with UN Tourism, regularly review and maintain the content.

5.1.1 AI technology in tourism education – UN Tourism Online Academy as a catalyst

AI is reshaping the landscape of education by offering new possibilities for personalized learning, improving access to knowledge and enhancing student engagement. In traditional and online learning environments, AI can adapt content to individual learning styles, analyse progress and provide targeted support, making education more inclusive and effective. This technological shift is particularly relevant in areas like tourism education, where understanding diverse perspectives, adapting to rapid sector changes and gaining practical knowledge are essential.

The UN Tourism Online Academy exemplifies the integration of AI into tourism education. Through its platform, the Academy utilizes AI tools to provide personalized learning experiences, adapting content to meet the needs of diverse learners worldwide. This approach not only enhances accessibility but also ensures that students from different regions and backgrounds receive a tailored education that aligns with their career goals and local tourism contexts.

By embracing AI technology, the UN Tourism Online Academy is driving a shift toward more flexible and adaptive learning models, facilitating students to engage

with course material at their own pace. Moreover, the Academy's use of AI facilitates continuous feedback, helping students to understand their progress and focus on areas that need improvement. This creates a more efficient and impactful learning experience, positioning the UN Tourism Online Academy as a key player in the global effort to advance education in the tourism sector through innovation.

5.1.2 AI Tutor: transforming the learning experience at the UN Tourism Online Academy

The UN Tourism Online Academy has long been committed to providing accessible and high-quality education in tourism. In a field as dynamic as tourism, learners need quick access to relevant information and tailored support to keep up with evolving sector trends. Traditional methods, while effective, often struggle to meet the diverse needs of students across various regions and educational backgrounds. Educators sought a solution that could provide individualized assistance and enable students to interact with course materials more efficiently, all while maintaining the accessibility that the UN Tourism Online Academy is known for.

To address these challenges and as part of its ongoing mission to integrate advanced learning technologies, the Academy introduced the AI Tutor, an innovative AI-powered tool designed to enhance the learning experience that allows creating fully customized AI-powered assistants, or "tutors", specialized in any chosen topic. The AI Tutor can deliver a wide range of support, from answering specific questions to offering detailed explanations of complex subjects of each course, making it a versatile asset in the educational process.

Following features can be found in the UN Tourism Online Academy AI Tutor:

- **Multilingual support:** The AI Tutor's ability to operate in five languages (Arabic, Chinese, English, French and Spanish) is a crucial advantage. This multilingual capability makes it possible for students around the world to engage with the content in their preferred language, promoting a more inclusive learning environment and helping to break down language barriers in tourism education.

- **Customized learning:** The AI Tutor is designed to provide tailored assistance that meets the unique requirements of each student. By utilizing course-specific materials, it ensures that all responses and guidance are directly relevant to the content being taught. This approach allows students to gain a deeper understanding of the course material, focussing on areas where they need the most support.

- **Efficiency and convenience:** The AI Tutor streamlines the learning process by offering quick, on-demand assistance. Students no longer need to spend time searching through extensive resources or waiting for instructor responses. This instant access to information makes learning more engaging and allows students to progress at their own pace.

The introduction of the AI Tutor marks a significant step forward in the mission of the UN Tourism Online Academy to harness technology for better learning outcomes. By offering a customized and efficient way for students to interact with course material, the AI Tutor is helping to shape a new era of tourism education that is more adaptable, engaging and aligned with the needs of the sector.

5.1.3 Personalization at a glance: AI Feedback at the UN Tourism Online Academy

AI Feedback is another AI-powered tool integrated into the UN Tourism Online Academy – an advanced evaluation tool designed to enhance the learning experience by delivering customized, detailed feedback on assignments and homework submissions at scale.

This user-friendly tool allows students to submit their work through the platform and get an immediate evaluation. Based on a predefined rubric and supporting documentation the AI assesses submissions. It generates detailed, ad-hoc feedback tailored to each student's work, highlighting strengths, areas for improvement and

specific guidance on how to enhance their submissions. This innovative approach ensures that students receive actionable insights into their progress, enabling them to improve and refine their skills effectively.

Why AI feedback is a game-changer?

- **Personalized feedback at scale:** AI Feedback provides individualized feedback efficiently. Unlike traditional methods, where delivering detailed comments can be time-consuming, this tool ensures that every student receives thorough and relevant insights into their work. This personalization enhances students' understanding of their performance, fostering a more tailored learning experience that encourages continuous improvement.

- **Consistency and fairness:** With predefined rubrics and documentation, AI Feedback maintains consistent evaluation standards. This ensures that all students are assessed fairly based on the same criteria, eliminating subjective biases that can occur in manual grading. Consequently, students can trust that their evaluations accurately reflect their performance.

- **Complementing human expertise:** While AI Feedback offers rapid and scalable evaluation, it is designed to work in conjunction with traditional human-provided feedback. Educators can use AI-generated insights as a foundation, allowing them to focus on more nuanced aspects of student work that require a human touch. This balance between AI and human feedback ensures that students receive comprehensive guidance, benefiting from the efficiency of technology and the expertise of their instructors.

AI Feedback represents a transformative advancement in the UN Tourism Online Academy's commitment to improving educational impact. This tool not only streamlines the feedback process but also enriches the learning experience by providing personalized and detailed evaluations of student work.

5.1.4 Accelerating AI adoption in tourism education

The swift integration of AI into tourism is not just reshaping the sector; it is also revolutionizing the way education in this sector is delivered. The UN Tourism Online Academy is at the forefront of this transformation, harnessing AI technologies to enhance learning experiences and prepare students for the future of tourism. By leveraging tools like AI Feedback, the Academy enables educators to provide personalized and timely assessments, ensuring that students receive insightful guidance tailored to their individual needs.

In an era where AI solutions are integrated into different sectors to automate tasks and enhance customer interactions, the Academy recognizes the importance of equipping students with the skills needed to thrive in this evolving landscape. From using AI-driven analytics to optimize course materials to implementing personalized learning pathways, the Academy is creating a more seamless and effective educational experience. This innovative approach not only enriches the learning environment but also empowers students to engage with cutting-edge technologies that are transforming the tourism sector.

The agility with which AI can be adopted allows educational institutions like the UN Tourism Online Academy to remain competitive, while adapting swiftly to new advancements. By embracing machine learning, natural language processing and other emerging technologies, the Academy is not only enhancing student outcomes but also contributing to the broader digital transformation of tourism education. As AI continues to develop, its role in shaping personalized learning experiences and fostering sustainable tourism practices will become increasingly vital, solidifying the Academy's position as a leader in tourism education.

While the adoption of AI presents numerous benefits, it also brings challenges that must be addressed. The UN Tourism Online Academy recognizes issues such as managing complex data, mitigating algorithmic biases, and navigating regulatory frameworks around data protection. However, these challenges also create opportunities for leadership in responsible AI practices. By

emphasizing ethical AI use and promoting environmental, social and governance (ESG) principles, the Academy can differentiate itself in the educational landscape, championing transparency, data privacy and inclusivity in tourism education.

5.1.5 Conclusion

The UN Tourism Online Academy is at the forefront of the AI-driven transformation in tourism education, ensuring that this evolution remains centred on human experiences. By leveraging AI technologies, the UN Tourism Online Academy enhances learning outcomes and operational efficiency while fostering a commitment to sustainability. This aligns with a broader movement towards smarter, more responsible tourism practices that benefit both students and the communities they will eventually serve. As AI continues to evolve, its role in tourism education will expand, unlocking new avenues for innovation and growth, all while prioritizing ethical considerations and human needs to provide accessible and quality online education designed to reach everyone, everywhere.

University student. © Yuri Arcurs | Dreamstime.com

5.2 Startups and scale-ups from the UN Tourism Innovation Network

Like many other sectors, tourism is rapidly evolving, with artificial intelligence at the forefront of innovation. As a human-centered sector, the impact of AI in tourism is profound. Startups are leading this transformation by enhancing customer experiences, optimizing efficiency and promoting sustainability, while traditional companies race to keep up with the rapid pace of change.

The UN Tourism Innovation Network, comprised of nearly 400 startups and scaleups as of 2024 that have either won or been finalists in UN Tourism innovation competitions, offers a global snapshot of cutting-edge innovation and adoption of AI in the tourism sector. Of these, 54 startups are harnessing AI as the core driver of their business models, while 53 others incorporate AI as a supporting tool to enhance operations and customer interactions. This network reflects the growing role of AI in shaping the future of tourism across diverse regions and markets.

However, this rapid evolution raises concerns about inclusivity, particularly for micro-, small and medium-sized enterprises (MSMEs) and rural communities without the necessary technical means, infrastructure and connections, such as reliable Internet access. These groups face significant barriers to adopting AI, as they often lack the financial resources to compete with larger players in the tourism industry. Despite the innovation showcased by startups, the digital divide risks leaving these businesses and communities behind, limiting their ability to participate in and benefit from AI-driven advancements.

Addressing this disparity requires targeted efforts to provide MSMEs and rural communities with the tools, training and resources needed to bridge the gap, ensuring that AI serves as an inclusive force for growth and opportunity across the entire tourism sector.

5.2.1 Startups and scaleups as catalysts for AI innovation

Startups are driving AI adoption faster than traditional companies due to their agility and expertise in deep tech. They are integrating AI across all stages of the travel journey – from booking to post-travel feedback – offering personalized, efficient and seamless solutions. Many startups are also forming strategic partnerships with industry giants, further accelerating AI integration in tourism.

Notably, several startups and scaleups from the UN Tourism Innovation Network have formed strategic partnerships with industry giants, further accelerating AI integration into the tourism sector. For example, GDX Travel, a finalist in the network, was recently acquired by Hopper to enhance its New Distribution Capability (NDC) and expand AI-driven travel technology. Similarly, Airside, known for its mobile identity solutions, secured investment from Amadeus to strengthen its AI-powered identity verification capabilities. These collaborations – along with partnerships with major players like Meliá Hotels and Expedia Group – highlight how startups are transforming tourism through AI and advanced technologies.

5.2.2 Accelerating AI adoption in tourism

The rapid adoption of AI in tourism is reshaping the sector in profound ways. Startups are leading this transformation by leveraging AI to automate tasks, personalize customer interactions and analyse vast amounts of data in real time. From AI-driven chatbots that provide 24/7 customer support to predictive analytics that optimize bookings, these technologies are creating more seamless and

efficient travel experiences. Additionally, dynamic pricing engines allow businesses to adjust prices based on demand and market conditions, maximizing revenue and improving competitiveness. The speed at which startups are adopting and innovating with AI positions them as crucial players in the future of tourism.

The flexibility and innovative approaches of startups allow them to deploy AI solutions more swiftly than larger companies, who are often burdened by legacy systems. This agility gives startups a significant edge, enabling them to experiment with emerging technologies like machine learning, computer vision and natural language processing. These innovations are not only transforming customer service but also streamlining operations, reducing costs and contributing to the sector's broader digital transformation. As AI continues to evolve, its potential to revolutionize areas such as personalized marketing, predictive maintenance and sustainable tourism practices will further solidify its role as a driving force in the future of travel.

5.2.3 Regional landscape of AI startups in the UN Tourism Innovation Network

AI adoption among tourism startups is geographically diverse, with significant contributions from Europe, Asia and the Pacific, and the Americas, where AI serves as a core technology. Meanwhile, startups from emerging destinations worldwide are increasingly utilizing AI as a secondary tool to enhance services. This broad range of AI applications allows startups to meet regional needs while driving global innovation and transforming the tourism sector.

- **Europe:** Europe remains at the forefront of AI-driven tourism innovation, particularly in sustainability, smart tourism and cultural experiences. Murmuration (France) leverages AI for environmental monitoring, tracking air quality and biodiversity. Twistic (Spain) and Hoomvip (Spain) use AI to enhance marketing and guest management. Travaxy (Israel) creates personalized itineraries for accessible travel, catering to travellers with specific needs. Green Urban Data (Spain) employs AI for urban sustainability, optimizing resource use and reducing environmental impact. B Lab Gastronomic (Spain) uses AI to deliver personalized culinary tourism experiences, and Jooks (France) enriches urban exploration with AI-powered audio guides and interactive routes. These companies drive innovation, optimize resources and promote sustainability and inclusivity, positioning Europe and Israel as leaders in AI-powered tourism solutions.

- **Asia and the Pacific, and the Middle East:** Startups like Sparklehaze (Saudi Arabia and Singapore) are transforming hospitality operations by integrating AI and IoT to optimize guest experiences. Meanwhile, Quantum Temple (Indonesia) combines AI with Web3 technology to promote cultural preservation and engagement. Shake to Win (China) leverages AI to connect users with cultural sites through personalized itineraries and augmented reality-enhanced engagement. These innovations are positioning Asia and the Pacific, and the Middle East as key regions in AI-driven tourism technology.

- **Americas:** In the Americas, Sojern and Defined.ai (United States of America) lead the way in AI-powered travel marketing and data analytics, using machine learning to optimize marketing strategies and deliver real-time insights. In Brazil, Everhost employs AI to automate property management, dynamic pricing and guest communication. Additionally, GeoSure (Colombia) uses AI for real-time safety assessments, providing travellers with information on health risks, crime rates and environmental conditions to help them make informed decisions. These innovations highlight the growing role of AI in enhancing operational efficiency and safety across the Americas.

- **Africa and emerging destinations:** Many emerging tourism destinations, including those in Africa, are adopting AI as a secondary tool to enhance tourism. Six African startups in the UN Tourism Innovation Network focus on eco-friendly and sustainable tourism. Rainmaker.travel (Namibia) uses AI to manage digital presence and distribution, empowering local businesses. Kamatjona Adventure (Namibia) and Mouja (Morocco) apply AI to personalize tours and

optimize sustainable tourism experiences. Purple Elephant Venture Studio (Kenya) and Ostelflow (Tunisia) use AI for regenerative tourism and resource efficiency. These startups demonstrate how AI enhances sustainability and management across Africa.AI and sustainable smart destinations.

AI is playing a transformative role in advancing sustainability within the tourism industry, particularly through the rise of smart tourism. Startups such as Green Urban Data and Murmuration are leading the charge by equipping cities with AI-powered tools that monitor and manage tourist flows, mitigate overcrowding and optimize the use of resources like water and energy. By providing actionable environmental insights, these solutions help destinations balance tourism growth with sustainability goals, ensuring that both tourists and local ecosystems thrive.

Through AI-driven analytics, cities can make data-informed decisions that reduce the environmental impact of tourism while improving the overall visitor experience. From intelligent waste management systems to smart energy grids that adjust to demand, AI empowers destinations to operate more efficiently and sustainably. These startups are not only addressing immediate challenges but also contributing to the global vision of sustainable tourism, where technology enables smarter, greener and more responsible travel for future generations.

5.2.4 Conclusion

Startups face challenges such as managing complex data, addressing algorithmic biases and navigating regulatory frameworks on data protection. However, these challenges present opportunities for leadership in responsible AI use. Startups can differentiate themselves by promoting ethical AI practices and ESG that emphasize transparency, data privacy, and inclusivity.

Startups in the UN Tourism Innovation Network are leading the AI-driven transformation in tourism, but at its core, this revolution remains powered by humans for humans. By leveraging AI technologies, these startups are not only enhancing customer experiences and driving operational efficiency but also promoting sustainability in a way that keeps the human at the core. The rapid global adoption of AI reflects a broader movement toward smarter, more sustainable tourism practices that benefit both travellers and the communities they visit. As AI continues to evolve, its role in tourism will only expand, creating new opportunities for innovation and growth – yet always adapted to human needs, respecting codes of ethics and responsibly guiding the way forward.

06. Case studies on AI in tourism from UN Tourism Affiliate Members

Hotel reception robot. AI-generated image. © Anna Shalamova | Dreamstime.com

This section presents twelve selected case studies from UN Tourism Affiliate Members, showcasing the innovative integration of artificial intelligence across various players within the tourism sector. The Affiliate Members network, composed of over 500 diverse members – including companies, educational and research institutions, destinations and NGOs – serves as a platform for fostering collaboration and innovation within the industry. These case studies, submitted through an open Call for Proposals among UN Tourism Affilite Members and selected by the Affiliate Members and Public-Private Collaboration Department to be featured on this publication, illustrate practical applications of AI in areas such as personalized marketing, real-time customer service, predictive analytics and smart destination management.

This chapter aims to inspire other stakeholders within the tourism industry to explore and adopt AI-driven solutions, not only to enhance traveller experiences but also to streamline operations, boost efficiency and gain a competitive edge in an increasingly tech-driven marketplace. Through the Affiliate Members network focussed on knowledge exchange and cross-sectoral collaboration, these AI-driven innovations contribute to the broader mission of inspireing and guiding the adoption of AI in tourism.

Tokyo tower, MountFuji and Kiyomizu-dera temple, Japan. © Shirophoto | Dreamstime.com

Case study 1: Booking.com

Fairness in machine learning – fraud prevention

Booking.com, a global leader in online travel services, has long utilized artificial intelligence (AI) to enhance customer experience and safeguard its partners. Addressing the challenge of credit card fraud, the company focussed on reducing false positives (legitimate transactions wrongly flagged as fraudulent) by refining its machine-learning algorithms. This case study highlights how Booking.com's efforts to balance fairness and accuracy in fraud detection improved customer satisfaction and protected small and medium-sized enterprises (SMEs).

Main category of the impact from the application of AI:

Customer experience.

Actions taken for the use of AI:

The Booking.com machine learning team focussed on algorithmic transparency and fairness and looked for possible bias. This led them to discovering that several countries were outliers on credit card chargeback fraud, some with majority false positive rates. False positives are a bad customer experience that can cause loss of a customer, but chargeback fraud can also be devastating for small and medium-sized businesses so false negatives need to be minimized. A balance between the two objectives must be found.

An experiment to include a bias correction measure in the machine learning algorithm was added to the base fraud detection model, which already produced very good results detecting fraud. By increasing the fairness quotient, Booking.com was able to reduce the number of false positives interrupting the booking of accommodation.

Partners/companies/internal resources involved:

Booking.com, Fairness task force and machine learning team.

Specific challenges identified to explore AI solutions:

Credit card fraud is a recurring challenge in the travel industry, with chargeback fraud a particularly problematic issue. Chargeback fraud occurs when a seemingly legitimate purchase is made, but the cardholder then dishonestly requests a chargeback from the card issuer; the issuer will then typically request the funds back from the business where the purchase (like a hotel room) was made. Booking.com has been using machine learning for over a decade to identify potentially fraudulent transactions. However, specific countries showed chargeback fraud occurring with higher than expected "false positive" rates, meaning that transactions were mistakenly flagged as fraudulent more often than they should have been.

Specific opportunities identified to explore AI solutions:

While chargeback fraud disproportionately affects small and medium sized businesses due to their tighter profit margins and the potential of higher processing fees as the result of multiple chargebacks, false positives can also result in losing a customer for life. Booking.com therefore wanted to identify and correct for biases in its machine learning algorithm. This is part of continuous work to ensure fairness in applying AI systems on the Booking.com platform. The correcting of bias led to a significant drop in false positives, resulting in fewer disruptions for partner accommodations and customers.

Achievements:

By introducing this mitigation strategy, Booking.com's machine learning team was able to cut false positives by half, while also keeping false negative rates similarly low.

Measurable outcomes or success metrics resulting from the implementation of AI:

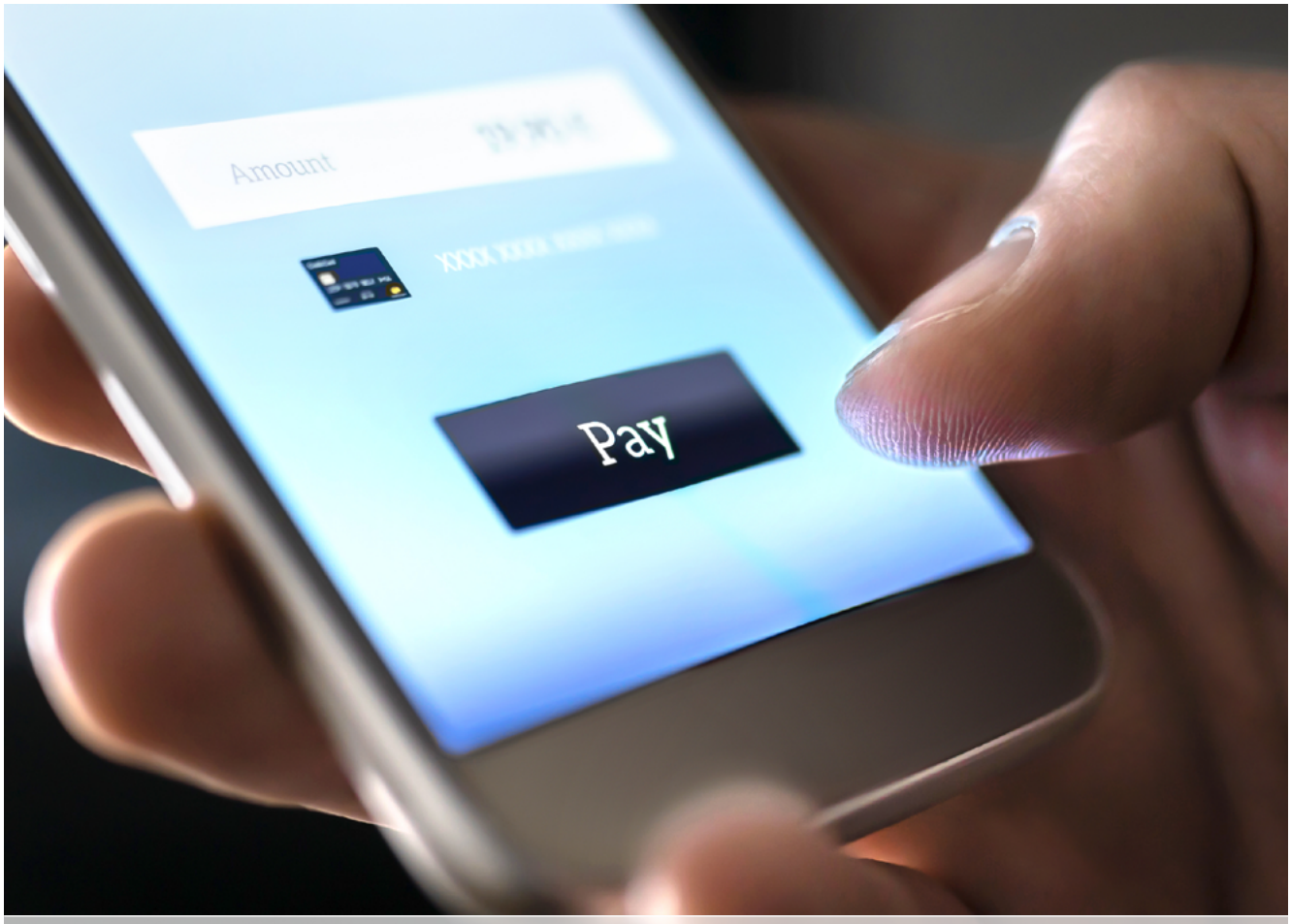
False positive was reduced by half. This case study is just one example of increasing fairness in AI models and algorithmic transparency. The AI and machine learning teams iterate on experiments to continuously improve the performance of fraud detection.

Lessons learned:

Increased confidence in AI detecting fraud helps small and medium-sized enterprises by ensuring they can depend on the legitimacy of bookings made, with an ever-reducing number of chargeback fraud cases.

Funding mechanism:

Company's own funds.



Credit card payment through smart phone application. © Tero Vesalainen | Dreamstime.com| Dreamstime.com

Case study 2: Colliers MENA

Smart Guidance chatbot in Jeddah, Saudi Arabia

Colliers MENA suppoted the implementation of the Smart Guidance chatbot to enhance the tourism experience in Jeddah. Utilizing advanced natural language processing (NLP) and machine learning, the chatbot provides real-time, personalized recommendations for attractions, hotels and activities.

Main category of the impact from the application of AI:

Customer experience.

Actions taken for the use of AI:

The company operates as consultancy, focussing on recommending AI solutions to their clients without directly managing destinations. The Smart Guidance chatbot Colliers MENA utilizes advanced technologies, including natural language processing (NLP) and machine learning. NLP allows the chatbot to engage in natural, intuitive conversations, understanding and responding to user inquiries in a human-like manner. Meanwhile, machine learning enables the chatbot to continuously enhance its performance by learning from each interaction, thereby offering increasingly accurate and relevant responses over time.

The Smart Guidance chatbot provides real-time recommendations for attractions, hotels, activities and travel plans, all customized according to individual user preferences and historical data. It serves as a centralized information source, reducing the need for tourists to visit multiple websites or applications. Additionally, its interactive design makes the process of obtaining information and planning activities more engaging and enjoyable for users.

Partners/companies/internal resources involved:

King Abdulaziz University, local government and tourism authorities.

Achievements:

The implementation of the Smart Guidance AI chatbot in Jeddah serves as a compelling example of how AI can revolutionize the tourism industry. By enhancing user satisfaction, increasing engagement and improving efficiency, the chatbot has set a new standard for tourist services.

Measurable outcomes or success metrics resulting from the implementation of AI:

- **User satisfaction:** The introduction of Smart Guidance significantly enhanced user satisfaction. According to the final evaluation, over 85% of users reported being highly satisfied with the performance of the chatbot, particularly appreciating the immediacy and accuracy of its responses. This high level of satisfaction was determined through post-interaction surveys that focussed on user experience.

- **Engagement:** The chatbot also succeeded in increasing user engagement. Tourists interacted with the chatbot more frequently and for longer durations compared to traditional information sources. This increase in engagement was quantified at approximately 30%, highlighting the utility of the chatbot and its user-friendliness.

- **Efficiency:** In terms of efficiency, the chatbot significantly streamlined the trip-planning process. By consolidating all necessary information into one single platform, it reduced the time required for trip planning by 40%. This efficiency allowed tourists to spend more time enjoying their visit rather than planning it. Additionally, the comprehensive service provided by the chatbot eliminated the need for tourists to download multiple travel applications, simplifying their overall experience.

Lessons learned:

This case study highlights the potential of AI to create more personalized and effective tourism experiences, ultimately benefiting both tourists and the local tourism industry.

Funding mechanism:

Public aid.

Traditional tend for welcoming familiy and friends. Jeddah, Saudi Arabia. © Laarow | Dreamstime.com

Case study 3: Expedia Group

Travel planning reimagined, fuelled by the power of AI – introducing Romie AI assistant

Expedia Group, a global leader in travel services, has harnessed Generative AI to develop Romie, an innovative virtual assistant designed to revolutionize the travel experience. Acting as a travel agent, concierge and personal assistant, Romie provides personalized and dynamic support, including group chat trip planning, smart searches, real-time itinerary updates and adaptive solutions to disruptions.

Main category of the impact from the application of AI:

Customer experience.

Actions taken for the use of AI:

Romie supports travellers through:

- **Group chat trip planning:** The traveller can invite Romie to join an SMS group chat and listen to vacation plans. If travellers wish for some advice, they can just type @Romie in the group to get suggestions on where to go or what to do, like they would ask a travel agent.
- **Smart search:** The traveller can ask Romie to summarize a group chat and bring what they learned about the trip straight into the Expedia shopping experience. Travellers can personalize their search even more by adding their own filters like rooftop views and early check-in to find the ideal hotel faster.
- **Building traveller itinerary:** Romie can pull in travel information from emails and suggest restaurants and activities near travellers' hotel.
- **Dynamic service:** Like the perfect personal assistant, Romie monitors weather changes or last-minute disruptions that may impact travellers' plans, and has alternative suggestions ready that are convenient for travellers.
- **Intelligent assistance:** Throughout the trip, Romie updates the travellers' itinerary in real time so anyone in the group chat with "Fear of Missing Out" can see what the other persons in the group are planning, and anyone that, for instance, needs to pick the traveller up from the airport can simply @Romie to check the time the traveller is landing.

Partners/companies/internal resources involved:

OpenAI and Yelp.

Specific challenges identified to explore AI solutions:

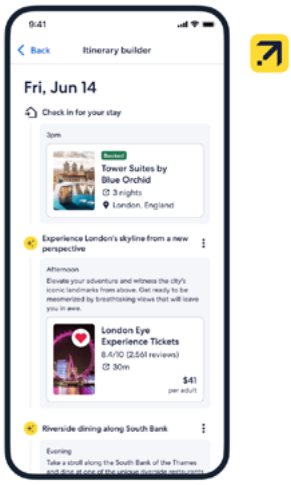
The alpha version of the Romie experience is currently available on EG Labs™, a hub for experimental products. It provides travellers with an AI able to assists with planning, shopping, booking and even help when something unexpectedly changes during a trip. The assistant serves as a travel agent, concierge and personal assistant, all in one. Like the ideal travel companion, Romie gets progressively intelligent – learning who the travellers are and remembering what type of trips the traveller likes.

Achievements:

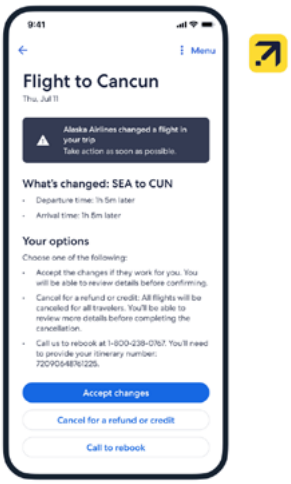
The project demonstrates the power of Expedia Group's multi-year tech transformation – how it has enabled the company to use the latest advancements in technology like Generative AI to unlock its travel data to personalize the entire trip experience for travellers from planning, to shopping to in-trip recommendations on restaurants.

Funding mechanism:

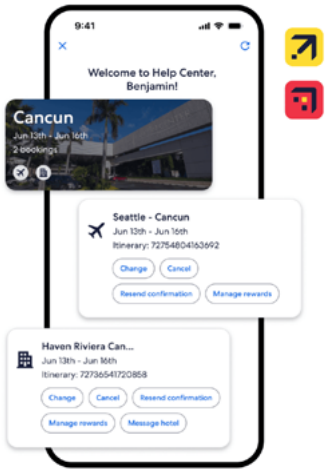
Research and development budget of the Expedia Group.



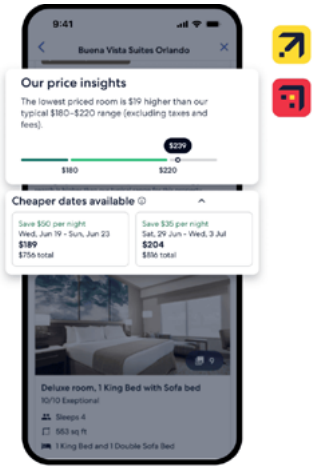
Itinerary Builder



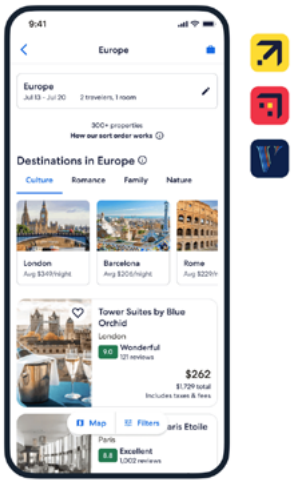
Air Self Service



Help Center

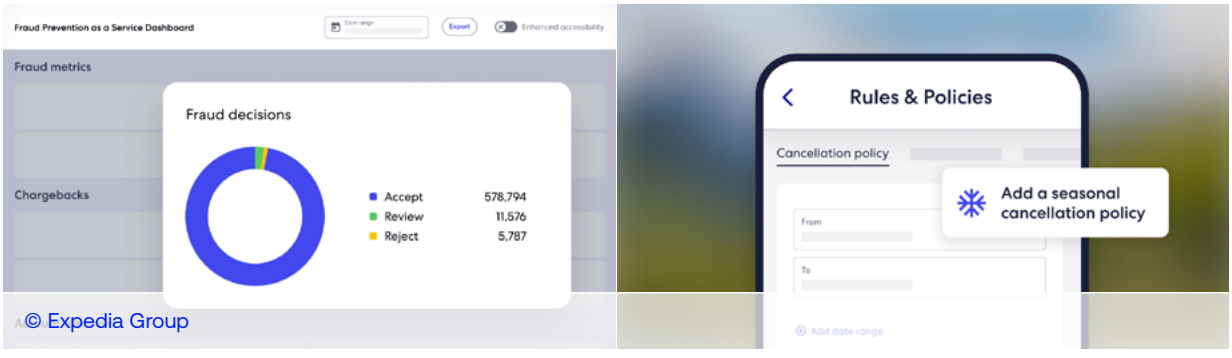


Lodging Price Comparison



Destination Comparison

Guest Review Summary



Case study 4: General Directorate of Tourism and Hospitality of Madrid Region

Application of AI to enhance tourist experience and destination quality in the Madrid region – a case for public-private collaboration

The General Directorate of Tourism and Hospitality of the Madrid Region, Spain, has leveraged artificial intelligence (AI) to enhance tourist experiences and elevate destination quality through a public-private collaboration model. In partnership with the Territorial Business Federation of Spanish Travel Agencies (FETAVE), the initiative developed an AI-powered platform designed to optimize customer service, personalize travel planning and improve the digital marketing capabilities of local travel agents.

Main category of the impact from the application of AI:

Customer experience.

Actions taken for the use of AI:

A platform for travel agents was designed and implemented. It uses advanced communication optimization techniques to enhance client interactions, thereby improving the travel experience in the Region of Madrid across the entire customer journey. For this, the following actions were taken:

- **Optimization of telephone messages** for enhanced customer service by optimizing telephone communications using AI, providing clearer and more efficient messaging:
- **Creation of itineraries and planning** for a leveraged AI to design customized itineraries and travel plans based on individual preferences and data analysis;
- **Text correction and elaboration** through AI proofreading, editing and creating engaging written content for marketing and informational purposes;
- **Editing and image creation tools** through implemented AI-driven tools for editing and creating images, enhancing visual appeal in promotional materials;
- **Artificial audio, music and video creation** through integrated AI to produce synthetic audio, music and video content for immersive marketing campaigns; and
- **Specialized training** was provided to more than 300 travel agents in the use of the platform and in the most advanced AI tools in digital marketing, essential for the correct use of the platform.

Partners/companies/internal resources involved:

- The destination mamagement organization (DMO) of the Madrid Region; and
- Territorial Business Federation of Spanish Travel Agencies (FETAVE).

Specific challenges identified to explore AI solutions:

- **Enhancing visitor experience:** the platform needed to offer more personalized and efficient services to tourists.
- **Improving quality of private offerings:** the project aimed to elevate the standards of services offered by private sector partners.
- **Digital transformation for sustainability:** the project recognized digitalization as a key factor for sustainable tourism development.
- **Compliance with the SDGs and the EU Tourism Transition Pathway:** the project committed to aligning with international sustainability goals.

Specific opportunities identified to explore AI solutions:

- **Innovative public-private collaboration:** the project established new methodologies for cooperation between the regional government and the private sector.
- **Boosting competitiveness:** the project improved the competitive edge of the travel agent sector and the destination as a whole.
- **Job opportunities:** the project generated new employment opportunities within the travel industry focussed on digital skills.
- **Professionalization and knowledge implementation:** the project enhanced industry expertise through specialized training programmes.
- **Immediate impact projects:** the project focussed on practical endevours that deliver quick and tangible results.
- **Enhanced tourism services through AI:** the platform leveraged AI to provide superior services and experiences to visitors.

Royal monastery of San Lorenzo de El Escorial near Madrid, Spain. © Motuxx | Dreamstime.com

Measurable outcomes or success metrics resulting from the implementation of AI:

- **Increased in travel agent participation:** the project trained and empowered over 300 travel agents, strengthening the network of professionals skilled in AI usage.
- **Tourism growth:** following the project's implementation, positive trends in tourist arrivals to the region were observed.
- **Improved online destination reputation:** there is increased engagement on social media and online reviews related to tourist experiences in the region.

Lessons learned:

Need of quick adaptation in terms of technological evolution for the IA.

Funding mechanism:

Public budget.

Next plans for further AI integration or innovation:

Continue with strategic digitalization projects in collaboration with the different agents of the tourism ecosystem and the support of the public administration.

- **Ongoing digitalization projects:** Continue collaborating with various agents in the tourism ecosystem to advance digital transformation.
- **Expansion of AI solutions:** Exploring additional AI applications to enhance operational efficiency and customer satisfaction.
- **Sustainability focus:** Integrating AI solutions that contribute to sustainable tourism practices in line with global standards.

Case study 5: Grupo Piñero

Hotel demand prediction through the use of AI

Grupo Piñero, a renowned tourism and hospitality company with operations across multiple destinations, is recognized for its Bahia Principe Hotels & Resorts division. Grupo Piñero has embraced artificial intelligence (AI) to enhance operational efficiency, specifically in hotel demand forecasting. By developing AI-driven occupancy prediction models for its 27 hotels, the company has transformed manual, time-intensive processes into streamlined, data-driven decision-making.

Main category of the impact from the application of AI:

Operational efficiency.

Actions taken for the use of AI:

The main actions taken to start using AI in this project was the construction of 27 models based on AI; more specifically: machine learning, one for each hotel. Later, an algorithm was launched to filter and organize predictions and a data presentation layer (microstrategy) was created to coexist with the rest of occupancy data reporting.

Partners/companies/internal resources involved:

Data protection officer, chief information security officer, operations teams, application teams, customer teams, sales teams and data office.

Specific challenges identified to explore AI solutions:

Anticipating or forecasting trends in occupancy is one of the main challenges that the company's hotel division (Bahia Principe Hotels & Resorts) faces. This is due to the fact that occupancy prediction yields both better decision-making and a better customer experience, as the hotels can better prepare their installations for the expected visitors. For several years, the revenue management team has been manually making occupancy predictions based on the historical information available to them, proving a manual, complex, arduous and risk-prone process. Moreover, the effective distribution of this information to the rest of departments also proved a challenge. With all of this in mind, the project that would implement AI to predict occupancy in the company's 27 hotels was born.

Specific opportunities identified to explore AI solutions:

The opportunity to open a new line of work in which value could be easily extracted from data while liberating teams to facilitate better decision-making was the first thing that Grupo Piñero identified when turning to AI for prediction solutions. The great support from the teams in implementing artificial intelligence in their processes also proved to be key in the first steps of this project.

Achievements and lessons learned:

Grupo Piñero realized how important it is to start AI initiatives that are feasible and how crucial it is to have a high-level sponsor to guide the company through a very complex but rewarding process. Thanks to this, Grupo Piñero has achieved an improvement in customer experience, revenue, adaptation of operating costs to demand, results of marketing investments, profitability and reduction of carbon footprint.

Measurable outcomes:

- Reducing approximately by 50% the time that the commercial team needed to analyse data.
- Accuracy of occupancy predictions by an average of 3%, which translates into a predictive improvement worth USD 20 million annually.

Funding mechanism:

Company's own funds.

How is AI continuing to evolve and shape the future of tourism?

"It is with great certainty that we can affirm that AI will play a significant role in the future of tourism and hospitality. The tools that it yields have the potential to completely alter the way in which we assist employees to not only be more productive but far more strategic for the company, eliminating tedious manual data entry tasks and allowing for our talent to evolve and grow with us. AI has also already started creating new sales channels, as well as new formats in which people seek vacations; as the general population becomes more and more familiar with enhanced technologies, the tourism sector will have to adapt accordingly to meet new expectations. From our side, we now have the opportunity to facilitate access to our products and services for our customers thanks to what AI can help us achieve, such as better preparation of installations. This also allows for something that many customers already seek in their hospitality experiences, which is an easier adaptation and personalization of our services.""

Next plans for further AI integration or innovation:

"After having started to implement AI in our internal and external solutions, our plan continues to be to design and execute small projects that help us familiarize ourselves with these new tools, and then, continue growing as our understanding grows as well. We also plan to continuously train our teams on the use of this technology, creating a strong team that is versed in Generative AI and ML disciplines to help us achieve our goals."

© Grupo Piñedo

Case study 6: JTB Corp.

Introducing Japan's first generative AI-powered multilingual chatbot for tourist information

JTB Corp., one of Japan's leading travel and tourism companies, in collaboration with the Osaka Convention & Tourism Bureau (OCTB) and the Kotozna Corporation, introduced Japan's first generative AI-powered multilingual chatbot, ***Kotozna laMondo.*** This solution enhances the customer experience by addressing language barriers for international tourists, offering 24/7 multilingual support across more than 20 languages.

Main category of the impact from the application of AI:

Customer experience.

Actions taken for the use of AI:

The Osaka Convention & Tourism Bureau (OCTB), a public interest incorporated foundation, has replaced its existing AI chatbot on OSAKA-INFO (Osaka's official tourist information website) with a generative AI chatbot capable of handling more than 20 languages – the first of its kind in Japan – enhancing multilingual acceptance capabilities for the rapidly growing number of foreign visitors to Japan.

Kotozna laMondo, a multilingual AI chatbot provided by Kotozna Corporation in collaboration with JTB Corp. has been introduced to OSAKA-INFO in October 2023, and has also been incorporated into Discover Osaka, the official tourism application of the OCTB.

In preparation for the Expo 2025 Osaka, Kansai, the OCTB will use generative AI chatbots to improve the convenience of multilingual inquiries at tourist information and call centres, and to save labour in the management of tourist information, thereby improving hospitality for and satisfaction of foreign visitors coming to Osaka.

Partners/companies/internal resources involved:

- The Osaka Convention & Tourism Bureau.
- Kotozna laMondo, a multilingual AI chatbot provided by Kotozna Corporation.

Achievements and lessons learned from the use of AI:

- **Improvements in customer experience:** Adapted for the OCTB in collaboration with JTB Corp., Kotozna laMondo introduced its GenAI-powered digital ambassador, which has significantly enhanced the customer experience at tourist information centers, attractions and malls across Japan and beyond. By providing multilingual support 24/7, it addresses the common language barriers faced by international tourists, ensuring they receive accurate and personalized assistance at any time. This dramatically reduces wait times and enhances overall satisfaction. AI's capability to handle complex inquiries with human-like interactions creates a seamless and engaging experience, which fosters a deeper connection with visitors and improves their overall experience, aligning with Japan's high standards for hospitality.

- **Improvements in operational efficiency:** Operational efficiency has seen dramatic improvements with the deployment of Kotozna laMondo in Japan's tourism and hospitality sectors. The GenAI solution automates routine customer service tasks, efficiently managing large volumes of inquiries without requiring proportional increases in staffing. This leads to significant cost savings and allows human employees to focus on more complex and strategic tasks, enhancing productivity. By scraping live website data, laMondo keeps its training process simple and up to date, reducing the need for manual updates. Additionally, by reducing the volume of emails, calls and contact form submissions, laMondo lightens the workload on human agents while maintaining a high level of personalized customer service, which is crucial in Japan's service-oriented culture.

- **Revenue generation:** Kotozna laMondo has had a substantial impact on revenue generation by increasing customer engagement and satisfaction, which drives repeat business and loyalty. The ability of the AI to upsell and cross-sell services based on individual customer preferences has led to higher sale volumes. Personalized recommendations provided by laMondo encourage visitors to spend more, as they feel the suggestions are specifically tailored to their interests. This targeted approach not only enhances the guest experience but also maximizes revenue potential by optimizing every customer interaction. Additionally, by improving service efficiency, laMondo helps reducing operational costs, further contributing to the bottom line.

- **Sustainability:** The implementation of Kotozna laMondo supports sustainability efforts by optimizing resource usage and minimizing waste. The precise and timely information delivery of the AI reduces the need for printed materials, significantly lowering paper consumption. Traditional methods of providing information to guests, such as brochures, maps and other printed materials, often result in significant waste and environmental impact. By offering digital, real-time information through laMondo, organizations can substantially decrease their reliance on these physical resources, leading to a more sustainable operation. This aligns with Japan's growing focus on sustainability and environmental responsibility.

Funding mechanism:
Organization's own funds.

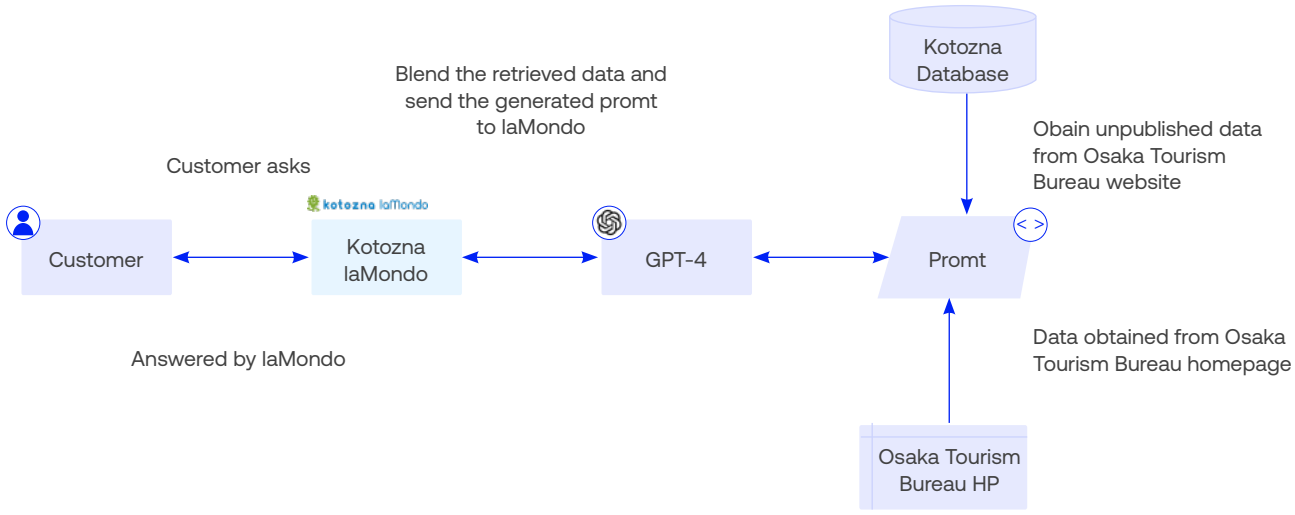
Osaka Castle, Japan. © Cowardlion | Dreamstime.com

How is AI continuing to evolve and shape the future of tourism?

"Business development without AI is impossible to imagine. Therefore, collaboration with AI-savvy business partners and employees will be more important than ever. Many of JTB Group's customers are already technologically savvy, using their smartphones and other devices to research and book travel. Yet a part of our organizational mindset still seems to cling to our 'analog' past and tends to underprioritize the importance of continually enhancing the customer's online experience. With Web 3.0, the frontiers of the metaverse are gradually expanding and more and more companies are using blockchain technology to roll out new services.

Before we turn our attention to the future, we must first acknowledge that many of our customers already use their phones and applications to get information and get things done. We must also recognize that AI is quickly working its way into the fabric of our lives. Within a few years, many things in our lives will be handled by AI."

Kotozna laMondo system diagram



Case study 7: Madrid Destino

VisitMadridGPT

Madrid Destino, the tourism arm of Madrid's City Council, developed VisitMadridGPT, a virtual assistant providing personalized travel recommendations. As the first AI project by a destination management organization (DMO) in Spain, it supports visitors in 95 languages, offering quick information to improve the overall travel experience in Madrid.

Main category of the impact from the application of AI:

Customer experience.

Actions taken for the use of AI:

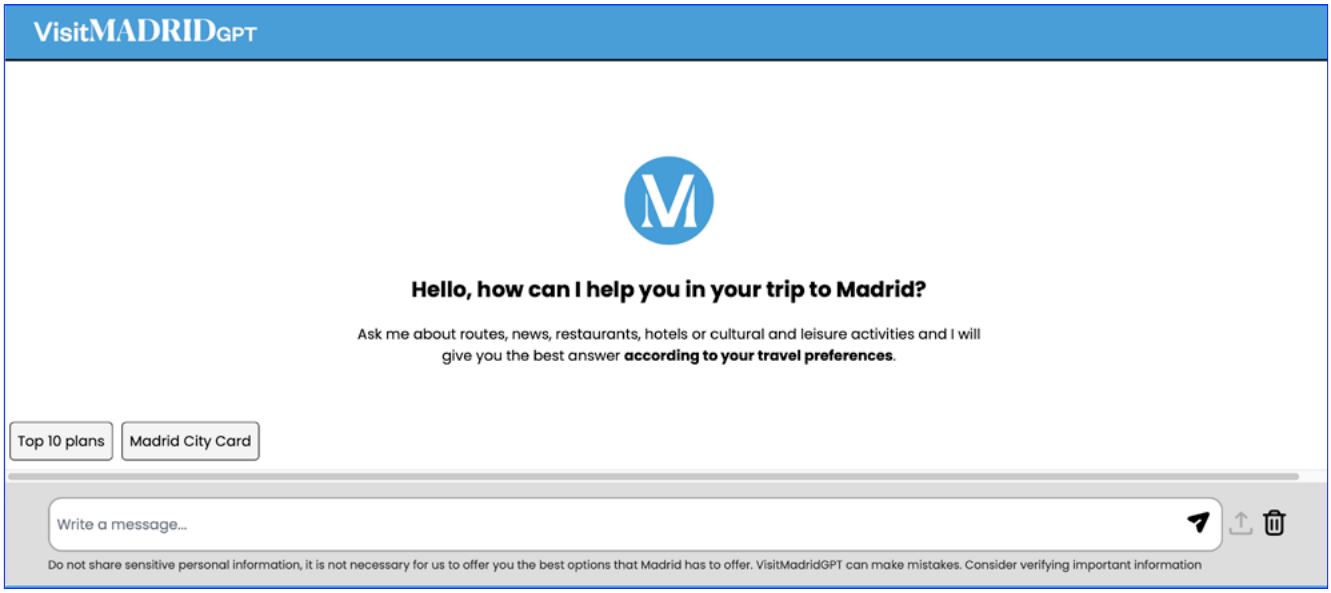
- Developing a proprietary virtual assistant to provide personalized recommendations based on visitor profiles is a key focus. For this assistant the aim is to be accurate, reliable and fast in delivering tailored suggestions.
- This project was the first launched from a destination mamagement organization (DMO) in Spain.

Partners/companies/internal resources involved:

iUrban (developers), Strategic Marketing Department Team (Madrid Destino).

Specific challenges identified to explore AI solutions:

- Limited availability of companies providing fine-tuning and developing personalized virtual assistants specifically for the tourism sector; and
- Lack of internal knowledge capacity on AI solutions.



Rooftop restaurant in Marid, Spain.
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Achievements and lessons learned from the use of AI:

Madrid's DMO reported that the development of the virtual assistant required extensive fine-tuning, testing and dedication to ensure it delivered responses as intended. Despite the advanced capabilities of AI, crafting the assistant's personality to align with the desired visitor experience was essential. Additionally, it was crucial that the data facilitated through Madrid's official website showed reliabile information.

To provide comprehensive answers, the model was also allowed to source information beyond the website, gaining additional context where necessary. Furthermore, ability of the assistant to respond in 95 languages quickly was a significant feature, enhancing its value to visitors.

Measurable outcomes or success metrics resulting from the implementation of AI:

- 7.300 visits in three months to visitmadridgpt.esmadrid.com/chat;
- 4.500 unique users;
- 1.6 visits per user;
- 35% bounce back only; and
- Visits from the five continents.

Funding mechanism:

Madrid Destino funds.

Next plans for further AI integration or innovation:

"A new digital ecosystem is about to be implemented, incorporating various integrated technologies, including AI. The goal is to pioneer innovative methods for promoting the destination more effectively and personally, with AI playing a crucial role in achieving this vision."

Case study 8: Meliá Hotels International

Personalization of online marketing audiences: tailoring experiences to each customer and their preferences

Meliá Hotels International, a global hospitality leader, is utilizing artificial intelligence (AI) to personalize customer experiences across its online platforms and contact centers. By implementing AI-driven tools, such as a real-time hotel recommendation system and tailored marketing strategies, Meliá enhances engagement and conversion rates.

Main category of the impact from the application of AI:

Customer experience.

Actions taken for the use of AI:

A real-time hotel recommendation system is being implemented to offer tailored suggestions for each customer based on their preferences. This includes the use of first-party cookies to personalize the website experience, adjusting certain components to align with individual user preferences.

Additionally, personalization extends to the Contact Centre, where customers are directed to the most suitable group of agents for their specific needs. Upselling offers at hotels are also being personalized to enhance the relevance and appeal of the promotions presented.

An AI-driven Q&A system is in development to assist clients in obtaining information about hotels. This system pulls data from the CMS Magnolia to simplify the search and retrieval of relevant hotel features for both customers and employees. Currently, the system is being tested within the Social Care, Contact Center and Gex service teams, and its effectiveness is being evaluated to identify further use cases.

Partners/companies/internal resources involved:

Melia Data Science, Digital Marketing and Web Development teams.

Specific challenges identified to explore AI solutions:

One of the biggest challenges in this project and for the use of AI is managing the transfer of large volumes of data from the Data Lake to the Data Management Platform.

Specific opportunities identified to explore AI solutions:

Meliá Hotels International offers more than 350 hotels on its online platforms, each with distinct characteristics such as brand, category, location, facilities, services or room types. To effectively highlight the hotels that align with individual customer interests, the use of AI presents a significant opportunity to enhance marketing strategies.

Achievements and lessons learned from the use of AI:

The main lesson learned is the importance of utilizing different AI models simultaneously to cater to various customer types.

Meliá Hotel in Hanoi, Viet Nam
© Iainhamer | Dreamstime.com

Measurable outcomes or success metrics resulting from the implementation of AI:

This project, utilizing AI, has led to both increased click-through and conversion rates. Additionally, by using a control group, it is possible to monitor the overall revenue generated from the personalization efforts.

Funding mechanism:

Company's own funds.

Next plans for further AI integration or innovation:

"Additionally, the development of a project known as the 'Marketing Mix Modeler' is underway to optimize marketing investments. Originally developed in collaboration with KPMG, the majority of the work is now handled internally. This model begins by making time series predictions based on each marketing partner's investment. It then allows for the simulation of outcomes for various investment levels with each partner. The final product is a simulator that forecasts revenue outcomes for different marketing mix scenarios, both for future months and to assess what might have occurred with different investment levels in previous months.

"In the coming years, the focus will be on continuing to develop new projects and evolving those currently in progress."

Case study 9: NEOM

Building cognitive empathy at scale using Arena's Human Behaviour Foundation Model

NEOM, a futuristic urban development in Saudi Arabia, in collaboration with Arena Technologies, has introduced the Arena OneBrain system – an AI-powered personal concierge integrated into the Visit NEOM App and Booking and Distribution System. Leveraging advanced technologies like the Large Human Behaviour Model (LXM) and Real-time Adaptation Engine, the system personalizes travel planning, enhances activity recommendations and refines guest experiences.

Main category of the impact from the application of AI:

Customer experience.

Partners/companies/internal resources involved:

NEOM Tourism and Arena Technologies.

Actions taken for the use of AI:

NEOM and Arena have developed an AI-based personal concierge, the Arena OneBrain system, which has been integrated into the Visit NEOM App and the Booking and Distribution System.

OneBrain consists of two core technologies: the Large Human Behaviour Model (LXM) and the Real-time Adaptation Engine. The LXM analyses human behaviour using data from thousands of products and millions of consumers and travellers. The Real-time Adaptation Engine refines the LXM in real time, selecting the best decisions for specific contexts. It continuously acquires new information and adjusts to changes and new traveller preferences as they arise.

Arena has installed, configured and integrated various components of the platform within NEOM systems, such as data, bookings, distribution and Visit NEOM application. Additionally, the company has ingested corpora of human expertise in the form of unstructured oral and verbal data and connected to real-time user experiences. This was achieved in just 0 days, demonstrating the first proof-of-intelligence for this novel user experience in the VisitNEOM App.

Specific challenges identified to explore AI solutions:

NEOM aims to leverage data and AI to offer a highly personalized experience through a unified smart travel booking engine, understanding tourists' preferences and plans, with their consent. The AI has two main functions:

- Being a travel assistant to help tourists decide what to do, when to do it, and manage their trip; and
- Being an orchestrator that personalizes experiences (beyond invasive tracking or broad use of metadata, demographics, or personally identifiable information) by sharing relevant behaviour data with partners, allowing them to tailor services to each tourist's needs.

Measurable outcomes or success metrics resulting from the implementation of AI:

Although still in the proof-of-concept stage, the AI assistant has demonstrated potential to enhance activity bookings and improve NEOM's overall Net Promoter Score (NPS), garnering positive feedback from test users, operators and NEOM guest services. By offloading routine tasks, it frees up staff to focus on crucial aspects of guest satisfaction and business operations. The assistant is anticipated to strengthen NEOM's relationships with guests by helping them understand their needs and continuously refining NEOM's services. It has been able to transform the booking experience by eliminating minutes or hours of friction, forms and frustration, thereby delighting future visitors with prompt answers, guidance and empathy in just seconds.

Lessons learned:

1. For better conversion rates, recommend activities with complete details like time, participants, transport and budget, options that need a simple "yes" or "no" from guests are more effective.

2. Context is more important than preferences when making effective recommendations. The more the AI understands the guest's context, the more accurate and relevant its suggestions become, resulting in higher booking conversions. NEOM's integrated city design significantly enhances the AI assistant's ability to understand and utilize contextual information.

3. Creating memorable moments for guests involves proactive care and timely, smart notifications. While personalization is essential, the timing and delivery of these interactions are crucial for meeting the high expectations of guests.

4. AI learns much faster than humans, processing weeks' worth of human learning in minutes. This fast learning is useful, but the challenge lies in unlearning outdated information and maintaining accuracy.

5. Privacy is a key consideration in designing the AI assistant. It is essential that users have control over their data, including decisions on what to share, with whom and for what purpose. Significant effort has been invested in safeguarding user identities and preventing data misuse.

Funding mechanism:

NEOM funds.

Next plans for further AI integration or innovation:

"The human behaviour model integrated into NEOM's visitor solution will function as the synaptic scaffolding, connecting all human interactions across both digital and physical experiences. This integration is designed to ensure visitors encounter highly personalized "Moments of Wow" throughout their journey. The Arena platform is being deployed extensively, starting with the AI Visitor Assistant, which will be available across all digital experiences and destinations within NEOM.

"Furthermore, Arena's platform will create synthetic AI training environments. These environments are intended to prepare future frontline service providers for visitor interactions, supporting the development of a strong service culture and enhancing staff training."

Case study 10: Tripadvisor

Revolutionizing travel reviews: Tripadvisor's AI-driven summaries

Tripadvisor, a leading online travel platform, has introduced Review Summaries, an AI-powered feature designed to enhance customer experience by providing concise overviews of traveller reviews. Using generative AI and large language models (LLMs), the feature summarizes key quality attributes such as cleanliness or location, offering users quick insights while preserving the authenticity of traveller feedback.

Main category of the impact from the application of AI:

Customer experience.

Actions taken for the use of AI:

Tripadvisor has introduced Review Summaries, a new AI-powered feature that offers concise overviews of recent traveller reviews on hotels, focussing on specific quality attributes identified by users. This feature allows users to quickly understand key aspects, such as a hotel's cleanliness, by reading a summary generated from traveller reviews. Additionally, users can skim through direct quotes from reviews that contributed to the summary, ensuring that the original voice and perspective of travellers are preserved.

This feature leverages cutting-edge generative AI and Large Language Models (LLMs) to analyse and condense vast amounts of review data, making it easier for users to access relevant information without sifting through extensive individual reviews.

Partners/companies/internal resources involved:

Improvements like this are always the result of a collaborative effort. While the focus here is on the machine learning aspect, the success of this project is also due to the significant contributions from various teams, including SEO, Design, User Research, Analytics, QA, MLOps and Web Engineering. Each of these teams plays a crucial role in bringing this and similar projects to life, ensuring that every element – from functionality to user experience – is carefully crafted and optimized.

Specific opportunities identified to explore AI solutions:

Each month, hundreds of millions of visitors rely on Tripadvisor for personal insights and recommendations across nearly 9 million restaurants, hotels and attractions worldwide. The vast collection of long-form user reviews is the foundation of the trust travellers place in Tripadvisor. Now, with advancements in AI models, this content can be effectively summarized in a way that remains transparent and impartial, enhancing the user experience while preserving the authenticity of traveller feedback.

Achievements and lessons learned from the use of AI:

- **Simplifying travellers's search with AI**
  When searching for a hotel for their next vacation, travellers often prioritize a clean room and a quiet environment to ensure a good night's sleep. Those who are meticulous about booking their accommodations might spend considerable time reading reviews and comparing different properties

to find the ideal place to stay. To assist with this process, Review Summaries now present valuable traveller insights in a clear and practical format, with easy access to original traveller quotes.

When users click on frequently visited hotel properties, they may notice a "Traveller Insights" section similar that includes a Review Summary feature on Tripadvisor displaying an AI-generated summary.

This summary is carefully crafted based on attribute summaries created for each quality aspect. It reflects the overall, unbiased opinions of users, highlighting what they value most. The summaries are designed to be easy to read, appropriately detailed, and based solely on quotes from reviews, ensuring impartiality and accurate representation of user experiences.

Also, a set of quality attributes is shown along with a single-word opinion (e.g., Cleanliness: Immaculate) to give a quick sense of user sentiment about the property. These attributes were selected because they align with the values that users prioritize when assessing accommodations. The one-word opinion provides a concise, unbiased snapshot of the property, reflecting the collective judgment of users.

Users can click on any of the attributes to access a summary describing how that attribute – such as cleanliness, value or location – applies to the property. Additionally, users can delve deeper by reading the actual quotes and complete reviews that were used to generate the attribute summary.

- **Building AI-driven summaries**

  A popular hotel on Tripadvisor.com may have thousands of existing reviews, making it challenging to present this content in a meaningful way. To address this, extensive user research and a recent large-scale customer survey were utilized to develop two types of summaries: (i) a detailed overall summary and (ii) a succinct attribute summary. By listening to users and analysing their feedback, Tripadvisor aimed to accommodate a diverse range of user preferences.

  The objective of the Review Summaries was to present the content in an easily digestible format while capturing the broad spectrum of both positive and negative opinions without favouring one side or introducing bias into the AI. Recognizing the high level of trust users place in Tripadvisor reviews, the new feature was designed to maintain transparency and impartiality.

  This approach underscores Tripadvisor's commitment to providing trustworthy and insightful content that accurately reflects the real experiences of travellers worldwide.

Measurable outcomes or success metrics resulting from the implementation of AI

- **Choosing the right attributes**

  The process began with identifying key review elements based on insights from the Power of Reviews report.[114] This comprehensive survey, which involved 6,000 users across five continents, provided valuable information on how travellers perceive review content and how it influences their vacation planning. The findings were crucial in enhancing the understanding of travellers' decision-making processes.

  The report highlighted the top review elements most valued by users when evaluating accommodations. These insights offered a clear understanding of what travellers prioritize when choosing a place to stay. As a result, these elements were selected as the basis for the review attributes used in the summarization process.

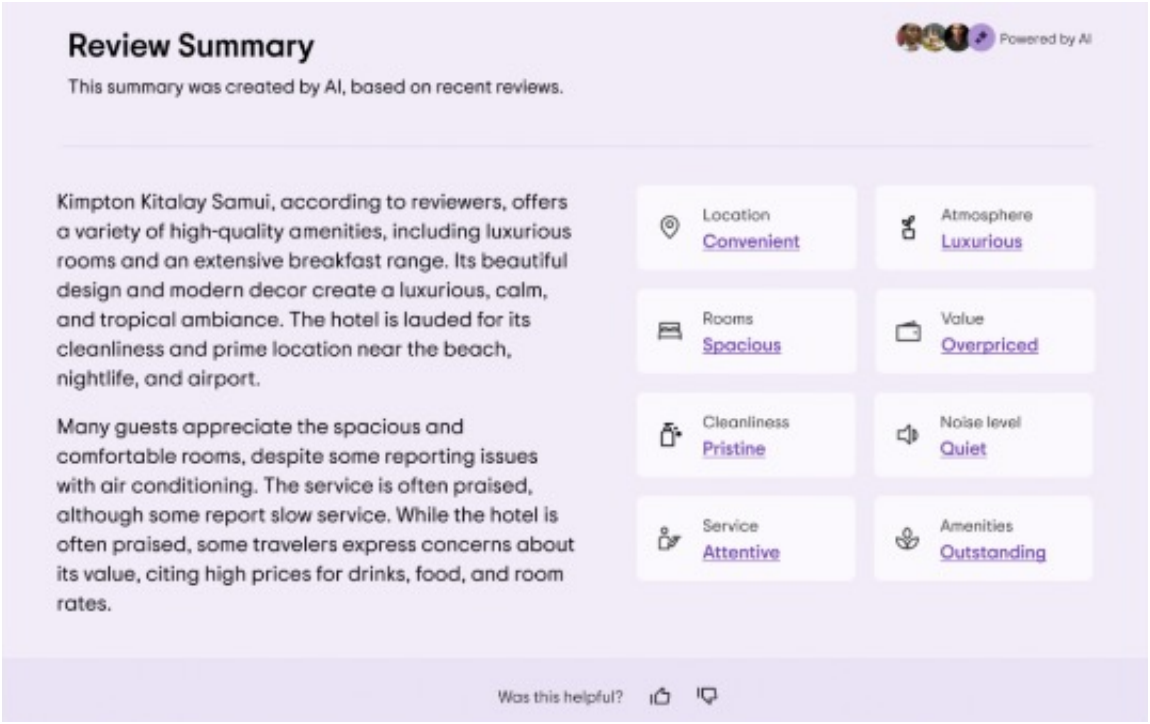
- **Choosing the right data**

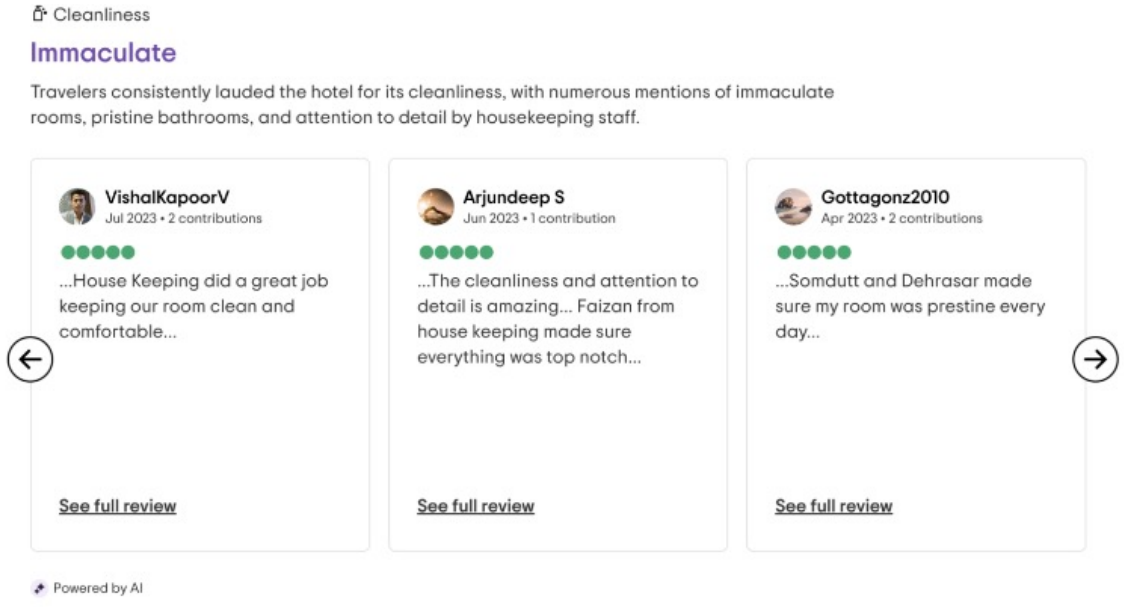
  In the Power of Reviews report, users indicated a strong preference for the most recent information from fellow travellers. As a result, summaries are only generated for properties that have a sufficient number of recent reviews to provide a comprehensive range of feedback.

114 Tripadvisor (2019), *The Power of Reviews: How online feedback influences traveler decisions*, available at: https://tripadvisor.mediaroom.com/2019-07-16-Online-Reviews-Remain-a-Trusted-Source-of-Information-When-Booking-Trips-Reveals-New-Research [31-10-2024].

Additionally, review summaries are created only for properties where an adequate number of attributes are discussed in the reviews. The Insight section is not produced if the reviews do not provide enough support for the relevant attributes, ensuring that the summaries are both relevant and substantiated by user feedback.

Funding mechanism:
Company's own funds.





Case study 11: Vienna Tourist Board

See the art behind AI art

The Vienna Tourist Board embraced artificial intelligence (AI) to create a unique and engaging campaign showcasing Vienna's rich artistic heritage. Featuring AI-generated reimaginings of iconic works by Klimt, Schiele and Bruegel – with their figures replaced by cats – the campaign juxtaposed these playful creations with the originals. Displayed on billboards and in digital media across major cities in the United States of America, such as Times Square in New York, the project aimed to highlight Vienna's unparalleled cultural significance. Using AI tools like Midjourney, DALL-E 2 and Topaz Gigapixel, the campaign blended technology with tradition, sparking conversations about AI art, copyright and the enduring value of human creativity.

Main category of the impact from the application of AI:

Customer experience.

Partners/companies/internal resources involved:

Leopold Museum, Kunsthistorisches Museum, Belvedere.

Actions taken for the use of AI:

The Vienna Tourist Board rolled out a campaign featuring AI-generated works of famous painters found in Vienna – like the world's largest collection of works by Klimt, Schiele and Bruegel – replacing their iconic figures with cats. These AI artworks were juxtaposed with the originals and showcased on billboards and in print and online ads in major cities of the United States of America. The AI tools used included Midjourney for creating the basic artwork, Dall-E 2 for extending the images, and Topaz Gigapixel for scaling up for large displays like Times Square billboards. In short videos historian Markus Hübl explains AI, Viennese art, and their intersection in UnArtificial Art.

With this project the Vienna Tourist Board wants travellers of all generations to understand and appreciate the cultural significance of its many museums.

This new campaign echoes its 2018 #ToArtItsFreedom about censorship, and its 2021 campaign that exposed works of arts on a new Only Fans account, which shows how Vienna is in touch with its past and in line with its future.

Specific challenges and opportunities identified to explore AI solutions:

The campaign aims to show that AI art is only possible because an algorithm references real works made by real humans, and the originals can often only be seen in Vienna.

One major point of discussion is the potential copyright infringement by AI tools. Although Klimt and Schiele's works are no longer under copyright protection, many protected artworks are used for training AI models.

Another challenge was finding the right balance between showcasing AI's possibilities and honouring real artists' accomplishments. This was especially difficult at the outset, as it was unclear what the limitations of current AI models were and if the idea was feasible.

Lessons learned:

Three main takeaways from this case are:

1. Be playful like a cat: Having fun while trying new things can lead to unexpected results and accelerates the learning process;

2. Steal like an artist: Don't be a copycat but take inspiration from various sources and combine them in new and surprising ways; and

3. Stay on the ball: With fast-paced technological trends, it's crucial to follow developments and regularly challenge your judgments. But more importantly, don't get distracted from what truly matters.

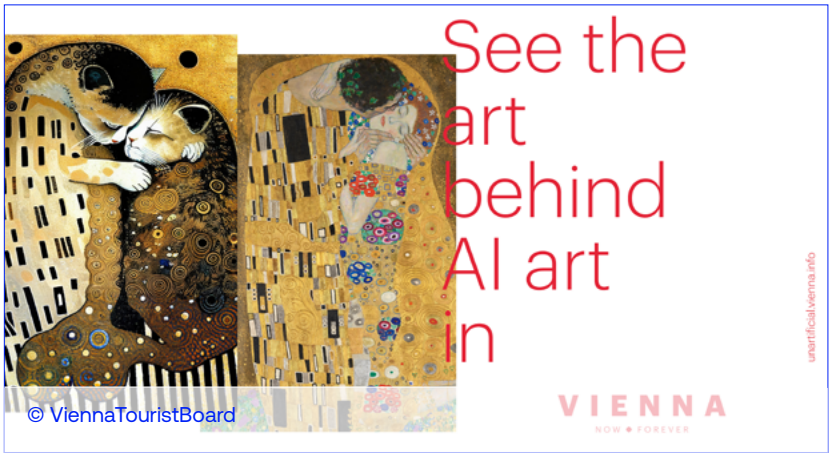
Measurable outcomes or success metrics resulting from the implementation of AI:

The campaign gained a reach of about 120 million people. Judging by the lower-than-average costs (e.g., cost per mille, cost per view, the audience was highly interested in the message. The campaign also sparked a controversial discussion about the nature of AI art and the value of real artists.

Funding mechanism:

Vienna Tourist Board funds.

© ViennaTouristBoard/Michael Nagle



© ViennaTouristBoard

Case study 12: Visit Benidorm

AI marketing for content creation and tourism marketing

Visit Benidorm, the destination management organization (DMO) of Benidorm, one of Spain's most visited coastal destinations, has strategically integrated artificial intelligence (AI) to enhance operational efficiency, particularly in social media and digital engagement. Despite Benidorm being a smaller destination, Visit Benidorm has leveraged AI to achieve significant impact in digital engagement and operational efficiency. Through tools like AI chatbots, personalized travel recommendations and search engine optimized content, Visit Benidorm has enhanced visibility, streamlined processes and improved customer interaction, demonstrating how AI can help even modest destinations achieve big results.

Main category of the impact from the application of AI:

Operational efficiency – social media.

Actions taken for the use of AI:

Visit Benidorm developed AI-powered chatbots to improve customer engagement on their website. They created an AI-assisted travel recommendation system to provide personalized travel suggestions to visitors interested in Benidorm.

They also enabled the translation of video content into different languages to cater to a diverse audience. The DMO additionally developed search-engine-optimized blog content through AI-driven keyword analysis, ensuring higher visibility and search engine ranking

Partners/companies/internal resources involved:

Visit Benidorm independently explores and implements AI tools without external partnerships. Their internal resources include a dedicated marketing team and an IT department that collaboratively evaluate and integrate AI technologies for content creation and marketing. They focus on self-testing various AI tools to determine their effectiveness and suitability.

Specific challenges identified to explore AI solutions:

- Selecting the appropriate AI tools, considering that some are paid services and may not fit Visit Benidorm's budget constraints;
- Integrating AI tools seamlessly with existing marketing platforms; and
- Keeping up with the continuous training required to stay updated with new AI developments and innovations.

Specific opportunities identified:

- Enhancing content personalization for different audience segments;
- Creating more engaging and interactive content using AI-generated graphics, voices and videos;
- Increasing productivity in video editing and creative processes such as scriptwriting and generating ideas; and
- Providing 24/7 support to website visitors through AI-powered chatbots, improving customer engagement and satisfaction.

Achievements:

- Increased engagement on social media platforms and on the reach to other users;
- Reduced content creation time with the help of AI tools;
- More impactful social media campaigns and posts were created, enhancing audience engagement and brand visibility; and
- Enhanced the ability of the DMO to quickly adapt to market trends and consumer preferences through real-time AI analytics.

Measurable outcomes:

- Visit Benidorm's chatbot has received inquiries from visitors in 18 different countries, indicating a broad international reach;
- AI-generated posts from the past year are among those with the highest reach and engagement;
- Significant reduction in operational costs related to content creation and marketing efforts; and
- Visit Benidorm's blog experienced a significant growth in 2023 compared to 2022, with total views increasing by 109% and total visitors increasing by 153.9%, thanks to SEO-optimized post generation through AI.

Lessons learned:

- Continuous training and upskilling of staff are crucial for maximizing the benefits of AI;
- It is essential to regularly evaluate the performance of AI tools and adjust strategies accordingly; and
- Filtering through the huge quantity of AI applications available in the market to identify the most useful for each DMO strategy is important.

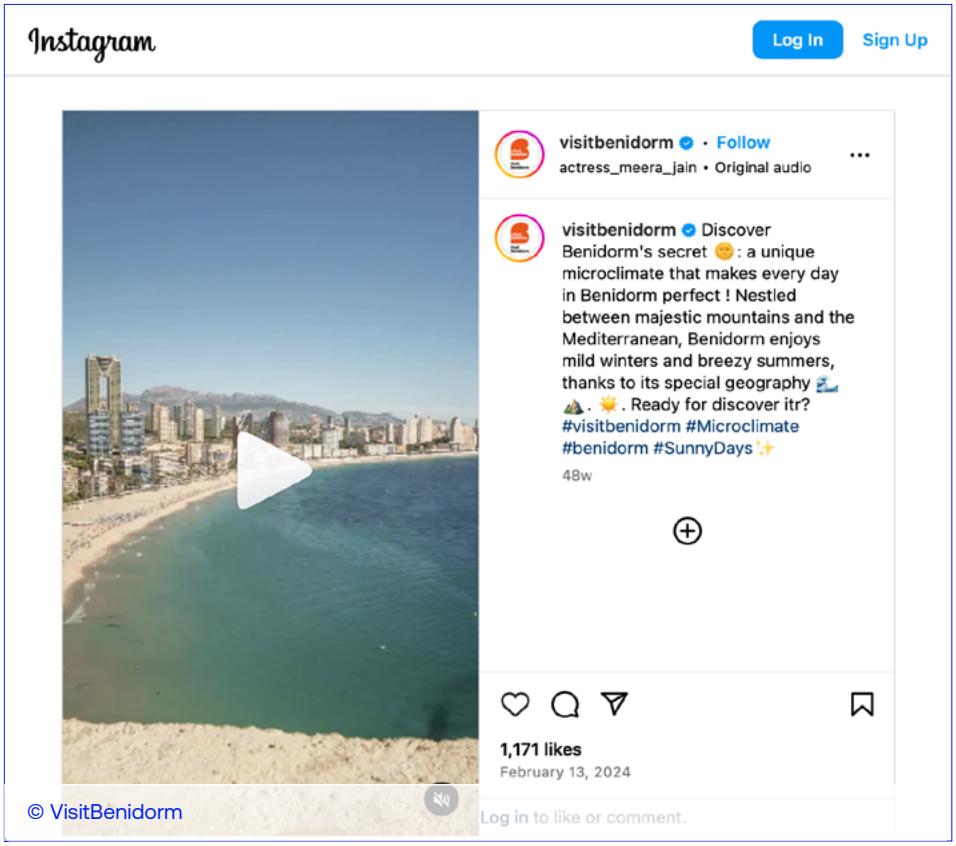
Funding mechanism:

Visit Benidorm funds, mixed public-private and non-profit organisation.

© VisitBenidorm

Next plans for further AI integration or innovation:

"Our organization plans to further integrate AI by expanding the use of AI-powered tools for content creation and marketing. We aim to implement more advanced predictive analytics to enhance our understanding of visitor trends and preferences. We also plan to improve our AI-driven chatbot capabilities to provide even more personalized and efficient customer service. Additionally, we are exploring the use of AI for augmented reality (AR) experiences to offer virtual tours and interactive content, enhancing the visitor experience. A significant focus will be on improving our metaverse, BenidormLand, with the use of AI, to create more immersive and engaging virtual experiences. We are also focussing on obtaining more specific data on tourists to enable hyper-personalization, ensuring that each visitor receives tailored recommendations and experiences based on their unique preferences and behaviours. Continuous training and upskilling of our team will be a priority to ensure we leverage the latest AI innovations effectively."



Annex: UN Tourism – leading the way in AI integration in global tourism

Tourism is often regarded as one of the most human-centric sectors, relying heavily on direct interactions, experiences and cultural exchanges. As a result, it holds immense potential to rapidly evolve through technological advancements like artificial intelligence (AI). UN Tourism is at the forefront of this transformation, driving the integration of AI into the tourism sector to enhance and innovate global tourism practices and in supporting its member states in integrating its development for a better, more sustainable, resilient and responsible sector.

Through its leadership roles, collaborations with other international agencies and commitment to research, UN Tourism is setting the stage for a future where AI revolutionizes the way tourism operates, while ensuring that human connection remains at its core.

Leadership in AI within the UN system

As the UN specialized agency responsible for tourism, UN Tourism plays a significant role in leading AI-driven initiatives across the global framework of the United Nations. UN Tourism, under its current mandate, has positioned itself as a leader in the integration of AI, not only for the tourism sector but also for contributing to broader UN efforts in technology and digital transformation. Its leadership is evidenced through its active involvement in key task forces and advisory groups, focussed on AI governance, ethical use and the practical application of AI technologies across various sectors:

- **High-Level Committee on Programmes (HLCP) UN Interagency Working Group on AI (IAWG-AI):** As a member of this working group, UN Tourism contributes to discussions on AI governance and programmatic coordination across the entire UN system. This collaboration ensures that AI policies and practices are coherent and aligned with the needs of various UN agencies. Against this background, the *United Nations System White Paper on AI Governance* was developed following a system-wide collaborative process.

  Link to this Committee:
  United Nations System White Paper on AI Governance | United Nations - CEB

  For more information, consult:
  United Nations System White Paper on AI Governance.pdf
  Governing AI for Humanity Report – September 2024

- **High-level Committee on Management Task Force to Develop a System-wide Normative and Operational Framework on the use of AI in the UN System HLCM Task Force on AI:** UN Tourism collaborates with this task force to help develop a system-wide normative and operational framework for AI use across the UN. The goal is to create a

unified approach to AI adoption that is ethical, sustainable and aligned with human rights and transparency principles.

Link to this Committee:
Artificial Intelligence | United Nations – CEB

For more information, consult:
Report on the Operational Use of AI in the UN System.pdf

- **AI for Good Partnership:** As part of this partnership, UN Tourism collaborates with over 40 UN agencies to harness AI's potential in addressing global challenges. By integrating AI into tourism, UN Tourism is exploring innovative ways to enhance sustainability, efficiency and inclusivity within the industry.

  Link to this Committee:
  AI for Good – All Year Always Online

  For more information, consult:
  Reports and Publications – AI for Good

- **ITU Focus Group on Metaverse and AI:** As chair of this group, UN Tourism leads efforts to explore how AI and metaverse technologies intersect with tourism. The metaverse holds potential for creating immersive tourism experiences, redefining the future of travel through virtual environments and AI-powered interactions.

  Link to this Committee:
  ITU: Committed to connecting the world

  For more information, consult:
  ITU Focus Group on metaverse (FG-MV)

- **ITU Task Force on the Metaverse:** UN Tourism also chairs this task force, guiding UN exploration of metaverse applications and ensuring that AI remains a core component of this transformative technology.

  Link to this Committee:
  ITU: Committed to connecting the world

  For more information, consult:
  ITU Focus Group on metaverse (FG-MV)

- **ITU Focus Group on metaverse (FG-MV)** *United Nations System White Paper on AI Governance:* UN Tourism participated in this analysis of institutional models of the UN system, its functions and existing international normative frameworks applicable to AI governance.

  Link to this publication:
  ITU Focus Group on metaverse (FG-MV)

  For more information, consult:
  ITU: Committed to connecting the world

- H**igh-Level Advisory Body on Artificial Intelligence:** UN Tourism supports the work of this body that provides strategic guidance on how AI can be leveraged to support global development, particularly in advancing the Sustainable Development Goals (SDGs). UN Tourism has an advisory role, contributing its insights on how AI can transform tourism and other key sectors.

  Link to this Committee:
  High-Level Advisory Body on Artificial Intelligence | Office of the Secretary-General's Envoy on Technology

  For more information, consult:
  News and Resources | Office of the Secretary-General's Envoy on Technology

- **"UN 2.0" of Our Common Agenda:** The Secretary-General António Guterres is advocating for the integration of innovation and new technologies across UN system organizations through "UN 2.0", including AI. UN Tourism is actively integrating innovation and, specifically, AI into its processes and platforms, such as the AI Tutor and Feedback tools of the UN Tourism Online Academy.

  Link to this Committee:
  United Nations | UN 2.0 | United Nations

  For more information, consult:
  UN 2.0 Policy Brief, UN 2.0 | United Nations

Innovation in AI and tourism

Since 2018, UN Tourism has made digital transformation a top priority, positioning innovation as a key driver for the future of tourism. To implement this vision, UN Tourism established the Innovation and Digital Transformation Department, dedicated to promoting AI and other cutting-edge technologies across the tourism landscape. This Department integrates AI holistically across three strategic pillars (innovation, education and investments) ensuring that AI development is seamlessly embedded within every aspect of tourism growth and transformation.

Over the past five years, UN Tourism has launched more than 30 startup competitions and innovation challenges, involving participants from over 150 countries. These initiatives have engaged more than 20,000 participants, spotlighting over 400 top startups with a collective funding of USD 2 billion. Through these efforts, UN Tourism has cultivated a robust ecosystem of innovation, focussing on AI-driven solutions that enhance operational efficiency and promote sustainable tourism practices. This ecosystem continues to evolve through initiatives like the Global Startup Competition, which is designed to identify and support AI solutions that address critical industry challenges.

At the World Travel Market 2024, UN Tourism further solidified its commitment to AI by launching the UN Tourism Artificial Intelligence Challenge, a global competition aimed at sourcing innovative AI-based ideas that push the boundaries of tourism transformation. This competition is part of UN Tourism's broader strategy to integrate AI and digitalization into its core operations, ensuring that tourism remains a tool for positive economic development and sustainability.

To sum up, AI plays a key role in promoting smart destinations that emphasize sustainability and environmental preservation. This is part of UN Tourism's People, Planet, Prosperity initiative, where AI enhances social impact, inclusive tourism and sustainable practices in line with the global Sustainable Development Goals.

UN Tourism's integration of AI into global tourism is setting a new benchmark for innovation and ethical technology use. Through leadership, research and collaboration, it is driving the tourism sector towards a more sustainable, inclusive and technologically advanced future. By supporting AI-driven startups and implementing strategic research initiatives, UN Tourism is ensuring that the benefits of AI extend not only to businesses but also to communities, the environment, and future generations.

Experiencing virtual reality. © Blurf | Dreamstime.com

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